

SECTION 2

Diagnostic Routines

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Diagnostic Routines

PREFACE

The Diagnostic Routines list the components and systems that can cause a particular condition in the order of highest probability, ease of repair, and accessibility. These Routines can be used as checklists to detect causes of malfunction.

The order in which the Diagnostic Routines are listed have been carefully organized to include the most frequent faults at the top of each Symptom List and least frequent at the bottom. In some cases, a system or component is listed ahead of another due to the fact that it is much easier to diagnose and, therefore, less time consuming. Unless the fault is evident, it is recommended that all diagnosis begin with a thorough visual inspection of a suspect 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 symptom(s) are still present.

All references, under the REFERENCE column in each Diagnostic Routine chart, are as follows:

- Section numbers reference a section in this Manual.
- Shop Manuals reference the Powertrain, Chassis and Electrical Shop Manuals.
- Pinpoint Tests reference a particular test in either Part II Mechanical Systems, or in Section 16 of this Manual.
- Test Steps reference the System Diagnosis start point for a particular symptom.

NOTE: When referenced to a Section or a specific Test Step in the Engine/Emissions Diagnosis Manual, look at the visual inspection chart provided prior to test procedure. These charts list obvious fault possibilities that may have been overlooked.

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Diagnostic Routines

201 CRANKS NORMALLY BUT WON'T START

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

System	Component	Reference
Engine Electrical	<ul style="list-style-type: none"> • Fuses • Power Relay(s) 	Section 15
Ignition	<ul style="list-style-type: none"> • Electrical Connections • Secondary Ignition Wires • Ignition Coil • Ignition Module • Distributor Cap and Rotor • Spark Plugs • Ignition Timing • Ignition Switch 	Section 14 Test Step IGN1
EEC	<ul style="list-style-type: none"> • Quick Test • VPWR • INJ • VREF • ECT (Code 9) • IDM (Code 1) • KAPWR • CID (Code 3) • TP (Code 12) 	Section 15 Pinpoint Test VPWR Pinpoint Test INJ Pinpoint Test VREF Pinpoint Test ECT Pinpoint Test IDM Pinpoint Test VPWR Pinpoint Test CID Pinpoint Test TP
Fuel Delivery	<ul style="list-style-type: none"> • Filters • Pump • Water/Dirt/Rust Contamination in Fuel • Lines • Tank (Fuel Supply) • Sender Filter • Pressure Regulator • Inertia Switch • Pump Switch (Integrated with VAF Meter) • Pump Relay • Injectors 	Section 13 Test Step F1
Inlet Air Control	<ul style="list-style-type: none"> • Electrical and Vacuum Connections • Air Cleaner and Duct • Throttle Plates and Linkage • VAF Meter (Binding) 	Section 10 Test Step IA1
Basic Engine	<ul style="list-style-type: none"> • Compression • Camshaft and Valve Train • Timing Belt 	Shop Manual Section 21-01

Diagnostic Routines

202 STARTS NORMALLY BUT WON'T RUN (STALLS)

System	Component	Reference
Vacuum Distribution	<ul style="list-style-type: none"> Leaks 	Visual and Audible
Ignition	<ul style="list-style-type: none"> Electrical Connections Ignition Timing Secondary Ignition Wires Ignition Coil Ignition Module Distributor Cap and Rotor 	Section 14 Test Step IGN1
Fuel Delivery	<ul style="list-style-type: none"> Filters Pump Water/Dirt/Rust Contamination in Fuel Lines Sender Filter Pressure Regulator Pump Relay Pump Switch (Integrated with VAF Meter) Injectors Inertia Switch 	Section 13 Test Step F1
EEC	<ul style="list-style-type: none"> Quick Test ECT (Code 9) VAF (Code 8) INJ CID (Code 3) ISC (Code 34) 	Section 15 Pinpoint Test ECT Pinpoint Test VAF Pinpoint Test INJ Pinpoint Test CID Pinpoint Test ISC
Inlet Air Control	<ul style="list-style-type: none"> Electrical and Vacuum Connections Throttle Plates and Linkage Air Cleaner and Duct Base Idle VAF Meter 	Section 10 Test Step IA1
By-Pass Air Control	<ul style="list-style-type: none"> BPA Valve ISC-BPA Valve 	Section 9 Test Step BPA1
PCV	<ul style="list-style-type: none"> Valve 	Section 11 Test Step PCV1

Diagnostic Routines

203 CRANKS NORMALLY BUT SLOW TO START

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

System	Component	Reference
Vacuum Distribution	<ul style="list-style-type: none"> • Vacuum Leaks 	Visual and Audible
Inlet Air Control	<ul style="list-style-type: none"> • Electrical and Vacuum Connections • Throttle Plates and Linkage • Air Cleaner and Duct • VAF Meter 	Section 10 Test Step IA1
Ignition	<ul style="list-style-type: none"> • Scope engine for: Spark Plugs, Coil, Module, Secondary Wires, Distributor Cap and Rotor • Ignition Timing 	Section 14 Test Step IGN1
Fuel Delivery	<ul style="list-style-type: none"> • Filters • Pump • Water/Dirt/Rust Contamination in Fuel • Sender Filter • Pressure Regulator • Lines • Injectors 	Section 13 Test Step F1
By-Pass Air Control	<ul style="list-style-type: none"> • BPA Valve • ISC-BPA Valve 	Section 9 Test Step BPA1
EEC	<ul style="list-style-type: none"> • Quick Test • ECT (Code 9) • VAF (Code 8) • PRC (Code 25) • INJ • ISC (Code 34) 	Section 15 Pinpoint Test ECT Pinpoint Test VAF Pinpoint Test PRCV Pinpoint Test INJ Pinpoint Test ISC
PCV	<ul style="list-style-type: none"> • Valve 	Section 11 Test Step PCV1
EVAP	<ul style="list-style-type: none"> • Components 	Section 8 Test Step EV1
Cooling	<ul style="list-style-type: none"> • Electric Fan (Hot Start Only) 	Shop Manual Section 27-01
Basic Engine	<ul style="list-style-type: none"> • Compression • Camshaft and Valve Train 	Shop Manual Section 21-01

Diagnostic Routines

204 ROUGH IDLE

System	Component	Reference
Vacuum Distribution	<ul style="list-style-type: none"> Vacuum Leaks 	Visual and Audible
By-Pass Air Control	<ul style="list-style-type: none"> BPA Valve ISC-BPA Valve 	Section 9 Test Step BPA1
Inlet Air Control	<ul style="list-style-type: none"> Electrical and Vacuum Connections Air Cleaner and Duct Base Idle Throttle Plates and Linkage VAF Meter 	Section 10 Test Step IA1
Ignition	<ul style="list-style-type: none"> Scope engine for: Spark Plugs, Coil, Module, Secondary Wires, Distributor Cap and Rotor Ignition Timing 	Section 14 Test Step IGN1
Fuel Delivery	<ul style="list-style-type: none"> Pump Pump Relay Pressure Regulator Injectors Fuel Rail 	Section 13 Test Step F1
PCV	<ul style="list-style-type: none"> Valve 	Section 11 Test Step PCV1
EEC	<ul style="list-style-type: none"> Quick Test ISC (Code 34) TP (Code 12) VAF (Code 8) VAT (Code 10) CID (Code 03) KAPWR MLP PSPS INJ VREF IDL BOO ACS ECT (Code 9) EGO (Code 15 and 17) 	Section 15 Pinpoint Test ISC Pinpoint Test TP Pinpoint Test VAF Pinpoint Test VAT Pinpoint Test CID Pinpoint Test VPWR Pinpoint Test MLP Pinpoint Test PSPS Pinpoint Test INJ Pinpoint Test VREF Pinpoint Test IDL Pinpoint Test BOO Pinpoint Test ACS Pinpoint Test ECT Pinpoint Test EGO
EVAP	<ul style="list-style-type: none"> Components 	Section 8 Test Step EV1
Exhaust	<ul style="list-style-type: none"> Pipes, Muffler, Catalytic Converter 	Section 6 Test Step EX1
Turbocharger	<ul style="list-style-type: none"> Bearings, Compressor, Turbine, Housing 	Section 12 Test Step LP1
Basic Engine	<ul style="list-style-type: none"> Compression Camshaft and Valve Train Intake Manifold 	Shop Manual Section 21-01

Diagnostic Routines

205 MISSES UNDER LOAD

System	Component	Reference
Ignition	<ul style="list-style-type: none"> • Scope engine for: Spark Plugs, Coil, Module, Secondary Wires, Distributor Cap and Rotor • Base Timing Plus Advance and Retard Functions 	Section 14 Test Step IGN1
EEC	<ul style="list-style-type: none"> • Quick Test • ECT (Code 9) • TP (Code 12) • VAF (Code 08) 	Section 15 Pinpoint Test ECT Pinpoint Test TP Pinpoint Test VAF
Fuel Delivery	<ul style="list-style-type: none"> • Filter • Pump • Lines • Pressure Regulator • Sender Filter • Injectors 	Section 13 Test Step F1

206 LOW IDLE (STALLS ON DECELERATION OR QUICK STOP)

System	Component	Reference
Inlet Air Control	<ul style="list-style-type: none"> • Base Idle • Throttle Plates and Linkage • VAF Meter • Dashpot 	Section 10 Test Step IA1
By-Pass Air Control	<ul style="list-style-type: none"> • BPA Valve • ISC-BPA Valve 	Section 9 Test Step BPA1
Fuel Delivery	<ul style="list-style-type: none"> • Pump Switch (In VAF Meter) 	Section 13 Test Step FA6
EEC	<ul style="list-style-type: none"> • Quick Test • IDM (Code 1) • KAPWR • ISC (Code 34) • INJ • IDL 	Section 15 Pinpoint Test IDM Pinpoint Test VPWR Pinpoint Test ISC Pinpoint Test INJ Pinpoint Test IDL

Diagnostic Routines

207 HESITATES OR STALLS ON ACCELERATION

System	Component	Reference
Inlet Air Control	<ul style="list-style-type: none"> • Electrical and Vacuum Connections • Throttle Plates and Linkage • Air Cleaner and Duct • Dashpot • Vane AFM • VAF Meter 	Section 10 Test Step IA1
Vacuum Distribution	<ul style="list-style-type: none"> • Vacuum Leaks 	Visual and audible
Ignition	<ul style="list-style-type: none"> • Scope engine for: Spark Plugs, Coil, Module, Secondary Wires, Distributor Cap and Rotor • Base Timing Plus Advance and Retard Functions 	Section 14 Test Step IGN1
Fuel Delivery	<ul style="list-style-type: none"> • Filter • Pump • Water/Dirt/Rust Contamination in Fuel • Sender Filter • Pressure Regulator • Lines • Injectors 	Section 13 Test Step F1
EEC	<ul style="list-style-type: none"> • Quick Test • ECT (Code 9) • EGO (Code 15 and 17) • IDM (Code 1) • IDL • TP (Code 12) • VAF (Code 8) • KAPWR • INJ • VREF 	Section 15 Pinpoint Test ECT Pinpoint Test EGO Pinpoint Test IDM Pinpoint Test IDL Pinpoint Test TP Pinpoint Test VAF Pinpoint Test VPWR Pinpoint Test INJ Pinpoint Test VREF
Turbocharger	<ul style="list-style-type: none"> • Turbocharger Assembly 	Section 12 Test Step LP1
Exhaust	<ul style="list-style-type: none"> • Components (Restricted) 	Section 6 Test Step EX1

Diagnostic Routines

208 BACKFIRE (INDUCTION OR EXHAUST)

System	Component	Reference
Vacuum Distribution	<ul style="list-style-type: none"> Vacuum Leaks 	Visual and Audible
Ignition	<ul style="list-style-type: none"> Scope Engine for: Spark Plugs, Coil, Module, Secondary Wires, Distributor Cap and Rotor Base Timing Plus Advance and Retard Functions 	Section 14 Test Step IGN1
Basic Engine	<ul style="list-style-type: none"> Compression Check Loose Intake Manifold Intake Manifold Gasket Camshaft Valve 	Shop Manual Section 23-03
EEC	<ul style="list-style-type: none"> Quick Test ISC (Code 34) CID (Code 3) INJ IDM (Code 1) TP (Code 12) VAF (Code 8) 	Section 15 Pinpoint Test ISC Pinpoint Test CID Pinpoint Test INJ Pinpoint Test IDM Pinpoint Test TP Pinpoint Test VAF
Exhaust	<ul style="list-style-type: none"> Components (Restricted) 	Section 6 Test Step EX1
Fuel Delivery	<ul style="list-style-type: none"> Filters Pump Water/Dirt/Rust Contamination in Fuel Lines Pressure Regulator Injectors Sender Filter 	Section 13 Test Step F1

Diagnostic Routines

209 LACK OF POWER

System	Component	Reference
Inlet Air Control	<ul style="list-style-type: none"> • Electrical and Vacuum Connections • Throttle Plates and Linkage • Air Cleaner and Duct • VAF Meter • Shutter Valve and Actuator • Resonance Chamber 	Section 10 Test Step IA1
Ignition	<ul style="list-style-type: none"> • Scope Engine for: Spark Plugs, Coil, Module, Secondary Wires, Distributor Cap and Rotor • Base Timing Plus Advance and Retard Functions 	Section 14 Test Step IGN1
Fuel Delivery	<ul style="list-style-type: none"> • Filter • Pump • Water/Dirt, Rust Contamination in Fuel • Sender Filter • Pressure Regulator • Lines • Injectors 	Section 13 Test Step F1
EEC	<ul style="list-style-type: none"> • Quick Test • CID (Code 3) • VAF (Code 8) • VAT (Code 10) • KAPWR • TP (Code 12) • VPWR • VREF 	Section 15 Pinpoint Test CID Pinpoint Test VAF Pinpoint Test VAT Pinpoint Test VPWR Pinpoint Test TP Pinpoint Test VPWR Pinpoint Test VREF
Exhaust	<ul style="list-style-type: none"> • Components (Restricted) 	Section 6 Test Step EX1
Turbocharger	<ul style="list-style-type: none"> • Turbocharger Assembly 	Section 12 Test Step LP1
Drive Train	<ul style="list-style-type: none"> • Clutch-MTX (Slipping) • Automatic Transaxle • Brakes (Dragging) 	Shop Manual Section 16-01 Section 17-01 Section 12

Diagnostic Routines

210 SURGES AT STEADY SPEED

System	Component	Reference
Vacuum Distribution	<ul style="list-style-type: none"> • Vacuum Leaks 	Visual and audible
Intake Air Control	<ul style="list-style-type: none"> • Electrical and Vacuum Connections • Throttle Plates and Linkage • Shutter Valve and Actuator 	Section 10 Test Step IA1
By-Pass Air Control	<ul style="list-style-type: none"> • BPA Valve • ISC-BPA Valve 	Section 9 Test Step BPA1
Ignition	<ul style="list-style-type: none"> • Scope Engine for: Spark Plugs, Coil, Module, Secondary Wires, Distributor Cap and Rotor • Base Timing Plus Advance and Retard Functions 	Section 14 Test Step IGN1
Fuel Delivery	<ul style="list-style-type: none"> • Pressure Regulator • Pump • Injectors 	Section 13 Test Step F1
EEC	<ul style="list-style-type: none"> • Quick Test • ECT (Code 9) • EGO (Code 15 and Code 17) • EVP • TP (Code 12) • VAT (Code 8) • VAF (Code 10) • VREF • INJ • CID (Code 3) • IDM (Code 1) 	Section 15 Pinpoint Test ECT Pinpoint Test EGO Pinpoint Test EVP Pinpoint Test TP Pinpoint Test VAT Pinpoint Test VAF Pinpoint Test VREF Pinpoint Test INJ Pinpoint Test CID Pinpoint Test IDM
EVAP	<ul style="list-style-type: none"> • Components 	Section 8 Test Step EV1
Turbocharger	<ul style="list-style-type: none"> • Turbocharger Assembly 	Section 12 Test Step LP1

Diagnostic Routines

211 HIGH IDLE (ENGINE DISELS OR KEEPS RUNNING WITH KEY OFF)

System	Component	Reference
Vacuum Distribution	<ul style="list-style-type: none"> • Vacuum Leaks 	Visual and Audible
Inlet Air Control	<ul style="list-style-type: none"> • Base Idle • Electrical and Vacuum Connections • Dashpot • Throttle Plates and Linkage • Air Cleaner and Duct • VAF Meter 	Section 10 Test Step IA1
By-Pass Air Control	<ul style="list-style-type: none"> • BPA Valve • ISC-BPA Valve 	Section 9 Test Step BPA1
Cooling	<ul style="list-style-type: none"> • Overheating 	Routine 218
Ignition	<ul style="list-style-type: none"> • Base Timing Plug Advance and Retard Functions 	Section 14 Test Step ADV2
EVAP	<ul style="list-style-type: none"> • Components 	Section 8 Test Step EV1
EEC	<ul style="list-style-type: none"> • Quick Test • ECT (Code 9) • VAF (Code 8) • ISC (Code 34) • CANP (Code 26) • VAT (Code 10) • PSPS • ACS • BLMT • DEF • HLDT 	Section 15 Pinpoint Test ECT Pinpoint Test VAF Pinpoint Test ISC Pinpoint Test CANP Pinpoint Test VAT Pinpoint Test PSPS Pinpoint Test ACCS Pinpoint Test ELU Pinpoint Test ELU Pinpoint Test ELU

Diagnostic Routines

212 ENGINE NOISE

System	Component	Reference
Squeal, Click, or Chirp	<ul style="list-style-type: none"> • Oil Level (Low) • Valve Train • Drive Belts (Loose) • Belt Driven Components • EEC Solenoids 	Visual and Audible
Rumble, Grind	<ul style="list-style-type: none"> • Belt Driven Components 	Audible
Rattle	<ul style="list-style-type: none"> • Components (Loose) 	Visual and Audible
Hiss	<ul style="list-style-type: none"> • Vacuum Distribution (Leaks) • Inlet Air Control (Leaks) • Spark Plugs (Loose) • Cooling System (Leaks) • Vacuum Operated Components (Leak) 	Visual and Audible
Snap	<ul style="list-style-type: none"> • Secondary Ignition 	Visual and Audible
Rap, Roar	<ul style="list-style-type: none"> • Exhaust System (Leaks) 	Visual and Audible
Light Tapping at One-Half Engine Speed and Non-Varying Frequency	<ul style="list-style-type: none"> • Excessive Valve Train Clearance at Rocker Arm Cam Follower, Valve Stem, Hydraulic Lash Adjuster or Camshaft Lobe(s) 	Shop Manual Section 21-01
Light Tapping as Above but with Varying Frequency Comes and Goes	<ul style="list-style-type: none"> • Sticking Valve(s) 	Shop Manual Section 21-01
Light to Medium Rap: Most Noticeable When Engine is Cold and at Midrange of Engine Speed. Noise Temporarily Reduced When Oil is Added to Affected Cylinder	<ul style="list-style-type: none"> • Excess Piston to Cylinder Bore Clearance (Piston Slap) 	Shop Manual Section 21-01

Diagnostic Routines

212 ENGINE NOISE — Continued

System	Component	Reference
Light to Medium Rap Each Engine Revolution. More Noticeable at Engine Idle. Shorting Out The Affected Cylinder Increases Noise	<ul style="list-style-type: none"> Excess Piston-to-Piston Pin Clearance 	Shop Manual Section 21-01
Medium-to-Heavy Sharp Knock at Medium Engine Speed and at NO Load or "Float" Condition. Shorting Out Cylinder Reduces Noise	<ul style="list-style-type: none"> Connecting Rod Bearing(s)-to-Crankshaft Clearance Excessive 	Shop Manual Section 21-01
Heavy, Dull Knock or Thud at any Engine Speed. More Severe Under Load	<ul style="list-style-type: none"> Main Bearing-to-Crankshaft Clearance Excessive 	Shop Manual Section 21-01
Heavy, Dull Knock or Thud. Manual Transmission Clutch Operation Will Change Noise. Automatic Transmission Stall Condition Will Increase Noise	<ul style="list-style-type: none"> Flywheel Loose or Cracked 	Shop Manual Section 21-01

Diagnostic Routines

213 POOR FUEL ECONOMY

System	Component	Reference
Vacuum Distribution	<ul style="list-style-type: none"> • Vacuum Leaks 	Visual and Audible
Inlet Air Control	<ul style="list-style-type: none"> • Air Cleaner and Duct • VAF Meter 	Section 10 Test Step IA1
Ignition	<ul style="list-style-type: none"> • Scope Engine for: Spark Plugs, Coil, Secondary Wires, Distributor Cap and Rotor • Base Timing Plus Advance and Retard Functions 	Section 14 Test Step IGN1
EEC	<ul style="list-style-type: none"> • Quick Test • EGO (Code 15 and 17) • INJ • CID (Code 3) • VAF (Code 8) • VAT (Code 10) • ECT (Code 9) 	Section 15 Pinpoint Test EGO Pinpoint Test INJ Pinpoint Test CID Pinpoint Test VAF Pinpoint Test VAT Pinpoint Test ECT
Fuel Delivery	<ul style="list-style-type: none"> • Pump • Pressure Regulator • Return Line (Restricted) • Injectors 	Section 13 Test Step F1
Cooling	<ul style="list-style-type: none"> • Thermostat 	Shop Manual Section 27-01
Factors External to the Engine	<ul style="list-style-type: none"> • Tire Pressure • Transmission-ATX (Slipping) • Brakes (Dragging) • Exhaust (Restricted) • Vehicle Load • Road and Weather Conditions • Driving Habits • Odometer Calibration 	Shop Manual Section 11-01 Section 17-27 Section 12 Section 26-01 Section 33-45
Base Engine	<ul style="list-style-type: none"> • Compression Check • Camshaft • Intake Manifold Gasket 	Shop Manual Section 21-01

Diagnostic Routines

214 HIGH OIL CONSUMPTION

System	Component	Reference
External Leaks	<ul style="list-style-type: none"> • Rocker Cover Gasket • Crankshaft Seals • Oil Pan Gasket and Seals • Dipstick • Oil Filter and Seal • Sending Unit • Engine Assembly 	Visual
Proper Dipstick	<ul style="list-style-type: none"> • Overfilling 	Shop Manual Section 21-01
PCV	<ul style="list-style-type: none"> • Valve 	Section 11 Test Step EV1
Turbocharger	<ul style="list-style-type: none"> • Compressor/Turbine Bearings and Seals • Oil Supply and Return • Oil Cooler 	Section 12 Test Step LP1
Internal Leaks	<ul style="list-style-type: none"> • Engine Break-In Period Not Complete • Oil Viscosity (Too Low or Diluted) • Oil Level (Too High) • Valve Stem Seals (Worn) • Valve Guides (Worn) • Engine Bearings (Worn) • Piston Rings (Worn) • Cylinder Walls (Worn) 	Shop Manual Section 21-01

215 SPARK KNOCK/PINGING

NOTE: If the following fails to correct the condition, it is recommended that the owner change the source of fuel and use higher octane fuel.

System	Component	Reference
Ignition	<ul style="list-style-type: none"> • Base Timing Plus Advance and Retard Functions • Secondary Ignition Wires 	Section 14 Test Step ADV2
Vacuum Distribution	<ul style="list-style-type: none"> • Vacuum Leaks • Vacuum Delay Valve • Vacuum Reservoir 	Visual, Audible Section 7 and 14
EEC	<ul style="list-style-type: none"> • Quick Test • VAF (Code 8) • CID (Code 3) • KC 	Section 15 Pinpoint Test VAF Pinpoint Test CID Pinpoint Test KC
Cooling	<ul style="list-style-type: none"> • Overheating 	Routine 218
Turbocharger	<ul style="list-style-type: none"> • Turbocharger Assembly • Intercooler 	Section 12 Test Step LP1

Diagnostic Routines

216 ENGINE VIBRATES AT NORMAL SPEEDS

System	Component	Reference
Engine Accessories	<ul style="list-style-type: none">• Fan• Belt Driven Components• Engine/Transmission Mounts• Engine Vibration Damper	Manual and Visual
Factors External to the Engine	<ul style="list-style-type: none">• Driveline• Tires• Wheel Balance	Manual and Visual

217 ENGINE RUNS COLD

System	Component	Reference
Gauge System	<ul style="list-style-type: none">• Gauge, Sender	Shop Manual Section 33-45
Cooling	<ul style="list-style-type: none">• Thermostat• Cooling Fan	Shop Manual Section 27-01
EEC	<ul style="list-style-type: none">• Quick Test• INJ• VAF (Code 8)• VAT (Code 10)• ECT (Code 9)	Section 15 Pinpoint Test SCG Pinpoint Test VAF Pinpoint Test VAT Pinpoint Test ECT

Diagnostic Routines

218 ENGINE RUNS HOT

System	Component	Reference
Cooling	<ul style="list-style-type: none"> • Coolant Level • Radiator or A/C Condenser • Pressure Cap and Overflow System • External Leaks • Cooling Fan • Cooling Fan Switch • Thermostat • Coolant (Anti-Freeze/Water Mixture) 	Shop Manual Section 27-01
Gauge System	<ul style="list-style-type: none"> • Gauge, Sender 	Shop Manual Section 33-45
Ignition	<ul style="list-style-type: none"> • Base Timing Plus Advance and Retard Functions 	Section 14 Test Step ADV2
Vacuum Distribution	<ul style="list-style-type: none"> • Vacuum Advance Valve 	Section 14 Test Step ADV1
EEC	<ul style="list-style-type: none"> • Quick Test • VAF (Code 8) • INJ • WAC • VAT (Code 10) 	Section 15 Pinpoint Test VAF Pinpoint Test INJ Pinpoint Test ROC Pinpoint Test VAT
Basic Engine	<ul style="list-style-type: none"> • Oil Level • Internal Leaks • Water Passages (Clogged) • Water Pump • Cylinder Head Gasket (Blown) • Cylinder Head (Cracked) • Block (Cracked/Warped) 	Shop Manual Section 21-01

Diagnostic Routines

219 EXHAUST SMOKE

System	Component	Reference
Black Smoke (Rich Mixture)	• Air Cleaner and Duct (Restricted)	Section 1 Test Step IA1
	• Injectors (Leaking) • Pressure Regulator	Section 13 Test Step FC1
	• EEC Components	Quick Test Section 15
Blue Smoke (Burning Oil)	• PCV Valve	Section 11 Test Step PCV 1
	• Valve Guides/Stems/Seals • Oil Drain Passages in Head	Shop Manual Section 21-01
	• Turbocharger Bearing Seals	Section 12 Test Step PFO 4
	• Piston Rings (Seized, Worn) • Pistons (Worn) • Cylinder Bores (Scuffed)	Shop Manual Section 21-01
White Smoke (Coolant in Combustion)	• BPA Valve • ISC-BPA Valve	Section 9
	• Intake Manifold and Gasket • Cylinder Head and Gasket • Block (Cracked/Porous)	Shop Manual Section 21-01

Diagnostic Routines

220 GAS SMELL

System	Component	Reference
Fuel Delivery	<ul style="list-style-type: none"> • Filter (Leaks) • Fuel Supply Line (Leaks) • Pressure Regulator (Leaks) • Pump (Leaks) • Fuel Tank Filler/Cap (Leaks) • Fuel Return Line (Leaks) • Injectors (Leak) 	Visual and Section 13
EVAP	<ul style="list-style-type: none"> • Line (Leak) • Carbon Canister (Leaks/Soaked) • Three-Way Check Valve (Leaks) • Rollover/Vent Valve (Leaks) • Canister Purge Solenoid (Leaks) 	Visual and Section 8

221 “CHECK ENGINE” LIGHT ALWAYS ON OR NEVER ON

System	Component	Reference
EEC	<ul style="list-style-type: none"> • Quick Test 	Pinpoint Test MIL

Diagnostic Routines

222 STATE EMISSION TEST FAILURE

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. 2) The vehicle had idled excessively long prior to the test.

Prior to starting any services, complaints of 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 emissions at idle.
- Run engine at 2500 ± 300 rpm.
- Read emissions within 30 seconds.
- Return engine speed to idle.
- Read emissions within 30 seconds.

If any emission components are changed, Keep Alive Memory (KAM) should be cleared before repeating State Emission Test procedure. Refer to Quick Test Appendix.

Diagnostic Routines

222 STATE EMISSION TEST FAILURE — Continued

System	Component	Reference
Fuel Delivery	<ul style="list-style-type: none"> • Injectors • Fuel Rail 	Section 13 Test Step FD1
EEC	<ul style="list-style-type: none"> • Quick Test • INJ • VAF (Code 8) • VAT (Code 10) 	Section 15 Pinpoint Test INJ Pinpoint Test VAF Pinpoint Test VAT
Ignition	<ul style="list-style-type: none"> • Scope Engine for: Spark Plugs, Coil, Module, Secondary Wires, Distributor Cap and Rotor • Base Timing Plus Advance and Retard Functions 	Section 14 Test Step IGN1
Inlet Air Control	<ul style="list-style-type: none"> • Throttle Plates and Linkage • Air Cleaner and Duct 	Section 10 Test Step IA1
Vacuum Distribution	<ul style="list-style-type: none"> • Vacuum Leaks/Blockage 	Visual and Audible
EVAP	<ul style="list-style-type: none"> • Carbon Canister, Canister Purge Solenoid 	Section 8 Test Step EV1
PCV	<ul style="list-style-type: none"> • Valve 	Section 11 Test Step PCV1
Exhaust	<ul style="list-style-type: none"> • Pipes, Muffler, Catalytic Converter 	Section 6 Test Step EG1
Cooling	<ul style="list-style-type: none"> • Unstabilized Engine 	Routine 218
Turbocharger	<ul style="list-style-type: none"> • Turbocharger Assembly 	Section 12 Test Step LP1
Basic Engine	<ul style="list-style-type: none"> • Scheduled Maintenance • Compression • Intake Manifold Gasket • Camshaft and Valve Train 	Shop Manual Section 21-01

Diagnostic Routines

223 IMPROPER SHIFT

System	Component	Reference
Base Transmission	• Components Common to All Transmissions	Shop Manual Section 16-01
4EAT	<ul style="list-style-type: none"> • Quick Test • TP (Code 12) • MLPD • MLPL • MLPOD • MSL • MMS • VSS (Code 6) • KAPWR • SS1 (Code 60) • SS2 (Code 61) • SS3 (Code 62) • TCS (Code 55) • CCC (Code 63) • TOT (1.8L, 1.9L 4EAT) • VPWR • VREF 	Section 15 Pinpoint Test TP Pinpoint Test MLP Pinpoint Test MLP Pinpoint Test MLP Pinpoint Test MSL Pinpoint Test MMS Pinpoint Test VSS Pinpoint Test VPWR Pinpoint Test SCP Pinpoint Test SCP Pinpoint Test SCP Pinpoint Test TCS Pinpoint Test SCP Pinpoint Test TOT Pinpoint Test VPWR Pinpoint Test VREF

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