

SECTION 2

Diagnostic Routines

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Diagnostic Routines

PREFACE

The Diagnostic Routines lists the components and 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 causes of malfunction.

It is not necessary that any given order be followed, but it makes good sense for the technician to visually inspect everything that his experience tells him could be the source of the condition before beginning a more involved diagnosis. The effectiveness of every service must be validated.

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

- Group numbers reference a group number shown in the Powertrain, Body or Chassis Shop Manuals.
- Section numbers reference a section in the Engine/Emissions Diagnosis Manual.
- Special Manual publications are referenced in some cases.

Diagnostic Routines

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Diagnostic Routines

201	CRANKS NORMALLY BUT WON'T START	
System	Component	Reference
Ignition	Electrical Connections Secondary Ignition Wires Ignition Coil Ignition Module Rotor Alignment Distributor Cap, Adapter, Rotor & Stator Spark Plugs Fouled Ignition Switch	Section 15 Group 23
External Carburetor/Fuel Charging Assy./Throttle Body	Electrical and Vacuum Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valve (7200) Throttle Linkages	Visual Section 4 and Group 24
EGR	Valve	Section 6
Internal Carburetor	Float/Inlet Needle and Seat Idle Air Bleeds and Fuel Passages	Section 4 and Group 24
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Tank (Fuel Supply) Dual Tanks (Selector Switch) Sender Filter Inertia Switch	Visual Section 11 (for mechanical pumps) Sections 18-21 (for electric pumps) and Group 24
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Basic Engine	Camshaft Timing Compression	Group 21

NOTE: Extended cranking, because of a "No Start" condition, can load the exhaust system with raw fuel, which can ruin the catalytic converter after the engine starts. To prevent this, disconnect the thermactor air supply (and, if EFI/CFI, the injectors), and run engine until surplus fuel is used up before reconnecting.

CA5629-C

Diagnostic Routines

202 STARTS NORMALLY BUT WON'T RUN (STALLS)		
System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Electrical and Vacuum Connections Fast Idle Speed Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Choke Pulldown Adjustment & Diaphragm Venturi Valve (7200) Choke Cap Indexing Feedback Solenoid (YFA)	Visual Section 4 and Group 24
Ignition	Electrical Connections Secondary Ignition Wires Ignition Coil Ignition Module Rotor Alignment Distributor Cap, Adapter, Rotor & Stator Ignition Switch Ballast Resistor	Section 15 and Group 23
EGR	Valve	Section 6
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Tank (Fuel Supply) Sender Filter Inertia Switch	Visual Section 11 (for mechanical pumps) Sections 18-21 (for electric pumps) and Group 24
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Internal Carburetor	Float/Inlet Needle and Seat Idle Air Bleeds and Fuel Passages	Group 24
Exhaust	Component (Restricted)	Section 5
Basic Engine	Camshaft and Valve Train	Group 21

CA7734-C

Diagnostic Routines

203 CRANKS NORMALLY BUT SLOW TO START		
System	Component	Reference
NOTE: It is a good practice to confirm that the correct starting procedure was being used by the customer before proceeding with diagnosis.		
External Carburetor/Fuel Charging Assy/Throttle Body	Electrical and Vacuum Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Choke Cap Indexing Accelerator Pump Venturi Valve (7200) Bowl Vents	Visual Section 4 and Group 24
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Sender Filter	Visual Section 11 (for mechanical pumps) Sections 18-21 (for electric pumps) and Group 24
Internal Carburetor	Hot Idle Compensator (may be external) Float/Inlet Needle and Seat Stepper Motor (7200) Cold Enrichment Adjustments (7200)	Visual Section 3, Section 4 and Group 24
Ignition	Scope Engine for: Spark Plugs, Coil, Secondary Ignition Wires, Distributor Cap, Adapter & Rotor Spark Plugs Fouled	Visual Section 15 and Group 23
Induction and Vacuum Distribution	Vacuum Leaks Air Cleaner Element Restricted	Visual, Audible, and Group 21
Cooling	Electric Fan (Hot Start Only)	Group 27
EGR	Valve	Section 6
PCV	Valve	Section 9
EVAP	Components	Section 7 and Group 24
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual

Diagnostic Routines

204	ROUGH IDLE	
System	Component	Reference
Cooling	Fan or Electric Fan (Loose or Cracked)	Visual
Vacuum Distribution	Vacuum Leaks	Visual, Audible
External Carburetor/Fuel Charging Assy Throttle Body	Curb or Fast Idle Speeds Electrical and Vacuum Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valve (7200) Choke Pulldown Bowl Vent Feedback Solenoid (YFA)	Visual Section 4 and Group 24
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor	Section 15, Group 23
Carburetor	Idle Mixture	Section 4
EGR	Valve Vacuum Regulator	Section 6
PCV	Valve	Section 9
EVAP	Components	Section 7 and Group 24
Ignition Timing	Base plus Advance and Retard Functions	Section 15
Internal Carburetor	Idle, Air Bleeds or Fuel Passages Float/Inlet Needle and Seat Stepper Motor (7200) Hot Idle Compensator (may be external) Altitude Compensator Cold Enrichment (7200)	Visual Section 3 Section 4 and Group 24
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Turbocharger		Group 24
Exhaust	Pipes, Muffler, Catalyst Resonator, Heat Control Valve	Section 5
Basic Engine	Compression Valve Train Camshaft Intake Manifold Gaskets	Group 21

CA7735-C

Diagnostic Routines

205 MISSES UNDER LOAD		
System	Component	Reference
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor	Section 15
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Fuel Delivery	Filter Pump Lines Sender Filter	Visual Section 11 (for mechanical pumps) Sections 18-21 (for electric pumps) and Group 24
External Carburetor/Fuel Charging Assy/Throttle Body	Electrical and Vacuum Connections Choke and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valves (7200)	Visual Section 4 and Group 24
Internal Carburetor	Basic: Idle, Main, and Accelerator Pump Float/Inlet Needle and Seat Main Metering Fuel Enrichment	Visual Section 4 and Group 24
Ignition Timing	Base plus Advance and Retard Functions	Section 15

CA5633-D

206 STALLS ON DECEL OR QUICK STOP		
System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Curb or Fast Idle Speed Electrical and Vacuum Connections Throttle Devices Venturi Valve (7200)	Visual Section 4 and Section 3
EGR	Valve	Section 6
Internal Carburetor	Idle Airbleeds or Fuel Passages Stepper Motor (7200) Hot Idle Compensator (may be external) Float/Inlet Needle and Seat Cold Enrichment (7200)	Visual Section 4 and Group 24
Turbocharger	Retard Switches	Group 24
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual

CA5634-D

Diagnostic Routines

207		
HESITATES OR STALLS ON ACCELERATION		
System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Choke Plate and Linkage Electrical & Vacuum Connections Cold Enrichment Rod and Linkage (7200) Accelerator Pump Venturi Valve (7200)	Visual Section 3 Section 4
Induction and Vacuum Distribution	Vacuum Leaks	Visual, Audible
Induction	Air Cleaner Duct and Valve	Section 8
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor	Section 15
External Carburetor/Fuel Charging Assy/Throttle Body	Curb or Fast Idle Speeds	Section 4 and Group 24
EGR	Valve	Section 6
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Sender Filter	Visual Section 11 (for mechanical pumps) Sections 18-21 (for electric pumps) and Group 24
Internal Carburetor	VV Diaphragm (7200) Power Valve Stepper Motor (7200) Main System (Restriction)	Section 4 and Group 24
EEC	Component Diagnostics	Section 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Turbocharger		Group 24
Ignition Timing	Base plus Advance and Retard Functions	Section 15
Exhaust (Restriction)	With Backpressure EGR System	Section 5

CA7736-C

208		
BACKFIRE (INDUCTION OR EXHAUST)		
System	Component	Reference
Vacuum Distribution	Vacuum Leak(s)	Visual, Audible
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap and Rotor, Crossed Wires	Section 15
External Carburetor	Choke Plate and Linkage	Visual and Section 4
Basic Engine	Intake Manifold Gaskets Compression Check Camshaft Valves	Group 21
Thermactor		Section 10
Pulse Air		Section 10
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Ignition Timing	Base plus Advance and Retard Functions	Section 15
Exhaust	Components (Restricted)	Section 5
Fuel Delivery	Filter Pump Water, Dirt, Rust, Contamination in Fuel Lines Sender Filter	Visual, Section 11 (for Mechanical Pumps), Sections 18-21 (for Electric Pumps) and Group 24

CA7737-C

Diagnostic Routines

209	LACK OF POWER	
System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Electrical and Vacuum Connections Choke Plate and Linkage Accelerator Pump Venturi Valves (7200)	Visual Section 4 and Group 24
Induction	Air Cleaner Duct and Valve and Element	Section 8
Fuel Delivery	Filter Pump Lines Sender Filter	Visual Section 11 (for mechanical pumps) Sections 18-21 (for electric pumps) and Group 24
EGR	Valve	Section 6
Internal Carburetor	Float/Inlet Needle and Seat Accelerator Pump Main Metering System Fuel Enrichment Altitude Compensator Stepper Motor (7200) Pullover Rod (Sticking 1949/6149)	Visual Section 4 and Group 24
Basic Engine	Compression Check Camshaft Valves	Group 21
Drive Train	Clutch, Automatic Transmission, Brakes	Groups 15, 16 and 17
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Turbocharger		Group 24
Exhaust	Components (Restricted)	Section 5
Ignition Timing	Base plus Advance Retard Functions	Section 15

CA5637-D

210	SURGE AT STEADY SPEED	
System	Component	Reference
External Carburetor/Fuel Charging Assy (Throttle Body)	Choke Plate and Linkage Electrical & Vacuum Connections Venturi Valves (7200) Feedback Solenoid (YFA)	Visual Section 4 and Group 24
Vacuum Distribution	Vacuum Leaks	Visual, Audible
Fuel Delivery	Filter Pump Lines Sender Filter	Visual Section 11 (for mechanical pumps) Sections 18-21 (for electric pumps) and Group 24
Internal Carburetor	Idle, Main Systems Float/Inlet Needle and Seat Fuel Enrichment Systems Altitude Compensator	Visual Section 4 and Group 24
EGR	Valve	Section 6
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Turbocharger		Group 24
EVAP	Components	Section 7 and Group 24
Basic Engine	Valve Train and Camshaft Intake Manifold Gaskets	Group 21
Thermactor		Section 10
Ignition Timing	Base plus Advance and Retard Functions	Section 15

CA7738-C

Diagnostic Routines

211	ENGINE DIESELS (OR IDLES TOO FAST)	
System	Component	Reference
External Carburetor/Fuel Charging Assy/Throttle Body	Curb or Fast Idle Speeds Electrical and Vacuum Connections Throttle Positioner or Dashpot Choke Plate and Linkage Fast Idle Linkage Venturi Valves (7200) Speed Control Chain	Visual Section 4 Section 3 and Group 24
Vacuum Distribution	Vacuum Leaks	Visual, Audible
Cooling	Overheating	Routine 218
Idle Speed Control	Components	Sections 12, 14 and Sections 18-21
Induction	Vacuum Leaks	Group 21

If engine idles smoothly after being shut off, trouble is likely to be in the ignition switch, ignition harness, starter solenoid "IGN" tap, or EEC relay.

CA5639-D

212	ENGINE NOISE	
Symptom	Component	Reference
Squeal, Click, or Chirp	Oil Level (low) Valve Train Drive Belts (loose) Belt Driven Components EEC Solenoids	Visual, Audible, Section 3 Group 21 and Group 27
Rumble, Grind	Belt Driven Components	
Rattle	Component (loose)	
Hiss	Thermactor System (leak) Vacuum Distribution System (leak) Induction System (leak) Spark Plug (loose)	Visual, Audible, Section 10 and Group 21
	Cooling System (leak)	Visual and Audible
	EVAP System (leak)	Section 7
Snap	Secondary Ignition	Visual and Audible
Rap, Roar	Exhaust System (leak) Pulse Air System (air cleaner)	Visual, Audible, Section 5 and Section 10
Whine	Turbocharger (some whine is normal)	Audible
Knock	Connection Rod Bearing (worn) Main Bearing (worn) Piston Pin (loose) Piston to Bore Clearance (cold engine)	Group 21
	Fuel Pump	Group 24
	Detonation	Routine 215

CA7739-A

Diagnostic Routines

213	POOR FUEL ECONOMY	
System	Component	Reference
While fuel consumption is drastically increased for short-run operation, stop and go driving, trailer towing, extended winter warm-up periods, etc., as opposed to "trip" mileage, an attempt should be made to determine these factors when confronted with "poor mileage" conditions. However, since the operator is not always at fault, the following is appended:		
External Carburetor/Fuel Charging Assy/Throttle Body	Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Electrical & Vacuum Connections Feedback Solenoid (YFA)	Visual and Section 4
Induction	Air Cleaner Duct and Valve Air Cleaner Element (Restricted)	Section 8
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor	Section 15
Internal Carburetor	Idle, Main Systems Enrichment Systems Float/Inlet Needle and Seat	Section 4 and Group 24
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Fuel Delivery	Fuel Return Line Blocked	Group 24
Cooling	Thermostat	Group 27
Factors External to the Engine	Tire Pressure & Type Clutch Operation Automatic Transmission Shift Pattern and Fluid Level Brake Drag Exhaust System Speedometer/Odometer Gear Ratio Axle Ratio Vehicle Load Road & Weather Conditions	Manual and Visual
Ignition Timing	Base plus Advance and Retard Functions	Section 15

CA5641-D

214	HIGH OIL CONSUMPTION	
System	Component	Reference
External Leaks		Visual
Proper Dipstick	Overfilling (sometimes accomplished by the "short stick" gas station procedure).	Manual and Visual
Induction	Air Cleaner Element (Sealing)	Visual and Group 24
PCV	Valve	Section 9
Turbocharger	Compressor/Turbine Bearing, Seals, Center Drain, Etc.	Visual and Group 24
Internal Leaks (blue smoke from tailpipe)	Valve Guides Valve Stem Seals Intake Manifold and Gasket Cylinder Head Drain Passages Piston Rings	Group 21

If the condition cannot be verified, clean engine, if necessary, change oil and filter (at customer's expense), seal and have customer drive 804.5 Km (500 miles) or enough distance to consume two quarts before returning for re-examination.

CA5642-B

Diagnostic Routines

215 SPARK KNOCK/PINGING		
System	Component	Reference
EGR	Verify correct application, then diagnose.	Section 6
Induction	Air Cleaner Duct and Valve Assembly	Section 8
Vacuum Distribution	Vacuum Leaks Spark Delay Valve PVS	Visual, Audible and Section 3
Basic Engine	Oil Level Compression Check Intake Manifold Gasket	Group 21
Cooling	Overheating	Routine 218
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Turbocharger		Group 24
Thermactor		Section 10
Ignition Timing	Initial plus Advance and Retard Functions	Section 15

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

CA5643-D

216 ENGINE VIBRATES AT NORMAL SPEEDS		
System	Component	Reference
Engine Accessories	Fan Belt Driven Components Engine Mounts Engine Vibration Damper	Manual and Visual
Otherwise	Non-Engine Components: Drive Line, Tires, Wheel Balance	Manual and Visual

CA6348-B

217 ENGINE RUNS COLD		
System	Component	Reference
Gauge System	Gauge, Sender	Group 33
Cooling	Thermostat	Group 27

CA6349-B

Diagnostic Routines

218	ENGINE RUNS HOT	
System	Component	Reference
Cooling	Coolant Level Radiator or A/C Condenser Pressure Cap and Overflow System External Leaks Belts and Belt Tension Fan and Fan Clutch Electric Fan (If So Equipped)	Visual Group 27
Gauge System	Gauge, Sender	Group 33
Cooling	Thermostat	Group 27
Ignition Timing	Base Plus Advance and Retard Functions	Section 15
Vacuum Distribution	Spark Delay Valve	Section 3
EEC	Component Diagnostics	Sections 18-21
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Cooling	PVS	Section 3
Basic Engine	Oil Level Internal Leak(s) Core Sand in Head/Block Water Pump	Group 21
Brake	Brakes (dragging)	

CA5644-D

219	EXHAUST SMOKE	
Symptom	Component	Reference
Black Smoke (rich mixture)	Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200)	Section 4 and Group 24
	Air Cleaner Element (Restricted)	Visual
	Internal Carburetor Components: Basic: Idle, Main and Accelerator Pump Metering Systems Enrichment Systems Fuel Inlet Needle/Seat Float	Visual Section 4 and Group 24
	EEC Components	Sections 18-21
	MCU Components	Special MCU Diagnosis Manual
Blue Smoke (burning oil)	PCV Valve	Section 9
	Valve Guides/Stems/Seals Oil Drain Passages in Head	Group 21
	Turbo Bearing Seals	Group 24
	Rings (not seated) Cylinder bores (scuffed)	Group 21
White Smoke (coolant in combustion)	Thermactor Vacuum Delay Valve (restricted) EGR Cooler Intake Manifold Cylinder Head/Gasket (leaks) Block (cracked/porous)	Section 3 Section 6 and Group 21

NOTE: White Smoke is normal during warm-up.

CA5645-D

Diagnostic Routines

220		
GAS SMELL		
System	Component	Reference
Fuel Delivery	Fuel Filter (leaks) Fuel Line to Carburetor (leaks) Fuel Pump (leaks) Fuel Line, Pump to Tank (leaks) Fuel Tank (leaks) Fuel Tank Filler Neck/Cap (leaks) Fuel Return Line (Blocked)	Visual Section 11 and Group 24
Internal Carburetor	Float/Inlet Needle (stuck)	Group 24
EVAP	Component (leaks)	Section 7 and Group 24

CA5646-C