

UNIFORM INSPECTION & COMMUNICATION STANDARDS 2010 - 2011

Engine Performance And Maintenance

ENGINE PERFORMANCE AND MAINTENANCE (INCLUDING EXHAUST SYSTEMS)

These materials are confidential and are not to be disclosed to, or utilized by, any individual or entity other than participants of the Motorist Assurance Program (MAP).

The Automotive Maintenance and Repair Association (AMRA) and MAP do not warrant these materials or guarantee their accuracy, and AMRA and MAP assume no liability for errors.

MAP STANDARDS OF SERVICE

MAP developed standards of service for shops to follow in working with customers. Written from the point of view of customers, and for the use of maintenance and repair shops, the standards expand on the ideas and promises established in MAP's Pledge to Customer

I. Our recommendations are based upon the following definitions.

System Failure - Parts/system indicated are out of manufacturers' specifications, have failed or are unable to perform their normal function as intended or designed by the manufacturers. Service/replacement is required.

Preventive/Scheduled Maintenance - Parts/system are scheduled for service/ replacement per industry standards or are near the end of their useful life and repair/ replacement is recommended in advance of parts/system failure. Service/replacement is suggested.

Improved System Performance - Parts/ system indicated are recommended for repair/ replacement to enhance/improve the vehicle's ability to perform as intended or designed by the manufacturer, or as requested by the customer. Service/replacement is suggested.

II. Training/Criteria Our personnel have acquired auto repair expertise through formal education or work experience. Where appropriate, personnel are moving toward certification (e.g. vehicle manufacturer, ASE, etc.) for the services performed. Continuing education will be supported by all MAP participants.

III. Appropriate Company Approved Inspection

We will perform an appropriate inspection based on MAP Uniform Inspection & Communication Standards.

IV. Written Estimates

Written estimates based on our inspection, in compliance with state and local regulations, will include parts (dollar amount), labor (dollar amount), and the total estimate.

V. Work Authorization

No work will be performed without the customer's prior approval.

VI. Limited Warranty

A minimum limited warranty will be offered of 90 days or 4,000 miles, whichever comes first, covering parts and labor.

VII. Returned Parts

All customers will be entitled to the return of old parts, or if they choose, they may examine the parts prior to leaving the store. Where failed parts are required to be returned to the manufacturer in order to honor the warranty, the customer will be allowed to examine the parts.

VIII. Classification of Parts

Replaced parts will be identified as new, remanufactured, rebuilt or used. MAP participants will inform the customer and indicate on the estimate and invoice whether a part is new, remanufactured, rebuilt or used.

THE MAP PROCESS - OVERVIEW

Repair Association, Inc. (AMRA). Participation in the Motorist Assurance Program comes from retailers, suppliers, independent repair facilities, vehicle manufacturers and industry associations.

Our organization's mission is to strengthen the relationship between the consumer and the auto repair industry. We produce materials that give motorists the information and encouragement to take greater responsibility for their vehicles-through proper, manufacturer / recommended maintenance. We encourage participating service and repair shops (including franchisees and dealers) to adopt (1) a Pledge of Assurance to their Customers and (2) the Motorist Assurance Program Standards of Service. All participating service providers have agreed to subscribe to this Pledge and to adhere to the promulgated Standards of Service demonstrating to their customers that they are serious about customer satisfaction.

These Standards of Service require that an inspection of the vehicle's (problem) system be made and the results communicated to the customer according to industry standards. Given that the industry did not have such standards, the Motorist Assurance Program successfully promulgated industry inspection communication standards in 1994-95 for the following systems: Exhaust, Brakes, ABS, Steering and Suspension, Engine Maintenance and Performance, HVAC, Electrical Systems, and Drive Train and Transmissions. Further, revisions to all of these inspection communication standards are continually re-published. Participating shops utilize these Uniform Inspection & Communication Standards as part of the inspection process and for communicating their findings to their customers.

The Motorist Assurance Program continues to work cooperatively and proactively with government agencies and consumer groups toward solutions that both benefit the customer and are mutually acceptable to both regulators and industry. We maintain the belief that industry must retain control over how we conduct our business, and we must be viewed as part of the solution and not part of the problem. Meetings with state and other government officials (and their representatives), concerned with auto repair and/or consumer protection, are conducted. Feedback from these sessions is brought back to the association, and the program adjusted as needed.

We welcome you to join us as we continue our outreach... with your support, both the automotive repair industry and your customers will reap the benefits. Please visit MAP at our Internet site www.motorist.org or contact us at:

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Falls Church, Virginia 22046

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THE MAP PROCESS - OVERVIEW OF SERVICE REQUIREMENTS AND SUGGESTIONS

It is MAP policy that all exhaust, brake, steering, suspension, wheel alignment, drive-train, engine performance and maintenance, and heating, ventilation and air conditioning, and electrical services be offered and performed under the standards and procedures specified in these sections.

Before any service is performed on a vehicle, an inspection of the appropriate system must be performed. The results of this inspection must be explained to the customer and documented on an inspection form. The condition of the vehicle and its components will indicate what services/part replacements may be "Required" or "Suggested". In addition, suggestions may be made to satisfy the requests expressed by the customer.

When a component is suggested or required to be repaired or replaced, the decision to repair or replace must be made in the customer's best interest, and at his or her choice given the options available.

This section lists the various parts and conditions that indicate a required or suggested service or part replacement. Although this list is extensive, it is not fully inclusive. In addition to this list, a technician may make a suggestion. However, any suggestions must be based on substantial and informed experience or the vehicle manufacturer's recommended service interval and must be documented. However, any suggestions must be documented and must be based on substantial and informed experience or the vehicle manufacturer's recommended service interval. NOTE: Vehicle manufacturer service intervals are often categorized as either Normal or Severe. Frequently, motorists are unaware that their driving patterns and habits meet the criteria for following Severe Service schedules. Severe Service is generally defined as, but not limited to one or more of the following conditions: Driving in stop-and-go traffic; frequent short trips; high-speed driving; extreme temperatures; towing or hauling.

Some conditions indicate that service or part replacement is required because the part in question is no longer providing the function for which it is intended, does not meet a vehicle manufacturer's design specification or is missing.

- **Example:** An exhaust pipe has corroded severely and has a hole in it through which exhaust gases are leaking. Replacement of the exhaust pipe in this case is required due to functional failure.
- **Example:** A brake rotor has been worn to the point where it measures less than the vehicle manufacturer's discard specifications. Replacement of the rotor is required because it does not meet design specifications.

Some conditions indicate that a service or part replacement is suggested because the part is close to the end of its useful life or addresses a customer's need, convenience or request. If a customer's vehicle has one of these conditions, the procedure may be only to suggest service.

- **Example:** An exhaust pipe is rusted, corroded or weak, but no leaks are present. In this case, the exhaust pipe has not failed. However, there is evidence that the pipe may need replacement in the near future. Replacement of the pipe may be suggested for the customer's convenience in avoiding a future problem.
- **Example:** The customer desires improved ride and/or handling, but the vehicle's shocks or struts have not failed. In this case, replacement may be suggested to satisfy the customer's wishes. In this case, replacement of the shocks or struts may not be sold as a requirement.

A customer, of course, has the choice of whether or not a shop will service his or her vehicle. He or she may decide not to follow some of your suggestions. When a repair is required, a MAP shop must refuse partial service on that system if, in the judgment of the service provider, proceeding with the work could create or continue an unsafe condition. When a procedure states that required or suggested repair or replacement is recommended, the customer must be informed of the generally acceptable repair/replacement options whether or not performed by the shop.

The following reasons may be used for required and suggested services. These codes are shown in the "Code" column of the MAP Uniform Inspection & Communications Standards that follow:

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement
A. Part no longer performs intended purpose B. Part does not meet a design specification (regardless of performance) C. Part is missing	1. Part is close to the end of its useful life B - Part does not meet a design specification (regardless of performance) (just above discard specifications, or weak; failure likely to occur soon, etc.) 2. To address a customer need, convenience, or request (to stiffen ride, enhance performance, eliminate noise, etc.) 3. To comply with maintenance recommended by the vehicle's Original Equipment Manufacturer (OEM) 4. Technician's recommendation based on substantial and informed experience 5. To comply with maintenance recommended by AMRA / MAP
NOTE: When a repair is required, the shop must refuse partial service to the system in question, if the repair creates or continues an unsafe condition.	NOTE: Suggested services are <i>always</i> optional. When presenting suggested repairs to the customer, you must present the facts, allowing the customer to draw their own conclusions and make an informed decision about how to proceed.

ENGINE PERFORMANCE & MAINTENANCE CHECKSHEET



ENGINE PERFORMANCE & MAINTENANCE CHECKSHEET

Date: _____
Name: _____
Address: _____
City: _____ State: _____ Zip Code: _____
Year: _____ Make: _____ Model: _____
Mileage: _____ License: _____ VIN: _____ Eng Code: _____

Customer Interview:

Reason Code Explanation

Code Reason

Required

- A Part No Longer Performs Intended Purpose
- B Part Does Not Meet A Design Specification (Regardless Of Performance)
- C Part Is Missing

Suggested/Optional

- 1 Part Is Close To The End Of Its Useful Life
- 2 To Address A Customer Need, Convenience Or Request
- 3 To Comply With Maintenance Recommended By The Vehicle's Original Equipment Manufacturer
- 4 Technician's Recommendation Based On Substantial And Informed Experience
- 5 To Comply With Maintenance Recommended By AMRAMAP



Your vehicle has been inspected following the Uniform Inspection and Communication Standards developed by the Motorist Assurance Program. MAP produces materials that give motorists the information and encouragement to take greater responsibility for their vehicles—through proper maintenance. We encourage participating service and repair shops to adopt the MAP Pledge of Assurance to their Customers and the Motorist Assurance Program Standards of Service. All participating service providers have agreed to subscribe to this Pledge and to adhere to the promulgated Standards of Service demonstrating to their customers that they are serious about customer satisfaction. For more information visit: www.motorist.org

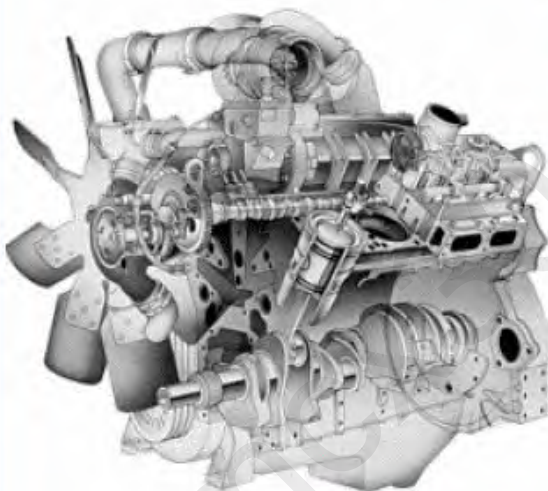
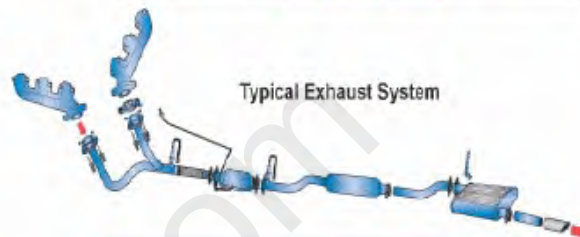
DISCLAIMER: This document may be used as a guide when performing vehicle inspection. This form is not to be used as an estimate form and may not comply with Local or State Laws. The Motorist Assurance Program is not responsible for the performance and accuracy of the motor vehicle inspection performed using this document.

Fig. 1: Engine Performance & Maintenance Checksheet (1 Of 2).

ENGINE PERFORMANCE & MAINTENANCE CHECKSHEET

Engine				
	OK	S	R	Condition
Drive Belts				
Timing Belt				
Air Filter				
Engine Oil				
Engine Oil Filter				
Fuel Filter				
Fuel Injectors				
Fuel Rails				
Fuel Regulators				
Spark Plugs				
Ignition Coil(s)				
Ignition Wires				
Idle Air Controls				
Ignition Modules				
Wiring Harnesses				
Vacuum Hoses				

Cooling System				
	OK	S	R	Condition
Belts				
Coolant Protection				Spec _____ Actual _____
pH / Concentration / Reserve Alkalinity				
Radiator Cap				Spec _____ Actual _____
Radiator				
Coolant Reservoir				
Upper Radiator Hose				
Lower Radiator Hose				
Heater Hoses				
Heater Core				
Cooling Fan/ Fan Clutch				



Exhaust & Emission				
	OK	S	R	Condition
Exhaust Manifolds				
EGR Valve & Components				
EFE Valve (Heat Riser)				
Catalytic Converters				
Oxygen Sensors				
Exhaust Pipes				
Mufflers / Resonators				
Tailpipes / Extensions				
EVAP Canister Filter				
PCV Breather Element				
PCV Valve				
Fuel Cap				

OK	Suggested 1, 2, 3, 4, 5	Required A, B, C
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Fig. 2: Engine Performance & Maintenance Checksheet (2 Of 2).

ENGINE PERFORMANCE AND MAINTENANCE

NOTE: **CHEMICAL ENGINE DECARBONIZATION** is a process utilizing chemicals to remove soft and semi-hardened gum, varnish, resin and carbon deposits from the air/fuel delivery systems and combustion chambers of gasoline internal combustion engines, providing benefits that include improved fuel economy, performance and driveability and reduced emissions. This process is performed to remove deposits preferably prior to deposit accumulation and hardening which may require costly mechanical deposit removal or component replacement.

NOTE: **SUGGEST** Chemical Engine Decarbonization service every 15,000 miles or 12 months.

NOTE: **CONTAMINATED OIL SYSTEM SERVICE** is an event based process

(beyond that of a normal oil and filter change) performed to remove coolant, water or fuel contamination. Contamination increases oil's oxidation rate and has been shown to result in increased engine wear and reduced oil flow.

CAUTION: Some OEM's (including GM and Honda) have issued Technical Service Bulletins advising that Chemical Crankcase Flushing may damage some engine components and that such damage will not be covered by the manufacturer's new car warranty.

ACCELERATOR PEDAL POSITION SENSOR

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	B	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

ACCESSORY BELTS

Condition	Code	Procedure
Alignment incorrect	B	Further inspection required
NOTE: Determine cause of incorrect alignment and require repair.		

Condition	Code	Procedure
Cracked	1	Suggest replacement
Frayed	1	Suggest replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: Determine cause of noise and suggest repair.		
Plies separated	A	Require replacement
Tension out of specification	B	Require adjustment or replacement
Worn beyond adjustment range	B	Require replacement
Worn so it contacts bottom of pulley	A	Require replacement

ACCESSORY PULLEYS

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bent, affecting performance	A	Require replacement
Cracked	A	Require replacement
Loose	B	Require repair or replacement
Missing	C	Require replacement
Pulley damaged, affecting belt life	A	Require replacement

AIR CONDITIONING CYCLING SWITCHES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		

Condition	Code	Procedure
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

AIR CONDITIONING PRESSURE SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

AIR DUCTS AND TUBES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Restricted, affecting performance	A	Require repair or replacement

AIR FILTER ELEMENTS

Condition	Code	Procedure
At or beyond service interval	3	Suggest replacement to comply with vehicle's OEM recommended service intervals
Leaking	A	Require replacement
Melted	A	Required replacement
Missing	C	Require replacement
Paper filter element oil-soaked	A	Require replacement

NOTE:

Further inspection required to determine cause.

Restricted, affecting performance	A	Require replacement
Water-contaminated	A	Require replacement

NOTE:

Further inspection required to determine cause.

AIR FILTER GASKETS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Missing	C	Require replacement

AIR FILTER HOUSINGS AND GASKETS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Leaking	A	Require repair or replacement
Missing	C	Require replacement

AIR FUEL RATIO SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

NOTE:

Determine cause and correct prior to repair or replacement of part.

Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement

NOTE:

Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.

Inoperative	A	Require repair or replacement. Further inspection required
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NOTE:

Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.

Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

NOTE:

Determine cause and correct prior to repair or replacement of part.

Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement

Condition	Code	Procedure
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

AIR INJECTION CONTROL SOLENOIDS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

NOTE:

Determine cause and correct prior to repair or replacement of part.

Connector missing	C	Require replacement
Inoperative	A	Require repair or replacement. Further inspection required

NOTE:

Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.

Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

NOTE:

Determine cause and correct prior to repair or replacement of part.

Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

AIR PLENUMS

Condition	Code	Procedure
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Condition	Code	Procedure
Integrated air or fuel control components inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Internal air or fuel components damaged, affecting performance	A	Require repair or replacement of component
Internal air or fuel components damaged, not affecting performance	Ã,Â	No service suggested or required
Internal air or fuel components missing	C	Require replacement of component
Leaking	A	Require repair or replacement
Restricted	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement

AIR PUMP BELTS

Condition	Code	Procedure
Alignment incorrect	B	Further inspection required
NOTE: Determine cause of incorrect alignment and require repair.		
At or beyond service interval	3	Suggest replacement to comply with vehicle OEM recommended service intervals
Cracked	1	Suggest replacement
Frayed	1	Suggest replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: Determine cause of noise and suggest repair.		
Plies separated	A	Require replacement
Tension out of specification	B	Require adjustment or replacement
Worn beyond adjustment range	B	Require replacement
Worn so it contacts bottom of pulley	A	Require replacement

AIR PUMPS (ELECTRIC DRIVEN)

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	A	Require replacement

Condition	Code	Procedure
NOTE: Inoperative includes intermittent operation.		
Leaking	B	Require replacement
Missing	C	Require replacement
Noisy	2	Suggest replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement

AIR TUBES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Restricted, affecting performance	A	Require repair or replacement

ASPIRATOR, CHECK AND DECEL VALVES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement
Melted, affecting performance	A	Require replacement
Melted, not affecting performance	Ã, Â	No service suggested or required
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement

BAFFLES

Condition	Code	Procedure

Condition	Code	Procedure
Application incorrect, affecting cooling system performance	A	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bent, affecting cooling system performance	A	Require repair or replacement
Blocked, affecting cooling system performance	A	Require repair or replacement
Broken, affecting cooling system performance	A	Require repair or replacement
Cracked, affecting cooling system performance	A	Require repair or replacement
Loose, affecting cooling system performance	A	Require repair
Loose, not affecting cooling system performance	2	Suggest repair
Missing, affecting cooling system performance	C	Require replacement

BALLAST PRIMARY SUPPLY RESISTOR WIRES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Conductor exposed	A	Require replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Insulation overheated	A	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

BALLAST RESISTORS AND PRIMARY SUPPLY RESISTORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware

Condition	Code	Procedure
Conductor exposed	A	Require replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Insulation overheated	A	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

BAROMETRIC PRESSURE SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

BATTERIES

NOTE: Proper operation of any electrical system or component can be affected by battery condition. The battery(ies) must meet or exceed minimum specification for vehicle as equipped and test to that specific battery's CCA.

Definition of Terms

Battery Performance Testing - Testing that determines whether or not a battery meets both vehicle OEM and battery manufacturer's specifications.

Cold Cranking Amp (CCA) Rating - The number of amperes a new, fully charged battery at 0°F (-17.8°C) can deliver for 30 seconds and maintain at least a voltage of 1.2 volts per cell (7.2 volts for a 12-volt battery).

Cranking Amps (CA) - The number of amperes a new, fully charged battery, typically at 32°F (0°C) can deliver for 30 seconds and maintain at least a voltage of 1.2 volts per cell (7.2 volts for a 12-volt battery).

OEM Cranking Amps - The minimum CCA required by the original vehicle manufacturer for a specific vehicle.

Condition	Code	Procedure
Battery frozen	A	Further inspection required
NOTE: Do not attempt to charge a frozen battery. Allow battery to warm thoroughly and then performance-test. If battery fails performance test, require replacement.		
Battery tests near the "end of its useful life" utilizing a tester or on-board monitor able to accurately determine this condition	1	Suggest Replacement
Case leaking	A	Require replacement
Casing swollen	A	Further inspection required

Condition	Code	Procedure
NOTE: No service suggested or required unless the battery fails performance test, in which case, require replacement.		
Circuit open internally	A	Require replacement
Electrolyte contamination	A	Further inspection required
NOTE: No service suggested or required unless the battery fails performance test, in which case, require replacement.		
Electrolyte discoloration	A	Further inspection required
NOTE: No service suggested or required unless the battery fails performance test, in which case, require replacement.		
Fails to accept and hold charge	A	Require replacement
NOTE: This phrase refers to a battery that fails to either accept and/or retain a charge using appropriate times listed in the Battery Charging Guide of the BCI Service Manual, battery charger operating manual, or battery manufacturer's specifications.		
Fluid level low	B	Further inspection required
NOTE: Determine cause of low fluid level. Refill to proper level(s) with water (distilled water preferred). Recharge battery and performance-test. If battery does not meet specifications, require replacement. If battery is sealed type (non-removable filler caps), require replacement.		
Out of performance specification for battery	B	Require replacement
NOTE: The battery may meet vehicle's OEM specifications for that vehicle but test below the minimum specifications defined by the battery manufacturer.		
Out of specification for application	B	Require replacement
NOTE: The battery may meet battery manufacturer's specifications but test below the minimum specification defined by the vehicle's OEM for that vehicle.		
Post (top or side) burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Post (top or side) burned, not affecting performance	2	Suggest repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Post (top or side) corroded, affecting performance	A	Require repair
Post (top or side) corroded, not affecting performance	2	Suggest repair
Post (top or side) loose	A	Require replacement
Post (top or side) melted, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Post (top or side) melted, not affecting performance	2	Suggest repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Specific gravity low	B	Further inspection required
NOTE: Recharge and test to manufacturer's specifications. If battery fails performance test, require replacement.		
State of charge low	A	Further inspection required
NOTE: Recharge and test to manufacturer's specifications. If battery fails performance test, require replacement.		
Top dirty	2	Suggest cleaning battery
Top wet	A	Require cleaning battery Further inspection required
NOTE: Check fluid level and adjust to manufacturer's specification. Suggest checking charging system for proper operation.		
Vent cap loose	A	Require repair or replacement of vent cap
Vent cap missing	C	Require replacement of vent cap

BATTERY CABLES, WIRES AND CONNECTORS

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Insulation damaged, conductors exposed	A	Require repair or replacement
NOTE: Exposed conductor at replacement (aftermarket) terminal end does not require repair or replacement.		
Insulation damaged, conductors not exposed	1	Suggest replacement
Open	A	Require repair or replacement
Protective shield (conduit) melted	2	Suggest repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Protective shield (conduit) missing	C	Suggest repair or replacement
Resistance (voltage drop) out of specification	A	Require repair or replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
Shorted	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Voltage drop out of specification	A	Require repair or replacement

BATTERY CONNECTORS

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement
NOTE: Exposed conductor at replacement (aftermarket) terminal end does not require repair or replacement.		
Open	A	Require repair or replacement
Protective shield (conduit) melted	2	Suggest repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Protective shield (conduit) missing	C	Suggest repair or replacement
Resistance (voltage drop) out of specification	A	Require repair or replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
Shorted	A	Require repair or replacement
Terminal broken	A	Require repair or replacement

Condition	Code	Procedure
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Voltage drop out of specification	A	Require repair or replacement

BATTERY TRAYS AND HOLD DOWN HARDWARE

Condition	Code	Procedure
Battery improperly secured	2	Suggest repair
Bent, affecting performance	A	Require repair or replacement
Bent, not affecting performance	Ã,Â	No service suggested or required
Broken, affecting performance	A	Require repair or replacement
Broken, not affecting performance	Ã,Â	No service suggested or required
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Cracked, affecting performance	A	Require repair or replacement
Cracked, not affecting performance	1	Suggest repair or replacement
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Water drain clogged	A	Require repair

BATTERY WIRES

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement
NOTE: Exposed conductor at replacement (aftermarket) terminal end does not require repair or replacement.		
Open	A	Require repair or replacement
Protective shield (conduit) melted	2	Suggest repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Protective shield (conduit) missing	C	Suggest repair or replacement
Resistance (voltage drop) out of specification	A	Require repair or replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
Shorted	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Voltage drop out of specification	A	Require repair or replacement

BELT IDLER ASSEMBLIES (ACCESSORY AND CAM BELTS)

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bearings worn	1	Suggest replacement
Cracked	2	Suggest replacement
Missing	C	Require replacement
Noisy	2	Suggest replacement
Seized	A	Require repair or replacement

BELT TENSIONERS (ACCESSORY AND CAM BELT)

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bearings worn	1	Suggest replacement
Belt tension incorrect	B	Require adjustment or repair
Cracked	B	Suggest replacement
Missing	C	Require replacement
Noisy	2	Suggest replacement
Pulley damaged, affecting belt life	A	Require replacement
Seized	A	Require repair or replacement

BELT-DRIVEN AIR PUMPS

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Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement
Missing	C	Require replacement
Noisy	2	Suggest replacement
Pulley alignment incorrect	B	Require repair or replacement
Pulley bent	A	Require replacement
Pulley cracked	A	Require replacement
Pulley loose	A	Require repair or replacement
Pulley missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement

BOOST CONTROL MECHANISM

Condition	Code	Procedure
Boost pressure incorrect	A	Require repair or replacement. Further inspection required
NOTE: Incorrect boost pressure includes intermittent operation.		
Leaking	A	Require repair or replacement

CAMSHAFT POSITION SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required

Condition	Code	Procedure
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

CARBURETORS AND CHOKES

NOTE: Proper operation of a carburetor includes the ability to control air/fuel mixtures during all phases of driving operation to comply with all federal and local emissions standards. Adjustments are to be considered repairs.

Condition	Code	Procedure
15,000 miles or 12 months beyond most recent Chemical Engine Decarbonization	5	Suggest chemical engine decarbonization
Air/fuel control incorrect	B	Require repair or replacement
Application incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Components binding	A	Require repair or replacement
Components damaged, affecting operation or performance	A	Require repair or replacement
Components missing	C	Require replacement of components
Contaminated	A	Require repair or replacement. Further inspection required
NOTE: Some components may be serviceable; check for accepted cleaning procedure. Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Controlling linkages binding	A	Require repair or replacement of linkage
Leaking	B	Require repair or replacement
Mechanical operation incorrect	B	Require repair or replacement
Operating incorrectly	B	Require repair or replacement

CASTING CORE PLUGS AND EXPANSION PLUGS

Condition	Code	Procedure
Leaking	A	Require replacement
Material type incorrect	2	Suggest replacement

CHARGE AIR COOLERS ""INTERCOOLERS"" (CAC)

Condition	Code	Procedure
Air-to-air intercooler leaking, affecting boost performance	A	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Leaking coolant	A	Require repair or replacement
Missing	C	Require replacement
Restricted, affecting performance	A	Require repair or replacement

CHECK VALVES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement
Melted, affecting performance	A	Require replacement
Melted, not affecting performance	Ã,Â	No service suggested or required
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement

CHEMICAL ENGINE DECARBONIZATION

NOTE: CHEMICAL ENGINE DECARBONIZATION is a process utilizing chemicals to remove soft and semi-hardened gum, varnish, resin and carbon deposits from the air/fuel delivery systems and combustion chambers of gasoline internal combustion engines, providing benefits that include improved fuel economy, performance and driveability and reduced emissions. This process is performed to remove deposits preferably prior to deposit accumulation and hardening which may require costly mechanical deposit removal or component replacement.

NOTE: SUGGEST Chemical Engine Decarbonization service every 15,000 miles or 12 months.

CHOKES

Condition	Code	Procedure
Air/fuel control incorrect	B	Require repair or replacement

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Components binding	A	Require repair or replacement
Components damaged, affecting operation or performance	A	Require repair or replacement
Components missing	C	Require replacement of components
Contaminated	A	Require repair or replacement. Further inspection required
NOTE: Some components may be serviceable; check for accepted cleaning procedure. Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Controlling linkages binding	A	Require repair or replacement of linkage
Leaking	B	Require repair or replacement
Mechanical operation incorrect	B	Require repair or replacement
Operating incorrectly	B	Require repair or replacement

CLUTCH PEDAL POSITION SWITCHES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement

Condition	Code	Procedure
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

COLD START INJECTORS

NOTE: You are not required to replace injectors in sets. However, you may suggest replacement of all injectors for preventive maintenance.

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

NOTE:

Determine cause and correct prior to repair or replacement of part.

Connector missing	C	Require replacement
Flow restricted	B	Require repair or replacement
Inoperative	A	Require repair or replacement. Further inspection required

NOTE:

Inoperative includes intermittent operation, out of OEM specification. Some components may be serviceable.

Leaking	A	Require repair or replacement
Resistance out of specification	B	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

NOTE:

Determine cause and correct prior to repair or replacement of part.

Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

COMBUSTION CHAMBER CLEANING

NOTE: See [CHEMICAL ENGINE DECARBONIZATION](#).

CONNECTORS

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement
Open	A	Require repair or replacement
Protective shield (conduit) melted	2	Suggest repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Protective shield (conduit) missing	C	Suggest repair or replacement
Resistance (voltage drop) out of specification	A	Require repair or replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
Shorted	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Voltage drop out of specification	A	Require repair or replacement

COOLANT RECOVERY TANKS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Leaking	A	Require repair or replacement
Missing (if original equipment)	C	Require replacement

COOLANT

Condition	Code	Procedure
Acidity (pH) incorrect	1	Suggest correction or replacement
At or beyond service interval	3	Suggest replacement

Condition	Code	Procedure
NOTE: The system should be drained and/ or flushed and refilled with correct coolant according to OEM recommended service interval and procedures.		
Contaminated	B	Require replacement or recycling Further inspection required
NOTE: Determine source of contamination and require correction prior to coolant replacement.		
Fluid discolored	Ã,Â	No service Suggested or Required
NOTE: Further testing necessary to determine condition of fluid.		
Level incorrect	B	Require correction of fluid level
NOTE: Determine source of incorrect level and suggest repair.		
Mixture incorrect	B	Require correction or replacement
Type incorrect	B	Require replacement

COOLING FAN MOTOR MODULES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Housing cracked	2	Suggest repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation or failure to perform all functions.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

Condition	Code	Procedure
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

COOLING FAN MOTOR RELAYS AND MODULES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Housing cracked	2	Suggest repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation or failure to perform all functions.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

COOLING FAN MOTOR RESISTORS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Missing	C	Require replacement
Open	A	Require replacement
Resistance out of specification	B	Require repair or replacement
Shorted	A	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

COOLING FAN MOTOR SENSORS AND SWITCHES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement

Condition	Code	Procedure
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

COOLING FAN MOTOR SWITCHES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement

Condition	Code	Procedure
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

COOLING FAN MOTORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Hydraulic fan motor leaking	A	Require repair or replacement
Inoperative	A	Require replacement
NOTE: Check fan motor/controls. Inoperative includes intermittent operation.		
Missing	C	Require replacement
Noisy	2	Suggest replacement
Rotation incorrect for application	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Vibration	1	Suggest replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

CRANKSHAFT POSITION SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

CYLINDER DEACTIVATION SOLENOID

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	A	Require replacement

Condition	Code	Procedure
NOTE: Inoperative includes intermittent operation.		
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	2	Suggest repair or replacement of linkage
Linkage broken	A	Require repair or replacement of linkage
Linkage loose, affecting performance	A	Require repair or replacement of linkage
Linkage loose, not affecting performance	1	Suggest repair or replacement of linkage
Linkage missing	C	Require replacement
Linkage noisy	2	Suggest repair or replacement
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
Out of adjustment	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

CYLINDER HEAD ASSEMBLIES

NOTE: A Cylinder Head Assembly is a cylinder head fitted with valves, associated springs, retainers, and on overhead camshaft cylinder heads (ORC), camshaft, camshaft bearings, lash adjusters, tappets and rockers.

Condition	Code	Procedure
Adjustable valve lash is out of specification	B	Require repair
Combustion efficiency is reduced due to carbon deposits in the combustion chamber	2	Suggest repair
Combustion efficiency is reduced due to carbon deposits on the intake valve	2	Suggest repair
Internal component failure (any component)	A	Require repair or replacement of cylinder head assembly

NOTE:

It is Required that all other failure-related components be inspected for cause and condition. Additional components or assemblies may be Suggested for repair or replacement, such as a water pump on a short block (reason code 4, technician's recommendation based on substantial and informed experience). For example: If there is a failed head gasket with an external coolant leak, in addition to Requiring replacement of the head gasket, inspection of the following for cause and condition is Required: Block, Cooling System, Cylinder Head. It may be suggested that additional inspections be performed, such as the other head gasket on a V - type engine.

DECEL VALVES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement
Melted, affecting performance	A	Require replacement
Melted, not affecting performance	Ã, Â	No service suggested or required
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement

DEFLECTORS

Condition	Code	Procedure
Application incorrect, affecting cooling system performance	A	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bent, affecting cooling system performance	A	Require repair or replacement
Blocked, affecting cooling system performance	A	Require repair or replacement
Broken, affecting cooling system performance	A	Require repair or replacement
Cracked, affecting cooling system performance	A	Require repair or replacement
Loose, affecting cooling system performance	A	Require repair
Loose, not affecting cooling system performance	2	Suggest repair
Missing, affecting cooling system performance	C	Require replacement

DIP STICK TUBES

Condition	Code	Procedure
Application incorrect	B	Require replacement
Bent	2	Suggest repair or replacement
Broken, affecting performance (for example, fuel mixture)	A	Require repair or replacement
Broken, not affecting performance	2	Suggest repair or replacement
Leaking, affecting performance (for example, fuel mixture)	A	Require repair or replacement
Leaking, not affecting performance	2	Suggest repair or replacement
Missing	C	Require replacement

DIP STICKS AND TUBES

Condition	Code	Procedure
Application incorrect	B	Require replacement
Bent	2	Suggest repair or replacement

Condition	Code	Procedure
Broken, affecting performance (for example, fuel mixture)	A	Require repair or replacement
Broken, not affecting performance	2	Suggest repair or replacement
Leaking, affecting performance (for example, fuel mixture)	A	Require repair or replacement
Leaking, not affecting performance	2	Suggest repair or replacement
Missing	C	Require replacement

DISTRIBUTOR ADVANCES AND RETARDERS (MECHANICAL AND VACUUM)

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Binding	A	Require repair or replacement
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement
Out of specification	B	Require repair or replacement

DISTRIBUTOR BOOTS AND SHIELDS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Deteriorated	A	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Torn	A	Require replacement

DISTRIBUTOR CAPS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Arcing	A	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Burned	A	Require replacement
Carbon button missing	A	Require replacement
Carbon button worn, affecting performance	A	Require replacement
Carbon button worn, not affecting performance	1	Suggest replacement
Carbon-tracked	A	Require replacement
Cracked	B	Require replacement
Loose	B	Suggest repair or replacement

Condition	Code	Procedure
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal eroded, affecting performance	A	Require repair or replacement
Terminal eroded, not affecting performance	Ã,Â	No service suggested or required
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

DISTRIBUTOR RETARDERS (MECHANICAL AND VACUUM)

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Binding	A	Require repair or replacement
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement
Out of specification	B	Require repair or replacement

DISTRIBUTOR ROTORS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Carbon-tracked	A	Require replacement
Contact burned	A	Require replacement
Corroded	1	Suggest replacement
Eroded	1	Suggest replacement
Loose	B	Require repair or replacement
Out of specification	B	Require replacement

DISTRIBUTOR SHIELDS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Binding	A	Require repair or replacement
Inoperative	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement
Out of specification	B	Require repair or replacement

DISTRIBUTORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bushings worn, affecting performance	A	Require repair or replacement
Bushings worn, not affecting performance	1	Suggest repair or replacement
Cam lobes worn, affecting performance	A	Require repair or replacement
Cam lobes worn, not affecting performance	1	Suggest repair or replacement
Gear broken	A	Require repair or replacement
Gear worn, affecting performance	A	Require replacement
Gear worn, not affecting performance	Ã,Â	No service suggested or required
Integrated pickup triggering device loose	A	Require repair or replacement
Integrated pickup triggering device magnetism incorrect	A	Require repair or replacement
Leaking oil internally	A	Require repair or replacement
Noisy	2	Suggest repair or replacement
Pickup triggering device (reluctor) broken	A	Require repair or replacement
Pickup triggering device (reluctor) loose	A	Require repair or replacement
Pickup triggering device (reluctor) weak	A	Require repair or replacement
Reluctor (pickup triggering device) broken	A	Require repair or replacement
Reluctor (pickup triggering device) loose	A	Require repair or replacement
Reluctor (pickup triggering device) weak	A	Require repair or replacement
Shaft bent	A	Require replacement
Thrust washer broken	A	Require repair or replacement
Thrust washer missing	C	Require repair or replacement
Thrust washer worn, affecting performance	A	Require repair or replacement
Thrust washer worn, not affecting performance	1	Suggest repair or replacement

EARLY FUEL EVAPORATION VALVES (HEAT RISER ASSEMBLIES)

Condition	Code	Procedure
Broken	A	Require replacement of affected parts
Diaphragm inoperative	A	Further inspection required
NOTE: Inoperative includes intermittent operation. If the inoperative diaphragm is separate from the heat riser, then require replacement of the inoperative diaphragm. If the inoperative diaphragm is part of the heat riser, then replace the heat riser.		
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Seized	A	Require replacement of affected parts
Spring broken	B	Require replacement of spring(s)
Spring inoperative	A	Require replacement of spring(s)

Condition	Code	Procedure
NOTE: Inoperative includes intermittent operation.		

EGR COOLERS

Condition	Code	Procedure
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Restricted, affecting performance	A	Require repair or replacement

EGR EXHAUST MANIFOLD PASSAGES

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement

EGR INTAKE AND EXHAUST MANIFOLD PASSAGES

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement

EGR PLATES AND COOLERS

Condition	Code	Procedure
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Restricted, affecting performance	A	Require repair or replacement

ELECTRONIC SPARK CONTROL MODULES

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

NOTE:

Determine cause and correct prior to repair or replacement of part.

Connector missing	A	Require repair
Contaminated	A	Require repair or replacement

NOTE:

Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement of source.

Leaking	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Includes inoperative, intermittent operation or failure to perform all functions.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

ELECTRONIC TRANSMISSION CONTROL DEVICES

Condition	Code	Procedure
Application Incorrect	B	Require repair or replacement
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Leaking	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation or failure to perform all functions.		
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

ELECTRONIC TRANSMISSION FEEDBACK DEVICES

Condition	Code	Procedure
Application Incorrect	B	Require repair or replacement
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement

Condition	Code	Procedure
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

ENGINE COOLANT TEMPERATURE SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement

Condition	Code	Procedure
Wire lead shorted	A	Require repair or replacement

ENGINE COOLING SYSTEMS

NOTE: Overheating, poor engine performance, and insufficient cabin heat can be affected by, but are not limited to, all of the components in the engine cooling system

ENGINE COVERS (OIL PAN, VALVE COVER, TIMING COVER)

Condition	Code	Procedure
Attaching hardware incorrect	B	Require replacement
Attaching hardware loose	A	Require repair or replacement
Attaching hardware missing	C	Require replacement
Baffle loose	2	Suggest repair or replacement
Baffle missing	C	Require replacement
Bent, affecting performance	A	Require repair or replacement
Bent, not affecting performance	Ã, Â	No service suggested or required
Cracked (not leaking)	2	Suggest repair or replacement
Leaking externally	A	Require repair or replacement
Leaking internally, causing fluid contamination	A	Require repair or replacement
Missing	C	Require replacement
Restricted passage	A	Require repair or replacement
Threads damaged	A	Require repair or replacement

ENGINE DECARBONIZATION

NOTE: See [CHEMICAL ENGINE DECARBONIZATION](#).

ENGINE OIL CANISTERS

Condition	Code	Procedure
At or beyond service interval	3	Suggest replacement to comply with vehicle's OEM recommended service intervals
Bulged	A	Require replacement. Further inspection required
NOTE: Inspect pressure relief valve.		
Canister attaching hardware broken	A	Require repair or replacement of hardware
Canister attaching hardware loose	A	Require repair
Canister attaching hardware missing	C	Require replacement
Canister attaching hardware not functioning	A	Require repair or replacement of hardware
Center tube collapsed	A	Require replacement. Further inspection required
NOTE: Inspect bypass.		
Dented	2	Suggest replacement. Further inspection required

Condition	Code	Procedure
NOTE: Determine cause, such as broken motor mount.		
Leaking	B	Require repair or replacement

ENGINE OIL COOLERS (EXTERNAL)

Condition	Code	Procedure
Air flow restriction	A	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bypassed	A	Require repair or replacement
Connection leaking	A	Require repair or replacement
Corroded	1	Suggest repair or replacement
Fins damaged, affecting performance	A	Require repair or replacement
Fins damaged, not affecting performance	2	Suggest repair or replacement
Fluid flow restrictions	A	Require repair or replacement
Internal restrictions, affecting performance	A	Require repair or replacement
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

ENGINE OIL DRAIN PLUGS AND GASKETS

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
NOTE: Some OEMs require replacement of drain plug gasket when removing drain plug. Inspect threads in oil pan for damage.		

ENGINE OIL FILTERS AND CANISTERS

Condition	Code	Procedure
At or beyond service interval	3	Suggest replacement to comply with vehicle's OEM recommended service intervals
Bulged	A	Require replacement. Further inspection required
NOTE: Inspect pressure relief valve.		
Canister attaching hardware broken	A	Require repair or replacement of hardware
Canister attaching hardware loose	A	Require repair
Canister attaching hardware missing	C	Require replacement
Canister attaching hardware not functioning	A	Require repair or replacement of hardware

Condition	Code	Procedure
Center tube collapsed	A	Require replacement. Further inspection required
NOTE: Inspect bypass.		
Dented	2	Suggest replacement. Further inspection required
NOTE: Determine cause, such as broken motor mount.		
Leaking	B	Require repair or replacement

ENGINE OIL GASKETS

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
NOTE: Some OEMs require replacement of drain plug gasket when removing drain plug. Inspect threads in oil pan for damage.		

ENGINE OIL PRESSURE GAUGES (MECHANICAL)

Condition	Code	Procedure
Indicates out of range	B	Further inspection required
NOTE: Gauge may indicate problem with contaminated oil, level, pressure, or temperature, or problem with gauge.		
Inoperative	A	Further inspection required
NOTE: Gauge may indicate problem with contaminated oil, level, pressure, or temperature, or problem with gauge. Inoperative includes intermittent operation, out of OEM specification, or out of range. Further inspection required to determine cause.		
Leaking	B	Require repair or replacement
Reads inaccurately	2	Suggest repair or replacement

ENGINE OIL

Condition	Code	Procedure
Additive Depletion	A	Require replacement of fluid
At or beyond service interval	3	Suggest replacement to comply with vehicle's OEM recommended service intervals
Contaminated	A	Require replacement of oil and filter; Further Inspection Required
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water when changing oil.		

Condition	Code	Procedure
Fluid discolored	Ã,Â	No Service Suggested or Required
NOTE: Further testing necessary to determine condition of fluid.		
Fluid incorrect	B	Require service
Level Incorrect	B	Adjust to correct level. Further Inspection Required.
NOTE: Determine cause of incorrect level such as leaking gaskets or contamination by engine coolant, fuel or water.		
Oxidized	A	Require replacement of fluid

EVAPORATIVE EMISSIONS (EVAP) CANISTER FILTERS

Condition	Code	Procedure
At or beyond service interval	3	Suggest replacement to comply with OEM recommended service interval
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Missing	C	Require replacement
Restricted, affecting performance	A	Require replacement
Restricted, not affecting performance	1	Suggest replacement
Water-contaminated	A	Require replacement

EVAPORATIVE EMISSIONS (EVAP) CANISTER PURGE DEVICES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

EVAPORATIVE EMISSIONS (EVAP) CANISTERS

Condition	Code	Procedure
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement
Missing	C	Require replacement
Saturated	A	Require replacement

EVAPORATIVE EMISSIONS (EVAP) FEEDBACK DEVICES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

EXHAUST GAS RECIRCULATION DEVICES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement

Condition	Code	Procedure
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	1	Suggest repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

EXHAUST GAS RECIRCULATION FEEDBACK DEVICES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	1	Suggest repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

EXPANSION PLUGS

Condition	Code	Procedure
Leaking	A	Require replacement
Material type incorrect	2	Suggest replacement

FAN CONTROL SENSOR

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

FUEL ACCUMULATORS AND DAMPERS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connections leaking	A	Require repair or replacement
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement

FUEL AND COLD START INJECTORS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Flow restricted	B	Require repair or replacement
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation, out of OEM specification. Some components may be serviceable.		

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Resistance out of specification	B	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

FUEL CAPS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Fails to maintain proper pressure	A	Require replacement
Gaskets missing	C	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Plugged (vacuum and pressure relief)	A	Require replacement
Seals missing	C	Require replacement

FUEL DAMPERS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connections leaking	A	Require repair or replacement
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement

FUEL DELIVERY CHECK VALVES

Condition	Code	Procedure
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Leaking externally	A	Require repair or replacement
Missing	C	Require replacement
Pressure leaking (bleeds down)	A	Require repair or replacement

FUEL DISTRIBUTORS (BOSCH CIS)

Condition	Code	Procedure
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Condition	Code	Procedure
15,000 miles or 12 months beyond most recent Chemical Engine Decarbonization	5	Suggest chemical engine decarbonization
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require repair or replacement
Out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement. Further inspection required
NOTE: Some components may be serviceable; check for accepted cleaning procedure.		

FUEL FILLER NECKS AND RESTRICTORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Restricted	2	Suggest repair or replacement

FUEL FILTERS

Condition	Code	Procedure
At or beyond service interval	3	Suggest replacement to comply with OEM recommended service interval
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Restricted, affecting performance	A	Require replacement
Restricted, not affecting performance	1	Suggest replacement
Water-contaminated	2	Suggest replacement

FUEL INJECTOR CLEANING

NOTE: See [CHEMICAL ENGINE DECARBONIZATION](#).

FUEL INJECTORS

Condition	Code	Procedure
15,000 miles or 12 months beyond most recent Chemical Engine Decarbonization	5	Suggest chemical engine decarbonization
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware

Condition	Code	Procedure
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

FUEL LEVEL SENDERS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

FUEL PRESSURE REGULATORS

Condition	Code	Procedure
Contaminated	2	Suggest repair or replacement. Further inspection required
NOTE: Some components may be serviceable; check for accepted cleaning procedure. Determine source of contamination. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Leaking (internally or externally)	A	Require repair or replacement
Pressure out of specification	B	Require repair or replacement
Vapor bypass restricted	A	Require repair or replacement

FUEL PUMPS (IN-TANK, EXTERNAL, ELECTRICAL OR MECHANICAL)

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require replacement
NOTE: Determine source of contamination. Require repair or replacement.		
Inoperative	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Inoperative includes intermittent operation.		
Leaking externally (includes pulsator)	A	Require repair or replacement
Leaking internally (includes pulsator)	A	Require repair or replacement
Noisy	2	Suggest repair or replacement
Out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

FUEL RAILS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Contaminated	A	Require replacement
NOTE: Determine source of contamination. Require repair or replacement.		
Leaking	A	Require repair or replacement
Restricted	A	Require repair or replacement
Rust-pitted	1	Suggest replacement

FUEL RESTRICTORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Restricted	2	Suggest repair or replacement

FUEL SYSTEM CLEANING SERVICE

NOTE:

See **CHEMICAL ENGINE DECARBONIZATION.**

FUEL TANKS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Baffles loose	A	Require repair or replacement
Contaminated	A	Require repair
NOTE: Determine source of contamination. Require repair or replacement.		
Corroded internally	A	Require repair or replacement
Distorted, affecting performance	B	Require replacement
Distorted, not affecting performance	Ã,Â	No service suggested or required
Leaking	A	Require repair or replacement

FUEL

Condition	Code	Procedure
Contaminated	B	Require repair or replacement
NOTE: Determine of source of contamination. Require repair or replacement.		
Fuel incorrect	B	Require flushing of system
NOTE: If a fuel other than specification fuel is present in the system, the required service is to flush and fill with the correct fuel.		

GASKETS

Condition	Code	Procedure
Leaking	A	Require repair or replacement
NOTE: Require inspection of mating and sealing surface and repair or replace as necessary.		

GROMMETS (VALVE COVER)

Condition	Code	Procedure
Leaking	A	Suggest repair or replacement
NOTE: Require inspection of mating and sealing surface and repair or replace as necessary.		

HARMONIC DAMPERS

Condition	Code	Procedure
Application incorrect	B	Require replacement

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Cracked	B	Require replacement
Dented (fluid type only)	A	Require replacement
Keyway distorted	A	Require repair or replacement
Leaking (fluid damper only)	A	Require replacement
Loose	A	Require replacement
Noisy	A	Require replacement
Outer ring slipped out of position	A	Require replacement
Positioned incorrectly	A	Require repair or replacement
Rubber damping material deteriorated	1	Suggest replacement
Seal surface worn, causing a leak	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

HEATER CONTROL VALVES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bypassed	A	Require replacement
Coolant leak	A	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation, or failure to perform all functions.		
Missing	C	Require replacement
Restricted	A	Require repair or replacement
Vacuum leak	A	Require repair or replacement

HEATER CORES

Condition	Code	Procedure
Air flow restriction	A	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bypassed	A	Require repair or replacement
Connection leaking	A	Require repair or replacement
Corroded	1	Suggest repair or replacement
Fins damaged, affecting performance	A	Require repair or replacement
Fins damaged, not affecting performance	2	Suggest repair or replacement
Internal restrictions, affecting performance	A	Require repair or replacement
Leaking	B	Require repair or replacement
Missing	C	Require replacement

HOSE CLAMPS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Connected incorrectly	A	Require repair
Corroded, not reusable	1	Suggest replacement
Cracked	A	Require replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Missing	C	Require replacement
Safety clip missing (not leaking)	C	Require replacement of safety clip
Stripped	A	Require replacement

HOSE CONNECTORS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Connected incorrectly	A	Require repair
Corroded, not reusable	1	Suggest replacement
Cracked	A	Require replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Safety clip missing (not leaking)	C	Require replacement of safety clip
Stripped	A	Require replacement

HOSE COUPLERS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Connected incorrectly	A	Require repair
Corroded, not reusable	1	Suggest replacement
Cracked	B	Require replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Safety clip missing (not leaking)	C	Require replacement of safety clip
Stripped	A	Require replacement

HOSES AND TUBE COUPLERS, CONNECTORS AND CLAMPS

NOTE: When replacing fuel lines and hoses, replace with product that meets or exceeds OEM design specifications.

Condition	Code	Procedure
Application incorrect	B	Require replacement
Connected incorrectly	A	Require repair
Corroded, not reusable	1	Suggest replacement
Cracked	B	Require replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Safety clip missing (not leaking)	C	Require replacement of safety clip
Stripped	A	Require replacement

HOSES AND TUBES (FUEL LINES, RADIATOR, VACUUM, BY-PASS, HEATER, RECOVERY TANK AND OIL COOLERS)

Condition	Code	Procedure
Application incorrect	B	Require replacement
At or beyond service interval	3	Suggest replacement
Connected incorrectly	A	Require repair
Corroded, not reusable	1	Suggest replacement
Cracked	B	Require replacement
Dry-rotted	1	Suggest repair or replacement
Hard	1	Suggest repair or replacement
Inner fabric (webbing) damaged	A	Require replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Leaking	A	Require repair or replacement
Melted	1	Suggest repair or replacement
Missing	C	Require replacement
Outer covering damaged	1	Suggest replacement
Outer covering damaged to the extent that the inner fabric is visible	A	Require replacement
Protective sleeves damaged	2	Suggest replacement of sleeves
Protective sleeves missing	C	Require replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement
Safety clip missing	C	Require replacement
Spongy	1	Suggest repair or replacement
Stripped	A	Require replacement
Swollen	B	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

HOUSINGS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Housing corroded	1	Suggest replacement of housing
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Installation incorrect	B	Require repair or replacement
Leaking	A	Require repair or replacement
Thermostat missing	C	Require replacement of thermostat
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement

IDLE AIR CONTROLS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

IDLE SPEED CONTROL ACTUATORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement

Condition	Code	Procedure
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

IGNITION BOOTS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Carbon-tracked	A	Require replacement
Corroded	1	Suggest repair or replacement
Insulation leaking (shorted)	A	Require repair or replacement
Metal heat shield bent	2	Suggest repair or replacement
Missing	C	Require replacement
Oil-soaked (spongy)	1	Suggest replacement
Resistance incorrect	B	Require replacement
Routed incorrectly	B	Suggest repair

Condition	Code	Procedure
NOTE: If improper routing affects the performance of other systems, require repair. Proper routing, hardware, heatshields, etc., are intended to prevent premature failure of secondary ignition components.		
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

IGNITION COIL TOWERS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Carbon-tracked	A	Require replacement
Corroded	1	Suggest repair or replacement
Insulation leaking (shorted)	A	Require repair or replacement
Metal heat shield bent	2	Suggest repair or replacement
Missing	C	Require replacement
Oil-soaked (spongy)	1	Suggest replacement
Resistance incorrect	B	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

IGNITION COILS

Condition	Code	Procedure
Arcing	A	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement

Condition	Code	Procedure
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Corroded, affecting performance	A	Require replacement
Corroded, not affecting performance	2	Suggest replacement
Distorted	Ä,Ä	No service suggested or required
NOTE: Distortion may be the result of overheating; coil should be tested.		
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Oil leaking	A	Require replacement
Out of specification	B	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

IGNITION CONTROL MODULES (ICM)

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Code set (if applicable)	A	Further inspection required
NOTE: Refer to manufacturer's diagnostic trouble code procedure and require repair or replacement of affected component(s).		
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	A	Require repair
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Leaking	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation, or failure to perform all functions.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

IGNITION SWITCHES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Binding, affecting performance	A	Require repair or replacement
Binding, not affecting performance	2	Suggest repair or replacement
Broken	A	Require repair or replacement
Burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Burned, not affecting performance	2	Suggest repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Cracked, affecting performance	A	Require repair or replacement
Cracked, not affecting performance	1	Suggest repair or replacement

Condition	Code	Procedure
Leaking	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation, or failure to perform all functions.		
Melted, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Melted, not affecting performance	2	Suggest repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Missing	C	Require replacement
Out of adjustment	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Won't return	A	Require repair or replacement
Worn	1	Suggest replacement

IGNITION TERMINALS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Carbon-tracked	A	Require replacement
Corroded	1	Suggest repair or replacement
Insulation leaking (shorted)	A	Require repair or replacement
Metal heat shield bent	2	Suggest repair or replacement
Missing	C	Require replacement
Oil-soaked (spongy)	1	Suggest replacement
Resistance incorrect	B	Require replacement
Routed incorrectly	B	Suggest repair
NOTE: If improper routing affects the performance of other systems, require repair. Proper routing, hardware, heatshields, etc., are intended to prevent premature failure of secondary ignition components.		
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

IGNITION WIRES (SECONDARY)

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Carbon-tracked	A	Require replacement
Corroded	1	Suggest repair or replacement
Insulation leaking (shorted)	A	Require repair or replacement
Metal heat shield bent	2	Suggest repair or replacement
Missing	C	Require replacement
Oil-soaked (spongy)	1	Suggest replacement
Resistance incorrect	B	Require replacement
Routed incorrectly	B	Suggest repair
NOTE: If improper routing affects the performance of other systems, require repair. Proper routing, hardware, heatshields, etc., are intended to prevent premature failure of secondary ignition components.		
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

INERTIA FUEL SHUT-OFF SWITCHES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

INTAKE AIR TEMPERATURE SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required

Condition	Code	Procedure
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

INTAKE CLEANING

NOTE: See [CHEMICAL ENGINE DECARBONIZATION](#).

INTAKE MANIFOLDS

Condition	Code	Procedure
15,000 miles or 12 months beyond most recent Chemical Engine Decarbonization	5	Suggest chemical engine decarbonization
Corroded, affecting sealability	A	Require repair or replacement
Integrated air or fuel control components inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Internal air or fuel components damaged, affecting performance	A	Require repair or replacement of component
Internal air or fuel components damaged, not affecting performance	Ã,Â	No service suggested or required
Internal air or fuel components missing	C	Require replacement of component
Leaking	A	Require repair or replacement
Out of specification	B	Require replacement
Restricted	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement
Warped	B	Require repair or replacement

IN-TANK FUEL STRAINERS

Condition	Code	Procedure
Missing	C	Require replacement
Restricted	A	Require repair or replacement
Torn	A	Require replacement

INTERCOOLERS

Condition	Code	Procedure
Air-to-air intercooler leaking, affecting boost performance	A	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Leaking coolant	A	Require repair or replacement
Missing	C	Require replacement
Restricted, affecting performance	A	Require repair or replacement

KNOCK SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

NOTE:

Determine cause and correct prior to repair or replacement of part.

Connector missing	C	Require replacement
Inoperative	A	Require repair or replacement. Further inspection required

NOTE:

Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.

Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

NOTE:

Determine cause and correct prior to repair or replacement of part.

Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

Condition	Code	Procedure
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

LIQUID VAPOR SEPARATORS

Condition	Code	Procedure
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	B	Require replacement
Missing	C	Require replacement
Restricted	A	Require repair or replacement

LONG BLOCK ASSEMBLIES

NOTE: A Long Block Assembly is a short block assembly together with a cylinder head assembly and all those components fitted within the rocker or cam cover, and timing cover (the whole presented as an assembly). A rebuilt or new oil pump, or kit shall be supplied or fitted as appropriate.

Condition	Code	Procedure
Combustion efficiency is reduced due to carbon deposits in the combustion chamber	2	Suggest repair
Internal component failure (any component)	A	Require repair or replacement of the long block assembly
NOTE: It is Required that all other failure-related components be inspected for cause and condition. Additional components or assemblies may be Suggested for repair or replacement such as a water pump on a short block (reason code 4, technician's recommendation based on substantial and informed experience). For example: If there is a failed head gasket with an external coolant leak, in addition to Requiring replacement of the head gasket, inspection of the following for cause and condition is Required: Block, Cooling System, Cylinder Head. It may be Suggested that additional inspections be performed, such as the other head gasket on a V -type engine.		

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement

Condition	Code	Procedure
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

MASS AIR FLOW (MAF) SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

METAL AIR MANIFOLDS AND PIPES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Broken	A	Require repair of injection tube or replacement of manifold
Corroded, affecting structural integrity	1	Suggest replacement of injection tube or manifold
Leaking	A	Require repair of injection tube or replacement of manifold
Loose	A	Require repair
Missing	C	Require replacement
Restricted	A	Require replacement of injection tube or manifold
Threads damaged	A	Require repair
Threads stripped (threads missing)	A	Require replacement

METAL AIR PIPES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware

Condition	Code	Procedure
Broken	A	Require repair of injection tube or replacement of manifold
Corroded, affecting structural integrity	1	Suggest replacement of injection tube or manifold
Leaking	A	Require repair of injection tube or replacement of manifold
Loose	A	Require repair
Missing	C	Require replacement
Restricted	A	Require replacement of injection tube or manifold
Threads damaged	A	Require repair
Threads stripped (threads missing)	A	Require replacement

MIX CONTROL SOLENOIDS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

Condition	Code	Procedure
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

MOTOR MOUNTS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Broken	A	Require replacement
Leaking (hydraulic mount)	A	Require replacement
Mounting hole worn, affecting performance	A	Require replacement
Mounting hole worn, not affecting performance	Ã,Â	No service suggested or required
Rubber deteriorated, affecting performance	A	Require replacement
Rubber deteriorated, not affecting performance	Ã,Â	No service suggested or required
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

O2 SENSORS

Condition	Code	Procedure
At or beyond service interval	3	Suggest replacement to comply with vehicle's OEM recommended service intervals
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement

Condition	Code	Procedure
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

OIL PANS

Condition	Code	Procedure
Attaching hardware incorrect	B	Require replacement
Attaching hardware loose	A	Require repair or replacement
Attaching hardware missing	C	Require replacement
Baffle loose	2	Suggest repair or replacement
Baffle missing	C	Require replacement
Bent, affecting performance	A	Require repair or replacement
Bent, not affecting performance	Ã, Â	No service suggested or required
Cracked (not leaking)	2	Suggest repair or replacement
Leaking externally	A	Require repair or replacement
Leaking internally, causing fluid contamination	A	Require repair or replacement
Missing	C	Require replacement
Restricted passage	A	Require repair or replacement
Threads damaged	A	Require repair or replacement

OIL PRESSURE SENDING UNITS

Condition	Code	Procedure
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	B	Require replacement
Output signal incorrect	B	Require repair or replacement

Condition	Code	Procedure
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

OIL PUMP PICK-UP SCREENS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bypass stuck	A	Require repair or replacement
Cracked	A	Require repair or replacement
Loose	A	Require repair or replacement
Missing	C	Require replacement
Positioned incorrectly	A	Require repair or replacement
Restricted	A	Require repair or replacement
Screen torn	A	Require replacement

OIL PUMPS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Broken	A	Require repair or replacement
Housing cracked	B	Require repair or replacement
Leaking	B	Require repair or replacement
Pressure relief valve stuck	A	Require repair or replacement
Seized	A	Require repair or replacement
Worn beyond specifications	B	Require repair or replacement

O-RINGS, GASKETS, SEALS AND SPRING LOCKS

Condition	Code	Procedure
Leaking	A	Require repair or replacement
NOTE: Require inspection of mating and sealing surface and repair or replace as necessary.		

PARK NEUTRAL POSITION SWITCHES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

PCV BREATHER ELEMENTS

Condition	Code	Procedure
At or beyond service interval	3	Suggest replacement to comply with vehicle's OEM recommended service intervals
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware

Condition	Code	Procedure
Attaching hardware not functioning	A	Require repair or replacement of hardware
Leaking	A	Require replacement
Melted	A	Required replacement
Missing	C	Require replacement
Restricted, affecting performance	A	Require replacement
Restricted, not affecting performance	1	Suggest replacement
Water-contaminated	A	Require replacement

PCV ORIFICES

Condition	Code	Procedure
At or beyond service interval	3	Suggest repair or replacement to comply with OEM recommended service intervals
Leaking	A	Require replacement
Missing	C	Require replacement
Restricted	A	Require repair or replacement

PCV VALVES

Condition	Code	Procedure
Application incorrect	B	Require replacement
At or beyond service interval	3	Suggest replacement to comply with vehicle's OEM recommended service intervals
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Grommet broken	A	Require repair or replacement of grommet
Grommet missing	C	Require replacement of grommet
Grommet not functioning	A	Require repair or replacement of grommet
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement
Missing	C	Require replacement
Restricted	A	Require replacement

PICK-UP ASSEMBLIES (INCLUDES MAGNETIC, HALL EFFECT AND OPTICAL)

Condition	Code	Procedure
Adjustment incorrect	B	Require repair
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement

Condition	Code	Procedure
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation. Refer to OEM recommended service procedures.		
Oil-soaked	A	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

POWER STEERING PRESSURE SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement

Condition	Code	Procedure
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

POWERTRAIN CONTROL MODULES (PCM) AND PROM

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Code set (if applicable)	A	Further inspection required
NOTE: Refer to manufacturer's diagnostic trouble code procedure and require repair or replacement of affected component(s).		
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require repair
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Leaking	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation or failure to perform all functions.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement

Condition	Code	Procedure
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

POWERTRAIN CONTROL PROM

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Code set (if applicable)	A	Further inspection required
NOTE: Refer to manufacturer's diagnostic trouble code procedure and require repair or replacement of affected component(s).		
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require repair
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Leaking	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation or failure to perform all functions.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

PRESSURIZED EXPANSION TANK CAPS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Coolant recovery check valve inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Fails to maintain proper pressure	B	Require replacement
Gasket missing	C	Require replacement of gasket
Missing	C	Require replacement
Seal missing	C	Require replacement of seal

RADIATOR / COOLING FAN BLADES

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bent	A	Require replacement
Broken	A	Require replacement
Cracked	B	Require replacement
Loose	A	Require repair or replacement
Missing	C	Require replacement

RADIATOR / COOLING FAN CLUTCHES

NOTE: Some lateral movement, measured at the fan blade tip, may be normal.

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bearing noisy	A	Require replacement

Condition	Code	Procedure
Bearing worn	A	Require replacement
Fastener loose	A	Require repair or replacement of fastener
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	B	Suggest replacement
Seized	A	Require replacement
Slips (insufficient fan speed)	A	Require replacement
Thermal control incorrect	B	Require repair or replacement

RADIATOR CAPS AND PRESSURIZED EXPANSION TANK CAPS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Coolant recovery check valve inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Fails to maintain proper pressure	B	Require replacement
Gasket missing	C	Require replacement of gasket
Missing	C	Require replacement
Seal missing	C	Require replacement of seal

RADIATORS

Condition	Code	Procedure
Air flow restriction	A	Require repair
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connection leaking	A	Require repair or replacement
Corroded	1	Suggest repair or replacement
Fins damaged, affecting performance	A	Require repair or replacement
Fins damaged, not affecting performance	2	Suggest repair or replacement
Internal oil cooler leaking	A	Require repair or replacement
Internal restrictions, affecting performance	A	Require repair or replacement
Internal restrictions, not affecting performance	2	Suggest repair or replacement
Leaking	B	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement
Tubes damaged, affecting performance	A	Require repair or replacement
Tubes damaged, not affecting performance	Ã,Â	No service suggested or required

ROLL OVER VALVES

Condition	Code	Procedure
Inoperative	A	Require replacement

Condition	Code	Procedure
NOTE: Inoperative includes intermittent operation.		
Leaking	B	Require replacement
Missing	C	Require replacement

SEALING COMPOUNDS

Condition	Code	Procedure
Leaking	A	Require repair or replacement
NOTE: Require inspection of mating and sealing surface and repair or replace as necessary.		

SEALS

Condition	Code	Procedure
Leaking	A	Require repair or replacement
NOTE: Require inspection of mating and sealing surface and repair or replace as necessary.		

SECONDARY AIR INJECTION SYSTEM MANAGEMENT DEVICES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

SENSORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
Connector missing	C	Require replacement
Inoperative	A	Require repair or replacement
Leaking (vacuum/fluid/air)	A	Require replacement
Out of adjustment	B	Further inspection required
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SHORT BLOCK ASSEMBLIES

NOTE: A Short Block Assembly is a cylinder block and all those components contained within the limits of the block deck or decks, the pan rail, the block rear face and the timing cover (where fitted), including the crankshaft.

Condition	Code	Procedure
Combustion efficiency is reduced due to carbon deposits in the combustion chamber	2	Suggest repair
Internal component failure (any component)	A	Require repair or replacement of the short block assembly

Condition	Code	Procedure
NOTE: It is Required that all other failure-related components be inspected for cause and condition. Additional components or assemblies may be Suggested for repair or replacement, such as a water pump on a short block (reason code 4, technician's recommendation based on substantial and informed experience). For example: If there is a failed head gasket with an external coolant leak, in addition to Requiring replacement of the head gasket, inspection of the following for cause and condition is Required: Block, Cooling System, Cylinder Head. It may be Suggested that additional inspections be performed, such as the other head gasket on a V -type engine.		

SHROUDS, BAFFLES AND DEFLECTORS

Condition	Code	Procedure
Application incorrect, affecting cooling system performance	A	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bent, affecting cooling system performance	A	Require repair or replacement
Blocked, affecting cooling system performance	A	Require repair or replacement
Broken, affecting cooling system performance	A	Require repair or replacement
Cracked, affecting cooling system performance	A	Require repair or replacement
Loose, affecting cooling system performance	A	Require repair
Loose, not affecting cooling system performance	2	Suggest repair
Missing, affecting cooling system performance	C	Require replacement

SPARK PLUGS

NOTE: You are not required to replace spark plugs in sets. However, you may suggest replacement of the other plugs for preventive maintenance.

Condition	Code	Procedure
Application incorrect	B	Require replacement
At or beyond service interval	3	Suggest replacement
Electrode eroded	1	Suggest replacement
Fouled	A	Require repair or replacement
NOTE: Determine cause of fouling and suggest repair.		
Gap incorrect	B	Require repair or replacement
Improperly Indexed	Ã,Ã	Remove and Reinstall following manufacturers installation requirements
Insulation broken	A	Require replacement
Insulator cracked	A	Require replacement
Leaking compression	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SPRING LOCKS

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Condition	Code	Procedure
Leaking	A	Require repair or replacement
NOTE: Require inspection of mating and sealing surface and repair or replace as necessary.		

SUPER CHARGERS

Condition	Code	Procedure
Attaching hardware damaged, affecting operation or performance	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Bearing noisy	A	Require replacement
Bearing worn	A	Require replacement
Boost pressure incorrect	A	Require repair or replacement
NOTE: Boost pressure problems may be caused by other systems or components.		
Clearance out of specification	B	Require repair or replacement
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement

SWITCHES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Binding, affecting performance	A	Require repair or replacement
Binding, not affecting performance	2	Suggest repair or replacement
Broken	A	Require repair or replacement
Burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Burned, not affecting performance	2	Suggest repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Cracked, affecting performance	A	Require repair or replacement
Cracked, not affecting performance	1	Suggest repair or replacement
Leaking	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation, or failure to perform all functions.		
Melted, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Melted, not affecting performance	2	Suggest repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Missing	C	Require replacement
Out of adjustment	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Won't return	A	Require repair or replacement
Worn	1	Suggest replacement

THERMAL VACUUM VALVES

Condition	Code	Procedure
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		

Condition	Code	Procedure
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

THERMOSTATIC AIR DOOR ASSEMBLIES

Condition	Code	Procedure
Attaching hardware damaged, affecting operation or performance	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Binding	A	Require repair or replacement
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Seized	A	Require repair or replacement

THERMOSTATS AND HOUSINGS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Housing corroded	1	Suggest replacement of housing
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Installation incorrect	B	Require repair or replacement
Leaking	A	Require repair or replacement
Thermostat missing	C	Require replacement of thermostat
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement

THROTTLE BODIES

Condition	Code	Procedure
15,000 miles or 12 months beyond most recent Chemical Engine Decarbonization	5	Suggest chemical engine decarbonization
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Deposits on throttle body components	A	Require repair
NOTE: Some throttles are coated by manufacturer; follow OEM-recommended procedures.		
Leaking	A	Require repair or replacement
Restricted, affecting performance	A	Require repair
NOTE: Some components may be serviceable; check for accepted cleaning procedure.		
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement
Throttle shaft binding, affecting performance	A	Require repair or replacement
Throttle shaft worn, affecting performance	A	Require repair or replacement
Throttle shaft worn, not affecting performance	1	Suggest repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

THROTTLE BODY CLEANING

NOTE: See [CHEMICAL ENGINE DECARBONIZATION](#).

THROTTLE CABLES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bent	A	Require repair or replacement
Binding	A	Require repair or replacement

Condition	Code	Procedure
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Ã,Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	Ã,Â	No service suggested or required
Bracket Corroded, affecting performance	A	Require repair or replacement
Bracket corroded, not affecting performance	2	Suggest repair or replacement
Bracket cracked, affecting performance	A	Require repair or replacement
Bracket cracked, not affecting performance	1	Suggest repair or replacement
Bracket loose, affecting performance	A	Require repair or replacement
Bracket loose, not affecting performance	1	Suggest repair or replacement
Bracket missing	C	Require replacement
Broken	A	Require replacement
Cracked	B	Require repair or replacement
Disconnected	A	Require repair or replacement
Kinked	A	Require repair or replacement
Melted	A	Require repair or replacement
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
Out of adjustment	B	Require repair or replacement
NOTE: Follow OEM recommended adjustment procedures. Require repair or replacement if out of specification.		
Routed incorrectly	B	Suggest repair
Seized	A	Require repair or replacement

THROTTLE LINKAGES AND CABLES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bent	A	Require repair or replacement
Binding	A	Require repair or replacement
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Ã,Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	Ã,Â	No service suggested or required
Bracket Corroded, affecting performance	A	Require repair or replacement
Bracket corroded, not affecting performance	2	Suggest repair or replacement
Bracket cracked, affecting performance	A	Require repair or replacement
Bracket cracked, not affecting performance	1	Suggest repair or replacement
Bracket loose, affecting performance	A	Require repair or replacement
Bracket loose, not affecting performance	1	Suggest repair or replacement
Bracket missing	C	Require replacement
Broken	A	Require replacement
Cracked	B	Require repair or replacement
Disconnected	A	Require repair or replacement
Kinked	A	Require repair or replacement
Melted	A	Require repair or replacement
Missing	C	Require replacement

Condition	Code	Procedure
Noisy	2	Suggest repair or replacement
Out of adjustment	B	Require repair or replacement
NOTE: Follow OEM recommended adjustment procedures. Require repair or replacement if out of specification.		
Routed incorrectly	B	Suggest repair
Seized	A	Require repair or replacement

THROTTLE POSITION SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

THROTTLE POSITION SWITCHES

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

TIMING BELT SPROCKETS

Condition	Code	Procedure
Alignment incorrect	B	Require repair
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bent	A	Require replacement
Cracked	B	Require replacement
Key damaged	A	Require replacement
Loose	A	Require repair or replacement
Missing	C	Require replacement

Condition	Code	Procedure
Pulley damaged, affecting belt life	A	Require replacement
Sprocket damaged, affecting belt life	A	Require repair or replacement
Sprocket loose	B	Require repair or replacement
Sprocket-to-shaft alignment incorrect	B	Require repair or replacement

TIMING BELTS

Condition	Code	Procedure
Adjustment incorrect	B	Suggest adjustment
NOTE: Inspect belt tensioners, pulleys, and cover.		
Alignment incorrect	B	Further inspection required
NOTE: Determine cause of incorrect alignment and require repair.		
At or beyond service interval	3	Suggest replacement to comply with vehicle OEM recommended service intervals
Broken	A	Require replacement
Cam timing out of specification	B	Require repair
Cracked	1	Suggest replacement
Fluid-soaked	1	Suggest replacement. Further inspection required
Frayed	1	Suggest replacement
Missing	C	Require replacement
NOTE: Internal engine damage may result from timing belt damage/failure.		
Noisy	2	Further inspection required
NOTE: Determine cause of noise and suggest repair.		
Plies separated	A	Require replacement
Teeth missing	A	Require replacement
Tension out of specification	B	Require adjustment or replacement

TIMING COVERS

Condition	Code	Procedure
Attaching hardware incorrect	B	Require replacement
Attaching hardware loose	A	Require repair or replacement
Attaching hardware missing	C	Require replacement
Baffle loose	2	Suggest repair or replacement
Baffle missing	C	Require replacement
Bent, affecting performance	A	Require repair or replacement
Bent, not affecting performance	Ã,Â	No service suggested or required
Cracked (not leaking)	2	Suggest repair or replacement
Leaking externally	A	Require repair or replacement
Leaking internally, causing fluid contamination	A	Require repair or replacement
Missing	C	Require replacement
Restricted passage	A	Require repair or replacement
Threads damaged	A	Require repair or replacement

TORQUE STRUTS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Binding	A	Require replacement
Body dented	A	Further inspection required
NOTE: Require replacement of units where dents restrict strut piston rod movement. If dents don't restrict movement, no service is suggested or required.		
Body punctured	A	Require replacement
Bushing deteriorated, affecting performance	A	Require replacement
Bushing deteriorated, not affecting performance	Ã,Â	No service suggested or required
Bushings missing	C	Require replacement
Bushings separated from mounting eye	1	Suggest replacement
Damping (none)	A	Require replacement
Leaking oil, enough for fluid to be running down the body	A	Require replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: If noise is isolated to shock or strut, suggest replacement.		
Piston rod bent	A	Require replacement
Piston rod broken	A	Require replacement
Seized	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

TRANSMISSION RANGE SWITCHES

Condition	Code	Procedure
Application Incorrect	B	Require repair or replacement
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		

Condition	Code	Procedure
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance .	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

TUBE CLAMPS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Connected incorrectly	A	Require repair
Corroded, not reusable	1	Suggest replacement
Cracked	B	Require replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Missing	C	Require replacement
Safety clip missing (not leaking)	C	Require replacement of safety clip
Stripped	A	Require replacement

TUBE CONNECTORS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Connected incorrectly	A	Require repair
Corroded, not reusable	1	Suggest replacement
Cracked	B	Require replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Safety clip missing (not leaking)	C	Require replacement of safety clip
Stripped	A	Require replacement

TUBE COUPLERS

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Condition	Code	Procedure
Application incorrect	B	Require replacement
Connected incorrectly	A	Require repair
Corroded, not reusable	1	Suggest replacement
Cracked	B	Require replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Safety clip missing (not leaking)	C	Require replacement of safety clip
Stripped	A	Require replacement

TUBES

Condition	Code	Procedure
Application incorrect	B	Require replacement
Application incorrect	B	Require replacement
At or beyond service interval	3	Suggest replacement
At or beyond service interval	3	Suggest replacement
Connected incorrectly	A	Require repair
Connected incorrectly	A	Require repair
Corroded, not reusable	1	Suggest replacement
Corroded, not reusable	1	Suggest replacement
Cracked	B	Require replacement
Cracked	B	Require replacement
Dry-rotted	1	Suggest repair or replacement
Dry-rotted	1	Suggest repair or replacement
Hard	1	Suggest repair or replacement
Hard	1	Suggest repair or replacement
Inner fabric (webbing) damaged	A	Require replacement
Inner fabric (webbing) damaged	A	Require replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Leaking	A	Require repair or replacement
Leaking	A	Require repair or replacement
Melted	1	Suggest repair or replacement
Melted	1	Suggest repair or replacement
Missing	C	Require replacement
Missing	C	Require replacement
Outer covering damaged	1	Suggest replacement
Outer covering damaged	1	Suggest replacement
Outer covering damaged to the extent that the inner fabric is visible	A	Require replacement
Outer covering damaged to the extent that the inner fabric is visible	A	Require replacement
Protective sleeves damaged	2	Suggest replacement of sleeves
Protective sleeves damaged	2	Suggest replacement of sleeves
Protective sleeves missing	C	Require replacement of sleeves
Protective sleeves missing	C	Require replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement

Condition	Code	Procedure
Safety clip missing	C	Require replacement
Safety clip missing	C	Require replacement
Spongy	1	Suggest repair or replacement
Spongy	1	Suggest repair or replacement
Stripped	A	Require replacement
Stripped	A	Require replacement
Swollen	B	Require replacement
Swollen	B	Require replacement
Threads damaged	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement
Type incorrect	2	Suggest repair or replacement

TURBO CHARGERS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Boost pressure incorrect	A	Require repair or replacement
NOTE: Boost pressure problems may be caused by other systems or components.		
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Oil seal (internal) leaking	A	Require repair or replacement
Vibrates	A	Require repair or replacement

VACUUM CONNECTIONS

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Melted	A	Require replacement
Missing	C	Require replacement
Oil-soaked (spongy)	1	Suggest replacement
Restricted	A	Require repair or replacement
Surface cracks (dry-rotted)	1	Suggest replacement

VACUUM HOSES, TUBES AND CONNECTIONS (NON-METALLIC)

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Melted	A	Require replacement
Missing	C	Require replacement
Oil-soaked (spongy)	1	Suggest replacement
Restricted	A	Require repair or replacement
Surface cracks (dry-rotted)	1	Suggest replacement

VACUUM REGULATOR SOLENOIDS

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Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Restricted, affecting performance	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

VACUUM TUBES

Condition	Code	Procedure
Leaking	A	Require repair or replacement
Melted	A	Require replacement
Missing	C	Require replacement
Oil-soaked (spongy)	1	Suggest replacement
Restricted	A	Require repair or replacement
Surface cracks (dry-rotted)	1	Suggest replacement

VALVE COVERS

Condition	Code	Procedure
Attaching hardware incorrect	B	Require replacement
Attaching hardware loose	A	Require repair or replacement
Attaching hardware missing	C	Require replacement
Baffle loose	2	Suggest repair or replacement
Baffle missing	C	Require replacement
Bent, affecting performance	A	Require repair or replacement
Bent, not affecting performance	Ä, Å	No service suggested or required
Cracked (not leaking)	2	Suggest repair or replacement
Leaking externally	A	Require repair or replacement
Leaking internally, causing fluid contamination	A	Require repair or replacement
Missing	C	Require replacement
Restricted passage	A	Require repair or replacement
Threads damaged	A	Require repair or replacement

VEHICLE SPEED SENORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement

Condition	Code	Procedure
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

VOLUME AIR FLOW SENSORS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement

Condition	Code	Procedure
Wire lead shorted	A	Require repair or replacement

WASTE GATE AND BOOST CONTROL MECHANISMS

Condition	Code	Procedure
Boost pressure incorrect	A	Require repair or replacement. Further inspection required
NOTE: Incorrect boost pressure includes intermittent operation.		
Leaking	A	Require repair or replacement

WASTE GATE CONTROL SOLENOIDS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

Condition	Code	Procedure
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

WATER PUMPS (ELECTRIC)

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	A	Require repair or replacement. Further inspection required
NOTE: Check fan motor/controls. Inoperative includes intermittent operation.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Noisy	2	Suggest replacement
Rotation incorrect for application	B	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Vibration	1	Suggest replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

WATER PUMPS (NON-ELECTRIC)

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware

Condition	Code	Procedure
Attaching hardware not functioning	A	Require repair or replacement of hardware
Corrosion (internal) is excessive, affecting performance	A	Require replacement
Corrosion (internal) is excessive, not affecting performance	2	Suggest cooling system service
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	A	Require replacement
Noisy	A	Require replacement
Rotation incorrect for application	B	Require repair or replacement
Shaft bent	A	Require replacement

WIRING HARNESSES AND CONNECTORS

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement
Open	A	Require repair or replacement
Protective shield (conduit) melted	2	Suggest repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Protective shield (conduit) missing	C	Suggest repair or replacement
Resistance (voltage drop) out of specification	A	Require repair or replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
Shorted	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

Condition	Code	Procedure
Voltage drop out of specification	A	Require repair or replacement

REASON CODE EXPLANATION

Code	Reason
Required	
A	Part No Longer Performs Intended Purpose
B	Part Does Not Meet A Design Specification (Regardless Of Performance)
C	Part Is Missing
Suggested/Optional	
1	Part Is Close To The End Of Its Useful Life
2	To Address A Customer Need, Convenience Or Request
3	To Comply With Maintenance Recommended By The Vehicle's Original Equipment Manufacturer
4	Technician's Recommendation Based On Substantial And Informed Experience
5	To Comply With Maintenance Recommended By AMRA/MAP

AUTOMOTIVE TERMINOLOGY & DEFINITIONS

ACCELERATION

an increase in velocity or speed.

ADDITIVE

in automotive terminology, a substance added to a liquid, such as engine oil, transmission fluid, gear oil or coolant to enhance its properties.

ADVANCED TECHNOLOGY VEHICLE (ATV)

a vehicle that combines new engine/power/drivetrain systems to significantly improve fuel economy. This includes hybrid power systems and fuel cells, as well as some specialized electric vehicles.

AIR GAP

a specified space between two components. Space or gap between spark plug electrodes, motor and generator armatures Ind field shoes. The space or gap between the compressor drive hub and pulley assembly.

AIR INJECTION REACTION (AIR) SYSTEM

a system that provides fresh air to the exhaust system under controlled conditions to reduce emissions. The air source can be a pulse-air pump or an electrically or belt driven pump. Upstream air injection goes into the exhaust manifold to assist in after-burning HC laden exhaust gases. Downstream air injection goes into the oxidation bed of the catalytic converter to help oxidize HC and CO emissions.

AIR PUMP

device to produce a flow of air at higher-than-atmospheric pressure. Normally referred to as a thermactor air supply pump.

AIR/FUEL RATIO

the proportion of air to fuel by weight in the fuel mixture drawn into the engine.

ALLOY

mixture containing mostly metals. For example, brass is an alloy of copper and zinc. Steel contains iron and other metals, but also carbon

ALTERNATIVE FUEL VEHICLE (AFV)

as defined by the Energy Policy Act, any dedicated, flexible-fuel, or dual-fuel vehicle designed to operate on at least one alternative fuel.

ALTERNATIVE FUEL

alternative fuel, also known as non-conventional fuels, is any material or substance that can be used as a fuel, other than fossil fuels, or conventional fuels of petroleum (oil), coal, propane, and natural gas. The term "alternative fuels" usually refers to a source of which energy is renewable. Methanol, denatured ethanol, and other alcohols; mixtures containing 85% or more by volume of methanol, denatured ethanol, and other alcohols with gasoline or other fuels; natural gas; liquefied petroleum gas; hydrogen; coal-derived liquid fuels; non-alcohol fuels (such as biodiesel) derived from biological material; and electricity. 'P-Series' fuels were added to this list since the original definition in EPAct.

AMBIENT TEMPERATURE

the temperature of the medium surrounding an object

ANTIFREEZE

a material such as ethylene glycol which is added to water to lower its freezing point; used in an automobile's cooling system.

B100

100% (neat) biodiesel.

B20

a blend of biodiesel fuel with petroleum-based diesel where 20% of the volume is biodiesel.

BABBITT

a soft bearing alloy used in engine bearings.

BACK PRESSURE

pressure created by a blockage or restriction in an exhaust system.

BACKFIRE

the sudden combustion of gasses in the intake or exhaust manifold, resulting in a loud explosion.

BALANCE SHAFT

a weighted shaft used on some engines to dampen or reduce vibration.

BALLAST RESISTOR

resistor in the primary side of the ignition system that is used to reduce voltage by approximately 4-5 volts.

BATTERY

batteries are the principal energy storage devices for hybrid electric vehicles (HEVs). Desirable attributes of high-power batteries for HEV applications are high-peak and pulse-specific power, high specific energy at pulse power, a high charge acceptance to maximize regenerative braking utilization, and long calendar and cycle life. Developing methods/designs to balance the packs

electrically and thermally, developing accurate techniques to determine a battery's state of charge, and developing abuse-tolerant batteries, and recyclability are additional technical challenges.

BDC

bottom dead center, when the piston is at its lower limit in the cylinder bore.

BEARING CAP

the lower half of the bearing saddle. It is removable, as in main cap or rod cap.

BEARING CLEARANCE

the space between a bearing and its corresponding component's loaded surface. Bearing clearances are commonly provided to allow lubrication between the parts.

BEARING CRUSH

the bearing is slightly larger at its parting lines so that when the two halves of the bearing are tightened together, the bearing seats firmly in its bore. This keeps the bearing from rotating.

BEARING LINING

the bearing surface area of a bearing, it is usually made up of an alloy of several metals, including lead.

BEARING SPREAD

the condition in which the distance across the outer edges of the bearing insert is slightly greater than the diameter of the housing bore. A bearing is spread slightly apart at its parting halves so that it snaps into place in its bore and remains there during assembly.

BEFORE TOP DEAD CENTER (BTDC)

the degrees of crankshaft rotation just before the piston in a specific cylinder reaches TDC, the highest point in its vertical travel on the compression stroke. On most vehicles, spark occurs a certain number of degrees of crankshaft rotation BTDC.

BI-FUEL VEHICLE

a vehicle with two separate fuel systems designed to run on either an alternative fuel, or gasoline or diesel, using only one fuel at a time. Bi-fuel vehicles are referred to as "dual-fuel" vehicles in the Clean Air Act Amendments and Energy Policy Act.

BLOCK

the casting made up of cylinders and the crankcase.

BLOWBY

the unburned fuel and products of combustion that are forced past the piston rings and into the crankcase during the combustion stroke.

BOOST PRESSURE.

term used when a turbocharger increases the air pressure entering an engine above atmospheric pressure.

BORE GAUGE

a precision measuring instrument used to measure the diameter of a bore.

BORE

a cylindrical hole.

BOSS

the part of a piston that fits around its pin.

BOTTOM DEAD CENTER (BDC)

when the piston is at its lower limit in the cylinder bore.

BRAKE HORSEPOWER

power developed by an engine as measured at the flywheel or crankshaft.

BRAKE-SPECIFIC FUEL CONSUMPTION

the ratio of engine fuel consumption to power output. It is a measure of engine efficiency.

BTDC

see 'before top dead center'.

CAMSHAFT BEARING

a bearing that supports the camshaft journal. On some engines it is full round and pressed in place. On some OHC engines the camshaft bearing is made up of two shells like a connecting rod bearing.

CAMSHAFT FOLLOWER

on OHC engines the equivalent of a rocker arm.

CAMSHAFT JOURNAL

the bearing area of a camshaft.

CAMSHAFT LOBE

the eccentric on a camshaft that acts on lifters or followers and in turn, other valvetrain components as the camshaft is rotated, to open the intake and exhaust valves.

CAMSHAFT POSITION SENSOR (CMP)

a magnetic, hall effect, optical or magneto resistive sensor usually mounted internally in the engine to inform the ECM or PCM of piston position on the intake stroke for timing and synchronization of sequential fuel injection.

CAMSHAFT SPROCKET

the sprocket on a camshaft that is turned by a chain or belt from the crankshaft. The camshaft sprocket has twice as many teeth as the crankshaft sprocket.

CARBON DIOXIDE (CO₂)

A product of combustion that has become an environmental concern in recent years. CO₂ does not directly impair human health, but is a greenhouse gas that traps the Earth's heat and contributes to the potential for global warming.

CARBON MONOXIDE (CO)

a colorless, odorless gas, which is highly poisonous. CO is produced by incomplete combustion. It is absorbed by the bloodstream 400 times faster than oxygen.

CARBON

a hard or soft nonmetallic element that forms in an engine's combustion chamber when oil is burned.

CARBURETOR

a device that atomizes air and fuel in a proportion that is burnable in the engine.

CASTING

metal that is manufactured by pouring it into a mold. It is more porous than forged metal and does not conduct heat as well. It is less expensive to manufacture, however.

CATALYTIC CONVERTER

an emission control device located in the exhaust system that contains catalysts, which reduce hydrocarbons, carbon monoxide and nitrogen oxides in the exhaust gases.

CATALYTIC OXIDATION

process of oxidizing unburned hydrocarbons and carbon monoxide by means of a catalytic reaction to reduce pollution.

CHOKE

a device used on carbureted vehicles to reduce the amount of air entering the intake manifold while leaving the amount of fuel unchanged. The purpose of a choke is to richen the mixture enough that a cold engine can still get enough vaporized fuel to start.

CLOSED LOOP

electronic feedback system in which sensors provide constant information on what is taking place in the engine; the state of the engine control computer system when it is working normally, at full operating temperature and normal speeds with the oxygen sensor switching. The fuel injection quantity is determined by the set of inputs from the engine control computer's sensors, most specifically the oxygen sensor in the exhaust stream. A closed loop system samples its output and uses that sampling to modify the next inputs.

CLOSED-LOOP CARBURETION

system in which the fuel/air ratio in the engine is carefully controlled to optimize emissions performance. A closed-loop system uses a fuel metering correction signal to optimize fuel metering.

COIL-ON-PLUG IGNITION

a Coil-on-Plug ignition system uses one ignition coil for each cylinder attached to the spark plug. The system replaces remote ignition coils and high-voltage ignition wires in a distributorless ignition system.

COLD START

difficulty of starting an internal combustion engine in cold weather because of gasoline, which evaporates more slowly when it is cold; oil, which gets thicker in cold weather; and the chemical reactions inside the battery, which progress more slowly in cold weather.

COMBUSTION CHAMBER

enclosure formed by a pocket in the cylinder head and the top of the piston, where the spark plug ignites the compressed air/fuel mixture. The volume of the cylinder above the piston when the piston is at TDC.

COMBUSTION

the burning of the air/fuel mixture.

COMMON RAIL DIRECT INJECTION (CDI)

a fuel-injection system that uses a single "rail" (fuel line) that maintains constant fuel pressure regardless of injection sequence (also called common rail injection). The engine's electronic timing regulates fuel-injection timing and quantity according to data from sensors on the camshafts and crankshafts so that compression and injection occur independently. Fuel is injected only as needed, which reduces fuel consumption and emissions.

COMPRESSION IGNITION

the form of ignition that initiates combustion in a diesel engine. The rapid compression of air within the cylinders generates the heat required to ignite the fuel as it is injected.

COMPRESSION RATIO

ratio of the volume in the cylinder above the piston when the piston is at bottom dead center to the volume in the cylinder above the piston when the piston is at top dead center.

COMPRESSION RINGS

usually the top two rings on a piston, they form a seal between the piston and cylinder wall to compress the air fuel mixture in the cylinder.

COMPRESSION STROKE

the second stroke of the 4-stroke engine cycle, in which the piston moves from bottom dead center and the intake valve is closed, trapping and compressing the air/fuel mixture in the cylinder.

COMPRESSION

in a solid material, compression is the opposite of tension. In a gas, compression causes the gas to be confined in a smaller area, raising its temperature and pressure.

COMPRESSION-IGNITION DIRECT-INJECTION (CIDI) ENGINE

commonly called the diesel engine, has the highest thermal efficiency of any internal combustion engine. Challenges to improvements include a lower specific power than the gasoline engine; significant particulate matter and nitrogen oxides in the exhaust; and the noise, vibration, and smell of the engine.

CONNECTING ROD BEARINGS

the plain bearing shells located in the big end of the connecting rod that support the connecting rod and piston on the crankshaft.

CONNECTING ROD CAP

the removable part of the big end of the connecting rod.

CONNECTING ROD

a rod that connects the crankshaft to the piston and enables the reciprocating motion of the piston to turn the crankshaft.

CONTINUOUS INJECTION

a system that uses fuel under pressure to maintain or change the fuel injection area.

COOLANT

the mixture of water and antifreeze used in an engine's cooling system to maintain the engine's temperature throughout its operating range.

COOLING FAN

a mechanically or electrically driven propeller that draws air through the radiator.

COOLING SYSTEM

the system used to remove excess heat from an engine and transfer it to the atmosphere. Includes the radiator, cooling fan, hoses, water pump, thermostat and engine coolant passages.

CORROSION INHIBITORS

additives used to inhibit corrosion (e.g., rust) in the fuel system.

CRANK THROW

distance from the crankshaft main bearing centerline to the connecting rod journal centerline. The stroke of any engine is the crank throw.

CRANK WEB

unmachined portion of a crankshaft that lies between two crank pins or between a crankpin and main bearing journal.

CRANKCASE

the lower part of an engine block that houses the crankshaft.

CRANKPIN

the part of the crankshaft to which the connecting rod is attached.

CRANKSHAFT JOURNALS

the bearing areas of a crankshaft are the main and rod journals.

CRANKSHAFT POSITION SENSOR (CKP)

a magnetic, hall effect, optical or magneto resistive sensor usually mounted internally in the engine, externally to the engine or in the distributor to inform the ECM or PCM of crankshaft position, location of No.1 piston, and crankshaft speed for ignition timing and other calculations needed by the system where rpm is an input.

CRANKSHAFT PULLEY

the belt drive pulley mounted on the front of the vibration damper.

CRANKSHAFT THRUST COLLAR

a flat machined area that is 90 degrees to the crankshaft main journals. The flange of the thrust main bearing rides against it to control crankshaft end thrust.

CRANKSHAFT

a lower engine part with main and rod bearing journals. It converts reciprocating motion to rotary motion.

CROSSFLOW RADIATOR

a radiator in which coolant enters on one side, travels through tubes, and collects on the opposite side (see downflow radiator).

CRUSH

the bearing is slightly larger at its parting lines so that when the two halves of the bearing are tightened together, the bearing seats firmly in its bore. This keeps the bearing from rotating.

CYLINDER HEAD

the casting that contains the valves and valve springs, and covers the top of the cylinders.

CYLINDER LEAKAGE TEST

in engine diagnostic test where the piston in the cylinder to be tested is brought to top dead center (TDC) on the compression stroke and compressed air is pumped into the cylinder through the spark plug hole. Where the air leaks out shows the location of the compression leak. A leakage tester will compare the air leaking out of the cylinder to the amount of air being put into it, expressed as a percentage.

CYLINDER SLEEVE

a replacement iron liner that fits into a cylinder bore. It can be either wet or dry. The outside diameter of wet sleeves contacts the coolant.

CYLINDER WALLS

the walls of the cylinder bore.

CYLINDER

round hole in the engine block for the piston.

DAMPER

a device mounted on the front of the crankshaft. It reduces the torsional or twisting vibration that occurs along the length of the crankshaft in multiple cylinder engines. It is also called a harmonic balancer.

DEAD CENTER

the extreme upper or lower position of the crankshaft throw at which the piston is not moving in either direction.

DECK

the top of the engine block where the cylinder head is attached.

DETONATION

abnormal combustion of an air fuel mixture. When pressure in the cylinder becomes excessive and the mixture explodes violently, instead of burning in a controlled manner. The sound of detonation can be heard as the cylinder walls vibrate. Detonation is sometimes confused with preignition or ping.

DIAGNOSTIC TROUBLE CODE (DTC)

a code that represents and can be used to identify a malfunction in a computer control system.

DIE CASTING

an accurate casting made by pouring pressurized molten material into a mold or die.

DIESEL ENGINE

any internal-combustion engine in which air is compressed to a sufficiently high temperature to ignite fuel injected into a cylinder. A diesel engine differs from other internal-combustion engines, such as gasoline engines, in that it employs no ignition devices, such as an electric spark. For this reason, it is often called a compression-ignition engine.

DIESEL FUEL

petroleum products normally used as fuel for diesel engines are components of crude oil having heavy hydrocarbons containing at least 12 to 16 carbon atoms per molecule. These heavier fractions are taken from crude oil after the more volatile portions used in gasoline are removed.

DIESELING

a condition by which hot spots in the combustion chamber(s) cause the engine to run on after the key is turned off.

DIRECT IGNITION

distributorless ignition system in which spark distribution is controlled by the computer.

DIRECT INJECTION (DI)

in DI, fuel is injected directly into the cylinder, as is typical in a diesel engine (also called direct fuel injection). Most other internal combustion engines use either carburetion (in which the air and fuel are mixed long before the air enters the cylinder) or port fuel injection (in which the fuel is injected just in front of the cylinder intake valve).

DIRECT INJECTION ENGINE

direct injection (DI) refers to fuel injected directly into the combustion chamber above the piston. Direct Injection has long been used on large diesel engines. Smaller diesels are increasingly adopting direct injection (vs. indirect injection into a pre-chamber). Direct Injection also can be used in spark ignition (generally gasoline) engines instead of port fuel injection - for cleaner emissions, increased full throttle power and potentially for lean-burn operation.

DIRECT INJECTION SPARK IGNITION (DISI)

with direct injection spark ignition (DISI) engines, fuel is injected in one of two ways depending on operating conditions. Lean burn operation (at part throttle), injects fuel after the air has entered, causing higher fuel concentration near the injector and spark plug for easy ignition. This is known as stratified charge. The overall air/fuel ratio is lean for better fuel consumption. At full power, fuel is injected at the same time as air (same as for conventional) to promote good mixing. Fuel evaporating in the combustion chamber cools the air slightly for higher volumetric efficiency and power. Since all fuel being injected goes directly into the cylinder, it can be metered more precisely, promoting cleaner emissions.

DIRECT INJECTION

a fuel injection system wherein fuel is sprayed directly into the combustion chamber, that is, no precombustion chambers or manifold injection.

DISPLACEMENT

the volume of a cylinder displaced by the piston as it moves from TDC to BDC (a complete stroke).

DISTILLATION CURVE

the percentages of gasoline that evaporate at various temperatures. The distillation curve is an important indicator for fuel standards such as volatility (vaporization).

DRIVEABILITY

the degree to which a vehicle operates properly, including starting, running smoothly, accelerating and delivering reasonable fuel mileage.

DRY SLEEVE

a sleeve, that when installed in a cylinder block, does come into contact with coolant.

DTC

see 'diagnostic trouble code',

DUAL-FUEL VEHICLE

vehicle designed to operate on a combination of an alternative fuel and a conventional fuel. This includes (a) vehicles that use a mixture of gasoline or diesel and an alternative fuel in one fuel tank, commonly called flexible-fuel vehicles; and (b) vehicles capable of operating either on an alternative fuel, a conventional fuel, or both, simultaneously using two fuel systems. They are commonly called bi-fuel vehicles.

DURATION

the length of time that a valve remains open, measured in crankshaft degrees.

DWELL TIME

degree of crankshaft rotation during which the primary circuit is on.

DYKEM BLUE

a dye which is painted on a valve seat in order to determine seat concentricity. The valve is inserted into the guide, lightly seated, and rotated about 1/8 in. A continuous blue line should appear all the way around the valve face if the valve and seat are mating properly. Open patches or breaks in the line indicate that the seat is not concentric and the low spots are not making contact.

E85

a mixture of 85% denatured ethanol and 15% gasoline, by volume; an alternative engine fuel.

E93

ethanol mixture that contains 93% ethanol, 5% methanol and 2% kerosene, by volume.

E95

ethanol/gasoline mixture that contains 95% denatured ethanol and 5% gasoline, by volume.

EGR VALVE POSITION SENSOR

a sensor mounted on the EGR valve that signals the engine control computer regarding EGR valve position and EGR flow.

EGR VALVE

see 'exhaust gas recirculation (EGR) valve',

EMBEDABILITY

the ability of the bearing lining material to absorb contaminants.

ENGINE BLOCK

the casting made up of cylinders and the crankcase.

ENGINE CONTROL MODULE (ECM)

the electronic computer that controls engine operation. ECM is synonymous with ECA, ECU, SBEC or SMEC. It is less powerful than the PCM or VCM in that it controls only engine operation.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

a sensor which works by a negative coefficient thermistor that loses resistance as its temperature goes up (just like the intake air temperature sensor). When the computer applies its 5-volt reference signal to the sensor, this voltage is reduced through a ground circuit by an amount corresponding to the temperature of the engine coolant.

ENGINE DISPLACEMENT

the volume displaced by all of the pistons in all of an engine's cylinders.

ENGINE

a device that converts heat energy into mechanical energy.

EQUIVALENCE RATIO

actual air/fuel ratio divided by the stoichiometric air/fuel ratio. An air/fuel mixture is said to be stoichiometric when fuel combustion consumes all of the initial reacting species in going to completion.

ETHANOL

a liquid alcohol made by fermenting sugars derived from starches in plants, such as corn or sugar cane ($\text{CH}_3\text{CH}_2\text{OH}$, ethyl or grain alcohol). When denatured (made unfit for human consumption), it can be used as an engine fuel. Can be produced chemically from ethylene or biologically from the fermentation of various sugars from carbohydrates found in agricultural crops and cellulosic residues from crops or wood. Used in the United States as a gasoline octane enhancer and oxygenate, it increases octane 2.5 to 3.0 numbers at 10% concentration. Ethanol also can be used in higher concentration in alternative fuel vehicles optimized for its use.

ETHYL TERTIARY BUTYL ETHER (ETBE)

a fuel oxygenate used as a gasoline additive to increase octane and reduce engine knock.

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE SOLENOID

"EVAP" canister purging is controlled by the engine control computer, which determines when the canister should be purged based on various sensor inputs. When purging is needed the computer operates the purge solenoid, which controls the vacuum to purge the canister. Generally, the purge solenoid is activated when the engine is running above idle speed and at normal operating temperature.

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE VALVE

a valve on the line between the EVAP canister and the intake manifold. When the engine is running, under certain operating conditions, the valve opens, fresh air is drawn in through the canister air filter and the air and fuel vapors are drawn into the engine and burned, purging the canister.

EVAPORATIVE EMISSION (EVAP) CANISTER

a charcoal-filled container with lines to the top of the fuel tank, to the intake manifold and to the air cleaner. The charcoal element adsorbs fuel vapors from the gas tank and stores them until the engine is running at normal operating temperatures and speeds. Then, a valve between the canister and engine opens, fresh air is drawn in through the canister air filter and the air and fuel vapors are drawn into the engine and burned, purging the canister.

EVAPORATIVE EMISSION (EVAP) SYSTEM

an emission control system that prevents HC emissions from escaping the fuel system to atmosphere.

EVAPORATIVE EMISSIONS

hydrocarbon vapors that escape from a fuel storage tank or a vehicle fuel tank or vehicle fuel system.

EXHAUST AFTERTREATMENT

a method of controlling emissions from internal combustion engines - primarily NO_x - by applying air pollution control technologies to engine exhaust (as opposed to treatments applied to the engine's intake air or during in-cylinder combustion stages).

EXHAUST GAS RECIRCULATION (EGR) SYSTEM.

helps prevent the formation of oxides of nitrogen (Nox) by recirculating a certain amount of exhaust as an inert gas through the intake manifold to keep the peak combustion temperatures below what would form those chemical compounds. The computer determines when and how much exhaust to recirculate based on information from all its other sensors. It then actuates the EGR solenoid, which opens a vacuum circuit or operates an electronic circuit or operates an electronic circuit to actually work the EGR valve. The computer uses a duty-cycle (percentage of on-time) signal to activate the solenoid.

EXHAUST GAS RECIRCULATION (EGR) VALVE

component in the EGR system, used to meter a controlled amount of exhaust gas into the intake air stream.

EXHAUST GAS RECIRCULATION (EGR)

an emissions control technique that reuses engine exhaust gases as part of the intake air supply to help reduce harmful emissions (especially Nox).

EXHAUST MANIFOLD

the part of the exhaust system that is fastened to the cylinder head.

EXHAUST PIPE

the pipe between the exhaust manifold and muffler.

EXHAUST PORT

the passage or opening in a four stroke cylinder head for the exhaust valve.

EXHAUST STROKE.

the final stroke in a 4-stroke cycle engine during which the exhaust valve is open and the intake valve is closed, exhausting the combusted gases.

EXHAUST VALVE

poppet valves in the cylinder head that control the flow of exhaust from the engine.

FEEDBACK

a basic concept in the way the engine control system works. 'Feedback' refers to the mechanism whereby the computer is able to measure the Oxygen in the exhaust stream and then modify the amount of fuel injected into the intake manifold to optimize exhaust emissions by keeping the air/fuel ratio at stoichiometry.

FLEXIBLE-FUEL VEHICLE (FFV)

a Vehicle with a common fuel tank designed to run on varying blends of unleaded gasoline with either ethanol or methanol.

FLOATING PIN

a piston pin that moves in the piston and the small end of a connecting rod. It is held in place by retaining clips in the pin bosses.

FLOODING

a condition in which unvaporized fuel in the intake manifold and/or combustion area, prevents the engine from starting.

FLUTTER

as applied to engine valves, refers to a condition wherein the valve is not held tightly on its seat due to a weak valve spring, during the time the cam is not lifting it.

FOOT POUND

a unit of measurement for torque. One foot pound is the torque obtained by a force of one pound applied to a wrench handle that is 12-in. long; a unit of energy required to raise a weight of one pound, a distance of one foot.

FOUR STROKE CYCLE ENGINE

an engine, either gasoline or diesel that uses four strokes: intake, compression, power and exhaust. A firing impulse occurs every two turns of the crankshaft. When this engine is a gasoline engine it is also called an Otto cycle engine after its inventor. A diesel engine is called a Diesel cycle engine for the same reason.

FREEZE PLUG

another name for core plug.

FUEL FLEXIBLE

ability of a vehicle to operate on either (a) a wide range of fuels blends (e.g., blends of gasoline and alcohol) or (b) two different fuels carried aboard the vehicle (e.g., gasoline and compressed natural gas).

FUEL INJECTION

a system that sprays fuel directly into the intake air stream.

FUEL INJECTOR

an electrically-opened nozzle that sprays finely atomized fuel through its aperture into the intake manifold during a cylinder's intake stroke. On some vehicles, these injections are sequential, on others, the injectors are fired all at once or in banks.

FUEL PRESSURE REGULATOR

uses intake manifold vacuum, or more properly intake manifold absolute pressure (MAP), to modify the pressure in the fuel rail. The fuel pump can pump more fuel than the engine can use, so the system routes the extra fuel back to the tank through the fuel pressure regulator.

FUEL PUMP (FP) RELAY

the computer controls the electric fuel pump by energizing the fuel pump relay. It does so by grounding the fuel pump relay coil circuit. The relay then directly supplies power to the fuel pump.

FUEL PUMP

a mechanical or electronic device that draws fuel from the fuel tank and sends it to the carburetor or fuel injection system.

FUEL RAIL

a manifold used to connect fuel injectors to the fuel pump

FUEL SHUTOFF

works by de-energizing the fuel pump relay. This occurs if the engine speed sensor indicates excessive engine speed or if the vehicle speed sensor indicates a certain mph.

FUEL TRIM (STFT / LTFT)

fuel delivery (volume) adjustments based on closed loop feedback. values above the nominal value (0%) indicate increased injector pulse width (IPW); values below 0% indicate decreased injector pulse width. Positive percentages indicate richening air/fuel ratio; negative percentages indicate a leaning air/fuel ratio. Short Term Fuel Trim (STFT) is based on current oxygen sensor switching values. Long Term Fuel Trim (LTFT) is a learned value used to compensate for continual deviation of STFT from the nominal value. For example, if STFT continually signals richening the air/fuel ratio, it will reach a value sufficient to increment the LTFT to a richer value.

FUEL, IGNITION OR SPARK MAP

a multi-dimensional 'map' that correlates engine speed, temperature, load and other factors into a specific spark advance and fuel injection pulse width for that set of conditions. There are several such 'maps' in the computer's hardwired memory. The fine-tuning of the fuel mixture is completed by the signal from the oxygen sensor. On some vehicles, a knock sensor is included to fine-tune the ignition advance to accommodate differences in fuel octane rating and engine wear.

GAS TURBINE

a rotary engine that draws energy from a fuel-air mixture. A compressor raises the pressure and temperature of the inlet air. The air is then moved into a burner, where fuel is injected and combusted to raise the temperature of the air. Power is produced when the heated, high-pressure mixture is expanded and cooled through the turbine.

GASKET

a material such as artificial rubber, cork, or steel used to seal between parts that would otherwise leak fuel, coolant, lubricants or combustion gases.

GLOW PLUG

an electrically heated wire that helps ignite diesel fuel when a compression ignition engine is cold and the compression process may not raise the air to a high enough temperature for ignition.

HARMONIC BALANCER

a device that reduces the torsional or twisting vibration that occurs along the length of the crankshaft in multiple cylinder engines. It is also called a vibration damper.

HEATED OXYGEN SENSOR(HO2S)

an oxygen sensor with a resistance element built into it to shorten the time needed to bring the sensor to operating temperature. Heated oxygen sensors will keep the sensor at operating temperature during idle, low speeds, and in very cold weather. The HO2's heater is on whenever the ignition switch is on.

HEMISPHERICAL COMBUSTION CHAMBER

a combustion chamber shape that resembles a half a globe. The valves are on the sides of the spark plug, which is in the center.

HG

the chemical symbol for the element mercury. Engine vacuum is measured in inches of mercury or in/Hg

HONE

abrasive tool for correcting small irregularities or differences in diameter in a cylinder, such as an engine cylinder or brake caliper; to enlarge or smooth a bore with a rotating tool containing an abrasive material.

HORSEPOWER (HP)

measurement of an engine's ability to perform work. One horsepower is the energy required to lift 550 pounds 1 foot in 1 second.

HOUSING BORE

the machined bore in a block or head where a bearing will be installed.

IDLE AIR CONTROL (IAC) VALVE

controls the amount of air allowed to bypass the closed throttle to keep the engine at the proper idle speed. The computer also controls the idle speed of the engine, depending on engine coolant temperature and the number of accessories such as headlights, air conditioning, etc. that are engaged. The idle air control (IAC) valve controls air flow through a throttle bypass passage by means of a stepper motor, an electric motor that can move to a specific location in its travel. Based on the information from its sensors and the parameters in its memory, the computer sends a duty-cycle (percentage of on-time) signal to the IAC valve motor to open or close the bypass to increase or slow the idle speed. This signal can range from zero to 100 percent, and corresponds to the amount of airflow the computer determines is needed. Displayed on the scan tool as counts or percentage.

IGNITABILITY

characteristic of a solid that enables it to spontaneously ignite. Any liquid with a flash point below 140°F is said to possess ignitability.

IGNITION COIL

transforms the low 12-volt battery ignition primary current into the high voltage secondary current that fires the spark in the plugs. The current through the primary coil windings builds up an electromagnetic field around the ferrous core of the coil. When the current is suddenly shut off, the electromagnetic field collapses and generates the high voltage in the secondary windings.

IGNITION CONTROL MODULE (ICM)

the computer does not directly operate the ignition coil, because of the comparatively high voltages and currents involved. Instead, it signals the ignition control module when to fire the spark. The (ICM) has a power transistor which turns on the ignition primary circuit to charge the coil by building an electromagnetic field around the ferrous core, and fires the spark by shutting off the current to the primary circuit, allowing the field to collapse and generate a high voltage spark current in the coil secondary circuit. The ignition control module typically includes additional internal circuits to perform other functions such as calculating dwell. Some modern systems have dwell and timing control in the PCM regulating the ICM to the duties of an on-off switch for the coil.

IGNITION SWITCH

a key operated switch located on the steering column, that connects and disconnects power to the ignition and electrical systems.

IGNITION SYSTEM

the components that produce the spark to ignite the air/fuel mixture in the combustion chamber.

IGNITION TIMING

refers in crankshaft degrees to the position of the piston in the cylinder when the spark occurs.

I-HEAD

a valve arrangement in most modern engines where the valve is positioned above the piston (in the cylinder head). The engine can be either an OHC (overhead cam) or pushrod type.

IMPELLER

commonly referred to as a pump, the impeller is the rear half of the torque converter shell that drives the turbine; a driving member in a turbine or pump.

INCH POUND

one twelfth of a foot pound.

INJECTOR

a device which receives metered fuel under relatively low pressure and is activated either electrically or mechanically to spray the fuel under relatively high pressure into the engine.

INSERT GUIDES

valve guides that are pressed fit in the cylinder head

INSTALLED SPRING HEIGHT

distance from the valve spring seat to the underside of the valve spring retainer.

INSTALLED STEM HEIGHT

distance from the valve spring seat to the stem tip.

INTAKE AIR TEMPERATURE (IAT) SENSOR

works by a negative coefficient thermistor that loses resistance as its temperature goes up (like the engine coolant temperature sensor). When the computer applies its 5-volt reference signal to the sensor, this voltage is reduced through a ground circuit by an amount corresponding to the temperature of the intake air.

INTAKE MANIFOLD

a part with runners that connect the fuel system to the intake valve ports.

INTAKE PORT

the passage or opening in a cylinder head that is closed by the intake valve.

INTAKE STROKE

the first stroke of a 4-stroke cycle engine in which the intake valve is open and the exhaust valve is closed, during which the downward motion of the piston draws the fuel/air mixture into the cylinder.

INTAKE VALVE

also called inlet valve, it closes off the intake port and opens it at the correct time in response to movement from the cam lobe.

INTEGRAL GUIDES

valve guides that are part of the cylinder head.

INTEGRAL SEATS

valve seats that are part of the head.

INTERCOOLER

a component on some turbocharged engines used to cool the compressed intake air.

INTERNAL COMBUSTION ENGINE (ICE)

engine that converts the energy contained in the fuel inside the engine into motion. Combustion engines use the pressure created by the expansion of the gases to do mechanical work.

JET

precisely-sized, calibrated hole in a hollow passage through which fuel or air can pass.

JOURNAL

the bearing surface on a shaft.

KEEPERS

small locks that hold the valve retainer onto the valve stem. Also called split locks.

KNOCK SENSOR(KS)

a sensor used in the engine control system that detects preignition, detonation and knocking. It contains a piezoelectric crystal that produces an AC voltage under vibration.

LAPPING

the process of fitting one surface to another by rubbing them together with an abrasive material between the two surfaces.

LASH ADJUSTER

a device for adjusting valve lash or maintaining zero lash in certain types of OHC engines. The lash adjuster is stationary in the cylinder head, with one end of a cam follower mounted on top of it. The other end of the follower acts on the valve stem when the camshaft lobe, which is positioned over the center of the follower, pushes the follower down.

LASH

the amount of clearance between components in a geartrain or valvetrain.

LEAN BURN ENGINE

a lean burn engine is designed to operate with a very lean air-fuel ratio during light load conditions. Most modern gasoline engines are controlled to run at a chemically correct (stoichiometric) air fuel ratio (about 14.7:1) to make the three-way catalyst operate at high efficiency, reducing tailpipe emissions. Lean burn engines mix more air with the fuel when full power is not needed, resulting in better fuel economy. Air/fuel ratio in lean burn engines can be as high as 20:1. When full power is needed, such as during acceleration or hill climbing, a lean burn engine reverts to a stoichiometric (14.7:1) ratio or richer.

LIFTER BORES

the holes in an engine block that the lifters fit into.

LIFTER

the valvetrain part that rides on the camshaft lobe.

LITER (L)

a metric measurement used to calculate the volume displacement of an engine. One liter is equal to 1,000 cubic centimeters or 61 cubic inches.

LOBE

the eccentric part of the camshaft that moves the lifter.

LOCATING LUG

the tab on a bearing back that fits into the slot in the main or rod bearing bore to locate it properly.

M85

85% methanol and 15% unleaded gasoline by volume, used as a motor fuel in FFVs.

MAF SENSOR

see 'mass airflow sensor'.

MAIN BEARING CAPS

the lower removable lower halves of the main bearing bores.

MAIN BEARING CLEARANCE

the clearance between the main bearing journal and its bearings.

MAIN BEARING JOURNAL

the central, load-bearing points along the axis of a crankshaft, where the main bearings support the shaft in the block.

MAIN BEARING SADDLE BORES

the housings that are machined for main bearings.

MAIN BEARINGS

the plain bearings that support the crankshaft in the engine block.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

a sensor that measures changes in intake manifold pressure resulting from changes in engine load and speed. The pressure in the intake manifold as referenced to a perfect vacuum. Manifold vacuum is the difference between MAP and atmosphere pressure. For example, in a standard atmosphere (sea level) the pressure is 29.92 inches of mercury, 101 kilopascals, or 0 inches of vacuum.

MANIFOLD ABSOLUTE PRESSURE

measure of the degree of vacuum or pressure within an intake manifold.

MANIFOLD VACUUM

relatively low pressure in an engine's intake manifold just below the throttle plate(s). Manifold vacuum is highest at idle and drops during acceleration.

MAP SENSOR

see 'manifold absolute pressure sensor'.

MASS AIRFLOW (MAF) SENSOR

a sensor in a fuel injection system that measures the mass (weight/density) of the incoming air flowing through a meter. The measurement transmitted to the PCM is usually either a frequency or a voltage.

MISFIRE

failure of an explosion to occur in one or more cylinders while the engine is running; can be continuous or intermittent failure.

MISS

a lack of power observed in one or more cylinders, either regularly or intermittently.

MULTI-PORT FUEL INJECTION (MPI)

a fuel injection system in which there is one fuel injector for each cylinder.

MULTIVISCOSITY OIL

chemically-modified oil that has been tested for viscosity at cold and hot temperatures.

MUSHROOM LIFTERS

lifters with contact faces that are wider than the lifter bore. They must be installed through the bottom of the lifter bores, before the cam is installed.

MUSHROOMED VALVE STEM TIP

a folding over of the metal at the tip of the valve stem in response to pounding from too loose a valve adjustment or a defective hydraulic lifter.

NITROGEN OXIDES (NOX)

a by-product of the combustion process when using petroleum-based fuels; one of the primary causes of acid rain and a contributor to global warming.

OHC ENGINE

overhead cam engine. An engine with the camshaft located in the cylinder head.

OIL CLEARANCE

the difference between the inside bearing diameter and the journal's diameter.

OIL GALLERY

a line that supplies oil to areas of the engine block or cylinder head.

OIL GROOVE

a groove machined in the bearing surface that provides a channel for oil flow.

OIL PAN

the part that encloses the crankcase at the lower end of the block.

OIL PRESSURE

the pressure that results from resistance to flow from the oil pump. As the pump turns faster, it produces more flow. A relief valve limits the amount of pressure it can produce.

OIL PUMP PICKUP

the screen that filters and keeps debris out of the oil pump.

OIL PUMP

the pump that circulates lubricating oil throughout the engine, usually driven by the camshaft (by way of the distributor).

OIL RINGS

the bottom ring on the pistons, scrapes excess oil from the cylinder walls to keep it from entering and burning in the combustion chamber.

ON-BOARD DIAGNOSTICS (OBD)

a diagnostic software system in the ECM or PCM that monitors computer inputs, outputs, and resultant engine/transmission operations for failure. OBD-I is thought of as any of the systems in use before OBD-II, typically 1979 to 1995 systems, although some OEMs started transitioning to OBD-II in 1994 and 1995. OBD-II has been a federally mandated system since 1996, it monitors emission control systems for degradation as well as for failures.

OPEN-LOOP FUEL CONTROL

system in which the air/fuel mixture is preset by design with no feedback correction signal to optimize fuel metering.

OSCILLOSCOPE

an instrument that displays electrical activity in the form of line patterns on a screen.

OVERBORE

the dimension by which a machined hole is larger than the standard size.

OVERHEAD CAM (OHC) ENGINE

an engine with the camshaft located in the cylinder head.

OVERHEAD VALVE ENGINE

an I-head engine. The intake and exhaust valves are located in the cylinder head.

OXIDES OF NITROGEN (NOX)

regulated air pollutants, primarily NO and NO₂ but including other substances in minute concentrations. Under the high pressure and temperature conditions in an engine, nitrogen and oxygen atoms in the air react to form various Nox. Like hydrocarbons, Nox are precursors to the formation of smog. They also contribute to the formation of acid rain.

OXYGEN SENSOR (O₂S)

a sensor that consists of a ceramic zirconium thimble, coated on each side with a very thin film of platinum. Once it reaches operating temperature of 600~650°F, the oxygen sensor begins to function as a very low current battery, producing between 0 and 1.0 volt with the output corresponding to the difference in oxygen between the exhaust and the ambient air. The signal from the oxygen sensor enables the computer to keep the air/fuel mixture as close as possible to the stoichiometric mixture. Under normal conditions, the oxygen sensor signal should fluctuate above and below 450 millivolts several times a second while the system is in closed loop.

PARTICULATE TRAP

diesel vehicle emission control device that traps and incinerates diesel particulate emissions after they are exhausted from the engine but before they are expelled into the atmosphere.

PCV SYSTEM

see 'positive crankcase ventilation system'.

PCV VALVE

a part of the positive crankcase ventilation system. Meters crankcase vapors into the intake manifold.

PISTON HEAD

the part of the piston that is above the rings.

PISTON PIN

see 'wrist pin',

PISTON RING

an open-ended ring which fits into a groove on the outer diameter of the piston. Its chief function is to form a seal between the piston and cylinder wall. Most automotive pistons have three rings: two for compression sealing, one for oil sealing.

PISTON SLAP

a noise that result from excessive piston to cylinder wall clearance.

PISTON

the cylindrical component that is attached to the connecting rod and moves up and down in the cylinder bore. The top of the piston forms the bottom of the combustion chamber. When combustion occurs, the piston is forced downward in the cylinder, moving the connecting rod which in turn rotates the crankshaft.

PLASMA-ASSISTED CATALYSIS

a diesel exhaust treatment system that uses a small amount of electricity from the engine to generate a nonthermal plasma (NTP) on a ceramic surface. The resulting reaction can reduce Nox and particulates by up to 90% without onboard chemicals or heating.

PLASTIGAGE

a plastic material that is compressed between a bearing and journal, and the resulting compressed material measured to determine the clearance.

PORT FUEL INJECTION (PFI)

port fuel injection (used spark-ignition engines) have injectors in the intake port near the valve. During the intake stroke, fuel sprayed into the port enters the combustion chamber along with the air charge.

PORT FUEL INJECTION

a fuel injection system that uses one injector at each cylinder, making fuel distribution exactly equal among all the cylinders.

PORTS

valve openings in a cylinder head.

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

a system that controls crankcase emissions by using a valve to meter crankcase vapors into the intake manifold.

POWER STROKE

the third stroke of a four-stroke cycle engine which begins with the combustion of the fuel/air mixture, driving the piston away from top dead center, which then exerts turning force on the crankshaft.

PRECOMBUSTION CHAMBER

a diesel engine design with a small combustion chamber in the cylinder head that contains the fuel injector. The fuel is ignited in this chamber. This design is often used with automotive diesels because of lower combustion pressures and because fuel quality is not as critical.

PREIGNITION

also called ping, it is abnormal combustion of the air/fuel mixture before it is time to do so. A hot surface or carbon deposit in the combustion chamber ignites the air/fuel mixture before the spark

plug is fired. The sound of preignition can be heard as the cylinder walls vibrate. Detonation is sometimes confused with preignition.

PRIMARY CIRCUIT

the low-voltage circuit of an ignition system.

PRUSSIAN BLUE

a paste used to determine the contact area between two parts, such as the height of the valve seat on the valve face.

PUMP OCTANE

the octane as posted on retail gasoline dispensers as $(R+M)/2$; same as Antiknock Index.

PUSH ROD

a rod between the lifter and rocker arm. They are sometimes hollow to allow oil distribution to the valves.

RADIATOR CAP

a device that seals the radiator and maintains a set pressure in the cooling system.

RADIATOR

the part of the cooling system that acts as a heat exchanger, transferring heat to atmosphere. It consists of a core and holding tanks connected to the cooling system by hoses.

REAR MAIN OIL SEAL

a seal that fits around the rear of the crankshaft to prevent oil leaks.

RECIPROCATING

an up and down or back and forth motion.

RIDGE REAMER

a tool used to remove the ridge from the top of a cylinder bore.

RIDGE

a raised area at the top of a cylinder bore created by ring wear. The ridge occurs because the piston ring does not travel all the way to the top of the bore, thereby leaving an unused portion of cylinder bore above the limit of ring travel. This ridge will usually be more pronounced on high mileage engines.

RIDGED HONE

a hone that removes metal and imparts a precise finish and crosshatch to the bore.

RING END GAP

the clearance between the ends of a piston ring when installed in the cylinder bore.

RING FILE

a tool used to trim the ends of a piston ring to bring the ring end gap within specification.

RING LANDS

the raised parts between the piston ring grooves.

ROCKER ARM

a pivot lever mounted on a round shaft or a stud. One end of the rocker arm is applied by the push rod and the other end acts upon the valve stem.

ROCKER SHAFT

a round pipe that is mounted parallel on top of the cylinder head. All of the rocker arms on the head are mounted on it.

ROCKER STUD

a stud that is pressed or threaded into a cylinder head on which the rocker arm is mounted.

SCAN TOOL DATA

Information from the ECM, PCM, or VCM that is displayed on the scan tool. This data includes component and system values on the data stream, DTCs, and on some systems, freeze frame data, system monitors and readiness monitors.

SEAT

a surface (Usually machined) upon which another part rests or seats (e.g., valve seat).

SEQUENTIAL FUEL INJECTION (SFI)

a fuel injection system that uses one electronically pulsed fuel injector for each cylinder. The injectors are pulsed in firing-order sequence, ordinarily during the engine's intake stroke for that cylinder.

SERPENTINE BELT

a flat, ribbed drive belt that makes multiple angles, driving several components.

SLUDGE

when oil is not changed often enough, moisture and by products of combustion combine in the engine oil to form sludge.

SPARK KNOCK

engine noise caused by abnormal, uncontrolled combustion due to preignition or detonation.

SPARK PLUG

an electrical device that is connected to a high voltage source. The high voltage travels down an electrode inside the spark plug and arcs across an air gap, thereby creating the spark that starts the combustion process in the combustion chamber.

SPARK-IGNITION (SI) ENGINE

an internal combustion engine in which the fuel mixture is ignited electrically. A spark-ignition engine runs on an Otto cycle - most gasoline engines run on a modified Otto cycle. This cycle uses a homogeneous air-fuel mixture that is combined before it enters the combustion chamber. Once in the combustion chamber, the mixture is compressed, then ignited by a spark plug (spark ignition). The engine is controlled by limiting the amount of air allowed inside through the use of a throttling valve placed on the air intake (carburetor or throttle body).

STOICHIOMETRIC.

chemically correct. An air/fuel mixture is considered stoichiometric when it is neither too rich nor too lean; an ideal mixture is composed of 14.7 parts air to one part fuel.

STROKE

the distance the piston moves from TDC to BDC.

SUPERCHARGER

a compressor, mechanically driven by the engine's crankshaft, that pumps air into the intake manifold.

SWIRL COMBUSTION

a swirling of the air/fuel mixture in a corkscrew pattern that improves combustion.

TAILPIPE EMISSIONS

EPA-regulated vehicle exhaust emissions released through the vehicle tailpipe. Tailpipe emissions do not include evaporative and refueling emissions, which are also regulated by EPA. EPA publishes allowable emission levels and vehicle certification standards in the Code of Federal Regulations.

TDC

see 'top dead center'.

TETRAETHYL LEAD OR LEAD

an octane enhancer. One gram of lead increases the octane of one gallon of gasoline about 6 numbers. The EPA has phased down the use of lead in gasoline as it has been determined to be a health hazard. Lead has been prohibited in highway vehicle gasoline since January 1, 1996.

THREE-WAY CATALYTIC CONVERTER (TWC)

a catalytic converter system that reduces exhaust gas emission levels. Usually consists of two beds of catalyst, the upstream bed (reduction bed) reducing Nox emissions to nitrogen and oxygen and the downstream bed (oxidation bed) reducing HC and CO emissions to CO₂, O₂, and H₂O.

THROTTLE BODY INJECTION (TBI)

also called central fuel injection, it has an intake manifold like that used with a carburetor. One or more fuel injectors are mounted in the throttle body, which resembles a carburetor in physical appearance.

THROTTLE POSITION (TP) SENSOR

a potentiometer that is mechanically connected to the throttle shaft of the throttle body assembly. It provides an input to the vehicle computer control system regarding throttle position. The TP sensor reduces the 5-volt reference voltage supplied by the computer to an amount corresponding to the degree to which the driver is holding the throttle open by foot.

THROTTLE VALVE (TV) PRESSURE.

in an automatic transmission, line pressure that passes through the valve of the throttle pressure spool valve.

TIMING BELT

a toothed reinforced belt used to drive the camshaft from a sprocket on the crankshaft.

TIMING CHAIN

a chain that drives the camshaft from a sprocket on the crankshaft.

TIMING GEARS

gears that drive the camshaft from the crankshaft.

TIMING

refers in crankshaft degrees to the position of the piston in the cylinder. When referring to camshaft timing, it is when the valves open. When referring to ignition timing, it is when the spark occurs.

TOP DEAD CENTER (TDC)

the position of the crankshaft for a specific cylinder when the piston is at the highest point in its vertical travel on the compression stroke.

TORQUE

the turning force produced by an engine.

TORQUE-TO-YIELD HEAD BOLTS

head bolts that are often not reusable. They are torqued into yield, which means that they have purposely stretched beyond the point where they will return to their original length. This provides more uniform clamping force.

TP SENSOR

see 'throttle position sensor'.

TURBINE

machine for generating rotary mechanical power from the energy in a stream of fluid. The energy, originally in the form of head or pressure energy, is converted to velocity energy by passing through a system of stationary and moving blades in the turbine.

TURBOCHARGER

an exhaust driven pump which compresses intake air and forces it into the combustion chambers at higher than atmospheric pressure. The increased air pressure allows more fuel to be burned and results in increased horsepower being produced.

UMBRELLA TYPE VALVE SEALS

valve guide seals that fit tightly on the valve stem. They move up and down with the valve stem acting like an umbrella to shield oil away.

VACUUM ADVANCE

a distributor mounted mechanism that controls spark advance in response to engine vacuum.

VALVE COVER

an enclosure fastened to the top of a cylinder head, over the valvetrain.

VALVE DURATION

the length of time, in degrees of crankshaft rotation, that a valve is open.

VALVE FACE

the area of the valve that contacts the valve seat.

VALVE FLOAT

when valves remain open, usually at high rpm, due to weak or broken valve springs.

VALVE GUIDE KNURLING

a method of refinishing the inside of a valve guide by restoring its original size. This method can be used on guides worn less than 0.007-in.

VALVE GUIDE LINER

a thin bronze bushing installed in a valve guide to restore it to original size.

VALVE GUIDE

a bore in the cylinder head that the valve stem fits into.

VALVE KEEPERS

small locks that hold the valve retainer onto the valve stem. Also called split locks.

VALVE LASH

the amount of clearance in the valvetrain when the lifter is on the base circle of the camshaft lobe.

VALVE LIFT

the distance from the valve seat when the valve is fully open.

VALVE LIFTER

a small cylinder that fits into a bore above the cam lobe. It acts on a push rod and rocker arm to open the valve.

VALVE ROTATOR

a part found at the end of some valve springs that rotates the valve each time it opens. This aids in providing even cooling to the valve.

VALVE SEAL

a seal located over the valve stem, used to prevent oil from leaking down the valve guide and into the combustion chamber.

VALVE SEAT

the machined surface that the valve face seats against.

VALVE SPRING COMPRESSOR

a tool used to compress the valve spring on a cylinder head. When the valve spring is compressed, the valve keepers can be removed, then the spring is released and the spring, valve spring retainer and valve can be removed from the cylinder head.

VALVE SPRING INSTALLED HEIGHT

the specified distance between the machined spring seat on the cylinder head to the underside of the valve spring retainer. Both grinding the valve and grinding the valve seat result in an increase in this dimension. A shim can be installed under the spring to restore the original installed height for proper spring tension.

VALVE SPRING RETAINER

the part that connects the valve spring to the valve and holds the valve against the cylinder head. It is held to the valve by keepers.

VALVE SPRING SEATS

metal shims used, usually on aluminum cylinder heads, to protect the head from the bottom of the valve spring.

VALVE SPRING

a small coil spring used to keep the valve closed against the valve seat.

VALVE STEM

the part of the valve that is inside the valve guide.

VALVE TIMING

set rotations of the camshaft and crankshaft to open/close valves at proper intervals during the piston strokes for optimal operation of an engine.

VALVE TRAIN GEOMETRY

the dynamic relationship between the rocker arm and valve stem during the time when the valve is opening and closing.

VALVETRAIN

parts that convert camshaft movement to valve movement. These include the camshaft, cam timing parts, lifters or cam followers, push rods, rocker arms, valve and spring.

VARIABLE FUEL VEHICLE (VFF)

a vehicle that has the capacity of burning any combination of gasoline and an alternative fuel. Also known as a flexible-fuel vehicle.

VARIABLE VALVE TIMING

variable valve timing allows the point at which an engine's valves open and close to change with operating conditions - such as engine speed and throttle position. In addition to changing the valve timing with respect to the crankshaft, some systems also change the duration the valve is open and the extent to which it opens. Varying these parameters allows the engine to operate more efficiently at all engine speeds while maintaining driveability.

VIBRATION DAMPER

see 'harmonic balancer'.

WASTEGATE

a valve used to limit the boost developed in a turbocharger. A wastegate allows some of an engine's exhaust flow to bypass the turbocharger's turbine under certain conditions.

WATER JACKET

also called a cooling jacket, it is the hollow area of a casting designed for coolant flow.

WET SLEEVE

a sleeve, which when installed in a cylinder block, is exposed to coolant.

WRIST PIN

a hollow metal tube that secures the piston to the connecting rod and allows the piston to swivel on the rod. Also called a piston pin.
