BRAKE 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

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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:

201 Park Washington Court

Falls Church, Virginia 22046

Tel: (703) 532-2027 * Fax: (202) 318-0378

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
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

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement
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 *always* 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.**

BRAKE SYSTEM CHECKSHEET

MOTORIST ASSURANCE PROGRAM
STANDARDS FOR AUTOMOTIVE REPAIR
QUALIFIED

MOTORIST ASSURANCE PROGRAM
STANDARDS FOR AUTOMOTIVE REPAIR

PARTICIPATING FACILITY 2010

BRAKE SYSTEM CHECKSHEET

Date: _____

Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Year: _____ Make: _____ Model: _____

Mileage: _____ License: _____ VIN: _____ Eng Code: _____

Customer Interview:

_____

_____

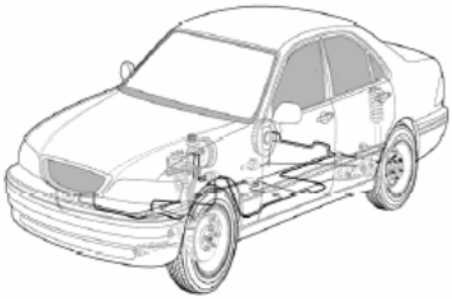
_____

_____

_____

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 AMRA/MAP*



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.

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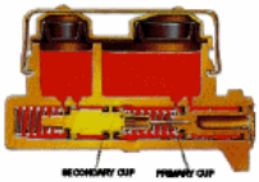
Fig. 1: Brake System Checksheet (1 Of 2)

BRAKE SYSTEM CHECKSHEET



UNDERHOOD	OK	S	R	Condition
Brake Fluid				
Copper ppm				
Moisture %				
Master Cylinder				
Aux. Reservoir				
Power Booster				
Valves				
Hoses / Fittings				
Steel Brake Lines				
Other				

LEFT FRONT	OK	S	R	Condition
Lugs / Studs				
Hose				
Brake Hardware				
Caliper / Wheel Cyl.				
ABS Sensor / Wire / Tone Ring				
Drum / Rotor Thickness				Spec_____ Actual_____
Rotor Runout				Spec_____ Actual_____
Pad / Shoe				Spec_____ Actual_____
Wheel Bearings / Seals				

RIGHT FRONT	OK	S	R	Condition
Lugs / Studs				
Hose				
Brake Hardware				
Caliper / Wheel Cyl.				
ABS Sensor / Wire / Tone Ring				
Rotor / Drum Thickness				Spec_____ Actual_____
Rotor Runout				Spec_____ Actual_____
Pad / Shoe				Spec_____ Actual_____
Wheel Bearings / Seals				

LEFT REAR	OK	S	R	Condition
Lugs / Studs				
Hose				
Brake Hardware				
Caliper / Wheel Cyl.				
ABS Sensor / Wire / Tone Ring				
Rotor / Drum Thickness				Spec_____ Actual_____
Rotor Runout				Spec_____ Actual_____
Pad / Shoe				Spec_____ Actual_____
Wheel Bearings / Seals				

RIGHT REAR	OK	S	R	Condition
Lugs / Studs				
Hose				
Brake Hardware				
Caliper / Wheel Cyl.				
ABS Sensor / Wire / Tone Ring				
Rotor / Drum Thickness				Spec_____ Actual_____
Rotor Runout				Spec_____ Actual_____
Pad / Shoe				Spec_____ Actual_____
Wheel Bearings / Seals				

OK	Suggested 1, 2, 3, 4, 5	Required A, B, C

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Fig. 2: Brake System Checksheet (2 Of 2)

BRAKE SYSTEMS

NOTE: **Some states may have specifications that differ from OEM. Check your local/state regulations. Where state or local laws are stricter, they take precedence over these guidelines.**

ACCELEROMETERS

Condition	Code	Procedure
Condition	**Code**	**Procedure**
Broken	A	Require replacement
Connector loose	A	Require repair or replacement
Loose	B	Require repair or replacement
Missing	C	Require replacement

Condition	Code	Procedure
Out of position	B	Require re-positioning to vehicle manufacturer's specifications
Output signal incorrect	B	Require replacement

ACCUMULATORS

Condition	Code	Procedure
Leaking	A	Require replacement
Missing	C	Require replacement
Pre-charge incorrect	B	Require replacement

ANCHOR PINS

Condition	Code	Procedure
Anchor pin bent	B	Require repair or replacement
Anchor pin broken	A	Require replacement
Anchor pin worn, affecting structural integrity	B	Require replacement

ANTI-LOCK BRAKE CONTROL ASSEMBLY(MODULE)

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require 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 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.**		
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
Malfunctioning	A	Require replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.**		
Missing	C	Require replacement

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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

ANTI-LOCK BRAKE CONTROLLER

Condition	Code	Procedure
Application incorrect	A	Require 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 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
Electro Magnetic Brake Inoperative	A	Require repair or replacement
Expansion Spring Brake Inoperative	A	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
Pulse Width Modulation Valve Inoperative	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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

ANTI-LOCK BRAKE SYSTEMS

NOTE: **Anti-lock brakes are an integral part of the brake system. It is essential that the Anti-lock brakes function properly when brake service is performed. Anti-lock brake systems are commonly referred to as "" ABS"" and will be referred to as ABS throughout these guidelines. Some ABS components also function as part of a traction control system (TCS). When diagnosing and servicing high pressure components, observe safety procedures and equipment requirements established by the vehicle manufacturer to reduce the possibility of serious personal injury.**

NOTE: **Intermittent electrical conditions are often caused by a loss of ground, poor connection, or water intrusion into the wiring harness. Electro-magnetic interference (EMI) may be caused by incorrect installation of accessories or components. EMI can result in improper system operation.**

AXLE SEAL

Condition	Code	Procedure
Leaking	A	Require repair or replacement

BACKING PLATES

Condition	Code	Procedure
Anchor pin bent	B	Require repair or replacement
Anchor pin broken	A	Require replacement
Anchor pin worn, affecting structural integrity	B	Require replacement
Backing plate bent	B	Require repair or replacement
Backing plate broken	A	Require replacement
Backing plate cracked	B	Require repair or replacement
Corroded, affecting structural integrity	A	Require replacement
Loose	B	Require repair or replacement
Missing	C	Require replacement
Shoe lands worn	A	Require repair or replacement

BLEEDER SCREW

Condition	Code	Procedure
Bent	A	Require replacement

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Condition	Code	Procedure
Broken	A	Require replacement
Incorrect	B	Require replacement of stud
Loose	A	Require repair or replacement of affected component
Nut flats rounded	A	Require replacement of nut
seized	A	Require replacement of nut and/or stud
Threads damaged	A	Require repair or replacement of component with damaged threads
Threads stripped (threads missing)	A	Require replacement of component with stripped threads

BRAKE ABS ACTIVE LIGHT (BLUE)

Condition	Code	Procedure
Bulb burned out	A	Require replacement
Light does not come on during bulb check	Â	Further inspection required to determine cause
Light flashes	Â	Further inspection required to determine cause
Light stays on after initial bulb check	Â	Further inspection required to determine cause

BRAKE FLUID

NOTE: **Most manufacturers prohibit the use of DOT 5 brake fluid in a system equipped with ABS. DOT 3, DOT 4, and DOT 5.1 brake fluids are clear or light amber in color. DOT 5 brake fluid is violet in color. Correct fluid type is normally stamped on the master cylinder cover.**

NOTE: **Fluid Flush - a process using a sufficient volume of fluid to help remove contaminants and replacing the contaminated fluid with new fluid of the same type and specification. At times a chemical may be used to enhance removal.**

NOTE: **Fluid Exchange/Replace - draining (evacuating) old fluid and replacing it with new fluid of the correct type and specification.**

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
At or beyond OEM service interval	3	Suggest fluid exchange/replacement
Brake fluid type incorrect	B	Require flushing and refilling
NOTE: **For example, DOT fluid lower than specified for the vehicle or silicone brake fluid (DOT 5) in an ABS system**		
Contaminated, for example, fluid other than brake fluid present	A	Require service
NOTE: **If a fluid other than brake fluid is present in the brake system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		
Contaminated, for example, fluid other than brake fluid present	B	Require service

Condition	Code	Procedure
NOTE: **If a fluid other than brake fluid is present in the brake system which DOES NOT affect the rubber parts, the required service is to flush and fill with the correct brake fluid.**		
Corrosion inhibitors depleted	B	Require fluid exchange/replacement
NOTE: **A copper content of 200 ppm or greater indicates a depletion of corrosion inhibitors in the brake fluid.**		
Fluid discolored	Â	No service suggested or required
NOTE: **Further testing necessary to determine condition of fluid.**		
Hydraulic component overhaul or replacement	3	Suggest flushing and refilling
Rubber master cylinder cover gasket distorted and gummy	A	Require replacement of gasket
NOTE: **This condition may indicate contaminated brake fluid. Further inspection required.**		

BRAKE FRICTION MATERIAL

NOTE: **Original Equipment Manufacturer (OEM) specifications designate replacement at different thicknesses. It is required that friction material be matched in axle sets for consistent braking characteristics.**

Condition	Code	Procedure
Contaminated, for example, fluid that leaked from caliper, wheel cylinder, or axle seal	A	Require replacement
NOTE: **Identify and repair cause of contamination prior to replacing friction material.**		
Cracked (Cracked through)	B	Require replacement
Cracked (Surface cracking)	Â	No service suggested or required. Further inspection may be necessary to determine cause
Flaking or chunking	B	Require replacement
Glazed (shiny)	Â	No service suggested or required
Grooves or ridges	Â	No service suggested or required
NOTE: **When reconditioning or replacing drums or rotors, replacement of friction material may be suggested depending on the severity of the grooves or ridges.**		
Permanently attached hardware bent	A	Require replacement
Permanently attached hardware broken	A	Require replacement
Permanently attached hardware loose	A	Require replacement
Permanently attached hardware missing	C	Require replacement
Permanently attached hardware seized	A	Require repair or replacement
Rivets loose	B	Require replacement
Separating from backing	B	Require replacement
Shoe table or web bent	B	Require replacement

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Condition	Code	Procedure
Shoe table or web cracked	A	Require replacement
Shoe table or web worn, affecting performance	A	Require replacement
Tapered wear	Â	Further inspection required
NOTE: **Some vehicles use friction materials that are tapered by design. Refer to specific vehicle application. If not normal, require replacement of friction materials and correction of cause.**		
Thickness of one pad is greater than opposite pad in the same caliper (uneven wear)	Â	Replacement of friction material not suggested or required Further inspection required. See Calipers and Caliper Hardware.
NOTE: **Uneven pad thickness is normal on some vehicles. Refer to specific vehicle applications.**		
Wear indicator device (electronic) contacts rotor	B	Require replacement of appropriate parts
NOTE: **The pad-wear indicator light may come on due to other electrical problems.**		
Wear indicator device (mechanical) broken	Â	Further inspection required
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured. The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is Suggested.**		
Wear indicator device (mechanical) bent	Â	Further inspection required
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material, must be measured. The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is Suggested.**		
Wear indicator device (mechanical) contacts rotor	Â	Further inspection required
NOTE: **The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is suggested.**		
Wear indicator device (mechanical) contacts rotor	Â	Further inspection required
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured.**		
Worn close to minimum specifications	1	Suggest replacement
NOTE: **When the part appears to be close to the end of its useful life, replacement may be suggested.**		
Worn to, or below minimum specifications	B	Require replacement

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BRAKE ON - OFF SWITCH

Condition	Code	Procedure
Bent, affecting performance	B	Require replacement
Broken	A	Require replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Missing	C	Require replacement
Out of adjustment	B	Require adjustment or replacement
Output signal incorrect	B	Require 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

BRAKE PADS

NOTE: **Original Equipment Manufacturer (OEM) specifications designate replacement at different thicknesses. It is required that friction material be matched in axle sets for consistent braking characteristics.**

Condition	Code	Procedure
Contaminated, for example, fluid that leaked from caliper, wheel cylinder, or axle seal	A	Require replacement
NOTE: **Identify and repair cause of contamination prior to replacing friction material.**		
Cracked (Cracked through)	B	Require replacement
Cracked (Surface cracking)	Â	No service suggested or required. Further inspection may be necessary to determine cause
Flaking or chunking	B	Require replacement
Glazed (shiny)	Â	No service suggested or required
Grooves or ridges	Â	No service suggested or required
NOTE: **When reconditioning or replacing drums or rotors, replacement of friction material may be suggested depending on the severity of the grooves or ridges.**		
Out of Adjustment	B	Require Adjustment or Repair
NOTE: **Determine cause and correct prior to adjustment or repair**		

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Condition	Code	Procedure
Out of Adjustment	B	Require Adjustment or Repair
NOTE: **Determine cause and correct prior to adjustment or repair**		
Out of Adjustment	B	Require Adjustment or Repair
NOTE: **Determine cause and correct prior to adjustment or repair**		
Out of Adjustment	B	Require Adjustment or Repair
NOTE: **Determine cause and correct prior to adjustment or repair**		
Out of Adjustment	B	Require Adjustment or Repair
NOTE: **Determine cause and correct prior to adjustment or repair**		
Permanently attached hardware bent	A	Require replacement
Permanently attached hardware broken	A	Require replacement
Permanently attached hardware loose	A	Require replacement
Permanently attached hardware missing	C	Require replacement
Permanently attached hardware seized	A	Require repair or replacement
Rivets loose	B	Require replacement
Separating from backing	B	Require replacement
Shoe table or web bent	B	Require replacement
Shoe table or web cracked	A	Require replacement
Shoe table or web worn, affecting performance	A	Require replacement
Tapered wear	B	Suggest replacement
NOTE: **Some vehicles use pads that are tapered by design. Refer to specific vehicle application. If not normal, require correction of cause and replacement of pads.**		
Thickness of one pad is greater than opposite pad in the same caliper (uneven wear)	Â	Replacement of friction material not suggested or required Further inspection required See Calipers and Caliper Hardware
NOTE: **Uneven pad thickness is normal on some vehicles. Refer to specific vehicle applications.**		
Wear indicator device (electronic) contacts rotor	B	Require replacement of appropriate parts
NOTE: **The pad-wear indicator light may come on due to other electrical problems.**		
Wear indicator device (mechanical) broken	Â	Further inspection required
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured. The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is suggested**		
Wear indicator device (mechanical) bent	Â	Further inspection required

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Condition	Code	Procedure
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured. The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is suggested**		
Wear indicator device (mechanical) contacts rotor	Â	Further inspection required
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured. The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is suggested**		
Worn close to minimum specifications	1	Suggest replacement
NOTE: **When the part appears to be close to the end of its useful life, replacement may be suggested.**		
Worn to, or below minimum specifications	B	Require replacement

BRAKE PEDALS

Condition	Code	Procedure
Bent, affecting performance	A	Require repair or replacement
Broken	A	Require repair or replacement
Pedal pad missing	C	Require replacement of pedal pad
Pedal pad worn	1	Suggest replacement
Pivot bushings worn, affecting performance	A	Require replacement of pivot bushings

BRAKE SHOE HARDWARE

NOTE: **See also Self-Adjusting Systems.**

Condition	Code	Procedure
Broken	A	Require replacement
Distorted	A	Require replacement
Missing	C	Require replacement
Surfaces rust-pitted	1	Suggest replacement
Worn, affecting performance	A	Require replacement

BRAKE SHOES

NOTE: **Original Equipment Manufacturer (OEM) specifications designate replacement at different thicknesses. It is required that friction material be matched in axle sets for consistent braking characteristics.**

Condition	Code	Procedure
Contaminated, for example, fluid that leaked from caliper, wheel cylinder, or axle seal	A	Require replacement
NOTE: **Identify and repair cause of contamination prior to replacing friction material.**		

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Condition	Code	Procedure
Cracked (Cracked through)	B	Require replacement
Cracked (Surface cracking)	Â	No service suggested or required. Further inspection may be necessary to determine cause
Flaking or chunking	B	Require replacement
Glazed (shiny)	Â	No service suggested or required
Grooves or ridges	Â	No service suggested or required
NOTE: **When reconditioning or replacing drums or rotors, replacement of friction material may be suggested depending on the severity of the grooves or ridges.**		
Out of Adjustment	B	Require adjustment or repair
NOTE: **Determine cause and correct prior to adjustment or repair**		
Permanently attached hardware bent	A	Require replacement
Permanently attached hardware broken	A	Require replacement
Permanently attached hardware loose	A	Require replacement
Permanently attached hardware missing	C	Require replacement
Permanently attached hardware seized	A	Require repair or replacement
Rivets loose	B	Require replacement
Separating from backing	B	Require replacement
Shoe table or web bent	B	Require replacement
Shoe table or web cracked	A	Require replacement
Shoe table or web worn, affecting performance	A	Require replacement
Tapered wear	Â	Further inspection required
NOTE: **Some vehicles use shoes that are tapered by design. Refer to specific vehicle application. If not normal, require correction of cause and replacement of shoes.**		
Thickness of one shoe is greater than opposite shoe in the same drum (uneven wear)	Â	Replacement of friction material not suggested or required. Further inspection required.
Worn close to minimum specifications	1	Suggest replacement
NOTE: **When the part appears to be close to the end of its useful life, replacement may be suggested.**		
Worn to, or below minimum specifications	B	Require replacement

BRAKE STOPLIGHT SWITCHES

Condition	Code	Procedure
Bent, affecting performance	B	Require replacement
Broken	A	Require replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Leaking	B	Require Repair or Replacement

Condition	Code	Procedure
Missing	C	Require replacement
Out of adjustment	B	Require adjustment or replacement
Output signal incorrect	B	Require 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

BRAKE WARNING LIGHT (AMBER)

Condition	Code	Procedure
Bulb burned out	A	Require replacement
Warning light does not come on during bulb check	Â	Further inspection required to determine cause
Warning light flashes	Â	Further inspection required to determine cause
Warning light stays on after initial bulb check	Â	Further inspection required to determine cause

BRAKE WARNING LIGHT (RED)

Condition	Code	Procedure
Bulb burned out	A	Require replacement
Warning light does not come on during bulb check	Â	Further inspection required to determine cause
Warning light flashes	Â	Further inspection required to determine cause
Warning light stays on after initial bulb check	Â	Further inspection required to determine cause

BULB SOCKETS

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
Bulb seized in socket	A	Require repair or replacement
Burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of socket.**		
Burned, not affecting performance	2	Suggest repair or replacement

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Condition	Code	Procedure
NOTE: **Determine cause and correct prior to repair or replacement of socket**		
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
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Leaking	B	Require repair or replacement
Melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
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

BULBS AND LEDS

NOTE: **Does not include soldered-in components.**

Condition	Code	Procedure
Application incorrect	B	Require replacement
NOTE: **Application incorrect includes wrong bulb coating or color.**		
Base burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base corroded, affecting performance	A	Require repair or replacement
Base corroded, not affecting performance	2	Suggest repair or replacement
Base loose, affecting performance	B	Require repair or replacement
Base loose, not affecting performance	1	Suggest repair or replacement
Burned out	A	Require replacement
Intermittent	A	Require replacement

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Condition	Code	Procedure
Missing	C	Require replacement
Seized in socket	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
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

CALIPER HARDWARE

Condition	Code	Procedure
Bent	A	Require repair or replacement
Broken	A	Require repair or replacement
Corroded, affecting performance	A	Require repair or replacement
Dust boots on slider pin (bolt) missing	C	Require replacement of boots
Dust boots on slider pin (bolt) torn	A	Require replacement of boots
Missing	C	Require replacement
Shim (OE standard) missing	C	Require replacement
NOTE: **Aftermarket shims may be suggested to reduce noise.**		
Shim bent	A	Require removal or replacement
NOTE: **Removal is acceptable if shim is not OEM.**		
Shim out of position	B	Require removal or replacement
NOTE: **Removal is acceptable if shim is not OEM.**		
Shim worn	A	Require removal or replacement
NOTE: **Removal is acceptable if shim is not OEM.**		
Slider pin (bolt) bent	A	Require replacement of slider pin or bolt and lubricants
Slider pin (bolt) rust-pitted	A	Require replacement of slider pin or bolt and lubricants
Slider pin (bolt) worn	A	Require replacement of slider pin or bolt and lubricants
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn, affecting performance	A	Require replacement

CALIPER MOUNTING PIN

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Condition	Code	Procedure
Slider pin (bolt) bent	A	Require replacement of slider pin or bolt and lubricants
Slider pin (bolt) rust-pitted	A	Require replacement of slider pin or bolt and lubricants
Slider pin (bolt) worn	A	Require replacement of slider pin or bolt and lubricants

CALIPER PISTON

Condition	Code	Procedure
Broken	A	Require repair or replacement
Corroded, affecting performance	A	Require repair or replacement
Worn, affecting performance	A	Require replacement

CALIPER SHIM

Condition	Code	Procedure
Shim (OEM standard) missing	C	Require replacement
Shim bent	A	Require removal or replacement
Shim out of position	B	Require removal or replacement
Shim worn	A	Require removal or replacement

CALIPER SLIDER PIN (BOLT) DUST BOOT

Condition	Code	Procedure
Dust boots on slider pin (bolt) missing	C	Require replacement of boots
Dust boots on slider pin (bolt) torn	A	Require replacement of boots
Missing	C	Require replacement

CALIPER SLIDER PIN (BOLT)

Condition	Code	Procedure
Broken	A	Require repair or replacement
Missing	C	Require replacement
Slider pin (bolt) bent	A	Require replacement of slider pin or bolt and lubricants
Slider pin (bolt) rust-pitted	A	Require replacement of slider pin or bolt and lubricants
Slider pin (bolt) worn	A	Require replacement of slider pin or bolt and lubricants
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn, affecting performance	A	Require replacement

CALIPERS

NOTE: **You are not required to replace or rebuild calipers in axle sets. However, when replacing or rebuilding a caliper due to the conditions that follow, you may suggest servicing, rebuilding, or replacement of the other caliper (on the same axle) for improved performance and preventive maintenance (for example, the part is close to the end of its useful life, replacing the caliper may extend pad life, or contribute to more balanced braking). When installing loaded calipers, it is required that friction material be matched in axle sets for consistent braking characteristics.**

Condition	Code	Procedure

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Condition	Code	Procedure
Bleeder port damaged	A	Require repair or replacement of caliper
Bleeder screw broken off in caliper	A	Require repair or replacement of caliper
NOTE: **Only required if hydraulic system must be opened.**		
Bleeder screw plugged	A	Require repair or replacement of bleeder screw
NOTE: **Only required if hydraulic system must be opened.**		
Bleeder screw seized	A	Require replacement of caliper
NOTE: **Seized is defined as a bleeder screw that cannot be removed after a practical attempt at removing. Only required if the hydraulic system must be opened.**		
Casting corroded, affecting structural integrity	A	Require replacement
Casting damaged, affecting structural integrity	A	Require replacement
Dust boot around caliper piston torn	A	Require replacement of dust boot
Leaking	A	Require repair or replacement
Mounting pin threads damaged	A	Require repair or replacement of component with damaged threads
Mounting pin threads stripped (threads missing)	A	Require repair or replacement of component with stripped threads
Mounting pin threads stripped in caliper bracket (threads missing)	A	Require repair or replacement of caliper bracket
Mounting pin threads stripped in steering knuckle (threads missing)	A	Require repair or replacement of steering knuckle
Parking brake cable support, lever, or return spring bent	A	Require replacement of parts
Parking brake cable support, lever, or return spring broken	A	Require replacement of parts
Parking brake mechanism in caliper inoperative	A	Require repair or replacement
Piston corroded (pitted or peeling chrome plating)	B	Require replacement of piston and rebuilding or replacement of caliper
Piston damaged, affecting performance	B	Require replacement of piston and rebuilding or replacement of caliper
Piston damaged, not affecting performance	Â	No service suggested or required
Piston finish worn off	B	Require replacement of piston and rebuilding or replacement of caliper
Piston sticking	A	Require rebuilding or replacement of caliper
Slide mechanism sticking	A	Require repair or replacement of slide mechanism

COMBINATION VALVE

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

Condition	Code	Procedure
Linkage bent (rear load valves)	A	Require repair or replacement of linkage
Linkage broken (rear load valves)	A	Require repair or replacement of linkage
Pressure out of specification	B	Require adjustment If not possible, require replacement
Seized	A	Require replacement
Sticking	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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

CONTROLLERS

Condition	Code	Procedure
Application incorrect	A	Require 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 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
Electro Magnetic Brake Inoperative	A	Require repair or replacement
Expansion Spring Brake Inoperative	A	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.**		

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Condition	Code	Procedure
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Pulse Width Modulation Valve Inoperative	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

DIGITAL RATIO AXLE CONTROLLERS AND BUFFERS (DRAB AND DRAM)

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 replacement of part.**		
Connector missing	C	Require replacement
Electro Magnetic Brake Inoperative	A	Require repair or replacement
Expansion Spring Brake Inoperative	A	Require repair or replacement
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Pulse Width Modulation Valve Inoperative	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

DISABLE 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

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Condition	Code	Procedure
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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Melted, not affecting performance	2	Suggest repair or replacement
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

DRUMS

NOTE: **Determine the need to recondition based upon individual drum conditions that follow. Friction material replacement does not require drum reconditioning unless other justifications exist. Do not recondition new drums unless they are being pressed or bolted onto an existing hub. It is not necessary to replace drums in axle sets. However, when replacing or reconditioning a drum due to the conditions that follow, you may suggest reconditioning of the other drum on the same axle to eliminate uneven braking behavior. Always wash drums after servicing or before installing.**

Condition	Code	Procedure
Balance weight missing Affecting performance	A	Require repair or replacement
Balance weight missing Not affecting performance	Â	No service suggested or required

Condition	Code	Procedure
Bell-mouthed, affecting performance	A	Require reconditioning or replacement
Cooling fin broken	Â	No service suggested or required
Cracked	B	Require replacement
Drum diameter is greater than OEM ""machine to"" specifications but less than ""discard at""	1	Suggest replacement
specifications, and the drum does not require reconditioning	Â	Â
NOTE: **Only applies to vehicles for which OEM ""machine to"" specifications exist. If OEM does not supply ""machine to"" specifications, the drum may be worn to discard specifications**		
Drum diameter will exceed OEM ""machine to"" specifications after required reconditioning	B	Require replacement
NOTE: **If OEM does not supply ""machine to"" specifications, you may machine to discard specifications.**		
Hard -spotted	2	Suggest reconditioning or replacement
Measured diameter is greater than OEM discard specifications	B	Require replacement
Out-of-round (runout), affecting performance	A	Require reconditioning or replacement
Out-of-round (runout), exceeding manufacturer's specifications	B	Require reconditioning or replacement
Scored	B	Require reconditioning or replacement
Surface threaded due to improper machining	B	Require reconditioning or replacement
Tapered, affecting performance	A	Require reconditioning or replacement

ELECTRICAL BRAKE 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
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 cause and correct prior to repair or replacement of part.**		
Inoperative	A	Require repair or replacement

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Condition	Code	Procedure
NOTE: **Inoperative includes intermittent operation.**		
Leaking externally	A	Require repair or replacement
Leaking internally	A	Require repair or replacement
Noisy	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

ELECTRICAL PARK MOTOR

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware broken	A	Require repair or 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 cause and correct prior to repair or replacement of part.**		
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking externally	A	Require repair or replacement
Leaking internally	A	Require repair or replacement
Noisy	2	Suggest repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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

ELECTRICAL PUMPS AND 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
Contaminated	A	Require replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking externally	A	Require repair or replacement
Leaking internally	A	Require repair or replacement
Noisy	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

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Condition	Code	Procedure
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

ELECTRO-MAGNETIC INTERFERENCE

NOTE: **An engineering term used to designate interference in a piece of electronic equipment caused by another piece of electronic or other equipment.**

ELECTRONIC BRAKE CONTROL MODULATOR

NOTE: **Many modulators can only be replaced as complete assemblies. Whenever possible, replace the failed component part. If replacement of the failed part is not possible, then replace the modulator assembly.**

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 replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Disabled	A	Require repair or replacement
Electrical failure	A	Require repair or replacement
External leak	A	Require repair or replacement
Housing cracked	B	Require repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Internal leak	A	Require repair or replacement
Missing	C	Require 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
Valve stuck	A	Require repair or replacement
Wire lead burned	A	Require repair or replacement

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

ELECTRONIC BRAKE DISTRIBUTION

NOTE: **EBD adjusts braking pressure front-to-rear, based on the weight distribution of passengers and/or cargo. Weight distribution is typically determined via the relative difference in rotational speed of the front and rear wheels. Greater braking pressure, (and subsequently stopping power), is directed to the rear wheels when loads in the rear are heavier. This contributes to a more controlled stop, and minimizes ""brake dive"" during hard braking.**

ELECTRONIC BRAKE TRACTION CONTROL MODULE

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require 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 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.**		
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
Malfunctioning	A	Require replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.**		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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 CONTROLLERS

Condition	Code	Procedure
Application incorrect	B	Require 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 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
Electro Magnetic Brake Inoperative	A	Require repair or replacement
Expansion Spring Brake Inoperative	A	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
Pulse Width Modulation Valve Inoperative	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

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Condition	Code	Procedure
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 TRACTION CONTROL

NOTE: **The further development of the electronic locking differential. It electronically reduces engine torque, preventing engine and wheel braking from working against each other. (Example: a driver continues to apply the accelerator while the electronic traction control is attempting to redistribute excess engine torque through braking). This system works in unison with some OEM's stability control systems.**

EXTERNAL BRAKE CABLE

Condition	Code	Procedure
Cable improperly adjusted	B	Require cable adjustment
Cable or individual wires in the cable are broken	A	Require replacement of cable assembly
Cable sticking	A	Require cable lubrication
Cable stuck inside conduit and cannot be lubricated so that parking brake functions properly	A	Require replacement of cable assembly

FLOW CONTROL VALVE

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
Linkage bent (rear load valves)	A	Require repair or replacement of linkage
Linkage broken (rear load valves)	A	Require repair or replacement of linkage
Pressure out of specification	B	Require adjustment If not possible, require replacement
Seized	A	Require replacement
Sticking	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

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

FLUID LEVEL SENSOR 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
Float saturated	A	Require replacement
Leaking	A	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
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

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Condition	Code	Procedure
Worn	1	Suggest replacement

FLUID

NOTE: **Most manufacturers prohibit the use of DOT 5 brake fluid in a system equipped with ABS. DOT 3, DOT 4, and DOT 5.1 brake fluids are clear or light amber in color. DOT 5 brake fluid is violet in color. Correct fluid type is normally stamped on the master cylinder cover.**

NOTE: **Fluid Flush - a process using a sufficient volume of fluid to help remove contaminants and replacing the contaminated fluid with new fluid of the same type and specification. At times a chemical may be used to enhance removal.**

NOTE: **Fluid Exchange/Replace - draining (evacuating) old fluid and replacing it with new fluid of the correct type and specification.**

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
At or beyond OEM service interval	3	Suggest fluid exchange/replacement
Brake fluid type incorrect	B	Require flushing and refilling
NOTE: **For example, DOT fluid lower than specified for the vehicle or silicone brake fluid (DOT 5) in an ABS system.**		
Contaminated, for example, fluid other than brake fluid present	B	Require service
NOTE: **If a fluid other than brake fluid is present in the brake system which DOES NOT affect the rubber parts, the required service is to flush and fill with the correct brake fluid.**		
Contaminated, for example, fluid other than brake fluid present	A	Require service
NOTE: **If a fluid other than brake fluid is present in the brake system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		
Corrosion inhibitors depleted	B	Require fluid exchange/replacement
NOTE: **A copper content of 200 ppm or greater indicates a depletion of corrosion inhibitors in the brake fluid.**		
Fluid discolored	Â	No service suggested or required
NOTE: **Further testing necessary to determine condition of fluid.**		
Hydraulic component overhaul or replacement	3	Suggest flushing and refilling with correct fluid
Rubber master cylinder cover gasket distorted and gummy	A	Require replacement of gasket

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Condition	Code	Procedure
NOTE: **This condition may indicate contaminated brake fluid.**		

FOUR WHEEL DRIVE 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
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

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FRICTION MATERIAL

NOTE: **Original Equipment Manufacturer (OEM) specifications designate replacement at different thicknesses. It is required that friction material be matched in axle sets for consistent braking characteristics.**

Condition	Code	Procedure
Contaminated, for example, fluid that leaked from caliper, wheel cylinder, or axle seal	A	Require replacement
NOTE: **Identity and repair cause of contamination prior to replacing friction material.**		
Cracked (Cracked through)	B	Require replacement
Cracked (Surface cracking)	Â	No service suggested or required. Further inspection may be necessary to determine cause
Flaking or chunking	B	Require replacement
Glazed (shiny)	Â	No service suggested or required
Grooves or ridges	Â	No service suggested or required
NOTE: **When reconditioning or replacing drums or rotors, replacement of friction material may be suggested depending on the severity of the grooves or ridges.**		
Out of Adjustment	B	Require Adjustment or Repair
Permanently attached hardware bent	A	Require replacement
Permanently attached hardware broken	A	Require replacement
Permanently attached hardware loose	A	Require replacement
Permanently attached hardware missing	C	Require replacement
Permanently attached hardware seized	A	Require repair or replacement
Rivets loose	B	Require replacement
Separating from backing	B	Require replacement
Shoe table or web bent	B	Require replacement
Shoe table or web cracked	A	Require replacement
Shoe table or web worn, affecting performance	A	Require replacement
Tapered wear	B	Suggest replacement
NOTE: **Some vehicles use pads that are tapered by design. Refer to specific vehicle application. If not normal, require correction of cause and replacement of pads.**		
Thickness of one pad is greater than opposite pad in the same caliper (uneven wear)	Â	Replacement of friction material not suggested or required. Further inspection required.
NOTE: **Uneven pad thickness is normal on some vehicles. Refer to specific vehicle applications.**		
Wear indicator device (electronic) contacts rotor	B	Require replacement of appropriate parts
NOTE: **The pad-wear indicator light may come on due to other electrical problems.**		
Wear indicator device (mechanical) bent	Â	Further inspection required

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Condition	Code	Procedure
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured. The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is Suggested.**		
Wear indicator device (mechanical) broken	Â	Further inspection required
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured.**		
Wear indicator device (mechanical) broken	Â	Further inspection required
NOTE: **The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is suggested.**		
Wear indicator device (mechanical) contacts rotor	Â	Further inspection required
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured. The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is Suggested.**		
Worn close to minimum specifications	1	Suggest replacement
NOTE: **When the part appears to be close to the end of its useful life, replacement may be suggested.**		
Worn to, or below minimum specifications	B	Require replacement

G SENSORS

Condition	Code	Procedure
Broken	A	Require replacement
Connector loose	A	Require repair or replacement
Loose	B	Require repair or replacement
Missing	C	Require replacement
Out of position	B	Require re-positioning to vehicle manufacturer's specifications
Output signal incorrect	B	Require replacement

GASKETS

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

GRAVITATIONAL SWITCHES

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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
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
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

GREASE SEAL

Condition	Code	Procedure
Leaking	A	Require repair or replacement

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

HEIGHT SENSING PROPORTIONING VALVE

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
Linkage bent (rear load valves)	A	Require repair or replacement of linkage
Linkage broken (rear load valves)	A	Require repair or replacement of linkage
Pressure out of specification	B	Require adjustment If not possible, require replacement
Seized	A	Require replacement
Sticking	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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

HIGH PRESSURE ACCUMULATOR

Condition	Code	Procedure
Leaking	A	Require replacement
Missing	C	Require replacement
Pre-charge incorrect	B	Require replacement

HOSES

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
Blistered	B	Require replacement

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Condition	Code	Procedure
Expansion affecting performance	A	Require Replacement
Fitting threads damaged	A	Require repair or replacement
Fitting threads stripped (threads missing)	A	Require replacement
Incorrectly secured	B	Require repair
Inner fabric (webbing) cut	B	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Outer covering is cracked to the extent that inner fabric of hose is visible	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly	B	Require repair

HUB

Condition	Code	Procedure
Worn or damaged affecting performance	A	Require repair or replacement

HYDRAULIC CONTROL UNIT

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 replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Disabled	A	Require repair or replacement
Electrical failure	A	Require repair or replacement
External leak	A	Require repair or replacement
Housing cracked	B	Require repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Internal leak	A	Require repair or replacement
Missing	C	Require 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

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Condition	Code	Procedure
Valve stuck	A	Require repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

HYDRAULIC MODULATORS

NOTE: **Many modulators can only be replaced as complete assemblies. Whenever possible, replace the failed component part. If replacement of the failed part is not possible, then replace the modulator assembly.**

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 replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Disabled	A	Require repair or replacement
Electrical failure	A	Require repair or replacement
External leak	A	Require repair or replacement
Housing cracked	B	Require repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Internal leak	A	Require repair or replacement
Missing	C	Require 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
Valve stuck	A	Require repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

HYDRO-BOOSTERS

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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
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Does not apply assist, or inadequate assist	A	Require repair or replacement
Leaking	B	Require repair or replacement
Leaks fluid at fitting	B	Require tightening or replacement
Leaks fluid at unit	B	Require repair or replacement
Leaks fluid from pressure hose(s)	B	Require replacement of hose(s)
Leaks fluid into passenger compartment	B	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

HYDRO-ELECTRIC BOOSTERS (POWERMASTER)

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 replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Does not apply assist, or inadequate assist	A	Require repair or replacement
Leaking	B	Require repair or replacement
Leaks fluid at fitting	B	Require tightening or replacement
Leaks fluid at unit	B	Require repair or replacement
Leaks fluid from pressure hose(s)	B	Require replacement of hose(s)
Leaks fluid into passenger compartment	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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

IGNITION DISABLE 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
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.**		
Melted, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement.**		
Missing	C	Require replacement
Out of adjustment	B	Require repair or replacement
Terminal broken	A	Require repair or replacement

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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
Won't return	A	Require repair or replacement
Worn	1	Suggest replacement

LAMP DRIVER RELAY

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
Housing broken	A	Require replacement
Housing cracked	2	Suggest replacement
Inoperative	A	Require 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

LATERAL ACCELERATION SWITCHES

Condition	Code	Procedure
Broken	A	Require replacement
Connector loose	A	Require repair or replacement
Loose	B	Require repair or replacement
Missing	C	Require replacement
Out of position	B	Require re-positioning to vehicle manufacturer's specifications
Output signal Incorrect	B	Require replacement

LEDS

NOTE: **Does not include soldered-in components.**

Condition	Code	Procedure

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Condition	Code	Procedure
Application incorrect	B	Require replacement
NOTE: **Application incorrect includes wrong bulb coating or color.**		
Base burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base corroded, affecting performance	A	Require repair or replacement
Base corroded, not affecting performance	2	Suggest repair or replacement
Base loose, affecting performance	B	Require repair or replacement
Base loose, not affecting performance	1	Suggest repair or replacement
Burned out	A	Require replacement
Intermittent	A	Require replacement
Missing	C	Require replacement
Seized in socket	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
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

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LENSES

Condition	Code	Procedure
Application incorrect	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
Broken, affecting performance	A	Require replacement
Broken, not affecting performance	Â	No service suggested or required
Cracked	B	Require replacement
Discolored	A	Require replacement
Leaking	B	Require repair or replacement
Melted, affecting performance	A	Require replacement
Melted, not affecting performance	2	Suggest replacement
Missing	C	Require replacement

LOW PRESSURE ACCUMULATOR

Condition	Code	Procedure
Leaking	A	Require replacement
Missing	C	Require replacement
Pre-charge incorrect	B	Require replacement

LUG NUT

Condition	Code	Procedure
Lug nut flats rounded	A	Require replacement of nut
Lug nut installed backward	B	Require repair
Lug nut mating surface dished	A	Require replacement of nut
Lug nut mating type incorrect	B	Require replacement of nut
Lug nut seized	A	Require replacement of nut and/or stud
Stud incorrect	B	Require replacement of stud
Threads damaged	A	Require repair or replacement of component with damaged threads
Threads stripped (threads missing)	A	Require replacement of component with stripped threads

MASTER CYLINDER COVER GASKET

Condition	Code	Procedure
Rubber master cylinder cover gasket distorted and gummy	A	Require replacement of the gasket
NOTE: **This condition may indicate contaminated brake fluid. See Brake Fluid.**		

MASTER CYLINDERS

Condition	Code	Procedure
Brake fluid leaking from rear of master cylinder bore	B	Require repair or replacement
Brake pedal drops intermittently	A	Require repair or replacement
NOTE: **This condition may be normal on some vehicles equipped with anti-lock brakes.**		
Fluid level low	Â	Further inspection required
NOTE: **Refer to OEM procedures for adjusting low fluid level. Inspect for brake hydraulic leaks and friction material wear.**		
Internal valve failure	A	Require repair or replacement
Master cylinder leaking brake fluid internally	A	Require repair or replacement
Piston does not return	A	Require repair or replacement
Ports plugged	A	Require repair or replacement
Pushrod out of adjustment	B	Require Repair or Replacement
Rubber master cylinder cover gasket distorted and gummy	A	Require replacement of the gasket
NOTE: **This condition may indicate contaminated brake fluid. See Brake Fluid.**		

MODULATORS

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NOTE: **Many modulators can only be replaced as complete assemblies. Whenever possible, replace the failed component part. If replacement of the failed part is not**

Condition	Code	Procedure
possible, then replace the modulator assembly.	Â	Â
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 replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Disabled	A	Require repair or replacement
Electrical failure	A	Require repair or replacement
External leak	A	Require repair or replacement
Housing cracked	A	Require repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Internal leak	A	Require repair or replacement
Missing	C	Require 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
Valve stuck	A	Require repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

MOTOR PACK

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

Condition	Code	Procedure
Connector broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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: **Determine cause and correct prior to repair or replacement of part.**		
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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Terminal corroded, not affecting performance	2	Require repair or replacement
Terminal loose not affecting performance	1	Suggest repair or replacement
Terminal Loose, Affecting Performance	B	Require repair or replacement

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
Contaminated	A	Require replacement
NOTE: **Determine source of contamination. Require repair or replacement.**		
Inoperative	A	Require repair or replacement

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Condition	Code	Procedure
NOTE: **Inoperative includes intermittent operation.**		
Leaking externally	A	Require repair or replacement
Leaking internally	A	Require repair or replacement
Noisy	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

PADS

NOTE: **Original Equipment Manufacturer (OEM) specifications designate replacement at different thicknesses. It is required that friction material be matched in axle sets for consistent braking characteristics.**

Condition	Code	Procedure
Contaminated, for example, fluid that leaked from caliper, wheel cylinder, or axle seal	A	Require replacement
NOTE: **Identify and repair cause of contamination prior to replacing friction material.**		
Cracked (Cracked through)	B	Require replacement
Cracked (Surface cracking)	Â	No service suggested or required. Further inspection may be necessary to determine cause
Flaking or chunking	B	Require replacement
Glazed (shiny)	Â	No service suggested or required
Grooves or ridges	Â	No service suggested or required
NOTE: **When reconditioning or replacing drums or rotors, replacement of friction material may be suggested depending on the severity of the grooves or ridges.**		
Out of Adjustment	A	Require Repair or Replacement
Permanently attached hardware bent	A	Require replacement
Permanently attached hardware broken	A	Require replacement
Permanently attached hardware loose	A	Require replacement
Permanently attached hardware missing	C	Require replacement
Permanently attached hardware seized	A	Require repair or replacement
Rivets loose	B	Require replacement

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Condition	Code	Procedure
Separating from backing	B	Require replacement
Shoe table or web bent	B	Require replacement
Shoe table or web cracked	A	Require replacement
Shoe table or web worn, affecting performance	A	Require replacement
Tapered wear	Â	Further inspection required
NOTE: **Some vehicles use pads that are tapered by design. Refer to specific vehicle application. If not normal, require correction of cause and replacement of pads.**		
Thickness of one pad is greater than opposite pad in the same caliper (uneven wear)	Â	Replacement of friction material not suggested or required Further inspection required. See Calipers and Caliper Hardware.
NOTE: **Uneven pad thickness is normal on some vehicles. Refer to specific vehicle applications.**		
Wear indicator device (electronic) contacts rotor	B	Require replacement of appropriate parts
NOTE: **The pad-wear indicator light may come on due to other electrical problems.**		
Wear indicator device (mechanical) broken	Â	Further inspection required
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured. The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is suggested**		
Wear indicator device (mechanical) bent	Â	Further inspection required
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured. The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is suggested**		
Wear indicator device (mechanical) contacts rotor	Â	Further inspection required
NOTE: **Explain to the customer that the purpose of the wear indicator is to alert him or her to check for friction wear. Wear indicators may be bent or broken. Therefore, the friction material must be measured. The need for friction material replacement is determined based upon the conditions stated in this section. Periodic inspection is suggested**		
Worn close to minimum specifications	1	Suggest replacement
NOTE: **When the part appears to be close to the end of its useful life, replacement may be suggested.**		
Worn to, or below minimum specifications	B	Require replacement

PARKING BRAKE CABLE

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Condition	Code	Procedure
Cable improperly adjusted	B	Require cable adjustment
Cable or individual wires in the cable are broken	A	Require replacement of cable assembly
Cable sticking	A	Require cable lubrication
Cable stuck inside conduit and cannot be lubricated so that parking brake functions properly	A	Require replacement of cable assembly

PARKING BRAKE MECHANISM

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 of inoperative parts
Parking brake parts bent	B	Require repair or replacement of bent parts
Parking brake parts broken	A	Require replacement of broken parts
Parking brake parts missing	C	Require replacement of missing parts
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

PARKING BRAKE SHOES

Condition	Code	Procedure
Contaminated, for example, fluid that leaked from caliper, wheel cylinder, or axle seal	A	Require replacement
NOTE: **Identify and repair cause of contamination prior to replacing friction material.**		
Cracked (Cracked through)	B	Require replacement
Cracked (Surface cracking)	Â	No service suggested or required. Further inspection may be necessary to determine cause
Flaking or chunking	B	Require replacement
Glazed (shiny)	Â	No service suggested or required
Grooves or ridges	Â	No service suggested or required
NOTE: **When reconditioning or replacing drums or rotors, replacement of friction material may be suggested depending on the severity of the grooves or ridges.**		
Out of Adjustment	B	Require adjustment or repair
NOTE: **Determine cause and correct prior to adjustment or repair**		
Permanently attached hardware bent	A	Require replacement
Permanently attached hardware broken	A	Require replacement
Permanently attached hardware loose	A	Require replacement
Permanently attached hardware missing	C	Require replacement
Permanently attached hardware seized	A	Require repair or replacement
Rivets loose	B	Require replacement
Separating from backing	B	Require replacement

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Condition	Code	Procedure
Shoe table or web bent	B	Require replacement
Shoe table or web cracked	A	Require replacement
Shoe table or web worn, affecting performance	A	Require replacement
Tapered wear	Â	Further inspection required
NOTE: **Some vehicles use shoes that are tapered by design. Refer to specific vehicle application. If not normal, require correction of cause and replacement of shoes.**		
Thickness of one shoe is greater than opposite shoe in the same drum (uneven wear)	Â	Replacement of friction material not suggested or required Further inspection required
Worn close to minimum specifications	1	Suggest replacement
NOTE: **When the part appears to be close to the end of its useful life, replacement may be suggested.**		
Worn to, or below minimum specifications	B	Require replacement

PARKING BRAKE 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
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

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Condition	Code	Procedure
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

PARKING BRAKE SYSTEMS

NOTE: **The parking brake is an integral part of the brake system. It is important that the parking brake function properly when brake service is performed.**

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
Cable improperly adjusted	B	Require cable adjustment
Cable or individual wires in the cable are broken	A	Require replacement of cable assembly
Cable sticking	A	Require cable lubrication
Cable stuck inside conduit and cannot be lubricated so that parking brake functions properly	A	Require replacement of cable assembly
Inoperative	A	Require replacement of inoperative parts
NOTE: **Inoperative Includes intermittent operation.**		
Parking brake parts bent	B	Require repair or replacement of bent parts
Parking brake parts broken	A	Require replacement of broken parts
Parking brake parts missing	C	Require replacement of missing parts
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

PEDAL TRAVEL 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

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Condition	Code	Procedure
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
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

PEDALS

Condition	Code	Procedure
Bent, affecting performance	A	Require repair or replacement
Broken	A	Require repair or replacement
Pedal pad missing	C	Require replacement of pedal pad
Pedal pad worn	1	Suggest replacement
Pivot bushings worn, affecting performance	A	Require replacement of pivot bushings

POWER DISTRIBUTION CENTER

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

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Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Broken, affecting performance	A	Require replacement
Broken, not affecting performance	Â	No service suggested or required
Burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of fuse box.**		
Burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of fuse box.**		
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
Cracked, affecting performance	A	Require repair or replacement
Cracked, not affecting performance	1	Suggest repair or replacement
Melted, affecting performance	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Melted, not affecting performance	2	Suggest replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
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

POWERMASTER

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 replacement

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Condition	Code	Procedure
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Does not apply assist, or inadequate assist	A	Require repair or replacement
Leaking	B	Require repair or replacement
Leaks fluid at fitting	B	Require tightening or replacement
Leaks fluid at unit	B	Require repair or replacement
Leaks fluid from pressure hose(s)	B	Require replacement of hose(s)
Leaks fluid into passenger compartment	B	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

PRESSURE DIFFERENTIAL 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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		

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Condition	Code	Procedure
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

PRESSURE 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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Melted, not affecting performance	2	Suggest repair or replacement

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Condition	Code	Procedure
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

PRESSURE TRANSDUCERS

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
Drive mechanism damaged, affecting performance	A	Require repair or replacement
NOTE: **Further inspection required to determine cause.**		
Drive mechanism damaged, not affecting performance	2	Suggest repair or replacement
NOTE: **Further inspection required to determine cause.**		
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation or out of specification.**		
Leaking (vacuum/fluid/air)	A	Require replacement
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	Â	No service suggested or required
Linkage binding, affecting performance	A	Require repair or replacement of linkage

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Condition	Code	Procedure
Linkage binding, not affecting performance	1	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
Out of adjustment	B	Further inspection required
NOTE: **Follow OEM recommended adjustment procedures. Repair or replace if out of specification.**		
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

PROPORTIONING VALVE

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
Linkage bent (rear load valves)	A	Require repair or replacement of linkage
Linkage broken (rear load valves)	A	Require repair or replacement of linkage
Pressure out of specification	B	Require adjustment If not possible, require replacement
Seized	A	Require replacement
Sticking	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

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

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
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
NOTE: **Inoperative includes intermittent operation.**		
Leaking externally	A	Require repair or replacement
Leaking internally	A	Require repair or replacement
Noisy	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

RELAYS

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

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Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Housing broken	A	Require replacement
Housing cracked	2	Suggest replacement
Inoperative	A	Require 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

RELUCTOR (SPEED) RING

NOTE: **If the toothed ring requires replacement and cannot be replaced as a separate component, replace the assembly of which the ring is a part**

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Bent	B	Require replacement
Contaminated, affecting performance	A	Require repair. Identify and correct cause
Cracked	A	Require replacement
Loose	A	Require replacement of worn parts
Missing	C	Require replacement
Number of teeth incorrect	B	Require replacement
Teeth broken	A	Require replacement
Teeth damaged, affecting performance	A	Require replacement

ROTORS

NOTE: **Determine the need to recondition based upon individual rotor conditions that follow. Friction material replacement does not require rotor reconditioning unless other justifications exist. Do not recondition new rotors unless it does not meet installed OEM specifications. It is not necessary to replace rotors in axle sets unless required by the vehicle manufacturer. However, when replacing or reconditioning a rotor due to the conditions that follow, you may suggest reconditioning of the other rotor on the same axle to eliminate uneven braking behavior. Determine the need to replace based upon the individual rotor conditions that follow. Reconditioning is defined as machining and block sanding, or block sanding only. Block sanding is defined as using 120-150 grit sandpaper with moderate to heavy force for 60 seconds per side. Always wash rotors after servicing or before installing.**

Condition	Code	Procedure

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Condition	Code	Procedure
Corrosion affecting structural integrity	A	Require replacement
NOTE: **Examples of severe corrosion are: composite plate separated from friction surfaces and cooling fins cracked or missing.**		
Cracked	B	Require replacement
Hard spots	2	Suggest reconditioning or replacement of rotor according to OEM specifications
Lateral runout (wobble) exceeds OEM specifications	B	Require re-indexing, reconditioning, or replacement according to specifications
Measured thickness is less than OEM discard specifications	B	Require replacement
Rotor thickness is less than OEM ""machine to"" specifications but thicker than ""discard at""	1	Suggest replacement
specifications, and rotor does not require reconditioning	Â	Â
NOTE: **Only applies to vehicles for which OEM ""machine to"" specifications exist. If OEM does not supply ""machine to"" specifications, the rotor may be worn to discard specifications.**		
Rotor thickness will be less than OEM ""machine to"" specifications after required reconditioning	B	Require replacement
NOTE: **If OEM does not supply ""machine to"" specifications, you may machine to discard specifications.**		
Surface finish incorrect	B	Require recondition or replacement
Surface is rust-pitted	B	Require reconditioning or replacement of rotor according to OEM specifications
Surface is scored	B	Require reconditioning or replacement of rotor according to OEM specifications
NOTE: **Scoring is defined as grooves or ridges in the friction contact surface. Some vehicle manufacturers require machining when scoring exceeds their allowable specifications.**		
Tapered affecting performance	A	Require reconditioning or replacement
Thickness variation (parallelism) exceeds OEM specifications	B	Require reconditioning or replacement of rotor according to OEM specifications

SELF-ADJUSTING SYSTEMS

Condition	Code	Procedure
Bent	A	Require repair or replacement of bent part
Broken	A	Require repair or replacement of broken part

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Condition	Code	Procedure
Inoperative	A	Require repair or replacement of inoperative parts
NOTE: **Inoperative includes intermittent operation.**		
Missing	C	Require replacement of missing part
Star wheel does not turn freely	A	Require repair or replacement

SHOE HARDWARE

NOTE: **See also Self-Adjusting Systems.**

Condition	Code	Procedure
Broken	A	Require replacement
Distorted	A	Require replacement
Missing	C	Require replacement
Surfaces rust-pitted	1	Suggest replacement
Worn, affecting performance	A	Require replacement

SHOES

NOTE: **Original Equipment Manufacturer (OEM) specifications designate replacement at different thicknesses. It is required that friction material be matched in axle sets for consistent braking characteristics.**

Condition	Code	Procedure
Contaminated, for example, fluid that leaked from caliper, wheel cylinder, or axle seal	A	Require replacement
NOTE: **Identify and repair cause of contamination prior to replacing friction material.**		
Cracked (Cracked through)	B	Require replacement
Cracked (Surface cracking)	Â	No service suggested or required. Further inspection may be necessary to determine cause
Flaking or chunking	B	Require replacement
Glazed (shiny)	Â	No service suggested or required
Grooves or ridges	Â	No service suggested or required
NOTE: **When reconditioning or replacing drums or rotors, replacement of friction material may be suggested depending on the severity of the grooves or ridges.**		
Out of Adjustment	B	Require Adjustment or Repair
Permanently attached hardware bent	A	Require replacement
Permanently attached hardware broken	A	Require replacement
Permanently attached hardware loose	A	Require replacement
Permanently attached hardware missing	C	Require replacement
Permanently attached hardware seized	A	Require repair or replacement
Rivets loose	B	Require replacement
Separating from backing	B	Require replacement
Shoe table or web bent	B	Require replacement
Shoe table or web cracked	A	Require replacement
Shoe table or web worn, affecting performance	A	Require replacement
Tapered wear	B	Suggest replacement

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Condition	Code	Procedure
NOTE: **Some vehicles use shoes that are tapered by design. Refer to specific vehicle application. If not normal, require correction of cause and replacement of shoes.**		
Thickness of one shoe is greater than opposite shoe in the same drum (uneven wear)	Â	Replacement of friction material not suggested or required. Further inspection required.
NOTE: **Uneven shoe thickness is normal on some vehicles. Refer to specific vehicle applications.**		
Worn close to minimum specifications	1	Suggest replacement
NOTE: **When the part appears to be close to the end of its useful life, replacement may be suggested.**		
Worn to, or below minimum specifications	B	Require replacement

SOCKETS

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
Bulb seized in socket	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.**		
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
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Leaking	B	Require repair or replacement
Melted	A	Require replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Shorted	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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

SPEED SENSOR (RELUCTOR) RING

NOTE: **If the toothed ring requires replacement and cannot be replaced as a separate component, replace the assembly of which the ring is a part.**

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Bent	B	Require replacement
Contaminated, affecting performance	A	Require repair. Identify and correct cause
Cracked	A	Require replacement
Loose	A	Require replacement of worn parts
Missing	C	Require replacement
Number of teeth incorrect	B	Require replacement
Teeth broken	A	Require replacement
Teeth damaged, affecting performance	A	Require replacement

SPEED SENSORS (ELECTRONIC WHEEL AND VEHICLE)

Condition	Code	Procedure
Air gap incorrect	B	Require adjustment or replacement
NOTE: **If a sensor is not adjustable, further inspection is required to identify and correct cause.**		
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 metal particles or water. Require repair or replacement**		
Inoperative	A	Require repair or replacement

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Condition	Code	Procedure
NOTE: **Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.**		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Leaking	B	Require repair or replacement
Loose	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Sensor housing cracked	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 replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead misrouted	B	Require re-routing according to vehicle manufacturer's specifications
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

STAR WHEEL

Condition	Code	Procedure
Bent	A	Require repair or replacement of bent part
Broken	A	Require repair or replacement of broken part
Inoperative	A	Require repair or replacement of inoperative parts
Missing	C	Require replacement of missing part
Star wheel does not turn freely	A	Require repair or replacement

STEEL BRAKE LINES

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
Corroded, affecting structural integrity	A	Require replacement
Fitting incorrect (for example, compression fitting)	B	Require replacement
Flare type incorrect	B	Require repair or replacement
Leaking	A	Require repair or replacement

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Condition	Code	Procedure
Line material incorrect (copper, etc.)	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly	B	Require routing correction
Rust-pitted	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

STOPLIGHT SWITCHES

Condition	Code	Procedure
Bent, affecting performance	B	Require replacement
Broken	A	Require replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Leaking	B	Require Repair or Replacement
Missing	C	Require replacement
Out of adjustment	B	Require adjustment or replacement
Output signal incorrect	B	Require 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

STROKE SENSOR

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

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Condition	Code	Procedure
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	A	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
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

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

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Condition	Code	Procedure
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

TIRES

NOTE: **Consult the vehicle owner's manual or vehicle placard for correct size, speed ratings, and inflation pressure of the original tires.**

Condition	Code	Procedure
Tire diameter incorrect, affecting ABS or TCS	A	Require replacement
Tire pressure incorrect, affecting ABS or TCS	A	Require repair or replacement
Tire size incorrect, affecting ABS or TCS	A	Require replacement

TONE RING

NOTE: **If the toothed ring requires replacement and cannot be replaced as a separate component, replace the assembly of which the ring is a part**

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Bent	B	Require replacement
Contaminated, affecting performance	A	Require repair. Identify and correct cause
Cracked	A	Require replacement
Loose	A	Require replacement of worn parts
Missing	C	Require replacement
Number of teeth incorrect	B	Require replacement
Teeth broken	A	Require replacement
Teeth damaged, affecting performance	A	Require replacement

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TOOTHED RINGS (TONE WHEEL)

NOTE: **If the toothed ring requires replacement and cannot be replaced as a separate component, replace the assembly of which the ring is a part**

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Bent	B	Require replacement
Contaminated, affecting performance	A	Require repair. Identify and correct cause
Cracked	A	Require replacement
Loose	A	Require replacement of worn parts
Missing	C	Require replacement
Number of teeth incorrect	B	Require replacement
Teeth broken	A	Require replacement
Teeth damaged, affecting performance	A	Require replacement

TRACTION CONTROL SYSTEM (TCS)

NOTE: **The further development of the electronic locking differential. It electronically reduces engine torque, preventing engine and wheel braking from working against each other. (Example: a driver continues to apply the accelerator while the electronic traction control is attempting to redistribute excess engine torque through braking). This system works in unison with some OEM's stability control systems.**

TRANSFER 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
Corroded, affecting structural integrity	A	Require replacement
Fitting incorrect (for example, compression fitting)	B	Require replacement
Flare type incorrect	B	Require repair or replacement
Leaking	A	Require repair or replacement
Line material incorrect (copper, etc.)	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly	B	Require routing correction
Rust-pitted	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

VACUUM BOOSTERS

Condition	Code	Procedure
Applies too much assist (oversensitive)	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
Auxiliary vacuum pump inoperative	A	Require repair or replacement

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Condition	Code	Procedure
NOTE: **Inoperative includes intermittent operation.**		
Check valve grommet deteriorated, affecting performance	A	Require replacement of grommet
Check valve grommet deteriorated, not affecting performance	1	Suggest replacement of grommet
Check valve inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Check valve leaking	A	Require replacement of check valve
Check valve missing	C	Require replacement of check valve
Check valve noisy	2	Suggest replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Leaking	A	Require replacement
Pushrod out of adjustment	B	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
Vacuum hose filter leaking	A	Require replacement of filter
Vacuum hose filter restricted	A	Require replacement of filter
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

VACUUM HOSES

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
Blistered	B	Require replacement
Fitting threads damaged	A	Require repair or replacement
Fitting threads stripped (threads missing)	A	Require replacement
Incorrectly secured	B	Require repair

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Condition	Code	Procedure
Inner fabric (webbing) cut	B	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Outer covering is cracked to the extent that inner fabric of hose is visible	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly	B	Require repair

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
Leaking	B	Require repair or replacement
Linkage bent (rear load valves)	A	Require repair or replacement of linkage
Linkage broken (rear load valves)	A	Require repair or replacement of linkage
Pressure out of specification	B	Require adjustment If not possible, require replacement
Seized	A	Require replacement
Sticking	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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

WEAR INDICATOR

Condition	Code	Procedure
Wear indicator device (electronic) contacts rotor	B	Require replacement of appropriate parts
Wear indicator device (mechanical) broken	Â	Further inspection required
Wear indicator device (mechanical) bent	Â	Further inspection required
Wear indicator device (mechanical) contacts rotor	Â	Further inspection required

WHEEL ATTACHMENT HARDWARE

NOTE: **For conditions noted below, also check condition of wheel stud holes. Proper lug nut torque is essential. Follow manufacturer's torque**

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specifications and tightening sequence. DO NOT lubricate threads unless specified by the vehicle manufacturer.

Condition	Code	Procedure
Bent	A	Require replacement
Broken	A	Require replacement
NOTE: **Some manufacturers require replacement of all studs on any wheel if two or more studs or nuts on the same wheel are broken or missing.**		
Loose	A	Require repair or replacement of affected component
Lug nut flats rounded	A	Require replacement of nut
Lug nut installed backward	B	Require repair
Lug nut mating surface dished	A	Require replacement of nut
Lug nut mating type incorrect	B	Require replacement of nut
Lug nut seized	A	Require replacement of nut and/or stud
Stud incorrect	B	Require replacement of stud
Threads damaged	A	Require repair or replacement of component with damaged threads
Threads stripped (threads missing)	A	Require replacement of component with stripped threads

WHEEL BEARINGS, RACES AND SEALS

NOTE: **When replacing or repacking wheel bearings, grease seal replacement is required. You are not required to replace these components in axle sets. Determine the need to replace based upon the individual component conditions.**

Condition	Code	Procedure
Axle seal on drive axle leaking	A	Require replacement of seal and inspection of axle, bearing, housing, and vent tube
Bearing end-play exceeds specifications	B	Require adjustment of bearing, if possible If proper adjustment cannot be obtained, require replacement of bearing and race assembly.
Bearing rollers, balls or races are worn, pitted, or feel rough when rotated as an assembly or	B	Require replacement of bearing and race assembly
other damage affecting performance.	Â	Â
Seal leaking	A	Require replacement of seal and inspection of bearings
NOTE: **Require inspection of mating and sealing surface and repair or replace as necessary. Check vent. A plugged vent may force fluid past the seal.**		
Seal missing	C	Require replacement

WHEEL CYLINDERS

NOTE: **You are not required to replace or rebuild wheel cylinders in axle sets. However, when rebuilding or replacing a wheel cylinder due to the conditions that follow, you may suggest rebuilding or replacement of the other wheel cylinder (on the same axle) for preventive maintenance, for**

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example, the part is close to the end of its useful life. Determine the need to rebuild or replace based upon the individual wheel cylinder conditions.

Condition	Code	Procedure
Attaching hardware bent	B	Require replacement of bent parts
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of corroded parts
Attaching hardware loose	A	Require repair or replacement
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bleeder port damaged (if non-repairable)	A	Require replacement
Bleeder screw broken off in wheel cylinder (if non-repairable)	A	Require replacement
NOTE: **Only required if the hydraulic system must be opened.**		
Bleeder screw plugged	A	Require repair or replacement
NOTE: **Only required if the hydraulic system must be opened.**		
Bleeder screw seized	A	Require replacement
NOTE: **Seized is defined as bleeder screw that cannot be removed after a practical attempt at removing. Only required if the hydraulic system must be opened.**		
Bore corroded (pitted)	B	Require replacement
Bore grooved	A	Require replacement
Bore oversized	B	Require replacement
Dust boot missing	C	Require replacement of dust boot
Dust boot torn	A	Require replacement of dust boot
Leaking	A	Require rebuilding or replacement
NOTE: **Leaking is defined as a drop or more. Dampness is normal.**		
Loose	B	Require repair or replacement
Piston corroded, affecting performance	B	Require replacement of piston and rebuilding or replacement of wheel cylinder
Piston finish worn off	B	Require replacement of piston and rebuilding or replacement of wheel cylinder
Piston stuck in bore	A	Require replacement of wheel cylinder
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

WIRING HARNESSES

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware

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Condition	Code	Procedure
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
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

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YAW RATE SENSOR

Condition	Code	Procedure
Broken	A	Require replacement
Connector loose	A	Require repair or replacement
Loose	B	Require repair or replacement
Missing	C	Require replacement
Out of position	B	Require re-positioning to vehicle manufacturer's specifications
Output signal incorrect	B	Require 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	

Code	Reason
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

ABS

see 'anti-lock brake system "

ANCHOR PIN

a component located on the brake backing plate, on which the brake shoes rotate and to which the return springs are secured.

ANTI-LOCK BRAKE SYSTEM (ABS)

a computer controlled system that allows the vehicle to be controlled under heavy braking by releasing hydraulic pressure to wheels that are about to lock up and skid. Sensors located at the wheels, monitor rotating wheel speed in relation to other wheels and send the information to a control module that in turn controls a hydraulic modulator, which regulates hydraulic fluid pressure to each brake assembly.

ANTI-LOCK BRAKING SYSTEM (ABS)

ABS keeps the wheels from fully locking up while braking to allow the driver to maintain steering control. Without ABS, too much force applied to the brake pedal can cause one or more wheels to stop turning (lockup) and begin skidding, greatly reducing the capability of the driver to steer. With ABS, maximum force on the brake pedal slows each wheel to the point of maximum braking - without skidding.
Since all wheels are still rolling, the driver maintains steering control within the limits of traction. Many light trucks use rear-wheel ABS to prevent rear wheel lockup.

BACKING PLATE

the component to which the brake shoes, wheel cy/inder and related components are attached.

BLEEDER VALVE

a valve located on disc brake calipers, wheel cylinders and some master cylinders that allows air and fluid to be removed from the brake system.

BRAKE DRAG

a condition that occurs when brake pads or shoes are in continuous contact with the disc brake rotors or brake drums.

BRAKE DRUM

a round cast iron housing attached to an axle shaft or spindle, on which the brake shoes press to stop its rotation.

BRAKE FADE

phenomenon that takes place when the temperature of the friction surfaces increases to a point where the application of heavy pedal pressure results in little braking action.

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BRAKE FLUID

the hydraulic fluid used to transmit hydraulic pressure through the brake lines in a brake system.

BRAKE FLUSHING

a procedure to clean the brake hydraulic system with fresh, clean fluid that should be performed whenever new parts are installed, if there is any doubt as to the grade of fluid in the system, if a glycol fluid has been mixed with a silicone-based fluid, or if the fluid has been contaminated with petroleum or mineral based fluids.

BRAKE HOSE

flexible hoses that connect the brake lines on the chassis with the calipers or wheel cylinders, or the junction block on a solid axle.

BRAKE LINE

metal tubing that carries the brake fluid from the master cylinder to other brake system components.

BRAKE PAD

see 'disc brake pad'.

BRAKE ROTOR

see 'disc brake rotor'.

BRAKE SHOE

friction material that is bonded or riveted to curved metal structures and attached to the backing plate. The brake shoes press on the brake drum to stop its rotation.

BURNISH

the process of polishing a part using the pressure of a sliding tool.

BURR

a ragged metal edge left on a part during machining.

CALIPER

see 'disc brake caliper'.

CHAFING

damage or wearing away caused by friction and rubbing.

CHAMFER

a bevel or taper at the edge of a hole or corner, usually cut at 45 degrees.

CLEARANCE

the specified distance between two components.

COMBINATION VALVE

a single unit in the hydraulic brake system that incorporates the metering and proportioning valves in conjunction with the pressure differential switch. Combination valves are categorized as being either two-function or three-function devices, depending on the number of functions they perform. A threefunction valve provides all of the aforementioned capabilities of metering, proportioning

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and warning. However, the two-function unit combines either the proportioning and warning light functions or the metering and warning light operations into a single component.

COMPENSATING PORT

an opening between the master cylinder bore and reservoir that allows brake fluid to return to the reservoir.

CONTRACTION

a reduction in size, drawing together, narrowing, shrinking or shortening; the opposite of expansion.

DATA LINK CONNECTOR

a means through which information about the state of the vehicle control system can be extracted with a scan tool. This information includes actual readouts on each sensor's input circuit and some actuator signals. It also includes any trouble codes stored. The data link connector is also used to disable the computer's ignition timing adjustments on some engines so base or reference timing can be measured with a timing light. Before OBD II, each OEM had a unique Data link Connector (DLC) and :alled it by a different name. With the advent of OBO-II, the DLC became standardized as a 16-pin connector to which the scan tool could be connected to read data and sometimes control outputs of the PCM.

DISC BRAKE CALIPER

a hydraulically actuated device in a disc brake system that is mounted straddling the brake disc. The caliper contains at least one piston and is used to provide clamping force of the brake pads on the disc.

DISC BRAKE PAD

friction material that is bonded or riveted to metal plates and mounted in the disc brake caliper. The brake pads are clamped against the disc brake rotor to stop its rotation.

DISC BRAKE ROTOR

a cast iron disc mounted on the wheel hub, which is clamped by the caliper and disc brake pads to slow and stop its rotation.

DISC BRAKE

a braking system that uses cast iron discs mounted on the wheel hubs, over which brake calipers are mounted. Hydraulic pressure from the brake system forces the caliper piston(s) against friction pads mounted in the calipers, which in turn clamp the brake discs, stopping their rotation.

DISTORTION

warp, twist or other deformation in a part.

DOT

department of transportation.

DRUM BRAKE

a braking system that uses cast iron drums mounted to the wheel hubs. Hydraulic pressure from the brake system forces pistons in the wheel cylinder to press friction lined brake shoes against the inside of the drum, stopping its rotation.

DUAL MASTER CYLINDER

a master cylinder that has one cylinder bore, but two pistons and two fluid reservoirs. Each piston applies hydraulic pressure to two wheels only. In the event one of the hydraulic circuits fails, the

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other provides enough braking power to stop the vehicle.

DUO-SERVO DRUM BRAKES

a drum brake design that provides increased stopping power due to the servo or self-energizing action of the brake shoes.

ELECTRONIC BRAKE-FORCE DISTRIBUTION

operates in conjunction with ABS to balance the force applied to brakes at front and rear wheels. Can prevent over-braking, improve brake-pad life, reduce "brake fade" caused by excessive heat, and ensure peak braking efficiency in all conditions.

ELECTRONIC CONTROL MODULE (ECM)

the computer in an electronic control system, also known as an electronic control unit (EGU).

ELECTRONIC CONTROL UNIT (ECU)

see 'electronic control module (ECM)'.

ELECTRONIC STABILITY CONTROL

the next logical evolution of ABS and traction control. It has ABS's hardware and two additional sensors: steering-wheel angle sensor, which measures the position and rate the steering-wheel is turning, and a yaw sensor, which measures the rate the vehicle is actually turning. By comparing them, the on-board computer will know if the vehicle is oversteering or understeering.

FEELER GAUGE

thin metal strip manufactured in precise thickness and used to measure clearance between parts; usually part of a set.

FIXED CALIPER

a brake caliper design that contains one or two pistons positioned on either side of the rotor. The caliper is rigidly attached to the spindle and the pads are applied with equal hydraulic pressure from both sides..

FIXED SEAL

a type of brake caliper seal that is installed in a groove in the caliper bore.

FLOATING CALIPER

a brake caliper design that uses an adapter, or anchor plate, which is bolted to the spindle. The caliper floats laterally across a pair of special bolts that are screwed into the adapter. As hydraulic pressure is applied to the piston, the inboard pad is forced against the rotor. This pressure causes the caliper to move inboard until an equal pressure is applied by the outside pad to the outer disc surface.

FRICTION

the resistance to the motion of two moving objects in contact with each other.

GO/NO-GO GAUGE

a measuring tool that tells if a tolerance is met or not.

HARD SPOT

in area in a casting which has become harder (more dense) than the surrounding material; areas in the friction surface of a brake drum or rotor that have become harder than the surrounding metal.

HOLD-DOWN SPRINGS

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springs that are used to keep the brake shoes secured to the backing plate.

HYDRAULIC PRESSURE

pressure exerted through a liquid.

HYDRO-BOOST

a power brake system that uses power steering pump fluid pressure rather than intake manifold vacuum.

HYGROSCOPIC

the ability of a material or substance to attract water.

ID

inside diameter.

INNER BEARING RACE

inner part of a ball or roller bearing that provides a surface for the balls or rollers to rotate.

INTEGRAL ABS

an anti-lock braking system that substitutes the traditional master cylinder and power booster with a self-contained hydraulic modulator and high-pressure accumulator.

LEADING-TRAILING DRUM BRAKES

a non-servo drum brake system where both brake shoes are held in place against a solidly attached anchor mounted to the bottom of the backing plate.

MASTER CYLINDER

the primary fluid pressurizing device in some hydraulic systems. In automotive use, it is found in the brake and hydraulic clutch systems and is pedal-activated, either directly or through a vacuum assist unit.

METERING VALVE

a valve used on front disc/rear drum brake systems for the purpose of providing a simultaneous application of the front and rear friction materials. Located in the front brake hydraulic circuit, the metering valve delays front disc brake operation until the rear brakes shoes overcome the return spring tension.

MILLIMETER

the base of metric size measurement. One millimeter equals 0.039370-in. One inch is equal to 25.4 m m.

MODULATOR

a component in the ABS system that contains the solenoid valves that regulate hydraulic fluid pressure to the calipers or wheel cylinders.

NORMAL WEAR

the average expected wear when operating under normal conditions.

OEM

original equipment manufacturer.

OXIDATION

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the process of combining with oxygen, resulting in rusting or burning. Rust is slow oxidation; fire is rapid oxidation.

PARKING BRAKE

a system that applies the brakes mechanically through a series of linkages and cables. Depending on the vehicle, the parking brake system will either be actuated using a foot pedal or a hand-operated lever.

PASCAL'S LAW

the law of physics stating that liquids are noncompressible, and that a force applied to the top of a liquid in a closed container is exerted equally in all directions.

PERMEABILITY

ability of a membrane or other material to permit a substance to pass through it.

PITTING

surface irregularities caused by corrosion or excess wear.

PLAY

the relative movement between or among parts.

POWER BOOSTER

a device that uses a diaphragm, engine vacuum and atmospheric pressure to assist the driver with brake application. Also known as a vacuum booster.

POWER BRAKES

a system that uses vacuum or hydraulic pressure to assist the driver with brake application.

PRELOAD

tightening a bearing a specified amount past zero lash to eliminate axial play.

PRESSURE DIFFERENTIAL SWITCH

a valve and switch assembly installed in dual circuit brake systems to alert the driver in the event of a pressure loss in one of the hydraulic circuits.

PRIMARY SHOE

the brake shoe in a duo-servo drum brake system that transfers part of its force to the secondary shoe. The brake shoe facing the front of the vehicle when the vehicle is moving forward.

PROPORTIONING VALVE

the proportioning valve is used to control hydraulic pressure to the rear brakes. When the pressure to the rear brakes reaches a predetermined level, the proportioning valve overcomes the force of its spring-loaded piston and stops the flow of fluid to the rear brakes. This action maintains rear brake system pressure at a lower level than the front brakes, keeping the rear brakes from locking during hard stops.

QUICK TAKE-UP MASTER CYLINDER

a master cylinder design that is used to prevent excessive brake pedal travel. The quick take-up master cylinder uses a larger rear cylinder bore and quick take-up valve. This arrangement provides a large volume of fluid at low pressure (light pedal application) during the initial part of the pedal stroke. Also called a step-bore master cylinder.

RACE

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a channel in the inner or outer ring of an anti-friction bearing in which the balls or rollers operate.

REGENERATIVE BRAKING

process of recovering some of a hybrid or electric vehicle's kinetic energy by allowing the wheels to drive a traction motor as a generator, thereby producing electric power that is stored for later use. When the driver brakes, the motor becomes a generator, using the kinetic energy of the vehicle to generate electricity that can be stored in the battery for later use. Traditional friction brakes are also necessary, as well as a strategy for smoothly blending the two braking mechanisms. Regenerative and friction brakes need to be controlled electronically so that stopping ability is maximized to make the dual brake operation transparent to the driver.

RESIDUAL PRESSURE

remaining or leftover pressure.

RETURN SPRINGS

springs that secure the tops of the brake shoes to an anchor pin on the backing plate. These springs allow the shoes to move in and out laterally.

SECONDARY SHOE

the brake shoe in a duo-servo drum brake system that receives force from the primary shoe when the brakes are applied. The secondary shoe does most of the braking when the vehicle is traveling forward, so its lining is larger than that of the primary shoe.

SENDING UNIT

a mechanical, electrical, hydraulic or electromechanical device which transmits information to a gauge or other receiving unit.

SERVO

a device, such as an electric motor or hydraulic piston, that is controlled by an amplified signal from a low power command device.

SLIDING CALIPER

a brake caliper design that operates similarly to the floating design, however, it attaches to the anchor plate using only one attachment point.

SPONGINESS

the feel of a soft or mushy brake pedal usually caused by trapped air in the hydraulic system.

STAR WHEEL

the star shaped wheel that is attached to the screw of a drum brake shoe adjuster. If brake shoe-to-drum clearance is excessive, the wheel is turned by the self-adjuster lever when the brakes are applied with the vehicle in reverse, moving the brake shoes closer to the drum.

TAPER

a gradual decrease in width or thickness; the difference in diameter between the cylinder bore at the bottom of the hole and the bore at the top of the hole, just below the ridge.

TECHNICAL SERVICE BULLETIN (TSB)

information published by vehicle manufacturers that describe updated service procedures and service procedures that should be used to handle vehicle defects.

TENSION

stress exerted on an object by pulling that tends to extend the material.

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TOLERANCE

the difference between the allowable maximum and minimum dimensions of a mechanical part; the basis for determining the accuracy of a fitting.

TORQUE SEQUENCE

a specified order in which a component's mounting bolts should be tightened

TORQUE WRENCH

a breaker bar or ratchet wrench with an indicator that measure the twisting effort applied to a fastener during tightening.

TORQUE

twisting effort on a shaft or bolt.

UNDERSIZE

when an inside or outside diameter has been machined to a dimension smaller than standard. Undersized bearings are used to compensate.

VACUUM BOOSTER

see 'power booster'.

VALVE

a device that controls the pressure, direction or rate of flow of a liquid or gas.

WARPAGE

a condition that exists when a part is bent or twisted; the degree to which a part deviates from flatness.

WHEEL CYLINDER

a cylinder connected to a drum brake hydraulic system. Hydraulic pressure in the system applies piston(s) in the wheel cylinder against the brake shoes, forcing the shoes against the inside of the brake drum and stopping its rotation.

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DRIVE TRAIN & TRANSMISSION 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

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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:

201 Park Washington Court

Falls Church, Virginia 22046

Tel: (703) 532-2027 * Fax: (202) 318-0378

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
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

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement
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 *always* 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.**

DRIVETRAIN AND TRANSMISSION

NOTE: **When a procedure states that a required or suggested repair or replacement is recommended, the basis for the recommendation MUST be explained to the customer. If the customer asks whether there are alternatives to the recommendation, generally acceptable repair/replacement options must be explained, whether performed or not by the shop.**

NOTE: **Whenever transmission or drive-train service is performed that affects the suspension alignment, for example, removing the engine cradle, it is required that the alignment be checked and corrected if necessary.**

NOTE: **The conditions listed for the components included in this section assume that the problem has been isolated to the specific component through proper testing.**

ACTUATORS (ELECTRICAL)

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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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: **Determine cause and correct prior to repair or replacement of part.**		
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

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

ACTUATORS (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.
Connector (Weatherpack type) leaking	A	Require repair or replacement.
Connector broken	A	Require repair or replacement.
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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.**		
Leaking (vacuum)	A	Require repair or replacement
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	2	Suggest repair or replacement of linkage
Linkage binding, affecting performance	A	Require repair or replacement of linkage
Linkage binding, not affecting performance	1	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

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Condition	Code	Procedure
Out of adjustment	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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Terminal corroded, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
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

AUTOMATIC TRANSMISSION / TRANSAXLE ASSEMBLIES/CVTS

Condition	Code	Procedure
Any internal component failure that requires removal of the assembly from the vehicle for service.	A	Require repair or replacement of the automatic transmission / transaxle assembly.
NOTE: **It is required that the torque converter and all other failure-related components be inspected for cause and condition. For components not requiring removal of the assembly, refer to the component listing**		

AUTOMATIC TRANSMISSION FLUID

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
Burned	Â	Further inspection required
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service

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Condition	Code	Procedure
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	Â	No service suggested or required
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Varnish deposits present on system components affecting performance	Â	Further inspection required

AXLES

Condition	Code	Procedure
Bent, affecting performance	A	Require replacement
Bent, beyond specification	B	Require repair or replacement
Broken	A	Require replacement
End play exceeds specifications	B	Require repair or replacement
Flange bent	A	Require replacement
Flange threads stripped	A	Require repair or replacement
Twisted	A	Require replacement
Worn, affecting performance	A	Require repair or replacement

BEARINGS AND RACES

NOTE: **When replacing or re-packing bearings, grease seal replacement is required. You are not required to replace these components in axle sets. Determine the need to replace based upon the individual component conditions that follow.**

Condition	Code	Procedure
Bearing end-play exceeds specifications	B	Require adjustment of bearing, if possible
NOTE: **If proper adjustment can't be obtained, require replacement of bearing assembly.**		
Bearing rollers, balls or races are worn, pitted, noisy, or feel rough when rotated as an assembly	B	Require replacement of bearing assembly

BELL CRANKS

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

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Condition	Code	Procedure
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bent, affecting performance	A	Require repair or replacement
Broken	A	Require repair or replacement
Cracked	A	Require repair or replacement
Missing	C	Require replacement
Worn, affecting performance	A	Require repair or replacement

BELL HOUSINGS

Condition	Code	Procedure
Bearing race loose in bore	A	Require repair or replacement
Broken, affecting performance	A	Require repair or replacement
Cracked	A	Require repair or replacement
Dowel pin holes worn, affecting performance	Â	See Dowel Pins, Guides, and Pilot Holes
Leaking Coolant	B	Require Repair or Replacement
NOTE: **This condition is found mostly on Hybrid vehicles with a liquid cooled inverter.**		
Machined surfaces damaged, affecting performance	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn, affecting performance	A	Require repair or replacement

BUSHINGS (EXTERNAL)

Condition	Code	Procedure
Attaching hardware bent	B	Require repair or replacement of bent part if available, otherwise, replace bushing
Attaching hardware broken	A	Require repair or replacement of broken part if available, otherwise, replace bushing
Attaching hardware corroded, affecting structural Integrity	A	Require repair or replacement of corroded part if available, otherwise, replace bushing
Attaching hardware incorrect	B	Require repair or replacement of incorrect part if available, otherwise, replace bushing
Attaching hardware loose	A	Require repair or replacement of loose part if available, otherwise, replace bushing
Attaching hardware missing	C	Require repair or replacement of missing part if available, otherwise, replace bushing
Attaching hardware threads damaged	A	Require repair or replacement of part with damaged threads if available, otherwise, replace bushing
Attaching hardware threads stripped (threads missing)	A	Require repair or replacement of part with damaged threads if available, otherwise, replace bushing
Binding	A	Require repair or replacement
Contaminated	1	Suggest replacement
Deteriorated, affecting performance	A	Require repair or replacement

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Condition	Code	Procedure
Distorted, affecting performance	A	Require repair or replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: **If noise isolated to bushing, suggest repair or replacement. Use only approved lubricant on rubber bushings. Petroleum-based lubricants may damage rubber bushings.**		
Rubber separating from internal metal sleeve on bonded bushing	A	Require replacement
Seized	A	Require replacement
Shifted out of position	B	Require repair or replacement
Split	A	Require replacement
Surface cracking (weather-checked)	Â	No service suggested or required
Worn affecting performance	A	Require repair or replacement
Worn, close to the end of Its useful life	1	Suggest replacement

CABLES (SPEEDOMETER)

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	2	Suggest repair or replacement of bracket
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	2	Suggest repair or replacement of bracket
Bracket corroded, affecting performance	A	Require 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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
Routed incorrectly, affecting performance	B	Require repair
Seized	A	Require repair or replacement

CABLES (TV, DETENT AND SHIFT)

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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
Bent	A	Require repair or replacement
Binding	A	Require repair or replacement

CARRIER BEARINGS

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 rollers, balls or races are worn, pitted, noisy, or feel rough when rotated as an assembly	A	Require replacement of bearing assembly
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	2	Suggest repair or replacement of bracket
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 holes elongated, affecting performance	A	Require repair or replacement
Bracket holes elongated, not affecting performance	Â	No service suggested or required
Bracket loose, affecting performance	A	Require repair or replacement
Bracket loose, not affecting performance	1	Suggest repair or replacement
Bracket missing	C	Require replacement
Cracked	B	Require replacement
Rough (brinelling, spalling)	A	Require replacement
Rubber deteriorated, affecting performance	A	Require replacement
Seized	A	Require replacement

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CLUTCH CABLES AND CABLE HOUSINGS

Condition	Code	Procedure
Broken	A	Require replacement
Cable bent	A	Require replacement
Cable binding	A	Require repair or replacement
Cable mounting loose	B	Require repair or replacement
Cable out of adjustment	B	Require repair or replacement
Frayed	B	Require replacement
Housing heat -damaged	1	Suggest replacement
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
Seized	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn, affecting performance	A	Require replacement

CLUTCH DISCS (MANUAL TRANSMISSIONS)

Condition	Code	Procedure
Backing plate cracked	B	Require replacement
Broken	A	Require replacement
Contaminated with oil	A	Require replacement
NOTE: **Determine source of oil and correct prior to repair or replacement of clutch disc.**		
Damper cushion broken	A	Require replacement
Damper cushion collapsed	A	Require replacement
Damper spring collapsed	A	Require replacement
Damper spring missing	C	Require replacement
NOTE: **Not all clutch discs have springs in all spring chambers on the disc.**		
Friction material cracked through	B	Require replacement
Friction material flaking or chunking	B	Require replacement
Friction material surface cracking	Â	No service suggested or required
Grooved	B	No service suggested or required unless the pressure plate or flywheel is being resurfaced or replaced. In this case, replacement of clutch disc is required
Ridged	B	No service suggested or required unless the pressure plate or flywheel is being resurfaced or replaced. In this case, replacement of clutch disc is required
Splines worn, affecting performance	A	Require replacement
Warped, affecting performance.	A	Require replacement
Wear exceeds specifications (where applicable)	B	Require replacement
Worn, affecting performance	A	Require replacement
Worn, not affecting performance yet close to the end of its useful life	1	Suggest replacement

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CLUTCH FORKS

Condition	Code	Procedure
Bent, affecting performance	B	Require replacement
Broken	A	Require repair or replacement
Cracked	B	Require repair or replacement
Worn, affecting performance	A	Require replacement
Worn, not affecting performance yet close to the end of its useful life	1	Suggest replacement

CLUTCH LINKAGES (MECHANICAL)

Condition	Code	Procedure
Components missing	C	Require replacement of missing components
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	2	Suggest repair or replacement of linkage

Condition	Code	Procedure
Linkage binding, affecting performance	A	Require repair or replacement of linkage
Linkage binding, not affecting performance	1	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
Out of adjustment	B	Require repair or replacement
Worn to the extent that it no longer performs its intended function	A	Require repair or replacement

CLUTCH MASTER CYLINDERS

Condition	Code	Procedure
Cover gasket distorted	A	Require replacement of cover gasket
Cover gasket gummy	A	Require replacement of cover gasket
NOTE: **This condition may indicate contaminated fluid. Further inspection required.**		
Cylinder leaking fluid from rear of bore	A	Require repair or replacement
Cylinder leaking fluid internally	A	Require replacement
Dust boot missing	C	Require replacement of dust boot
Dust boot punctured	A	Require replacement of dust boot
Dust boot torn	A	Require replacement of dust boot
Fluid level incorrect	B	Require fluid level adjustment
Housing damaged, affecting performance	A	Require repair or replacement
Master cylinder has residue in reservoir	2	Further inspection required
NOTE: **Do not replace master cylinder unless it exhibits conditions listed for replacement.**		
Pushrod out of adjustment	B	Require Repair or Replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

CLUTCH PEDALS

Condition	Code	Procedure
Bent, affecting performance	A	Require repair or replacement
Bent, not affecting performance	2	Suggest repair or replacement
Broken	A	Require repair or replacement
Pedal pad missing	C	Require replacement of pedal pad
Pivot bushings worn, affecting performance	A	Require replacement of pivot bushings

CLUTCH PIVOTS

Condition	Code	Procedure
Bent, affecting performance	A	Require replacement

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Condition	Code	Procedure
Broken	A	Require repair or replacement
Cracked	B	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn, affecting performance	A	Require replacement
Worn, not affecting performance, but close to the end of its useful life	2	Suggest replacement

CLUTCH PRESSURE PLATES

Condition	Code	Procedure
Balance weight missing	C	Require replacement
Broken	A	Require replacement
Contact surface distorted	B	Require replacement
Cracks	B	Require replacement
Fingers bent	A	Require replacement
Hard spots	B	Require replacement
Scored	B	Require replacement
Spring rate less than specifications	B	Require replacement
Worn beyond specifications	B	Require replacement
Worn close to the end of its useful life	1	Suggest replacement
Worn, affecting performance	A	Require replacement

CLUTCH RELEASE BEARINGS

Condition	Code	Procedure
Collar broken	A	Require replacement
Cracked	B	Require replacement
Rough when rotated as an assembly	B	Require replacement
Seized	A	Require replacement
Wear exceeds specifications	B	Require replacement
Worn close to the end of its useful life	1	Suggest replacement
Worn, affecting performance	A	Require replacement

CLUTCH SLAVE CYLINDERS (CONCENTRIC)

Condition	Code	Procedure
Bearing rough when rotated as an assembly	B	Require replacement
Bearing seized	A	Require replacement
Bleeder pipe leaks	A	Require repair or replacement
Carrier assembly worn, affecting performance	A	Require replacement
Collar broken	A	Require replacement
Cracked	B	Require replacement
Housing leaks	A	Require replacement
Inoperative	A	Require replacement
Release binding	A	Require replacement
Spring broken	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn, affecting performance	A	Require replacement

CLUTCH SLAVE CYLINDERS (CONVENTIONAL OR EXTERNAL)

Condition	Code	Procedure

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Condition	Code	Procedure
Binding	A	Require repair or replacement
Bleeder port damaged (not repairable)	A	Require replacement
NOTE: **Only required if the hydraulic system must be opened.**		
Bleeder port damaged (repairable)	A	Require repair
NOTE: **Only required if the hydraulic system must be opened.**		
Bleeder screw broken off in slave cylinder	A	Require replacement
NOTE: **Only required if the hydraulic system must be opened.**		
Bleeder screw seized	A	Require replacement
NOTE: **Seized is defined as a bleeder screw that cannot be removed after a practical attempt at removing it has been made. Only required if the hydraulic system must be opened.**		
Bore corroded (pitted)	B	Require replacement
Bore grooved	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

COMPANION FLANGES

Condition	Code	Procedure
Bearing cap bore distorted	A	Require repair or replacement
Bent, affecting performance	A	Require replacement
Bolt holes elongated	A	Require repair or replacement
Bushing or seal surface worn, affecting performance	A	Require repair or replacement
Leaking through soft yoke plug	A	Require repair or replacement of soft yoke plug
Retainer strap bent	A	Require replacement of retainer strap
Slip yoke broken	A	Require replacement
Splines worn close to the end of their useful life	1	Suggest replacement
Splines worn, affecting performance	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
U-bolt damaged, affecting performance	A	Require replacement of U-bolts
Yoke damaged, affecting performance	A	Require repair or replacement

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

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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
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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Terminal corroded, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
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
Transmission connector leaking	See Transmission Assembly	Â
Voltage drop out of specification	A	Require repair or replacement

COOLER BYPASS VALVES

Condition	Code	Procedure
Inoperative	A	Require replacement
Installed incorrectly	A	Require repair
Leaking	A	Require repair or replacement
Restricted	A	Require repair or replacement

COOLER LINES

Condition	Code	Procedure
Abrasion damage, affecting structural integrity	A	Require repair or replacement
Abrasion damage, not affecting structural integrity	Â	No service suggested or required
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
Clamp corroded, not reusable	1	Suggest replacement
NOTE: **If clamp removed, require replacement.**		
Connected incorrectly	A	Require repair
Corroded, affecting structural integrity	A	Require replacement
Corroded, not affecting structural integrity	Â	No service suggested or required
Cracked	B	Require repair or replacement
Fitting type incorrect (such as compression fitting)	B	Require replacement
Flange leaking	A	Require repair or 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 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
Routed incorrectly	B	Require repair
Swollen	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

COOLERS

Condition	Code	Procedure
Air flow obstruction	A	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
Connection leaking	A	Require repair or replacement
Contaminated	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	Â	No service suggested or required
Internal restrictions	B	Require repair or replacement
Leaking	A	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	Â	No service suggested or required

CV JOINTS

Condition	Code	Procedure

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Condition	Code	Procedure
Bearing, bushing or seal surface worn, affecting performance	A	Require repair or replacement
Boot clamp broken	A	Require repair or replacement of clamp
Boot clamp loose	A	Require repair or replacement of clamp
Boot clamp missing	C	Require repair or replacement of clamp
Boot leaking	A	Require replacement of CV boot
NOTE: **Further inspection of joint required before replacing boot.**		
Boot surface cracked, not leaking	2	Suggest replacement of CV boot
Cage broken	A	Require repair or replacement of CV joint
Housing damaged to the extent that it no longer performs its intended function	A	Require repair or replacement of CV joint
NOTE: **Housing assembly may appear blue in color from normal manufacturing process of heat treating the housing.**		
Housing worn to the extent that it no longer performs its intended function	A	Require repair or replacement
NOTE: **Housing assembly may appear blue in color from normal manufacturing process of heat treating the housing.**		
Internal parts binding	A	Require repair or replacement
Internal parts worn	A	Require repair or replacement
Lubricant missing	C	Require cleaning, inspection, and repacking of CV joint
Mounting holes elongated	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

DIFFERENTIAL AND FINAL DRIVE ASSEMBLIES

NOTE: **Does not include half shafts.**

Condition	Code	Procedure
Any internal component failure that requires removal of the assembly from the vehicle for service.	A	Require repair or replacement of the differential assembly
NOTE: **For components not requiring removal of the assembly, refer to the component listing.**		

DIFFERENTIAL FLUID

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement

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Condition	Code	Procedure
NOTE: **Determine and correct cause.**		
Burned	Â	Further inspection required
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	Â	No service suggested or required
NOTE: **Further testing necessary to determine condition of fluid.**		
fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Rubber master/ clutch cylinder cover gasket distorted or gummy	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Varnish deposits present on system components affecting performance	Â	Further inspection required

DIP STICK TUBES

Condition	Code	Procedure
Broken	A	Require repair or replacement
Check ball missing	C	Require repair or replacement
Cracked	B	Require repair or replacement
Hold down bracket broken	A	Require repair or replacement
Hold down bracket missing	C	Require replacement
Leaking	B	Require repair or replacement

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Condition	Code	Procedure
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

DIP STICKS (FLUID LEVEL INDICATORS)

Condition	Code	Procedure
Application incorrect	B	Require replacement
Broken	A	Require replacement
Compressed	A	Require repair or replacement
Missing	C	Require replacement
Modified	A	Require replacement
Stretched	A	Require repair or replacement

DOWEL PINS, GUIDES AND PILOT HOLES

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Cracked	A	Require repair or replacement
Distorted	A	Require repair or replacement
Missing	C	Require replacement
Positioned incorrectly	B	Require repair or replacement
Stepped	A	Require repair or replacement
Worn to the extent that it no longer performs its intended function	A	Require repair or replacement

DRAIN PLUGS AND GASKETS

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

DRIVE SHAFT FLANGES

Condition	Code	Procedure
Bearing cap bore distorted	A	Require repair or replacement
Bent, affecting performance	A	Require replacement
Bolt holes elongated	A	Require repair or replacement
Bushing or seal surface worn, affecting performance	A	Require repair or replacement
Leaking through soft yoke plug	A	Require repair or replacement of soft yoke plug
Retainer strap bent	A	Require replacement of retainer strap
Slip yoke broken	A	Require replacement
Splines worn close to the end of their useful life	1	Suggest replacement
Splines worn, affecting performance	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
U-bolt damaged, affecting performance	A	Require replacement of U-bolts

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Condition	Code	Procedure
Yoke damaged, affecting performance	A	Require repair or replacement

DRIVE SHAFTS AND HALF SHAFTS

Condition	Code	Procedure
Balance weight missing	C	Require repair or replacement
Bearing cap bore distorted	A	Require repair or replacement
Bent	A	Require replacement
Bolt holes elongated	A	Require repair or replacement
Bushing or seal surface worn, affecting performance	A	Require repair or replacement
Leaking through soft yoke plug	A	Require repair or replacement of soft yoke
Out of balance	A	Require repair or replacement
Retainer strap bent	A	Require replacement of retainer strap
Slip yoke broken	A	Require replacement
Splines worn, affecting performance	A	Require repair or replacement
Splines worn, not affecting performance, but close to the end of their useful life	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
U-bolt damaged, affecting performance	A	Require replacement of U-bolts
Yoke damaged, affecting performance	A	Require repair or replacement of Yoke

DUST BOOTS

Condition	Code	Procedure
Cracked, not leaking	1	Suggest replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Torn	A	Require replacement
Weather checked, surface cracked	Â	No service suggested or required

ENGINE 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	Â	No service suggested or required
Rubber deteriorated, affecting performance	A	Require replacement
Rubber deteriorated, not affecting performance	Â	No service suggested or required
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

EXCITER RINGS

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Bent	B	Require replacement

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Condition	Code	Procedure
Contaminated, affecting performance	A	Require repair. Identify and correct cause
Cracked	B	Require replacement
Loose	A	Require replacement of worn parts
Missing	C	Require replacement
Number of teeth incorrect	B	Require replacement
Teeth broken	A	Require replacement
Teeth damaged, affecting performance	A	Require replacement

FILLER TUBES

Condition	Code	Procedure
Broken	A	Require repair or replacement
Check ball missing	C	Require repair or replacement
Cracked	B	Require repair or replacement
Hold down bracket broken	A	Require repair or replacement
Hold down bracket missing	C	Require replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

FILTERS AND SCREENS

Condition	Code	Procedure
At service interval	3	Suggest replacement
Bent, affecting performance	A	Require repair or replacement
Exceeding service interval	3	Suggest replacement
Missing	C	Require replacement
Near service interval	3	Suggest replacement
Restricted	A	Require repair or replacement
NOTE: **Further inspection may be required to determine the source of restriction or contamination.**		
Torn	A	Require replacement
Worn, affecting performance (metal or nylon screen type)	A	Require repair or replacement

FLANGES

Condition	Code	Procedure
Bearing cap bore distorted	A	Require repair or replacement
Bent, affecting performance	A	Require replacement
Bolt holes elongated	A	Require repair or replacement
Bushing or seal surface worn, affecting performance	A	Require repair or replacement
Leaking through soft yoke plug	A	Require repair or replacement of soft yoke plug
Retainer strap bent	A	Require replacement of retainer strap
Slip yoke broken	A	Require replacement
Splines worn close to the end of their useful life	1	Suggest replacement
Splines worn, affecting performance	A	Require replacement
Threads damaged	A	Require repair or replacement

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Condition	Code	Procedure
Threads stripped (threads missing)	A	Require replacement
U-bolt damaged, affecting performance	A	Require replacement of U-bolts
Yoke damaged, affecting performance	A	Require repair or replacement

FLEX PLATES

Condition	Code	Procedure
Bent, affecting performance	A	Require replacement
Bent, not affecting performance	Â	No service suggested or required
Bolt or stud holes elongated	B	Require replacement
Broken	A	Require replacement
Cracked	B	Require replacement
Ring gear worn close to the end of its useful life	1	Suggest replacement
Ring gear worn to the extent that it no longer performs its intended function	A	Require replacement
Weights missing	A	Require repair or replacement

FLUID LEVEL INDICATORS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Broken	A	Require replacement
Compressed	A	Require repair or replacement
Missing	C	Require replacement
Modified	A	Require replacement
Stretched	A	Require repair or replacement

FLUIDS AND LUBRICANTS

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
Burned	Â	Further inspection required
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		

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Condition	Code	Procedure
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	Â	No service suggested or required
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Rubber master/ clutch cylinder cover gasket distorted or gummy	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Varnish deposits present on system components affecting performance	Â	Further inspection required

FLYWHEELS

NOTE: **Clutch disc replacement does not necessitate flywheel reconditioning, unless other conditions justify the reason to do so.**

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 (other than mounting area)	A	Require repair or replacement of hardware
NOTE: **Some manufacturers allow slight surface cracking in the friction surface.**		
Cracks in mounting area	B	Require replacement
Hard spots	B	Require repair or replacement
Ring gear teeth worn, affecting performance	A	Require replacement of ring gear
Runout exceeds specifications	B	Require repair or replacement
Scored	B	Require repair or replacement
Surface cracks after resurfacing to manufacturer's minimum specifications	B	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wear exceeds specifications	B	Require replacement
Worn, affecting performance	A	Require repair or replacement
Worn, not affecting performance, but close to the end of its useful life	1	Suggest repair or replacement

FORCE MOTORS

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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
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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.**		
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
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	1	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

GASKETS

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

GUIDES

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Cracked	A	Require repair or replacement
Distorted	A	Require repair or replacement
Missing	C	Require replacement

Condition	Code	Procedure
Positioned incorrectly	B	Require repair or replacement
Stepped	A	Require repair or replacement
Worn to the extent that it no longer performs its intended function	A	Require repair or replacement

HALF SHAFTS

Condition	Code	Procedure
Balance weight missing	C	Require repair or replacement
Bearing cap bore distorted	A	Require repair or replacement
Bent	A	Require replacement
Bolt holes elongated	A	Require repair or replacement
Bushing or seal surface worn, affecting performance	A	Require repair or replacement
Leaking through soft yoke plug	A	Require repair or replacement of soft yoke plug
Out of balance	A	Require repair or replacement
Retainer strap bent	A	Require replacement of retainer strap
Slip yoke broken	A	Require replacement
Splines worn, affecting performance	A	Require repair or replacement
Splines worn, not affecting performance, but close to the end of their useful life	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
U-bolt damaged, affecting performance	A	Require replacement of U-bolts
Yoke damaged, affecting performance	A	Require repair or replacement of yoke

HOSES, LINES, AND TUBES

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 line or tube	A	Require replacement
Hard hose	1	Suggest 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	2	Suggest replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Routed incorrectly	2	Suggest replacement
Safety clip missing	C	Require replacement
Spongy	1	Suggest repair or replacement
Stripped	A	Require replacement
Surface cracked (weather-checked)	1	Suggest repair or replacement
Swollen	B	Require replacement

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Condition	Code	Procedure
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	1	Suggest repair or replacement

HOUSINGS (BELL, CASE, TAIL(EXTENSION) AND AUXILIARY)

Condition	Code	Procedure
Bearing race loose in bore	A	Require repair or replacement
Broken, affecting performance	A	Require repair or replacement
Cracked	B	Require repair or replacement
Dowel pin holes worn, affecting performance	A	Require repair or replacement
Machined surfaces damaged, affecting performance	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn, affecting performance	A	Require repair or replacement

HYDRAULIC FLUID

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
Burned	Â	Further inspection required
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	Â	No service suggested or required
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Rubber master/ clutch cylinder cover gasket distorted or gummy	A	Require service

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Condition	Code	Procedure
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Varnish deposits present on system components affecting performance	Â	Further inspection required

INTERMEDIATE SHAFT SUPPORT BEARINGS

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 rollers, balls or races are worn, pitted, noisy, or feel rough when rotated as an assembly	A	Require replacement of bearing assembly
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	2	Suggest repair or replacement of bracket
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 holes elongated, affecting performance	A	Require repair or replacement
Bracket holes elongated, not affecting performance	Â	No service suggested or required
Bracket loose, affecting performance	A	Require repair or replacement
Bracket loose, not affecting performance	1	Suggest repair or replacement
Bracket missing	C	Require replacement
Cracked	B	Require replacement
Rough (brinelling, spalling)	A	Require replacement
Rubber deteriorated, affecting performance	A	Require replacement
Seized	A	Require replacement

KEY INTERLOCK SYSTEMS

NOTE: **See: Actuators (Electrical), Cables, Linkages (External), Switches**

LIMITED SLIPS

Condition	Code	Procedure
Any internal component failure that requires removal of the assembly from the vehicle for service.	A	Require repair or replacement of the differential assembly.
NOTE: **For components not requiring removal of the assembly, refer to the component listing.**		

LINES

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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 line or tube	A	Require replacement
Hard hose	1	Suggest 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	Suggest replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Routed incorrectly	B	Suggest replacement
Safety clip missing	C	Require replacement
Spongy	1	Suggest repair or replacement
Stripped	A	Require replacement
Surface cracked (weather-checked)	I	Suggest repair or 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

LINKAGES (EXTERNAL)

Condition	Code	Procedure
Components missing	C	Require replacement of missing components
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	2	Suggest repair or replacement of linkage
Linkage binding, affecting performance	A	Require repair or replacement of linkage
Linkage binding, not affecting performance	1	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
Out of adjustment	B	Require repair or replacement
Worn to the extent that it no longer performs its intended function	A	Require repair or replacement

LOCKING HUB ASSEMBLIES

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Condition	Code	Procedure
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Loose	B	Require repair or replacement
Seized in any position	A	Require repair or replacement

LOCKING HUB CONTROL KNOBS

Condition	Code	Procedure
Damaged, affecting performance	A	Require replacement
Missing	C	Require replacement
Worn, affecting performance	A	Require replacement

LUBRICANTS

Condition	Code	Procedure
Additive Depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
At service interval	3	Suggest replacement
Beyond service interval	3	Suggest replacement
Burned	A	Further inspection required
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correctly specified hydraulic fluid.**		
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Near service interval	3	Suggest replacement
Oxidized	A	Require replacement of fluid
Rubber master cylinder cover gasket distorted and gummy	A	Require service
NOTE: **If a fluid other than brake fluid is present in the system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		

MANUAL TRANSMISSION FLUID

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Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
Burned	Â	Further inspection required
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	Â	No service suggested or required
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid discolored	Â	No service suggested or required
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Rubber master/ clutch cylinder cover gasket distorted or gummy	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Varnish deposits present on system components affecting performance	Â	Further inspection required

MANUAL TRANSMISSION/TRANSAXLE ASSEMBLIES

Condition	Code	Procedure

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Condition	Code	Procedure
Any internal component failure that requires removal of the assembly from the vehicle for service.	A	Require repair or replacement of the manual transmission / transaxle assembly.

NOTE:
For components not requiring removal of the assembly, refer to the component listing.

METAL CLAD SEALS

Condition	Code	Procedure
Leaking	A	Require repair or replacement

NOTE:
Require inspection of mating and sealing surface and repair or replace as necessary. Check vent. A plugged vent may force fluid past the seal.

METALASTIC JOINTS

NOTE: **These joints may be found on half and/or drive shafts. They are usually found on European vehicles featuring a three-lug drive flange. They may be equipped with a centering ball or pin.**

Condition	Code	Procedure
Drive flange bent	A	Require replacement
Drive flange damaged, affecting performance	A	Require replacement
Rubber drive joint cracked	2	Suggest replacement
Rubber drive joint damaged, affecting performance	A	Require replacement
Rubber drive joint split between mounting holes	A	Require replacement
Rubber drive joint torn at mounting holes	A	Require replacement
Rubber drive joint weather-cracked	Â	No service suggested or required

MODULATOR PINS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Missing	C	Require replacement

MODULATORS

Condition	Code	Procedure
Bent, affecting performance	A	Require replacement
Contaminated (water, fuel, etc.)	A	Require replacement

NOTE:
Further inspection is required to determine the cause of the contamination.

Housing cracked	A	Require replacement
Inoperative	A	Require replacement

NOTE:
Inoperative includes intermittent operation.

Leaking fluid externally	A	Require repair or replacement
Leaking fluid internally	A	Require replacement
Leaking vacuum	A	Require replacement

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Condition	Code	Procedure
Nipple broken	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

MOUNTS (ENGINE, TRANSAXLE AND TRANSMISSION)

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	Â	No service suggested or required
Rubber deteriorated, affecting performance	A	Require replacement
Rubber deteriorated, not affecting performance	Â	No service suggested or required
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

ODOMETER DRIVES (MECHANICAL)

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
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Teeth broken	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn close to the end of its useful life	1	Suggest replacement
Worn, affecting performance	A	Require replacement

ODOMETER HEADS (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
Lens broken	A	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		

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Condition	Code	Procedure
Lens cloudy	2	Suggest repair or replacement
NOTE: **If lens is available as a separate part, suggest replacement of lens only.**		
Lens missing	C	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Malfunctioning	A	Require repair or replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.**		
Noisy	2	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

OIL PANS

Condition	Code	Procedure
Bent, interfering with filter or other internal components	A	Require repair or replacement
Leaking	A	Require repair or replacement

PANS

Condition	Code	Procedure
Bent, interfering with filter or other internal components	A	Require repair or replacement
Leaking	A	Require repair or replacement

PILOT HOLES

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Cracked	A	Require repair or replacement
Distorted	A	Require repair or replacement
Missing	C	Require replacement
Positioned incorrectly	B	Require repair or replacement
Stepped	A	Require repair or replacement
Worn to the extent that it no longer performs its intended function	A	Require repair or replacement

PRESSURE PLATES

Condition	Code	Procedure
Balance weight missing	C	Require replacement
Broken	A	Require replacement
Contact surface distorted	B	Require replacement
Cracks	B	Require replacement
Fingers bent	A	Require replacement
Hard spots	B	Require replacement
Scored	B	Require replacement
Spring rate less than specifications	B	Require replacement

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Condition	Code	Procedure
Worn beyond specifications	B	Require replacement
Worn close to the end of its useful life	1	Suggest replacement
Worn, affecting performance	A	Require replacement

PRESSURE 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
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

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RACES

NOTE: **When replacing or re-packing bearings, grease seal replacement is required. You are not required to replace these components in axle sets. Determine the need to replace based upon the individual component conditions that follow.**

Condition	Code	Procedure
Bearing end-play exceeds specifications	B	Require adjustment of bearing, if possible If proper adjustment cannot be obtained, require replacement of bearing assembly
NOTE: **When replacing or re-packing bearings, grease seal replacement is required. You are not required to replace these components in axle sets. Determine the need to replace based upon the individual component conditions**		
Bearing rollers, balls or races are worn, pitted, or feel rough when rotated as an assembly	B	Require replacement of bearing assembly
NOTE: **When replacing or re-packing bearings, grease seal replacement is required. You are not required to replace these components in axle sets. Determine the need to replace based upon the individual component conditions**		

RUBBER JOINTS (METALASTIC)

NOTE: **These joints may be found on half and/or drive shafts. They are usually found on European vehicles featuring a three-Jug drive flange. They may be equipped with a centering ball or pin.**

Condition	Code	Procedure
Drive flange bent	A	Require repair or replacement
Drive flange damaged, affecting performance	A	Require replacement
Rubber drive joint cracked	2	Suggest replacement
Rubber drive joint damaged, affecting performance	A	Require replacement
Rubber drive joint split between mounting holes	A	Require replacement
Rubber drive joint torn at mounting holes	A	Require replacement
Rubber drive joint weather-cracked	Â	No service suggested or required

SCREENS

Condition	Code	Procedure
At service interval	3	Suggest replacement
Bent, affecting performance	A	Require repair or replacement
Exceeding service interval	3	Suggest replacement
Missing	C	Require replacement
Near service interval	3	Suggest replacement
Restricted	A	Require repair or replacement
NOTE: **Further inspection may be required to determine the source of restriction or contamination.**		
Torn	A	Require replacement
Worn, affecting performance (metal or nylon screen type)	A	Require repair or replacement

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SEALS (METAL CLAD)

Condition	Code	Procedure
Leaking	A	Require repair or replacement

NOTE:
Require inspection of mating and sealing surface and repair or replace as necessary. Check vent. A plugged vent may force fluid past the seal.

SEALS

Condition	Code	Procedure
Leaking	A	Require repair or replacement

NOTE:
Require inspection of mating and sealing surface and repair or replace as necessary. Check vent. A plugged vent may force fluid past the seal.

SELECTOR INTERLOCK SYSTEMS

NOTE: **See: Actuators (Electrical), Cables, Linkages (External), Switches**

Condition	Code	Procedure
Binding	A	Require repair or replacement
Broken	A	Require repair or replacement
Components missing	C	Require replacement of missing components
Loose, affecting performance	A	Require repair or replacement
Out of adjustment	B	Require repair
Worn, affecting performance	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

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 or out of specification.

Leaking (vacuum/fluid/air)	A	Require replacement
Out of adjustment	B	Further inspection required

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Condition	Code	Procedure
NOTE: **Follow OEM recommended adjustment procedures. Repair or replace if out of specification.**		
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

SERVOS

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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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.**		
Leaking (vacuum)	A	Require repair or replacement
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	2	Suggest repair or replacement of linkage
Linkage binding, affecting performance	A	Require repair or replacement of linkage
Linkage binding, not affecting performance	1	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

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Condition	Code	Procedure
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 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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Terminal corroded, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
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

SHIFT INTERLOCK SYSTEMS (SELECTOR AND KEY INTERLOCK SYSTEMS)

NOTE: **See: Actuators (Electrical), Cables, Linkages (External), Switches**

Condition	Code	Procedure
Binding	A	Require repair or replacement
Broken	A	Require repair or replacement
Components missing	C	Require replacement of missing components
Loose, affecting performance	A	Require repair or replacement
Out of adjustment	B	Require repair
Worn, affecting performance	A	Require repair or replacement

SIDE COVERS

Condition	Code	Procedure
Bent, interfering with filter or other internal components	A	Require repair or replacement
Leaking	A	Require repair or replacement

SLIP YOKES

Condition	Code	Procedure
Bearing cap bore distorted	A	Require repair or replacement
Bent	A	Require replacement
Bolt holes elongated	A	Require repair or replacement
Bushing or seal surface worn, affecting performance	A	Require repair or replacement
Leaking through soft yoke plug	A	Require repair or replacement of soft yoke plug
Retainer strap bent	A	Require replacement of retainer strap

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Condition	Code	Procedure
Slip yoke broken	A	Require replacement
Splines worn close to the end of their useful life	1	Suggest replacement
Splines worn, affecting performance	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
U-bolt damaged, affecting performance	A	Require replacement of U-bolts
Yoke damaged, affecting performance	A	Require repair or replacement

SOLENOIDS

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, affecting performance	A	Require repair or replacement.
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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.**		
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.
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	1	Suggest repair or replacement.
Terminal loose, affecting performance	B	Require repair or replacement.
Terminal loose, not affecting performance	1	Suggest repair or replacement.

SPEED SENSORS (ELECTRONIC WHEEL AND VEHICLE)

Condition	Code	Procedure
Air gap incorrect	B	Require adjustment or replacement

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Condition	Code	Procedure
NOTE: **If a sensor is not adjustable, further inspection is required to identify and correct cause.**		
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 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
Loose	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Sensor housing cracked	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 replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead corroded	A	Require repair or replacement
Wire lead misrouted	B	Require re-routing according to vehicle manufacturer's specifications
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

SPEEDOMETER- DRIVEN GEAR HOUSING

Condition	Code	Procedure

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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
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Teeth broken	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn close to the end of its useful life	1	Suggest replacement
Worn, affecting performance	A	Require replacement

SPEEDOMETER/ODOMETER DRIVES (MECHANICAL)

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
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Teeth broken	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn close to the end of its useful life	1	Suggest replacement
Worn, affecting performance	A	Require replacement

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SPEEDOMETER/ODOMETER HEADS (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
Lens broken	A	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Lens cloudy	2	Suggest repair or replacement

Condition	Code	Procedure
NOTE: **If lens is available as a separate part, suggest replacement of lens only.**		
Lens missing	C	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Malfunctioning	A	Require repair or replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.**		
Noisy	2	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SPEEDOMETERS/ODOMETERS (ELECTRONIC)

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
Leaking	B	Require replacement
Lens broken	A	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Lens cloudy	2	Suggest repair or replacement
NOTE: **If lens is available as a separate part, suggest replacement of lens only.**		
Lens missing	C	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only .**		
Malfunctioning	A	Require repair or replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.**		
Mechanical head noisy	2	Suggest repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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

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
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

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Condition	Code	Procedure
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

TONE WHEELS

NOTE: **If the toothed ring requires replacement and cannot be replaced as a separate component, replace the assembly of which the ring is a part.**

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Bent	B	Require replacement
Contaminated, affecting performance	A	Require repair. Identify and correct cause
Cracked	A	Require replacement
Loose	A	Require replacement of worn parts
Missing	C	Require replacement
Number of teeth incorrect	B	Require replacement
Teeth broken	A	Require replacement
Teeth damaged, affecting performance	A	Require replacement

TOOTHED RINGS (TONE WHEEL)

NOTE: **If the toothed ring requires replacement and cannot be replaced as a separate component, replace the assembly of which the ring is a part.**

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Bent	B	Require replacement
Contaminated, affecting performance	A	Require repair. Identify and correct cause
Cracked	A	Require replacement
Loose	A	Require replacement of worn parts
Missing	C	Require replacement
Number of teeth incorrect	B	Require replacement
Teeth broken	A	Require replacement
Teeth damaged, affecting performance	A	Require replacement

TORQUE CONVERTERS

Condition	Code	Procedure
Converter clutch lock-up operation is faulty	A	Require replacement
Cover shell damaged, affecting performance	A	Require replacement
Does not meet stall speed specification	B	Require replacement
End play exceeds specifications	B	Require replacement
Hub broken	A	Require replacement
Hub cracked	A	Require replacement
Internal component failure	A	Require replacement
Leaking	B	Require repair or replacement
Pilot broken	A	Require replacement
Pilot worn, affecting performance	A	Require replacement
Threads damaged	A	Require repair or replacement

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Condition	Code	Procedure
Threads stripped (threads missing)	A	Require replacement
Weights missing	C	Require replacement

TRANSAXLE 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	Â	No service suggested or required
Rubber deteriorated, affecting performance	A	Require replacement
Rubber deteriorated, not affecting performance	Â	No service suggested or required
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

TRANSDUCERS (TRANSMISSION)

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
NOTE: **Inoperative includes intermittent operation or out of specification.**		
Leaking (vacuum/fluid/air)	A	Require replacement
Out of adjustment	B	Further inspection required
NOTE: **Follow OEM recommended adjustment procedures. Repair or replace if out of specification.**		
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

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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

TRANSFER CASE ASSEMBLIES

Condition	Code	Procedure
Any internal component failure that requires removal of the assembly from the vehicle for service.	A	Require repair or replacement of the transfer case differential assembly
NOTE: **For components not requiring removal of the assembly, refer to the component listing.**		

TRANSFER CASE FLUID

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
Burned	Â	Further inspection required
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	Â	No service suggested or required
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level

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Condition	Code	Procedure
Oxidized	A	Require replacement of fluid
Rubber master/ clutch cylinder cover gasket distorted or gummy	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Varnish deposits present on system components affecting performance	Â	Further inspection required

TRANSMISSION COOLERS

Condition	Code	Procedure
Air flow obstruction	A	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
Connection leaking	A	Require repair or replacement
Contaminated	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	Â	No service suggested or required
Internal restrictions	B	Require 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	Â	No service suggested or required

TRANSMISSION 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	Â	No service suggested or required
Rubber deteriorated, affecting performance	A	Require replacement
Rubber deteriorated, not affecting performance	Â	No service suggested or required
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

TRANSMISSION PANS

Condition	Code	Procedure
Bent, interfering with filter or other Internal components	A	Require repair or replacement

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Condition	Code	Procedure
Leaking	A	Require repair or replacement

TRANSMISSION RANGE INDICATORS (PRNDL)

Condition	Code	Procedure
Binding	A	Require repair or replacement
Broken	A	Require repair or replacement
Components missing	C	Require replacement of missing components
Loose, affecting performance	A	Require repair or replacement
Out of adjustment	B	Require repair
Worn, affecting performance	A	Require repair or replacement

TUBES

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 line or tube	A	Require replacement
Hard hose	1	Suggest 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	Suggest replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Routed incorrectly	B	Suggest replacement
Safety clip missing	C	Require replacement
Spongy	1	Suggest repair or replacement
Stripped	A	Require replacement
Surface cracked (weather-checked)	1	Suggest repair or 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

UNIVERSAL JOINTS (CARDAN OR CROSS TYPE)

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 cap distorted	B	Require replacement
Binding	A	Require replacement

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Condition	Code	Procedure
Cross (trunion) worn, affecting performance	A	Require replacement
Double cardan centering ball damaged	A	Require replacement
Double cardan centering ball worn, affecting performance	A	Require replacement
Double cardan centering spring broken	A	Require replacement
Double cardan centering spring missing	C	Require replacement
Double cardan centering spring weak	A	Require replacement
End cap seal cracked	2	Suggest replacement
End cap seal missing	C	Require replacement of seal
Grease fitting broken	A	Require replacement of grease fitting
NOTE: **A broken grease fitting does not require replacement of the U-Joint.**		
Grease fitting missing	C	Require replacement of grease fitting
NOTE: **A missing grease fitting does not require replacement of the U-Joint.**		
Rust-colored powder around end cap seals	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Worn, affecting performance	A	Require replacement

VACUUM CONTROLS

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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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.**		
Leaking (vacuum)	A	Require repair or replacement
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	2	Suggest repair or replacement of linkage
Linkage binding, affecting performance	A	Require repair or replacement of linkage

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Condition	Code	Procedure
Linkage binding, not affecting performance	1	Require 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 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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
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

VACUUM HOSES

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 line or tube	A	Require replacement
Hard hose	1	Suggest 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, affecting performance	B	Require 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	Suggest replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Routed incorrectly	B	Suggest replacement
Safety clip missing	C	Require replacement
Spongy	1	Suggest repair or replacement
Stripped	A	Require replacement
Surface cracked (weather-checked)	1	Suggest repair or replacement
Swollen	B	Require replacement
Threads damaged	A	Require repair or replacement

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Condition	Code	Procedure
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

VACUUM 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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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.**		
Leaking (vacuum)	A	Require repair or replacement
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	2	Suggest repair or replacement of linkage
Linkage binding, affecting performance	A	Require repair or replacement of linkage
Linkage binding, not affecting performance	1	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 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

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Condition	Code	Procedure
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Terminal corroded, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
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

VACUUM-OPERATED 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
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.**		

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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
Won't return	A	Require repair or replacement
Worn affecting performance	B	Require replacement

VEHICLE SPEED SENSORS

Condition	Code	Procedure
Air gap incorrect	B	Require adjustment or replacement
NOTE: **If a sensor is not adjustable, further inspection is required to identify and correct cause.**		
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 metal particles or water. Require repair or replacement.**		
Inoperative	B	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
Loose	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Sensor housing cracked	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

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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 misrouted	B	Require re-routing according to vehicle manufacturer's specifications
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

VENTS

Condition	Code	Procedure
Broken	A	Require replacement
Missing	C	Require replacement
Plugged	A	Require repair or replacement
NOTE: **A plugged vent may force fluid past the seal.**		

VIBRATION DAMPERS

Condition	Code	Procedure
Broken	A	Require replacement
Missing	C	Require replacement
Out of position	B	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

WHEEL ATTACHMENT HARDWARE

NOTE: **For conditions noted below, also check conditions of wheel stud holes. Proper lug nut torque is essential. Follow recommended torque specifications and tightening sequence. DO NOT lubricate threads unless specified by the vehicle manufacturer.**

Condition	Code	Procedure
Bent	A	Require replacement
Broken	A	Require replacement
NOTE: **Some manufacturers require replacement of all studs on that wheel if two or more studs or nuts on the same wheel are broken or missing.**		
Loose	A	Require repair or replacement of affected component
Lug nut installed backward	B	Require repair or replacement
Lug nut mating surface dished	A	Require replacement of nut
Lug nut mating type incorrect	B	Require replacement of nut
Lug nut rounded	A	Require replacement of nut
NOTE: **Only required if removing wheel.**		
Lug nut seized	A	Require replacement of nut

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Condition	Code	Procedure
NOTE: **Only required if removing wheel.**		
Stud incorrect	B	Require replacement of stud
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

WHEEL SPEED SENSORS

Condition	Code	Procedure
Air gap incorrect	B	Require adjustment or replacement
NOTE: **If a sensor is not adjustable, further inspection is required to identify and correct cause.**		
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 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
Loose	A	Require repair or replacement
Missing	C	Require replacement
Resistance out of specification	B	Require repair or replacement
Sensor housing cracked	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 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

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Condition	Code	Procedure
Wire lead corroded	A	Require repair or replacement
Wire lead misrouted	B	Require re-routing according to vehicle manufacturer's specifications
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or 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.**		
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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Terminal corroded, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Terminal corroded, not affecting performance	1	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Transmission connector leaking	See Transmission Assembly	Â
Voltage drop out of specification	A	Require repair or replacement

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YOKES AND SLIP YOKES

Condition	Code	Procedure
Bearing cap bore distorted	A	Require repair or replacement
Bent	A	Require replacement
Bolt holes elongated	A	Require repair or replacement
Bushing or seal surface worn, affecting performance	A	Require repair or replacement
Leaking through soft yoke plug	A	Require repair or replacement of soft yoke plug
Retainer strap bent	A	Require replacement of retainer strap
Slip yoke broken	A	Require replacement
Splines worn close to the end of their useful life	1	Suggest replacement
Splines worn, affecting performance	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
U-bolt damaged, affecting performance	A	Require replacement of U-bolts
Yoke damaged, affecting performance	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

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AUTOMOTIVE TERMINOLOGY & DEFINITIONS

ACTUATOR

a control device that delivers mechanical action in response to a vacuum or electrical signal; anything that the engine control computer uses to do something, such as trigger fuel injection or fire a spark plug. Most actuators on a computercontrolled engine system are activated by grounding their circuits rather than by actively powering them, since that protects the computer from short circuits.

ADDITIVE

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

AUTO SHIFT MANUAL TRANSMISSION AND SELECT SHIFT MANUAL TRANSMISSION

select shift manual (SSM) and auto shift manual (ASM) use a combination of auto-clutch and shift-by-wire electronic control system technology to provide the customer a fun-to-shift experience along with significant fuel economy improvements over a base manual transmission. The Select Shift Manual mode allows a customer to command gear changes according to his/her

personal preference like a conventional manual transmission. The Auto Shift Manual mode provides the customer automatic gear shifting much like an automatic transmission.

AUTOMATIC TRANSMISSION FLUID (ATF)

the oil that is used in an automatic transmission.

AUTOMATIC TRANSMISSION

a transmission that changes forward gears automatically.

AXLE HOUSING

an enclosure for the differential and drive axles.

AXLE

a rotating shaft that rotates another part, such as a wheel.

BALL BEARING

a friction-reducing bearing that uses a series of steel balls held between inner and outer bearing races such as in a roller clutch.

BAND

in an automatic transmission, a device used to prevent members of a planetary gearset from rotating.

BEARING RACE

the machined surface of a bearing assembly against which the needles, balls or rollers ride. The outer race is also called a cup.

BEARING

part that supports and reduces friction between a stationary and moving part or two moving parts.

BELL HOUSING

connects the engine to the transmission and encloses the clutch assembly. It also provides mounting points for part of the clutch release mechanism.

CARDAN UNIVERSAL JOINT

the most common type of universal joint used. Consists of a center cross, four bearing cups, each containing a set of needle roller bearings, grease seals and snap rings.

C-CLIP

part used to retain the axle shaft in a drive axle assembly

CLUTCH DISC

the part of a clutch that receives the driving motion from the flywheel and pressure plate assembly and transmits that motion to the transmission input shaft.

CLUTCH FACING

the friction material on a clutch disc.

CLUTCH FORK

also known as the release fork. The device which moves the throwout (release) bearing, activating the pressure plate.

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CLUTCH PACK

in an automatic transmission, an assembled series of clutch friction discs and clutch plates that are alternately layered.

CLUTCH PRESSURE PLATE

the part of a clutch assembly that is used to hold the driven disc against the flywheel. The pressure plate is composed of a cover and coil springs, driving disc and release levers, or a diaphragm spring.

CLUTCH RELEASE BEARING

a sealed ball or roller bearing unit that rides on a sleeve over the transmission input shaft, and acts on the pressure plate to disengage the clutch disc when the clutch release mechanism is applied. Also called a throwout bearing.

CLUTCH THROWOUT BEARING

see 'clutch release bearing'.

CLUTCH

in a manual transmission, a device that allows the driver to engage and disengage the engine from the drivetrain; in an automatic transmission, a device capable of both holding and turning members of a planetary gearset; a device used to engage and disengage and A/C compressor.

CONSTANT MESH

in a transmission, where all gears are constantly in contact and turning with one another.

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

a continuously variable transmission is an automatic that can select any desired drive ratio within its operating range. Unlike a traditional three-, four-, or fivespeed automatic transmission the CVT is an "infinite speed" transmission, the CVT continually selects an optimum overall drive ratio between engine and drive wheels for all operating conditions, whether accelerating or cruising. Unlike conventional automatics, there are no perceptible shifts. During maximum acceleration, the drive ratio Is adjusted to maintain peak engine horsepower. At a constant vehicle speed, the ratio is set to maintain an engine rpm which will support the required power. A CVT provides smooth, fast acceleration and high cruising efficiency with the convenience of an automatic transmission.

COUNTERGEAR

a set of different size gears incorporated in one casting, used in a manual transmission.

DIFFERENTIAL CARRIER

enclosure for the differential and ring and pinion gears. Can be removable or integral part of axle housing. Also called differential housing.

DIFFERENTIAL CASE

housing for the differential pinion gears and side gears. Mounting point for ring gear.

DIFFERENTIAL PINION GEARS

gears that are meshed with the differential side gears and rotate on the differential pinion shaft inside the differential case.

DIFFERENTIAL PINION SHAFT

a shaft mounted inside the differential case, provides support and pivot for the differential pinion gears.

DIFFERENTIAL SIDE GEARS

gears that are meshed with the pinion gears inside the differential case and splined to the axle shafts.

DIFFERENTIAL

gear assembly that transmits power from the driveshaft to the wheels; allows the outside wheel to turn faster than the inside when cornering.

DIRECT DRIVE

downward gear engagement in which the input shaft and output shaft are locked together; the gearing in a drivetrain in which one turn of the crankshaft equals one turn of the wheels.

DOUBLE CARDAN UNIVERSAL JOINT

two cardan universal joints connected by a yoke; also called a constant velocity (CV) joint.

DOUBLE OFFSET JOINT

a Rzeppa type plunger CV-joint used on the inboard side of the interconnecting shaft.

DOWEL

a peg or pin which fits into corresponding holes used for holding two parts together or to locate two parts in a set position.

DRIVE MEMBER

a gear that drives or provides power for other gears in a planetary gearset.

DRIVELINE ANGLE

see 'driveshaft angle'.

DRIVELINE

all of the parts connecting the engine to the drive axle.

DRIVESHAFT ANGLE.

the installation angle of the driveshaft off the true horizontal; also called driveline angle.

DRIVESHAFT

transfers power from the transmission to the differential on a rear-wheel drive vehicle. Consists of a hollow metal tube with universal joints at each end, each of which is attached to yokes at the transmission and differential.

DRIVETRAIN

all of the components that generate power and transfer it to the vehicle's wheels.

ELECTRONIC AUTOMATIC TRANSMISSION

an electronic automatic transmission utilizes an electronic control module to signal when to shift. The module also determines when to lock and unlock the torque converter. By controlling these functions electronically rather than mechanically, the transmission can be tuned for better driveability.

ENDPLAY

the amount of axial or end-to-end movement in a shaft due to clearance in the bearings; the regulated movement of a component, usually a shaft, during operation.

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EXCESSIVE WEAR

in mechanical terms, wear of a component that exceeds designed limits; wear caused by overloading a part that is in an out-of-balance condition, resulting in lower-than-normal life expectancy of the part being subjected to the adverse operating condition.

EXTENSION HOUSING

aluminum or cast iron enclosure for the transmission output shaft and bearings, speedometer drive and driven gears. Provides support for driveshaft slip yoke.

FLANGE

a projecting rim or collar on a component used for holding it in place, giving it strength or guiding it into place or attaching it; a part mounted on the pinion gear that provides the mounting point for the rear universal joint of the driveshaft.

FLYWHEEL

a cast iron or steel wheel mounted to the end of the crankshaft; helps to smooth the engine's power delivery, the teeth around its circumference provide an engagement for the starter, and it provides the mounting points for the pressure plate and friction surface for the clutch disc.

FOUR WHEEL DRIVE (4WD)

system that supplies power to both the front and rear wheels of the vehicle when activated.

FREE PLAY

the measurable travel in a mechanical device between the time force is applied and work is accomplished; looseness in a linkage between the start of application and the actual movement of the device, such as the movement in the steering wheel before the wheels start to turn.

FREE TRAVEL

distance a clutch pedal moves before it begins to take up slack in the clutch linkage; essentially the same as free play, usually applied to shaft movement.

FREEWHEEL

a mechanical device that engages the driving member to impart motion to a driven member in one direction but not the other; in automotive terms, a device that permits the driveshaft to continue turning when its speed exceeds that of the crankshaft, thus allowing free coasting with the gear train engaged.

FRONT WHEEL DRIVE

the entire drivetrain is located at the front of and drives the front wheels of the vehicle.

FULL FLOATING AXLE

system where the weight of the vehicle is supported by the axle housing and the axle bearing is located outside of the axle housing; most often used on trucks.

FULLY SYNCHRONIZED

in a manual transmission, where gears are changed using synchronizers.

GEAR PITCH

number of teeth per given unit of pitch diameter. Gear pitch is determined by dividing the number of teeth by the pitch diameter of the gear.

GEAR RATIO

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the number of revolutions a driving gear must turn to rotate the driven gear through one revolution. Numerical value determined by dividing the number of teeth on the driven gear by the number of teeth on the driving gear; the ratio between the number of teeth on meshing gears.

GEAR REDUCTION

when a smaller gear drives a larger gear, there is a speed reduction but an increase in torque.

GEAR

a toothed wheel, disc, etc. designed to mesh with another or with the thread of a worm; used to transfer or change motion.

GOVERNOR PRESSURE

the change in line pressure that takes place as a result of an increase in vehicle speed.

GOVERNOR

a device used on non-electronic automatic transmissions, which regulates the operation of the shift valves inside the valve body according to vehicle speed.

HELICAL GEAR

a gear in which the teeth are cut so as to form a spiral; gear with teeth that are cut at an angle or are spiral to the gear's axis of rotation.

HUNTING GEARSET

differential gearset where any one pinion gear tooth contacts all ring gear teeth.

HYPOID GEAR

bevel-cut gear in a system in which the driven gear is not in the same plane as the drive gear. A type of spiral, beveled ring and pinion gearset in a differential. Hypoid gears mesh below the ring gear centerline.

INPUT SHAFT

the shaft that is splined to the clutch disc and transfers power from the engine into the transmission; the shaft to which torque is applied, usually carrying the drive gear or gears.

INSERT SPRING.

exerts pressure on the inserts in a synchronizer assembly.

INSERT

a part of the synchronizer assembly that fits between the hub and sleeve, also called key or plate. The insert spring pushes the inserts into the sleeve, helping to center the sleeve on the hub.

LIMITED SLIP DIFFERENTIAL

a type of differential that uses clutches to supply a major portion of the drive torque to the wheel that has better traction when one wheel is slipping,

LINE PRESSURE

in an automatic transmission, the hydraulic pressure of the fluid after it leaves the pump and is regulated by the pressure regulator.

LIVE AXLE

an axle on which the wheels are firmly affixed, with the axle driving the wheels.

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MAINLINE PRESSURE

in an automatic transmission, pressure that is regulated in the hydraulic system.

MESH

to fit closely together or interlock, as the fit of gear teeth.

NEEDLE BEARING

an anti-friction device that consists of a number (usually a large number) of thin rollers riding within races.

NEUTRAL START SWITCH

a switch that prevents starter engagement if the transmission is in another gear besides Park or Neutral.

NONHUNTING GEARSET

differential gearset in which one drive pinion gear tooth contacts only three ring gear teeth after several rotations.

OIL COOLER

device used to remove heat from the engine or transmission oil. There are oil-to-air coolers and oil coolers that are incorporated into the vehicle's cooling system.

ORIGINAL EQUIPMENT MANUFACTURER (OEM)

the original manufacturer of a vehicle or engine.

OUTER BEARING RACE

outer part of a bailor roller bearing that provides a surface for the balls or rollers to rotate. Can be integral with the bearing or a separate part.

OUT-OF-ROUND

when a previously round hole or bore has different diameters when measured at different points due to wear or distortion.

OUTPUT SHAFT

the shaft that delivers the power that has come through the transmission or transaxle.

OVERDRIVE

a gear assembly that outputs more shaft revolutions than were input.

OVERRUNNING CLUTCH

a clutch that locks in one direction and overruns or freewheels in the other.

PINION GEAR

the smaller, drive gear of the ring and pinion gearset; one of the gears inside the differential that rotates on the differential pinion shaft; rotates around the sun gear in a planetary gearset.

PINION

the smaller of two meshing gears.

PLANETARY CARRIER

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houses the pinion gears in a planetary gearset.

PLANETARY GEARSET

a gear system consisting of three primary components: a sun gear, a planetary pinion carrier and a ring or internal gear.

POWERTRAIN CONTROL MODULE (PCM)

on vehicles with computer control systems, the main computer that determines engine operation based on sensor inputs and by using its actuator outputs. The PCM may also control transmission operation.

PRESSURE PLATE

the driving member of the clutch assembly. Coil springs or a diaphragm spring in the pressure plate exert pressure on the clutch disc, holding it against the flywheel.

REAR WHEEL DRIVE

system where the driveline drives the rear wheels of the vehicle. Most often the engine is located in the front of the vehicle and a transmission and drive shaft connect to a drive axle, however there are also systems where the entire drive line is located toward the rear of the vehicle.

RELEASE BEARING

see 'clutch release bearing'.

REVERSE IDLER GEAR

a gear used to reverse the direction of power in a transmission.

RING GEAR

the larger, driven gear of the ring and pinion gearset; the largest member in a planetary gearset, also known as the internal gear or annulus. The internal teeth of the gear mesh with and rotate on the planetary pinions.

ROTARY FLOW

torque converter oil flow associated with the coupling stage of operation.

SEAL

a part, usually made of rubber or plastic, installed around a moving part or shaft to prevent leaks.

SEMI-FLOATING AXLE

system where the axle bearing is located inside the axle housing and the weight of the vehicle is supported by the axle.

SHIFT FORK

a device in a manual transmission that moves the synchronizer assembly sleeve, in response to movement from the shift linkage.

SHIFT RAILS

the parts of transmission shift linkage that transfer motion from the driver-controlled gear shift lever to the shift forks.

SHIFTER

the lever operated by the driver to shift the transmission. The shifter is attached directly to internal linkage in the transmission or it is mounted on the outside of the transmission or on the frame or

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vehicle floor, and connected to the transmission or trans axle by external linkage rods or cables.

SLAVE CYLINDER

a device that is connected to the release bearing in a hydraulic clutch system. When the clutch pedal is depressed, hydraulic fluid flows from the master cylinder through the hydraulic fluid line to the slave cylinder. Pressure in the system causes the slave cylinder to act on the release bearing, disengaging the clutch

SLIP YOKE

a driveline component that is splined to the transmission output shaft and connected to the driveshaft front U-joint. Allows in and out movement on the transmission extension housing in response to rear suspension movement.

SLIP

condition caused when a driving part rotates faster than a driven part.

SPLINES

grooves cut into the outside or inside surface of a component to enable it to fit with another component having corresponding grooves. Commonly used to keep a component secured on a rotating shaft.

SPRAG CLUTCH

a type of overrunning clutch.

SUMP

the reservoir that holds the oil for the pump.

SYNCHRONIZER

a type of clutch assembly used in a manual transmission to shift gears. Consists of a hub splined to the main shaft, inserts (keys) and insert springs, outer sleeve and blocking rings. There are grooves machined into the sleeves to capture the shift forks, which transfer the motion from the gearshift linkage. The sleeve moves along the splined inner hub in response to the shift fork, forcing the blocking ring against the gear cone and then, when the gear is at the same speed, slides over the blocking ring and gear engagement teeth, locking the gear to the synchronizer hub and shaft.

THROWOUT BEARING

see 'clutch release bearing'.

THRUST BEARING

a bearing that separates rotating parts from each other and non-rotating parts, and absorb thrust loads; a bearing with side surfaces that controls the fore and aft movement of a shaft.

TORQUE CONVERTER CLUTCH

a device located inside the torque converter that mechanically links the engine and transmission together.

TORQUE CONVERTER

a fluid coupling device used to transfer engine torque from the crankshaft to the transmission.

TORQUE STEER

the tendency of many front -wheel-drive vehicles with half-shafts of unequal length, to turn somewhat from the desired direction when accelerating, especially in a curve, or when

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decelerating in a curve.

TRANSFER CASE

attached to or connected to the transmission in a four-wheel drive vehicle. Transfers power to both front and rear axles.

TRANSMISSION CONTROL MODULE (TCM)

the computer that controls the transmission.

TRANSMISSION

transfers the engine's power to the driveshaft and the rear wheels. Contains a series of gears that provide torque multiplication, so the vehicle can be moved from a standstill and also cruise at highway speeds at lower engine rpms.

TRANSVERSE

perpendicular or at a right angle to a front-to-back centerline.

TRIPOD JOINT

a type of CV-joint consisting of a spider, which is splined to the interconnecting shaft of the halfshaft, three rollers that turn on needle roller bearings located between the spider and rollers, a housing, or yoke, that is part of the stub shaft, and a boot. Used on the inboard side of the halfshaft.

UNIVERSAL JOINT (U-JOINT)

a joint that allows the drives haft to transmit torque at different angles as the suspension moves up and down.

VACUUM MODULATOR

a device used to vary line pressure according to engine load in an automatic transmission.

VALVE BODY

in an automatic transmission, the housing that contains most of the valves used for transmission operation.

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ELECTRICAL 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

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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:

201 Park Washington Court

Falls Church, Virginia 22046

Tel: (703) 532-2027 * Fax: (202) 318-0378

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.

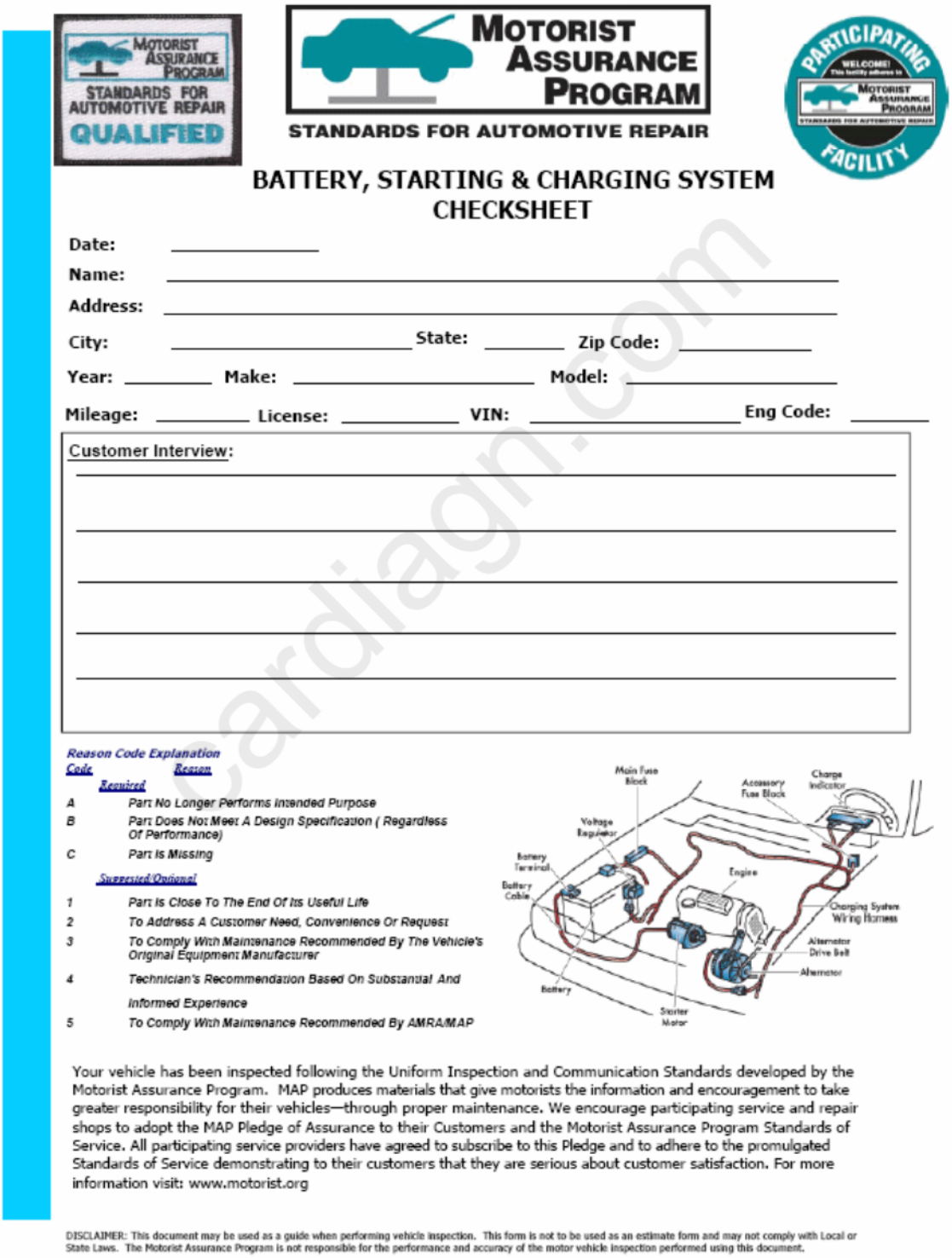
A customer, of course, has the choice of whether or not a shop will service his or her vehicle. He or she may decide not to follow some of your suggestions. When a repair is required, a MAP shop must refuse partial service on that system if, in the judgment of the service provider, proceeding with the 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
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

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement
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 *always* 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.**

BATTERY, STARTING & CHARGING SYSTEM CHECKSHEET



MOTORIST ASSURANCE PROGRAM
STANDARDS FOR AUTOMOTIVE REPAIR

BATTERY, STARTING & CHARGING SYSTEM 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 AMRA/MAP*

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.

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Fig. 1: Battery, Starting & Charging System Checksheet (1 Of 2)

BATTERY, STARTING & CHARGING SYSTEM CHECKSHEET

Battery

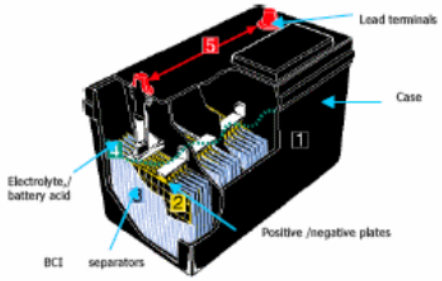
	OK	S	R	Condition
Battery				
Fluid Level				
Case				
Posts				
Voltage				
CCA				Minimum OE Spec _____ Actual _____
Battery Box				
Battery Hold Down				
Battery Bolts				
Heat Shield				

Alternator / Generator

	OK	S	R	Condition
Alternator				
Volts				Spec _____ Actual _____
Voltage Regulator				
Pulleys				
Belt				
Tensioner				
Brackets				

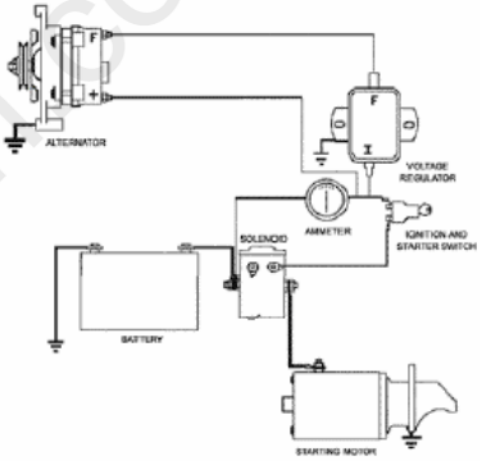
Starter Motor

	OK	S	R	Condition
Starter				
Cranking Amperage or Voltage				Spec _____ Actual _____
Starter Drive				
Solenoid				
Cables				



Wire, Cables, Fuse Block

	OK	S	R	Condition
Cables				
Positive				
Negative				
Ground Straps				
Cable Ends				
Wiring				
Fuse Blocks				
Fuses / Circuit Breakers				
Indicator Lights / Gauges				
Battery Cooling Fan				
Terminals / Connectors				



Generic Starting & Charging System

OK	Suggested 1, 2, 3, 4, 5	Required A, B, C

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Fig. 2: Battery, Starting & Charging System Checksheet (2 Of 2)

ELECTRICAL SYSTEMS

ACTUATOR MOTORS (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

Condition	Code	Procedure
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.**		
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
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
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

ACTUATOR MOTORS (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
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
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking (vacuum)	A	Require repair or replacement
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	2	Suggest repair or replacement of linkage
Linkage binding, affecting performance	A	Require repair or replacement of linkage
Linkage binding, not affecting performance	1	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

AIR BAGS

NOTE: **For all air bag components and conditions, refer to vehicle manufacturer's specifications for diagnosis and parts replacement.**

ALTERNATORS AND GENERATORS

NOTE: **If components have been added that increase vehicle electrical load requirement (for example, sound systems, air conditioning, alarm systems, etc.), charging system output must meet the increased demand.**

Condition	Code	Procedure
Alternator output meets OEM specification but is insufficient for add on electrical load	2	Suggest upgrade of alternator or removal of excess electrical load
Alternator's rated output is below OEM specification	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware non-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
Diode inoperative	A	Require repair or replacement

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Condition	Code	Procedure
NOTE: **Inoperative includes intermittent operation.**		
Housing broken, affecting performance	A	Require repair or replacement
Housing broken, not affecting performance	Â	No service suggested or required
Housing cracked, affecting performance	A	Require repair or replacement
Housing cracked, not affecting performance	1	Suggest repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Noisy	2	Suggest repair or replacement
Pulley 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
Terminal resistance (voltage drop) out of specification	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Voltage drop out of specification	A	Require repair or replacement

AMPLIFIERS

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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Malfunctioning	A	Require repair or replacement
NOTE: **Malfunctioning includes inoperative, intermittent operation, or failure to perform all functions.**		
Missing	C	Require replacement
Sound quality poor	A	Require repair or replacement

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Condition	Code	Procedure
NOTE: **Make sure poor sound quality is not caused by ignition/charging system or other forms of electrical interference.**		
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

ANTENNAS

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, affecting performance	2	Suggest repair or replacement
Binding	2	Suggest repair or replacement
Broken	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 or out of specification.**		
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement
Missing	C	Require replacement
Motor runs continuously	A	Require or replacement
Power antenna noisy	2	Suggest repair or replacement
Sticking	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.**		

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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

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 0Â° F (-17.8Â° 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 32Â° F (0Â° C) can deliver for 30 seconds and maintain at least a voltage of 1.2 volts per cell (7.2 volts for a 12volt battery).

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

Condition	Code	Procedure
Battery frozen	Â	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
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

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Condition	Code	Procedure
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.**		
NOTE: **If battery does not meet specifications, require replacement.**		
NOTE: **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
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.**		

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Condition	Code	Procedure
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
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

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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 CABLES

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
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

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Condition	Code	Procedure
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	Â	No service suggested or required
Broken, affecting performance	A	Require repair or replacement
Broken, not affecting performance	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
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
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
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

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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
Voltage drop out of specification	A	Require repair or replacement

BELTS

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

BULB SOCKETS

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
Bulb seized in socket	A	Require repair or replacement
Burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of socket.**		
Burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of socket.**		
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.**		

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Condition	Code	Procedure
Connector missing	C	Require replacement
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Leaking	B	Require repair or replacement
Melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
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

BULBS, SEALED BEAMS AND LEDS

NOTE: **Does not include soldered-in components.**

Condition	Code	Procedure
Adjustment out of specification	B	Require repair or replacement
Application incorrect	B	Require replacement
NOTE: **Application incorrect includes wrong bulb coating or color.**		
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
Base burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base corroded, affecting performance	A	Require repair or replacement
Base corroded, not affecting performance	2	Suggest repair or replacement
Base leaking	A	Require repair or replacement
Base loose, affecting performance	B	Require repair or replacement
Base loose, not affecting performance	1	Suggest repair or replacement
Base melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		

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Condition	Code	Procedure
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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
Burned out	A	Require replacement
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
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Cracked	B	Require replacement
Intermittent	A	Require replacement
Lamp base melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Seized in socket	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
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

CD PLAYERS

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

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Condition	Code	Procedure
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
Malfunctioning	A	Require repair or replacement
NOTE: **Malfunctioning includes inoperative, intermittent operation, or failure to perform all functions.**		
Missing	C	Require replacement
Skips	A	Require repair or replacement
Sound quality poor	A	Require repair or replacement
NOTE: **Make sure poor sound quality is not caused by ignition/charging system or other forms of electrical interference.**		
Speed incorrect	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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

CIGARETTE LIGHTER ASSEMBLIES

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.**		
Loose	B	Require repair or replacement
Missing	2	Suggest replacement
Sticking	A	Require repair or replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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

CIRCUIT BREAKERS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Blown	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
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
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement
Missing	C	Require replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
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, 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

CLUTCH 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

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Condition	Code	Procedure
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
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

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

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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
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest 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.**		
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, 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

CONTROL MODULES

Condition	Code	Procedure
Application incorrect	B	Require 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 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

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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	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
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

CRUISE CONTROL BRAKE 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

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Condition	Code	Procedure
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

CRUISE CONTROL 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	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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

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Condition	Code	Procedure
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
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

CRUISE CONTROL CLUTCH 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
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

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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
Won't return	A	Require repair or replacement
Worn	1	Suggest replacement

CRUISE CONTROL 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	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
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

CRUISE CONTROL RESERVOIRS

Condition	Code	Procedure

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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

CRUISE CONTROL 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

CRUISE CONTROL VACUUM DUMP RELEASE 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
Broken	A	Require repair or replacement
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	B	Suggest replacement
Out of adjustment	B	Further inspection required
NOTE: **Follow OEM recommended adjustment procedures. Require repair or replacement if out of specification.**		

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CRUISE CONTROL VACUUM HOSES, TUBES AND

Condition	Code	Procedure
Reservoirs	Â	Â
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

CRUISE CONTROL VEHICLE SPEED SENSORS

Condition	Code	Procedure
Air gap incorrect	B	Require adjustment to vehicle manufacturer's specifications

Condition	Code	Procedure
NOTE: **If a sensor is not adjustable, further inspection is required to identify and correct cause.**		
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
Housing cracked	B	Require replacement
Internal resistance does not meet specifications	B	Require replacement
NOTE: **Component failure may be caused by water intrusion into the wiring harness. Always check insulation for damage and wiring for excessive resistance.**		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
NOTE: **Some integral bearing assemblies with sensors may require replacement.**		
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
NOTE: **Component failure may be caused by water intrusion into the wiring harness. Always check insulation for damage and wiring for excessive resistance.**		
Surface contaminated	2	Suggest cleaning; identify and correct source
Tip bent	B	Require replacement
Tip broken	B	Require replacement
Tip missing	B	Require replacement
Wire lead burned	A	Require replacement
Wire lead conductors exposed	B	Require replacement
Wire lead corroded	A	Require replacement
Wire lead open	A	Require replacement
Wire lead shorted	A	Require replacement

DEFOGGERS

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

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Condition	Code	Procedure
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.**		
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

DEFROSTERS

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
NOTE: **Inoperative includes intermittent operation.**		
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

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

DELAYS

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
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
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
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

DIMMERS

Condition	Code	Procedure

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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
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
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
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
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

ELECTRIC HEATERS

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

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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 repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

EQUALIZERS

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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Malfunctioning	A	Require repair or replacement
NOTE: **Malfunctioning includes inoperative, intermittent operation, or failure to perform all functions.**		
Missing	C	Require replacement
Sound quality poor	A	Require repair or replacement
NOTE: **Make sure poor sound quality is not caused by ignition/charging system or other forms of electrical interference.**		
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

FUSE BLOCKS

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, affecting performance	A	Require replacement
Broken, not affecting performance	Â	No service suggested or required
Burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of fuse box.**		
Burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of fuse box.**		
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
Cracked, affecting performance	A	Require repair or replacement
Cracked, not affecting performance	1	Suggest repair or replacement
Melted, affecting performance	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Melted, not affecting performance	2	Suggest replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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

FUSE BOXES AND BLOCKS

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, affecting performance	A	Require replacement
Broken, not affecting performance	Â	No service suggested or required
Burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of fuse box.**		
Burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of fuse box.**		
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
Cracked, affecting performance	A	Require repair or replacement
Cracked, not affecting performance	1	Suggest repair or replacement
Melted, affecting performance	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Melted, not affecting performance	2	Suggest replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
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

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Condition	Code	Procedure
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

FUSES, FUSIBLE LINKS AND CIRCUIT BREAKERS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Blown	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
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
Inoperative	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement
Missing	C	Require replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
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

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FUSIBLE LINKS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Blown	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
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
Inoperative	A	Require replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement

Condition	Code	Procedure
Missing	C	Require replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
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

GAUGES

NOTE: **Includes odometers, speedometers, and tachometers (except cable-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
Leaking	B	Require replacement
Lens broken	A	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Lens cloudy	2	Suggest repair or replacement
NOTE: **If lens is available as a separate part, suggest replacement of lens only.**		
Lens missing	C	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Malfunctioning	A	Require repair or replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.**		
Mechanical head noisy	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.**		

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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
Terminal loose, not affecting performance	1	Suggest repair or replacement

GENERATORS

NOTE: **If components have been added that increase vehicle electrical load requirement (for example, sound systems, air conditioning, alarm systems, etc.), charging system output must meet the increased demand.**

Condition	Code	Procedure
Alternator output meets OEM specification but is insufficient for add on electrical load	2	Suggest upgrade of alternator or removal of excess electrical load
Alternator's rated output is below OEM specification	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware non-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
Diode inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Housing broken, affecting performance	A	Require repair or replacement
Housing broken, not affecting performance	Â	No service suggested or required
Housing cracked, affecting performance	A	Require repair or replacement
Housing cracked, not affecting performance	1	Suggest repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Noisy	2	Suggest repair or replacement
Pulley 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.**		

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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
Terminal resistance (voltage drop) out of specification	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Voltage drop out of specification	A	Require repair or replacement

GROUND CABLES AND STRAPS

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
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Insulation damaged, exposing conductors	2	Suggest replacement
Loose	A	Require repair
Missing	C	Require replacement
Open	A	Require repair or replacement
Resistance high	A	Require repair or replacement
Terminal resistance (voltage drop) is out of specification	B	Require repair or replacement
Voltage drop out of specification	B	Require repair or replacement

GROUND STRAPS

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
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Insulation damaged, exposing conductors	2	Suggest replacement
Loose	A	Require repair
Missing	C	Require replacement
Open	A	Require repair or replacement
Resistance high	A	Require repair or replacement
Terminal resistance (voltage drop) is out of specification	B	Require repair or replacement
Voltage drop out of specification	B	Require repair or replacement

HEADLIGHT ADJUSTERS

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

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Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Bent, preventing adjustment	A	Require repair or replacement
Broken	A	Require repair or replacement
Indicator broken	A	Require replacement
Indicator missing	C	Require replacement
Missing	C	Require replacement of adjusters
Seized	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

HEATING ELEMENTS (DEFROSTERS, DEFOGGERS, ELECTRIC HEATERS AND SEATS)

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
NOTE: **Inoperative includes intermittent operation.**		
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

HORNS AND SIRENS

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

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Condition	Code	Procedure
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
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Missing	C	Require replacement
Out of adjustment	B	Require adjustment
Sound quality poor	A	Require repair or replacement. Further inspection required
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	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

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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

INDICATOR LIGHTS

Condition	Code	Procedure
Does not come on during bulb check	Â	Further inspection required
NOTE: **See service manual for further information.**		
Fails to function properly during test mode	Â	Further inspection required
NOTE: **See service manual for further information.**		
On constantly	Â	Further inspection required
NOTE: **See service manual for further information.**		
On intermittently	Â	Further inspection required
NOTE: **See service manual for further information.**		

KEYLESS ENTRY KEYPADS AND TRANSMITTERS

Condition	Code	Procedure

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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
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
Malfunctioning	A	Require repair or replacement
NOTE: **Malfunctioning includes inoperative, intermittent operation, or failure to perform all functions.**		
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

KEYLESS ENTRY TRANSMITTERS

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
Malfunctioning	A	Require repair or replacement
NOTE: **Malfunctioning includes inoperative, intermittent operation, or failure to perform all functions.**		
Terminal broken	A	Require repair or replacement

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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
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

LEDS

NOTE: **Does not include soldered-in components.**

Condition	Code	Procedure
Adjustment out of specification	B	Require repair or replacement
Application incorrect	B	Require replacement
NOTE: **Application incorrect includes wrong bulb coating or color.**		
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
Base burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base corroded, affecting performance	A	Require repair or replacement
Base corroded, not affecting performance	2	Suggest repair or replacement
Base leaking	A	Require repair or replacement
Base loose, affecting performance	B	Require repair or replacement
Base loose, not affecting performance	1	Suggest repair or replacement
Base melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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

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Condition	Code	Procedure
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
Burned out	A	Require replacement
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
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Cracked	B	Require replacement
Intermittent	A	Require replacement
Lamp base melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Seized in socket	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
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

LENSES

Condition	Code	Procedure
Adjustment out of specification	B	Require repair
Application incorrect	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
Broken, affecting performance	A	Require replacement
Broken, not affecting performance	Â	No service suggested or required

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Condition	Code	Procedure
Cracked	B	Require replacement
Discolored	A	Require replacement
Leaking	B	Require repair or replacement
Melted, affecting performance	A	Require replacement
Melted, not affecting performance	2	Suggest replacement
Missing	C	Require replacement

MICROPHONES

Condition	Code	Procedure
Application incorrect	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
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.**		
Membrane torn	A	Require replacement
Missing	C	Require replacement
Polarity reversed	A	Require repair
Sound quality poor	A	Require repair or replacement. Further inspection required
NOTE: **Make sure poor sound quality is not caused by ignition/charging system or other forms of electrical interference.**		
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

MIRRORS (ELECTROCHROMATIC AND HEATED)

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

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Condition	Code	Procedure
Attaching hardware not functioning	A	Require repair or replacement of hardware
Broken	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
Cracked	B	Require replacement
Inoperative	A	Require 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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

MOTORS

Condition	Code	Procedure
Amperage draw out of specification	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
Bracket bent	A	Require repair or replacement
Bracket broken	A	Require repair or replacement
Bracket cracked	A	Require repair or replacement
Bracket holes elongated, affecting performance	A	Require repair or replacement
Bracket holes elongated, not affecting performance	Â	No service suggested or required
Bracket missing	C	Require replacement
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.**		
Drive mechanism damaged, affecting performance	A	Require repair or replacement

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Condition	Code	Procedure
NOTE: **Further inspection required to determine cause.**		
Drive mechanism damaged, not affecting performance	2	Suggest repair or replacement
NOTE: **Further inspection required to determine cause.**		
Fails to disengage	A	Require repair or replacement
Housing broken, affecting performance	A	Suggest repair or replacement
Housing broken, not affecting performance	Â	No service suggested or required
Housing cracked, affecting performance	A	Require repair or replacement
Housing cracked, not affecting performance	1	Suggest repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	Â	No service suggested or required
Linkage binding, affecting performance	A	Require repair or replacement of linkage
Linkage binding, not affecting performance	1	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	Further inspection required
NOTE: **Follow OEM recommended adjustment procedures. Repair or replace if out of specification.**		
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
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement

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Condition	Code	Procedure
Wire lead shorted	A	Require repair or replacement

NEUTRAL SAFETY 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
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

ODOMETERS, SPEEDOMETERS AND TACHOMETERS (CABLE DRIVEN)

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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
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
Drive cable broken	A	Require replacement
Drive cable noisy	2	Suggest repair or replacement
Inoperative	A	Further inspection required
NOTE: **Inoperative includes intermittent operation, out of OEM specification, or out of range.**		
Leaking	B	Require replacement
Lens broken	A	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Lens cloudy	2	Suggest repair or replacement
NOTE: **If lens is available as a separate part, suggest replacement of lens only.**		
Lens missing	C	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Noisy	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

ODOMETERS

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

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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
Leaking	B	Require replacement
Lens broken	A	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Lens cloudy	2	Suggest repair or replacement
NOTE: **If lens is available as a separate part, suggest replacement of lens only.**		
Lens missing	C	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Malfunctioning	A	Require repair or replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.**		
Mechanical head noisy	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

POWER DISTRIBUTION CENTER

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, affecting performance	A	Require replacement
Broken, not affecting performance	Â	No service suggested or required
Burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of fuse box.**		
Burned, not affecting performance	2	Suggest repair or replacement

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Condition	Code	Procedure
NOTE: **Determine cause and correct prior to repair or replacement of fuse box.**		
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
Cracked, affecting performance	A	Require repair or replacement
Cracked, not affecting performance	1	Suggest repair or replacement
Melted, affecting performance	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Melted, not affecting performance	2	Suggest replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
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

PULLEYS

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
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, affecting performance	A	Require replacement
Cracked	B	Require replacement
Loose	B	Require repair or replacement
Missing	C	Require replacement
Pulley damaged, affecting belt life	A	Require replacement

RECEIVERS, AMPLIFIERS, EQUALIZERS AND SUB-WOOFER VOLUME CONTROLS

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

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Condition	Code	Procedure
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
Malfunctioning	A	Require repair or replacement
NOTE: **Malfunctioning includes inoperative, intermittent operation, or failure to perform all functions.**		
Missing	C	Require replacement
Sound quality poor	A	Require repair or replacement
NOTE: **Make sure poor sound quality is not caused by ignition/charging system or other forms of electrical interference.**		
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

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RELAY BOXES

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, affecting performance	A	Require replacement
Broken, not affecting performance	Â	No service suggested or required
Burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of relay box.**		
Burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of relay box.**		
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
Cover missing	C	Require replacement of cover
Cracked, affecting performance	A	Require repair or replacement
Cracked, not affecting performance	1	Suggest repair or replacement
Melted, affecting performance	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Melted, not affecting performance	2	Suggest replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
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

RELAYS

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
Housing broken	A	Require replacement
Housing cracked	2	Suggest replacement
Inoperative	A	Require 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

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Condition	Code	Procedure
Terminal loose, not affecting performance	1	Suggest repair or replacement

SEALED BEAMS

NOTE: **Does not include soldered-in components.**

Condition	Code	Procedure
Adjustment out of specification	B	Require repair or replacement
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
Base burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base corroded, affecting performance	A	Require repair or replacement
Base corroded, not affecting performance	2	Suggest repair or replacement
Base leaking	A	Require repair or replacement
Base loose, affecting performance	B	Require repair or replacement
Base loose, not affecting performance	1	Suggest repair or replacement
Base melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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
Burned out	A	Require replacement
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
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement

Condition	Code	Procedure
Cracked	B	Require replacement
Intermittent	A	Require replacement
Lamp base melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Seized in socket	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
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

SEAT HEATERS

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
NOTE: **Inoperative includes intermittent operation.**		
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

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Condition	Code	Procedure
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

SECURITY ALARM 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 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.**		
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

SIRENS

Condition	Code	Procedure
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
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Missing	C	Require replacement
Out of adjustment	B	Require adjustment
Sound quality poor	A	Require repair or replacement. Further inspection required
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

SOLENOIDS

NOTE: **For starter solenoids that are integral to the starter assembly, see Starters. For starter relays, see Relays.**

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
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

Condition	Code	Procedure
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

SPEAKERS AND MICROPHONES

Condition	Code	Procedure
Application incorrect	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
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.**		
Membrane torn	A	Require replacement
Missing	C	Require replacement
Polarity reversed	A	Require repair
Sound quality poor	A	Require repair or replacement. Further inspection required
NOTE: **Make sure poor sound quality is not caused by ignition/charging system or other forms of electrical interference.**		
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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

SPEEDOMETER AND TACHOMETER 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	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
Routed incorrectly	B	Suggest repair
Seized	A	Require repair or replacement

SPEEDOMETER 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

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Condition	Code	Procedure
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
Routed incorrectly	B	Suggest repair
Seized	A	Require repair or replacement

SPEEDOMETERS

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
Leaking	B	Require replacement
Lens broken	A	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Lens cloudy	2	Suggest repair or replacement
NOTE: **If lens is available as a separate part, suggest replacement of lens only.**		
Lens missing	C	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		

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Condition	Code	Procedure
Malfunctioning	A	Require repair or replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.**		
Mechanical head noisy	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

STARTERS

NOTE: **To prevent misdiagnosis, care should be taken to eliminate the possibilities of mechanical problems or high resistance in power and/or ground circuits.**

Condition	Code	Procedure
Amperage draw does not meet OEM specifications	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
NOTE: **Inspect block or bell housing mounting surface.**		
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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 holes elongated, affecting performance	A	Require repair or replacement
Bracket holes elongated, not affecting performance	Â	No service suggested or required
Bracket loose, affecting performance	A	Require repair or replacement
Bracket loose, not affecting performance	1	Suggest repair or replacement
Bracket missing	C	Require replacement
Drive gear damaged, affecting performance	A	Require repair or replacement
NOTE: **Further inspection required to determine cause. Require inspection of ring gear.**		
Drive gear damaged, not affecting performance	2	Suggest repair or replacement

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Condition	Code	Procedure
NOTE: **Further inspection required to determine cause. Require inspection of ring gear and service as needed.**		
Fails to disengage	A	Require repair or replacement
Housing broken, affecting performance	A	Require repair or replacement
Housing broken, not affecting performance	Â	No service suggested or required
Housing cracked, affecting performance	A	Require repair or replacement
Housing cracked, not affecting performance	1	Suggest repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Noisy	2	Suggest repair or replacement
Shimmed incorrectly	B	Require repair
Starter shaft bushing missing	C	Require replacement
NOTE: **Bushing may be in bell housing.**		
Starter shaft bushing worn, affecting performance	A	Require replacement
Starter shaft bushing worn, not affecting performance	1	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

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SUB-WOOFER VOLUME CONTROL

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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Malfunctioning	A	Require repair or replacement
NOTE: **Malfunctioning includes inoperative, intermittent operation, or failure to perform all functions.**		
Missing	C	Require replacement

Condition	Code	Procedure
Sound quality poor	A	Require repair or replacement
NOTE: **Make sure poor sound quality is not caused by ignition/charging system or other forms of electrical interference.**		
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Melted, not affecting performance	2	Suggest repair or replacement

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Condition	Code	Procedure
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

TACHOMETER 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	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
Routed incorrectly	B	Suggest repair
Seized	A	Require repair or replacement

TACHOMETERS

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
Leaking	B	Require replacement
Lens broken	A	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Lens cloudy	2	Suggest repair or replacement
NOTE: **If lens is available as a separate part, suggest replacement of lens only.**		
Lens missing	C	Require repair or replacement
NOTE: **If lens is available as a separate part, require replacement of lens only.**		
Malfunctioning	A	Require repair or replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.**		
Mechanical head noisy	2	Suggest repair or replacement
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

TAPE PLAYERS AND CD PLAYERS

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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement

Condition	Code	Procedure
Malfunctioning	A	Require repair or replacement
NOTE: **Malfunctioning includes inoperative, intermittent operation, or failure to perform all functions.**		
Missing	C	Require replacement
Skips	A	Require repair or replacement
Sound quality poor	A	Require repair or replacement
NOTE: **Make sure poor sound quality is not caused by ignition/charging system or other forms of electrical interference.**		
Speed incorrect	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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

TENSIONERS

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

TIMERS

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

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Condition	Code	Procedure
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
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
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
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

TRANSCEIVERS

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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Malfunctioning	A	Require repair or replacement

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Condition	Code	Procedure
NOTE: **Malfunctioning includes inoperative, intermittent operation, or failure to perform all functions.**		
Missing	C	Require replacement
Sound quality poor	A	Require repair or replacement
NOTE: **Make sure poor sound quality is not caused by ignition/charging system or other forms of electrical interference.**		
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

TRANSDUCERS

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
Drive mechanism damaged, affecting performance	A	Require repair or replacement
NOTE: **Further inspection required to determine cause.**		
Drive mechanism damaged, not affecting performance	2	Suggest repair or replacement
NOTE: **Further inspection required to determine cause.**		
Inoperative	A	Require repair or replacement

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Condition	Code	Procedure
NOTE: **Inoperative includes intermittent operation or out of specification.**		
Leaking (vacuum/fluid/air)	A	Require replacement
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	Â	No service suggested or required
Linkage binding, affecting performance	A	Require repair or replacement of linkage
Linkage binding, not affecting performance	1	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
Out of adjustment	B	Further inspection required
NOTE: **Follow OEM recommended adjustment procedures. Repair or replace if out of specification.**		
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

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VACUUM ACCUMULATORS (RESERVOIRS)

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

VOLTAGE REGULATORS

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

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
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
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

WASHER FLUID 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.**		
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

WASHER PUMPS

Condition	Code	Procedure

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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
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 externally	A	Require repair or replacement
Leaking internally	A	Require repair or replacement
Noisy	2	Suggest repair or 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

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WIPER ARMS AND BLADES

NOTE: **Windshield coatings or waxes can cause blades to not function as intended. Clean surface before making final judgment about blade 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
Attaching socket stripped	A	Require replacement
Bent	A	Require repair or replacement
Loose	2	Suggest repair or replacement
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement

Condition	Code	Procedure
Size incorrect	2	Suggest replacement
Tension insufficient	B	Require repair or replacement
Torn	A	Require replacement
Worn, affecting performance	A	Require replacement
Worn, not affecting performance	1	Suggest replacement

WIPER BLADES

NOTE: **Windshield coatings or waxes can cause blades to not function as intended. Clean surface before making final judgment about blade 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
Attaching socket stripped	A	Require replacement
Bent	A	Require repair or replacement
Loose	2	Suggest repair or replacement
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
Size incorrect	2	Suggest replacement
Tension insufficient	B	Require repair or replacement
Torn	A	Require replacement
Worn, affecting performance	A	Require replacement
Worn, not affecting performance	1	Suggest replacement

WIPER HOSES AND NOZZLES

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
Blocked	A	Require repair or replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Oil-soaked (spongy)	1	Suggest replacement
Spray pattern incorrect	2	Suggest repair or replacement
Surface cracks (dry-rotted)	1	Suggest replacement

WIPER LINKAGES

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
Attaching stud stripped	A	Require replacement
Bent	A	Require repair or replacement
Inoperative	A	Require replacement

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Condition	Code	Procedure
NOTE: **Inoperative includes intermittent operation.**		
Loose	2	Suggest repair or replacement
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
Tension insufficient	B	Require repair or replacement
Worn, affecting performance	A	Require replacement
Worn, not affecting performance	1	Suggest replacement

WIPER NOZZLES

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
Blocked	A	Require repair or replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Oil-soaked (spongy)	1	Suggest replacement
Spray pattern incorrect	2	Suggest repair or replacement
Surface cracks (dry-rotted)	1	Suggest replacement

WIPER PUMP RESERVOIRS

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
Cap missing	C	Require replacement
Leaking	A	Require repair or replacement
Missing	C	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

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Condition	Code	Procedure
Insulation damaged, conductors not exposed	1	Suggest 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.**		
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
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

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

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AUTOMOTIVE TERMINOLOGY & DEFINITIONS

ACTUATOR

a control device that delivers mechanical action in response to a vacuum or electrical signal; anything that the engine control computer uses to do something, such as trigger fuel injection or fire a spark plug. Most actuators on a computercontrolled engine system are activated by grounding their circuits rather than by actively powering them, since that protects the computer from short circuits.

AEMD (AUTOMOTIVE ELECTRIC DRIVE MOTOR)

a U.S. Department of Energy program to develop low-cost traction drive motors for automotive applications.

AIR BAGS

air bags are fabric bags that are filled quickly with a gas to provide supplemental protection for vehicle passengers during some collisions. Side-impact air bags are becoming increasingly

available. Air bags are most effective in protecting vehicle occupants who are properly belted.

ALTERNATING CURRENT (A C)

electrical current that flows in one direction, from positive to negative, and then reverses direction, from negative to positive.

ALTERNATOR

a belt driven device that provides electrical current for the vehicle's charging system.

AMMETER

an instrument for measuring the strength of electrical current flow in a circuit in terms of amperes.

AMPERAGE

the amount of electrical current flowing in a circuit.

AMPERE (AMP)

a unit for measuring the strength (rate of flow) of an electrical current.

AMPLIFIER

a device with electron tubes or semiconductors used to increase the voltage or current of a signal.

AMPLIFY

to enlarge or strengthen original characteristics. Usually used in reference to electronics.

ANION

negative ion. Alkali, molten carbonate, and solid oxide fuel cells are "anion-mobile" cells - anions migrate through the electrolyte toward the anode.

ANODE

one of two electrodes in a fuel cell or battery. The anode, the negative post of the fuel cell, conducts the electrons that are freed from the hydrogen molecules so that they can be used in an external circuit. It has channels etched into it that disperse the hydrogen gas equally over the surface of the catalyst.

ARCING

the ability of electrical energy to jump across an air gap.

ARMATURE

a laminated, soft iron core wrapped by wire that converts 11ectrical energy to mechanical energy.

BATTERY ACID

the sulfuric acid solution used as the electrolyte in a battery.

BATTERY CELL

the part of a battery made from two dissimilar metals and an acid solution. A cell stores chemical energy to be used later as electrical energy.

BATTERY SAVER

the battery saver system is an effective way to prevent complete battery discharge when the engine is shut down. Based on the preset time-limit, the system automatically disconnects the battery load when the battery is not being charged. Depressing the reset push button will enable the battery to

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be reconnected for additional periods of time. Critical systems can be set up to have battery power maintained.

BATTERY

a device that produces electricity through, electrochemical action.

BENDIX DRIVE

the starter drive gear that is attached to the starter motor armature and engages the gear teeth on the flywheel.

BRUSH

a bar of conductive material that rides on the commutator of a generator or motor.

CAPACITOR

a device, made up of two or more conducting plates, separated by an insulator, used to store an electric surge or charge of current.

CATHODE

one of two electrodes in a fuel cell or battery. The cathode, the positive post of the fuel cell, has channels etched into it that distribute the oxygen to the surface of the catalyst. It also conducts the electrons back from the external circuit to the catalyst, where they can recombine with the hydrogen ions and oxygen to form water.

CATION

positive ion. Phosphoric acid and proton exchange membrane (PEM) fuel cells are "cation-mobile" cells - the cation migrates through the electrolyte toward the cathode.

CHARGING SYSTEM

the system that supplies electrical power for vehicle operation and recharges the battery.

CIRCUIT BREAKER

a device used in an electrical circuit to interrupt current flow in the event of an overload or short.

CIRCUIT

a path through which electricity flows before returning to its source.

COLD CRANKING AMPS

the amount of cranking amperes that a battery can deliver in 30 seconds at OÂ°F (- 18Â°C).

COMMUTATOR

a slotted ring located at the end of the armature of a generator or motor. The commutator provides the electrical connection between the armature and brushes.

CONDUCTIVITY

transmission of electricity by metallic substances. Metals have high electrical conductivity, and with few exceptions, their conductivity decreases with increasing temperature.

CONDUCTOR

a material that provides a path for the flow of electrical current or heat.

CONTINUITY

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the condition that exists in a working electrical circuit. A circuit that is unbroken, not open.

CORRODE

gradual loss from a metal surface from chemical action.

CORROSION

deteriorative loss of a metal as a result of environmental reactions.

CORROSIVITY

the characteristic of a material that enables it to dissolve metals and other materials or burn the skin.

DELAYED ACCESSORY POWER

delayed accessory power continues electric power temporarily to certain convenience features after vehicle power has been turned off. For example, the feature allows the customer to close a window without reinserting the key. Delayed accessories include radio and power windows, power moon roof and message center.

DIGITAL SIGNAL PROCESSING AUDIO SYSTEM

a Digital Signal Processing (DSP) system modifies audio signals digitally to achieve better control of sound quality. DSP can be used for standard functions such as volume, balance, fade and tone control, as well as AM and FM stereo decoding. It also allows advanced audio processing such as concert hall emulation, sound shaping and adaptive noise reduction filtering.

DIGITAL VOLT/OHMMETER (DVOM)

an instrument that measures volts, ohms and amps and displays the results numerically.

DIGITAL

a voltage signal that uses on and off pulses.

DISCHARGE

the flow of current from a battery; to remove the refrigerant from an air conditioning system.

DIVERSITY ANTENNA

a diversity antenna system uses two antennas mounted at different locations on the vehicle and automatically chooses one that provides the better FM radio signal.

DUTY CYCLE

a signal that varies the ratio of on time to off time, resulting in a square wave that can range between zero and 100 percent or may be high or low, and off may be high or low; in a process, the ratio of on time to total cycle time; in fuel injectors, the percentage of on-time to total cycle time; in solenoids, the percentage of on-time to total cycle time.

ELECTRICITY

electric current used as a power source. Electricity can be generated from a variety of feedstocks, including oil, coal, nuclear, hydro, natural gas, wind, and solar. In electric vehicles, onboard rechargeable batteries power electric motors.

ELECTROCHEMISTRY

science that deals with the relation of electricity to chemical changes and with the interconversion of chemical and electrical energy.

ELECTRODE

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electrical terminal that conducts an electric current into or out of a fuel cell.

ELECTRODE

a terminal that conducts an electric current into or away from the conducting part of a circuit, such as the terminal of a battery; firing terminals found in a spark plug.

ELECTROLYSIS

chemical and electrical decomposition process that can damage metals such as brass, copper and aluminum in the cooling system; the decomposition of an electrolyte by the action of an electric current passing through it.

ELECTROLYTE

chemical compound that conducts electricity from one electrode to the other inside a fuel cell.

ELECTROLYTE

a material whose atoms become ionized (electrically charged) in solution. In automobiles, the battery electrolyte is a mixture of sulfuric acid and water.

ELECTROMAGNET

an iron core surrounded by a coil of wire that temporarily becomes a magnet when an electric current flows through the wire.

ELECTROMAGNETIC INDUCTION

moving a wire through a magnetic field to create current flow in the wire.

ELECTROMECHANICAL

refers to a device that incorporates both electrical and mechanical principles together in its operation.

ELECTRONIC

pertaining to the control of systems or devices by the use of small electrical signals and various semiconductor devices and circuits.

EMITTER

in a transistor, the region or layer of semiconductor material from which electrons are injected into the base region.

ENERGY

the capacity for doing work and overcoming resistance.

FIELD COIL

a wire coil on an alternator rotor or starter motor frame; a field coil produces a magnetic field when energized.

FLUX DENSITY

the degree of concentration of the magnetic lines of force that emanate from a magnetic sensor; when the tooth of a reluctor aligns with the sensor tip, the magnetic lines of force are squeezed together, which increases flux density.

FLYWHEEL

a mechanical battery that stores kinetic energy. A flywheel is essentially a spinning wheel with a motor. Flywheels can be more responsive than chemical batteries, and they are less susceptible to

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the effects of weather.

FREQUENCY

the number of cycles of a periodic waveform typically measured in one second intervals or hertz (cycles per second).

FUSE

a metal circuit protection device that melts when there is a circuit overload or short.

FUSIBLE LINK

a smaller gauge wire that is included in an electrical circuit to provide circuit protection. The smaller gauge wire will melt when the circuit is overloaded.

GENERATOR

a device that converts mechanical energy into electrical energy; SAE J1930 nomenclature for an alternator; a generating device that uses diode rectifiers to convert ac to dc.

GROUND CIRCUIT

that part of the circuit that is connected electrically to the negative terminal of the battery. Every electric circuit has a power and ground side. Most computer actuations consist of completing the ground side of an actuator's circuit; this protects the computer from short circuits. Resistance in a ground circuit will reduce the current through it and cause deterioration in the function of the circuit.

GROUND

a connecting body whose electrical potential is zero to which an electrical circuit can be connected.

HALL EFFECT

when current flows through a thin wafer of semiconductor material, and a magnetic field crosses it at a right angle, a voltage known as a Hall effect voltage will be generated at the edge of the material. Interrupting the magnetic field turns off the voltage. This is the principle used by Hall effect sensors.

HEAT SINK

part of a system designed to be at a lower temperature than its surroundings, used to dissipate heat from that system; device to dissipate heat and protect parts.

HIGH INTENSITY DISCHARGE HEADLAMPS

high intensity discharge (HID) headlamps provide a brighter, whiter light for increased forward visibility. They produce about 2 times as much light as conventional halogen bulbs and have a distinct appearance. Also, they are more durable than filament bulbs and require 37 percent less power to operate.

HIGH TENSION

that part of a system that operates under or carries high voltage; in an ignition system, voltages in the secondary circuit of the system as opposed to the low, primary circuit voltage.

HYDROMETER

an instrument used to measure the specific gravity of a solution.

IMPEDANCE

the total resistance of an electrical device measured in ohms.

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INDUCTION

the process by which an electric or magnetic effect is produced in an electrical conductor or magnetic body, when it is exposed to variation of a field of force. Induction is the principle used in an ignition coil to increase voltage.

INSULATED CIRCUIT.

a circuit that includes all of the high-current cables and connections from the battery to the starter motor.

INSULATOR

a non-conductive material used to insulate wires in an electrical circuit.

INTEGRATED CIRCUIT

an electrical circuit containing many interconnected amplifying devices and circuit elements formed on a single body or chip of semiconductor material; diodes, transistors and other electronic components mounted on semiconductor material and able to perform numerous functions.

ION CHROMATOGRAPHY

a form of liquid chromatography that uses ion-exchange resins to separate atomic or molecular ions based on their interaction with the resin.

ION

atom that carries a positive or negative charge because of the loss or gain of an electron.

KEEP-ALIVE MEMORY

a series of vehicle battery-powered memory locations in the microcomputer that store information on input failure, identified in normal operations for use in diagnostic routines; adapts some calibration parameters to compensate for changes in the vehicle system.

LIGHT EMITTING DIODE (LED)

a digital electronic display device which can be used as a simple signal light or arranged to show letters and/or numbers.

LIQUID CRYSTAL DIODE (LCD)

a digital electronic display device made of a special glass and liquid, which requires a separate light source.

MAGNET

any substance that attracts iron or an iron, steel or any ferrous metal alloy.

MAGNETIC FIELD

the areas surrounding the poles of a magnet which are affected by its forces of attraction or repulsion; the region of space in which there is a measurable magnetic force.

MAGNETIC GAUGES

electrical analog gauges that use magnetic forces to move the needle left or right.

MAGNETIC PULSE GENERATOR

a sensor used to monitor the position of any point on a rotating part such as a crankshaft or input shaft.

MEMORY PROFILE SYSTEM

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the Memory Profile System offers different drivers the ability to set into memory their preferred positions for several comfort and convenience features. A driver is identified by a unique key fob or entry code, and the vehicle systems automatically adjust to his or her settings. Depending on the vehicle, some of the following features can be included in the memory profile: Seat position Steering wheel position (tilt/telescope) Mirror positions Safety belt "D" ring height Pedal positions Radio stations Power steering assist level Ride firmness

MEMORY

part of a computer that stores or holds programs and other data.

MERCURY SWITCH

a type of switch that uses the flow of liquid metal, Mercury, to complete the electrical circuit. Mercury switches are frequently used to control trunk and underhood lights.

MICROPROCESSOR

the portion of a microcomputer that receives sensor input and handles calculations.

MODULE

an electronic control unit.

MOTOR

a machine that converts electrical energy into mechanical energy.

MOTOR

in an HEV, an electric traction motor converts electrical energy from the energy storage unit to mechanical energy that drives the wheels of the vehicle. Unlike a traditional vehicle, where the engine must "ramp up" before full torque can be provided, an electric motor provides full torque at low speeds. This characteristic gives the vehicle excellent "off the line" acceleration.

OHM

a unit of electrical resistance of a circuit in which an electromotive force of one volt maintains a current of one ampere, named after German physicist Georg Ohm.

OHMMETER

an instrument that measures electrical resistance in ohms.

OHM'S LAW

a basic law of electricity expressing the relationship between current, resistance and voltage in any electrical circuit. Ohm's law states that the voltage in a circuit is equal to the current multiplied by the resistance.

PARALLEL CIRCUIT

a circuit with more than one path for the current to follow.

PARALLEL CONFIGURATION

a hybrid electric vehicle (HEV) with a parallel configuration has a direct mechanical connection between the power unit and the wheels, as in a conventional vehicle, but also has an electric motor that drives the wheels. For example, a parallel vehicle could use the power created from an internal combustion engine for highway driving and the power from the electric motor for accelerating.

PERIOD

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in an electrical signal the period is the amount of time it takes for one cycle of an electrical signal to repeat itself; the number of periods that occur in one second is the frequency of the signal.

PHASE

any point or points of parallel movements or oscillations, in or out of synchronization; the rotational positions of the U-joints and yokes in a driveline.

PHOTOVOLTAIC PANEL

photovoltaic panels contain cells that convert sunlight into electricity. While solar-powered vehicles are not currently feasible for production, solar panels could be used to power vehicle components, such as a fan to exhaust hot interior air when the vehicle is parked in the sun or to recharge the vehicle battery. Photovoltaic panels can be integrated into the hood, roof, sunroof, deck lid or spoiler.

PICKUP COIL

a weak, permanent magnet-and-wire assembly which forms a position sensor.

PIEZOELECTRIC SENSOR

a sensor that generates voltage from physical shock or motion, a knock sensor.

POLARITY

the condition of being positive or negative relative to a reference point or object; the particular state (positive or negative) with reference to the two magnetic poles.

POTENTIOMETER

a device that changes voltage by varying its internal resistance.

PROGRAM

a set of instructions or procedures that a computer must follow when controlling a system.

PULSE WIDTH MODULATED

eIectronic control of a solenoid that rapidly cycles it on and off many times per second in order to achieve a specific output.

PULSE WIDTH

the length of time during which a circuit is energized.

RANDOM ACCESS MEMORY (RAM)

a type of memory used in a computer to store information temporarily.

READ-ONLY MEMORY (ROM)

a type of memory used in a computer to store information permanently, as opposed to the temporary storage provided by random-access memory (RAM).

RECTIFIER

a device that changes alternating current (AC) into direct current (DC).

RECTIFY

to change one type of voltage to another.

REFERENCE PULSE

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a voltage signal generated by the crankshaft position sensor (or distributor, or camshaft position sensor - all equivalent components for this purpose). The voltage signal is sent to the computer as a fixed number of degrees BTDC for each cylinder, with the signal for cylinder No.1 distinguishable from the signal for the others.

REFERENCE VOLTAGE

the voltage supplied by the system computer to certain sensors. The sensors reduce the voltage by a specific amount, according to their function, and send the signal back to the computer. The computer then uses the reduced voltage signal to interpret the information sent.

RELAY

an electromagnetic switch that uses low amperage current to control a circuit with high amperage.

RELUCTOR

in an electronic ignition, the trigger wheel mounted on the distributor shaft that triggers the pickup coil, which in turn signals the control module to fire the coil.

REMOTE LIGHTING SYSTEM

the Remote Lighting System removes the sources of light from the lamp fixture. Instead, light for all fixtures is generated from a single "light battery". Light is transmitted to the various fixtures and accessories via fiber optics or light pipes. The advantages of remote lighting include reduced power consumption, greater durability and more flexibility in packaging and styling lamp fixtures.

RESISTANCE

the opposition offered by a substance or body to the passage of electric current through it.

RESISTOR

an electrical device installed in a circuit to lower voltage and current flow.

RHEOSTAT

a variable resistor used to control current flow in a circuit.

SATURATION

point at which current flowing through a coil or wire has built up the maximum magnetic field.

SEMICONDUCTOR

a material that is neither a good conductor of electricity nor a good insulator.

SENSOR

any mechanism by which the engine control computer can measure some variable on the engine, such as coolant temperature or engine speed. Each sensor works by sending the computer a signal of some sort, a coded electronic message that corresponds to some point on the range of the variable measured by that sensor.

SERIES CIRCUIT

a circuit that has only one path for current to follow.

SERIES CONFIGURATION

some hybrid electric vehicles (HEVs) use a series configuration, in which the heat engine or fuel cell together with a generator produce electricity for the battery pack and electric motor. Series HEVs have no mechanical connection between the hybrid power unit and the wheels; this means that all motive power is transferred from chemical energy to mechanical energy, to electrical energy, and back to mechanical energy to drive the wheels.

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SERIES-PARALLEL CIRCUIT

a circuit that combines series and parallel circuits.

SHORT CIRCUIT

a condition that occurs in an electrical circuit when the current bypasses the intended load and takes a path with little or no resistance, such as another circuit or ground.

SHUNT

an alternate path through which electrical current or fluids may flow.

SOLENOID

a coil of wire that becomes an electromagnet when current flows through it. It then loses its magnetism when the current flow is turned off. The solenoid contains an iron plunger inside the wire coil that is spring loaded to one position. When the solenoid is energized, the plunger moves to the other position.

SOLID STATE

an electrical device with no moving parts.

SPECIFIC GRAVITY

the ratio of the weight or mass of the given volume of a substance to that of an equal volume of another substance, e.g. - water for liquids and solids; air or hydrogen for gases, are used as standards.

SPLICE

to join or unite by weaving, binding, soldering, cementing, etc., usually at the ends of two objects.

SQUARE WAVE/SINE WAVE

voltage fluctuations of different shapes in an electric circuit. The square wave goes immediately from one voltage to the other; the sine wave gradually changes, going through the intervening values. An electromagnetic pulse generator like a wheel speed sensor or a reluctor-type distributor pickup produces a sine wave. Hall Effect sensors, photoelectric switches, and other on-off signal generators produce square waves. For many purposes, square waves are easier for computers to work with, so on many vehicles there are electronic devices to modify sine waves into square waves.

STARTER

the electric motor that is used to start an engine.

STATOR

a device located between the impeller and turbine in a torque converter. It contains specifically angled blades around both sides of its circumference to redirect the flow of fluid coming off the turbine, which increases the force of the fluid driving the turbine, resulting in torque multiplication.

STEPPER MOTOR

an electric motor that can move to a specific position on its range of travel.

SWITCH

a device used to open, close or direct the current in an electrical circuit.

THERMISTOR

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a temperature sensitive variable resistor in which the resistance decreases as its ternperature increases.

TRANSDUCER

a device that changes a force into an electrical signal.

TRANSDUCER

device that converts variations in one energy form into corresponding variations in another, usually electrical.

TRANSISTOR

an electronic device produced by joining three sections of semiconductor materials. Used as a switching or amplifying device.

ULTRACAPACITOR

ultracapacitors are higher specific energy and power versions of electrolytic capacitors-devices that store energy as an electrostatic charge. They are electrochemical systems that store energy in a polarized liquid layer at the interface between an ionically conducting electrolyte and a conducting electrode. Energy storage capacity increases by increasing the surface area of the interface. Ultracapacitors are being developed as primary energy devices for power assist during acceleration and hill climbing, as well as recovery of braking energy.

VARIABLE RELUCTANCE SENSOR

a magnetic sensor that generates its own alternating current voltage based on the interference of a moving object across its tip.

VARIABLE RESISTOR

a resistor that can be adjusted so the amount of resistance produced in the circuit changes.

VOLT

unit of electromotive force. One volt of electromotive force applied steadily to a conductor of one-ohm resistance produces a current of one ampere.

VOLTAGE DROP

voltage lost by the passage of electrical current through resistance.

VOLTAGE REGULATOR

a device used to control the output of an alternator or generator.

VOLTMETER

an instrument used to measure voltage in a circuit.

WATT

a unit of measurement of electrical power. One volt multiplied by one amp equals one watt.

ZENER DIODE

a silicone diode that allows current to flow in the opposite direction, once an applied voltage reaches a certain level.

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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

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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:

201 Park Washington Court

Falls Church, Virginia 22046

Tel: (703) 532-2027 * Fax: (202) 318-0378

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

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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 *always* 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

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MOTORIST ASSURANCE PROGRAM

STANDARDS FOR AUTOMOTIVE REPAIR

ENGINE PERFORMANCE & MAINTENANCE CHECKSHEET

Date: _____

Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Year: _____ Make: _____ Model: _____

Mileage: _____ License: _____ VIN: _____ Eng Code: _____

Customer Interview:

_____

_____

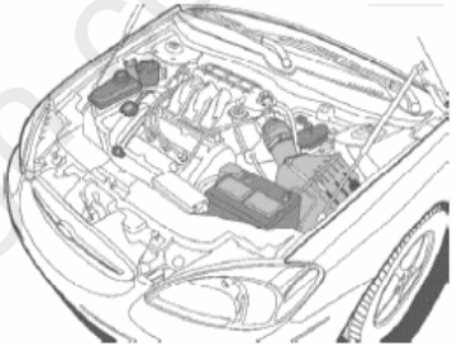
_____

_____

_____

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 AMRA/MAP*



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

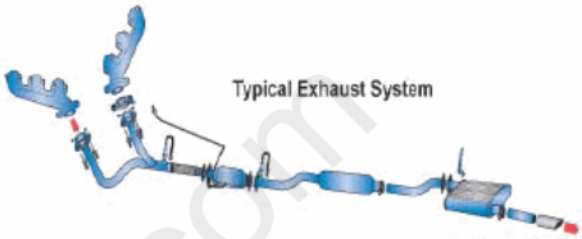
DISCLAIMER: This document may be used as a guide when performing vehicle inspection. This form is not to be used as an estimate form and may not comply with Local or State Laws. The Motorist Assurance Program is not responsible for the performance and accuracy of the motor vehicle inspection performed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

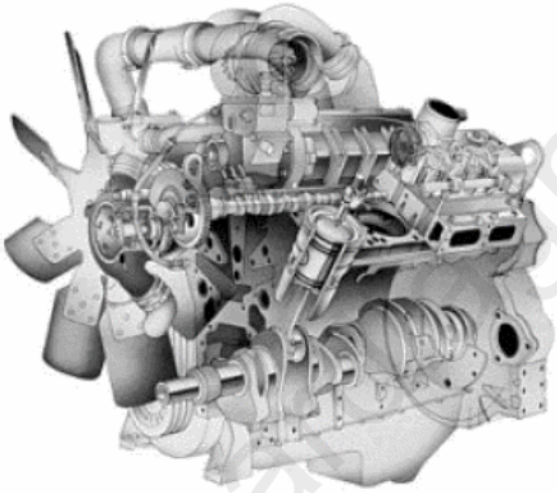
Fig. 1: Engine Performance & Maintenance Checksheet (1 Of 2)

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 dvising 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.**		

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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.**		

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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

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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

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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
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

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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

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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

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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

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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

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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 0Ã‚Â° F (-17.8Ã‚Â° 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 32Ã‚Â° F (0Ã‚Â° C) can deliver for 30 seconds and maintain at least a voltage of 1.2 volts per cell (7.2 volts for a 12volt battery).

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

Condition	Code	Procedure
Battery frozen	Ã‚Â	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

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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

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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

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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

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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

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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

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

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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 or 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

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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

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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

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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

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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

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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

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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

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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

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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.**		

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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

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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

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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

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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)

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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

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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

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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

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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

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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

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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.**		

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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.**		

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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

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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

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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

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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

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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.**		

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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)

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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

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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.**		

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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

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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

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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

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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
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

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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

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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

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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	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

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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

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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	Ã,Â	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

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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

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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
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

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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

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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

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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

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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

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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

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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

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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,Â	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

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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.**		

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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

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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

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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

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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

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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

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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

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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.**		

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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

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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	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

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

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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

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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

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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

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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

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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

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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-thanatmospheric 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 hat 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

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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 paning 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.

BIOCK

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.

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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 (CO_2)

A product of combustion that has become an environmental concern in recent years. CO_2 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.

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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)

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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.

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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 cranksnan end tnrust.

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.

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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

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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

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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 pintle 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

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the volume displaced by aIl 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 (CH3CH2OH, 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 Nox - 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).

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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

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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)

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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)

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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 (lAC) 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 lAC 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 140Ã‚Â°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, aI/owing 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 halt ot the torque converter shell that drives the turbine; a driving nember 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)

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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 fitltng 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 litters 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

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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 whiIe the engine is running; can be continuous or intermittent failure.

MISS

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

MULTI-PORT FUEL INJECTION (MFI)

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)

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a diagnostic software system in the ECM or PCM that monitors computer inputs, outputs, and resultant engine/transmission operations for failure. OBD-l is thought of as any of the systems in use before OBD-ll , typically 1979 to 1995 systems, although some OEMs started transitioning to OBD-ll in 1994 and 1995. OBD-ll 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 600Ã‚Â°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',

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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 nto 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

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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 lear. 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.

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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

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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, 02, 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 valley 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 thecrankshatt.

TIMING GEARS

gears that drive the camshaft from the crankshaft.

TIMING

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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 andmoving 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.

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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.

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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 (VFV)

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.

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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

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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:

201 Park Washington Court

Falls Church, Virginia 22046

Tel: (703) 532-2027 * Fax: (202) 318-0378

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
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

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement
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 *always* 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.**

EXHAUST SYSTEMS

WARNING: **Federal EPA rules prohibit altering an exhaust system in any way that defeats the emission reduction components of a vehicle. Be sure to review and adhere to EPA policy on removing and replacing catalytic converters. Where state or local laws are stricter, they take precedence over these guidelines.**

NOTE: **Some exhaust systems are of a welded design. It is not required that the entire system be replaced. Determine the need to replace individual components based on conditions of component.**

CATALYTIC CONVERTERS

Condition	Code	Procedure
Air injection tube broken	A	Require repair or replacement of injection tube or replacement of catalytic converter
Air injection tube burnt	A	Require repair or replacement of injection tube or replacement of catalytic converter
Air injection tube leaking	A	Require repair or replacement of injection tube or replacement of catalytic converter
Air injection tube loose	A	Require repair or replacement of injection tube or replacement of catalytic converter
Air injection tube restricted	A	Require repair or replacement of injection tube or replacement of catalytic converter
Air injection tube threads damaged	A	Require repair or replacement of injection tube or replacement of catalytic converter
Air injection tube threads stripped (threads missing)	A	Require repair or replacement of injection tube or replacement of catalytic converter
Body Cracked	B	Require repair or replacement
Converter empty	A	Require repair or replacement
Converter fill plug missing	C	Require repair or replacement
Converter missing	C	Require repair or replacement
Exhaust gases leaking	A	Require repair or replacement
Flanges leaking	A	Require repair or replacement of flanges
Inlet pipes cracked	B	Require repair or replacement
Internal rattle (except pellet-type)	2	Further Inspection required
NOTE: **If the converter is breaking up, suggest converter replacement. If an object has fallen into the converter, remove object**		
Mounting brackets that are part of converter broken	A	Require repair or replacement
Obvious overheating	Require testing of converter	

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Condition	Code	Procedure
NOTE: **Overheating is caused by something other than the converter. Further diagnosis is required to determine the cause of the overheating.**		
Outlet pipes cracked	B	Require repair or replacement
Pieces of catalyst material found downstream	1	Suggest replacement
Plugged	A	Require replacement
NOTE: **Determine cause and correct to ensure that new converter will not become plugged.**		
Testing has determined that existing converter has been lead-poisoned, contaminated or failed testing	A	Require repair or replacement

EXHAUST AND TAIL PIPES

Condition	Code	Procedure
Broken bracket	A	Require repair or replacement
Pipe Bent Out Of Position	B	Require repair or replacement
Pipe Broken	A	Require repair or replacement
Pipe Cracked	B	Require repair or replacement
Pipe Leaking	A	Require replacement
Pipe Missing	C	Require replacement
Pipe Plugged	A	Require replacement
Pipe Weak Due To Corrosion, But No Leaks Present	1	Suggest replacement
Weld Broken	A	Require repair or replacement

EXHAUST CONNECTIONS

Condition	Code	Procedure
Attaching hardware Incorrect	B	Require replacement of hardware
Clamp broken	A	Require replacement
Clamp Loose	A	Require repair or replacement
Clamp missing	C	Require replacement
Corroded, affecting structural integrity	1	Suggest replacement
Incorrect type (i.e. Flange, Ball & Socket, etc.)	B	Require replacement
Leaking	A	Require repair
Loose	A	Require repair

HANGERS

Condition	Code	Procedure
Broken	A	Require replacement
Corroded, affecting structural integrity	1	Suggest replacement
Incorrect type	B	Require replacement
Loose	B	Require repair or replacement
Missing	C	Require replacement
Out of position	B	Require repair or replacement

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Condition	Code	Procedure
Rubber deteriorated	1	Suggest replacement

HEAT RISERS (MECHANICAL EFE DEVICES)

Condition	Code	Procedure
Broken	A	Require replacement of affected parts
Diaphragm Inoperative	A	Require replacement
NOTE: **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 heatriser**		
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement of affected parts
Seized	A	Require repair or replacement of affected parts
Spring broken	B	Require replacement of spring(s)
Spring Inoperative	A	Require replacement of spring(s)

HEAT SHIELDS

Condition	Code	Procedure
Bent, affecting performance	B	Require repair or replacement
Broken	A	Require replacement
Corroded affecting structural integrity	1	Suggest replacement
Loose	B	Require repair or replacement
Missing	C	Require replacement

MANIFOLDS (CAST AND TUBE TYPE)

Condition	Code	Procedure
Air injection tube in manifold broken	A	Require repair or replacement of injection tube or replacement of manifold
Air injection tube in manifold corroded, affecting structural integrity	1	Suggest replacement of Injection tube or manifold
Air injection tube in manifold leaking	A	Require repair or replacement of injection tube or replacement of manifold
Air injection tube in manifold loose	A	Require repair
Air injection tube in manifold restricted	A	Require replacement of injection tube or manifold
Air injection tube in manifold threads damaged	A	Require repair of injection tube or manifold
Air injection tube in manifold threads stripped (threads missing)	A	Require replacement of injection tube or manifold
Bolt Broken	A	Require replacement of bolt(s)

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Condition	Code	Procedure
Bolt Loose	A	Require tightening or replacement of bolt(s)
Bolt Missing	C	Require replacement of bolt(s)
Corroded, affecting sealability	A	Require repair or replacement
Cylinder head threads stripped	A	Require repair or replacement of cylinder head
Gasket leaking	A	Require tightening or replacement of gasket
Heat Stove Bent	B	Require Repair Or Replacement of Stove
NOTE: **Stove may not be available separately. This may require replacement of manifold.**		
Heat Stove Broken	A	Require replacement of stove
NOTE: **Stove may not be available separately. This may require replacement of manifold.**		
Heat Stove Corroded, Affecting Structural Integrity	1	Suggest replacement of stove
NOTE: **Stove may not be available separately. This may require replacement of manifold.**		
Heat Stove Missing	C	Require replacement of stove
NOTE: **Stove may not be available separately. This may require replacement of manifold.**		
Manifold Broken	A	Require repair or replacement
Manifold Cracked	B	Require repair or replacement
Manifold Warped	A	Require repair or replacement
Out of specification	B	Require repair or replacement
Stud broken	A	Require replacement of stud
Stud missing	C	Require replacement of stud
Stud threads damaged	A	Require Repair Or Replacement of Stud
Stud threads stripped (threads missing)	A	Require replacement of stud

MECHANICAL EFE DEVICES

Condition	Code	Procedure
Broken	A	Require replacement of affected parts
Diaphragm Inoperative	A	Require replacement
NOTE: **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 heatriser**		
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement of affected parts
Seized	A	Require repair or replacement of affected arts

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Condition	Code	Procedure
Spring broken	B	Require replacement of spring(s)
Spring Inoperative	A	Require replacement of spring(s)

MUFFLER VALVE

Condition	Code	Procedure
Inoperative	A	Require repair or replacement
NOTE: **It may be necessary to replace the muffler assembly to correct this condition.**		

MUFFLERS AND RESONATORS

Condition	Code	Procedure
Body shell distorted, affecting performance or structural integrity	A	Require replacement
Corrosion Hole	A	Require replacement
Missing	C	Require replacement
Mounting bracket broken	A	Require repair or replacement
Mounting bracket cracked	B	Require repair or replacement
Nipple Cracked	A	Require repair or replacement
Nipple Loose	B	Require replacement
Outer wrap peeling (Exhaust Not Leaking)	1	Suggest replacement
Plugged	A	Require replacement
Puncture (other than drain hole)	A	Require replacement
Rattling or knocking noise from inside muffler	B	Require replacement
Seam open (exhaust leaking)	A	Require replacement
Sound quality unsatisfactory	2	Suggest replacement to address customer need and/or request
Split (exhaust leaking)	A	Require replacement
NOTE: **Further diagnosis required to determine cause of the split seam (i.e. Backfiring).**		
Weak due to corrosion, but no leaks present	1	Suggest replacement

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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

Code	Reason
4	Technician's Recommendation Based On Substantial And Informed Experience
5	To Comply With Maintenance Recommended By AMRA/MAP

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UNIFORM INSPECTION & COMMUNICATION STANDARDS 2010 - 2011

Heating, Ventilation And Air Conditioning Systems

HEATING, VENTILATION & AIR CONDITIONING 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

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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:

201 Park Washington Court

Falls Church, Virginia 22046

Tel: (703) 532-2027 * Fax: (202) 318-0378

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
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

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement
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 *always* 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.

HEATING, VENTILATION & AIR CONDITIONING SYSTEM CHECKSHEET

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MOTORIST ASSURANCE PROGRAM
STANDARDS FOR AUTOMOTIVE REPAIR
QUALIFIED

MOTORIST ASSURANCE PROGRAM
STANDARDS FOR AUTOMOTIVE REPAIR

PARTICIPATING FACILITY

HEATING, VENTILATION & AIR CONDITIONING SYSTEM CHECKSHEET

Date: _____

Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Year: _____ Make: _____ Model: _____

Mileage: _____ License: _____ VIN: _____ Eng Code: _____

Customer Interview:

_____

_____

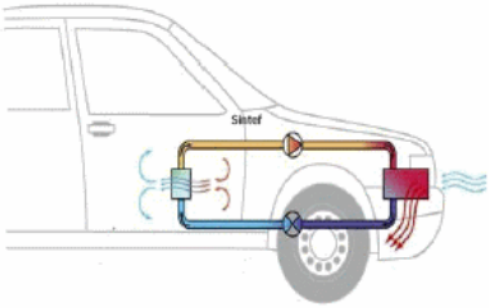
_____

_____

_____

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 AMRA/MAP*



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.

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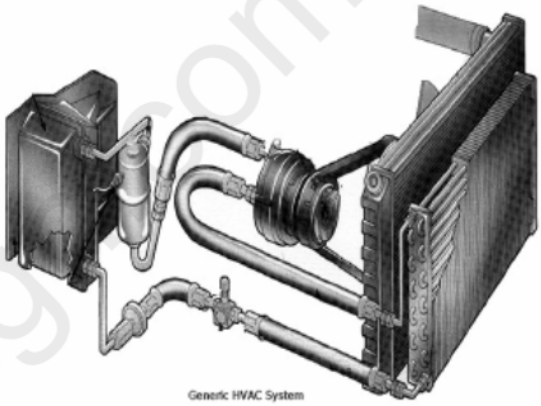
Fig. 1: Heating, Ventilation & Air Conditioning System Checksheet (1 Of 2)

HEATING, VENTILATION & AIR CONDITIONING SYSTEM CHECKSHEET

Underhood	OK	S	R	Condition
Drive Belts				
Clutch				
Seals / Connections				
Electrical Connections				
Compressor				
Compressor High Side Pressure				Spec _____ Actual _____
Compressor Low Side Pressure				Spec _____ Actual _____
Expansion Device				
In-line Filters				
Pulleys / Tensioners				
Service Ports				
Refrigerant Type				Spec _____ Actual _____
Refrigerant Oil Type				
Condenser				
Accumulator				
Receiver / Drier				
High Pressure Hoses				
Low Pressure Hoses				
Metal Lines				

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				

Interior Components	OK	S	R	Condition
Vents / Ducts				
Controls				
Blower Motor				
Center Outlet Temp				Spec _____ Actual _____
Evaporator				
Evaporator Drain Hose				
Actuators				
Fuses / Circuit Breakers				
Cabin Air Filter				



OK	Suggested 1, 2, 3, 4, 5	Required A, B, C

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Fig. 2: Heating, Ventilation & Air Conditioning System Checksheet (2 Of 2)

HEATING, VENTILATION & AIR CONDITIONING SYSTEMS

NOTE: AIR CONDITIONING SYSTEM FLUSHING utilizes chemicals or refrigerant to remove oil, debris and contaminants from the evaporator, condenser, hoses or metal lines.

NOTE: An INLINE FILTER, both high and low side, protects a/c components from residual debris in the system. An inline filter or suction screen is suggested when a condenser, evaporator, compressor, expansion valve, accumulator/drier, hoses or metal lines is replaced, or if debris is found in the system during an a/c repair. An inline filter is suggested to help prevent future component damage and increase system longevity.

ACCUMULATORS

Condition	Code	Procedure
NOTE: **When replacing this component it is suggested to install or replace high and low side inline filters to prevent future component damage (see Code 5).**		
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
Beyond vehicle manufacturer's service interval	3	Suggest replacement
Desiccant at the end of its useful life (saturated with moisture)	1	Suggest repair or replacement
Desiccant bag deteriorated	A	Require replacement. Further inspection required
NOTE: **Inspect system to determine effects of desiccant bag deterioration.**		
Leaking	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Tubing connection leaking	A	Require repair or replacement

ACTUATORS (ELECTRICAL)

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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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.**		
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.**		

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Condition	Code	Procedure
Terminal burned, not affecting performance	2	Suggest 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

ACTUATORS (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
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement.**		
Connector melted, not affecting performance	2	Suggest 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.**		
Leaking (vacuum)	A	Require repair or replacement
Linkage bent, affecting performance	A	Require repair or replacement of linkage
Linkage bent, not affecting performance	2	Suggest repair or replacement of linkage
Linkage binding, affecting performance	A	Require repair or replacement of linkage
Linkage binding, not affecting performance	1	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

AIR CONDITIONING FITTINGS

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Condition	Code	Procedure
Abrasion damage, affecting structural integrity	A	Require repair or replacement
Abrasion damage, not affecting structural integrity	Â	No service suggested or required
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
Clamp corroded, not reusable	1	Suggest replacement
Connected incorrectly	A	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Corroded, not affecting structural integrity	Â	No service suggested or required
Cracked	A	Require repair or replacement
Fitting type incorrect (such as compression fitting)	B	Require replacement
Flange leaking	A	Require repair or 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 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
Routed incorrectly	B	Require repair
Swollen	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

AIR CONDITIONING HOSES

NOTE: **When replacing this component it is suggested to install or replace high and low side inline filters to prevent future component damage (see Code 5).**

Condition	Code	Procedure
Abrasion damage, affecting structural integrity	A	Require repair or replacement
Abrasion damage, not affecting structural integrity	Â	No service suggested or required
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
Clamp corroded, not reusable	1	Suggest replacement
Connected incorrectly	A	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Corroded, not affecting structural integrity	Â	No service suggested or required
Cracked	A	Require repair or replacement
Fitting type incorrect (such as compression fitting)	B	Require replacement
Flange leaking	A	Require repair or replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement

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Condition	Code	Procedure
Leaking	A	Require repair or replacement
Melted	1	Suggest repair or replacement
Missing	C	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 missing	C	Require replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Routed incorrectly	B	Require repair
Swollen	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

AIR CONDITIONING METAL LINES

NOTE: **When replacing this component it is suggested to install or replace high and low side inline filters to prevent future component damage (see Code 5).**

Condition	Code	Procedure
Abrasion damage, affecting structural integrity	A	Require repair or replacement
Abrasion damage, not affecting structural integrity	Â	No service suggested or required
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
Clamp corroded, not reusable	1	Suggest replacement
Connected incorrectly	A	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Corroded, not affecting structural integrity	Â	No service suggested or required
Cracked	A	Require repair or replacement
Fitting type incorrect (such as compression fitting)	B	Require replacement
Flange leaking	A	Require repair or 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 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
Routed incorrectly	B	Require repair
Swollen	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

AIR CONTROL DOORS

Condition	Code	Procedure

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Condition	Code	Procedure
Air control door binding	A	Require repair or replacement
Air control door broken	A	Require repair or replacement
Air control door leaking	A	Require repair or replacement
Air control door seized	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
Cracked	2	Suggest repair or replacement
Drain hole restricted	A	Require repair
Drain plugged	A	Require repair
Duct disconnected	A	Require repair or replacement
Duct leaking	A	Require repair or replacement
Duct missing	C	Require replacement
Duct restricted	A	Require repair or replacement
Leaking	B	Require repair or replacement
Noisy	2	Suggest cleaning or repair
Odor	2	Suggest cleaning or repair
Restricted	A	Require cleaning, repair, or replacement

AIR DAMS (EXTERNAL)

Condition	Code	Procedure
Application incorrect, affecting air conditioning 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 air conditioning system performance	A	Require repair or replacement
Blocked, affecting air conditioning system performance	A	Require repair or replacement
Broken, affecting air conditioning system performance	A	Require repair or replacement
Cracked, affecting air conditioning system performance	A	Require repair or replacement
Loose, affecting air conditioning system performance	A	Require repair
Loose, not affecting air conditioning system performance	2	Suggest repair
Missing, affecting air conditioning system performance	C	Require replacement

AIR DISTRIBUTION SYSTEM

Condition	Code	Procedure
Air control door binding	A	Require repair or replacement
Air control door broken	A	Require repair or replacement
Air control door leaking	A	Require repair or replacement
Air control door seized	A	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware

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Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Cracked	2	Suggest repair or replacement
Drain hole restricted	A	Require repair
Drain plugged	A	Require repair
Duct disconnected	A	Require repair or replacement
Duct leaking	A	Require repair or replacement
Duct missing	C	Require replacement
Duct restricted	A	Require repair or replacement
Leaking	B	Require repair or replacement
Noisy	2	Suggest cleaning or repair
Odor	2	Suggest cleaning or repair
Restricted	A	Require cleaning, repair, or replacement

BELTS

Condition	Code	Procedure
Alignment incorrect	B	Further inspection required
NOTE: **Determine cause of incorrect alignment and require repair.**		
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
Serpentine belt routed incorrectly	B	Require repair
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

BLEND DOORS

Condition	Code	Procedure
Air control door binding	A	Require repair or replacement
Air control door broken	A	Require repair or replacement
Air control door leaking	A	Require repair or replacement
Air control door seized	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
Cracked	2	Suggest repair or replacement
Drain hole restricted	A	Require repair
Drain plugged	A	Require repair
Duct disconnected	A	Require repair or replacement
Duct leaking	A	Require repair or replacement

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Condition	Code	Procedure
Duct missing	C	Require replacement
Duct restricted	A	Require repair or replacement
Leaking	B	Require repair or replacement
Noisy	2	Suggest cleaning or repair
Odor	2	Suggest cleaning or repair
Restricted	A	Require cleaning, repair, or replacement

BLOWER FANS (BLOWER WHEEL OR SQUIRREL CAGE)

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
Broken	A	Require replacement
Cracked	B	Require replacement
Distorted	A	Require replacement
Fins missing	C	Require replacement
Hub separated	A	Require replacement
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Mounting loose	A	Require repair or replacement
Noisy	2	Suggest replacement
Out of balance	A	Require repair or replacement

BLOWER 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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Current draw out of specification	B	Require repair or replacement
Inoperative	A	Require replacement

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Condition	Code	Procedure
NOTE: **Check fan motor/controls. Inoperative includes intermittent operation.**		
Missing	C	Require replacement
Motor speed insufficient	2	Suggest repair or 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

BLOWER 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
Conductor exposed	A	Require replacement
Connector broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	1	Suggest 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.**		

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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

BLOWER 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
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
NOTE: **Missing includes high pressure cut-off switches not installed during a retrofit from R12 to 134a.**		
Out of adjustment	B	Require repair or replacement
Pressure switch 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

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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
Won't return	A	Require repair or replacement
Worn	1	Suggest replacement

CABIN AIR FILTERS

Condition	Code	Procedure
Air flow obstruction	A	Require cleaning or replacement
At or beyond service interval	3	Suggest replacement
Microbial growth causing odor	A	Require replacement of filter
Missing	C	Require replacement

CIRCUIT BREAKERS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Blown	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
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
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Insulation damaged, conductors exposed	A	Suggest repair or replacement
Missing	C	Require replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to 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

COMPRESSOR CLUTCH ASSEMBLIES

Condition	Code	Procedure
Air gap incorrect	B	Require repair or replacement

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Condition	Code	Procedure
Bearing seized	A	Require replacement of bearing or assembly
Bearing worn, affecting performance	A	Require replacement of bearing or assembly
Coil shows signs of overheating	1	Suggest replacement of coil
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector melted, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Hub broken	A	Require replacement
Hub cracked	B	Require replacement
Hub loose on shaft	A	Require replacement
Hub scored, affecting performance	A	Require replacement
Hub warped, affecting performance	A	Require replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Noisy	2	Suggest repair or replacement
Slips	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to 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
Will not disengage	A	Require repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

COMPRESSORS

NOTE: **When replacing this component it is suggested to install or replace high and low side inline filters to prevent future component damage (see Code 5).**

Condition	Code	Procedure
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
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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 holes elongated, affecting performance	A	Require repair or replacement
Bracket holes elongated, not affecting performance	Â	No service suggested or required
Bracket loose, affecting performance	A	Require repair or replacement
Bracket loose, not affecting performance	1	Suggest repair or replacement
Bracket missing	C	Require replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Housing broken, affecting performance	A	Require repair or replacement
Housing broken, not affecting performance	Â	No service suggested or required
Housing cracked, affecting performance	A	Require repair or replacement
Housing cracked, not affecting performance	1	Suggest repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
NOTE: **Compressor noise can also be caused by low oil level, state of charge, air contamination, or type of refrigerant.**		
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

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Condition	Code	Procedure
Threads stripped (threads missing)	A	Require replacement
Tubing connection leaking	A	Require 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

CONDENSER AIR SEALS

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

CONDENSER 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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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

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

CONDENSERS

NOTE: **When replacing this component it is suggested to install or replace high and low side inline filters to prevent future component damage (see Code 5).**

Condition	Code	Procedure
Abrasion damage, affecting structural integrity	A	Require repair or replacement
Abrasion damage, not affecting structural integrity	Â	No service suggested or required
Air flow obstruction, affecting 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 performance	A	Require repair or replacement
Bent, not affecting performance	Â	No service suggested or required
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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 holes elongated, affecting performance	A	Require repair or replacement
Bracket holes elongated, not affecting performance	Â	No service suggested or required
Bracket loose, affecting performance	A	Require repair or replacement
Bracket loose, not affecting performance	1	Suggest repair or replacement
Bracket missing	C	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Corroded, not affecting structural integrity	Â	No service suggested or required
Fitting type incorrect (such as compression fitting)	B	Require replacement
Flange leaking	A	Require repair or replacement
Leaking	A	Require repair or replacement
Restricted internally	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

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
Circuit open	A	Require repair or replacement
Circuit resistance (voltage drop) out of specification	A	Require repair or replacement

Condition	Code	Procedure
Circuit shorted	A	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Diode open	A	Require repair or replacement
Diode shorted	A	Require repair or replacement
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement
Protective shield (conduit) melted	2	Require replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Protective shield (conduit) missing	C	Require replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
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

CONTROL 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
Binding	A	Require repair or replacement
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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

Condition	Code	Procedure
Bracket holes elongated, affecting performance	A	Require repair or replacement
Bracket holes elongated, not affecting performance	Â	No service suggested or required
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 repair or replacement
Cracked	2	Suggest repair or replacement
Disconnected	A	Require repair or replacement
Kinked	2	Suggest repair or replacement
Melted	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
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

CONTROL HEADS (FUNCTION SELECTORS)

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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Contaminated	2	Suggest require 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
Melted, not affecting performance	Â	No service suggested or required
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement

CONTROL LINKAGES

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, affecting performance	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	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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 holes elongated, affecting performance	A	Require repair or replacement
Bracket holes elongated, not affecting performance	Â	No service suggested or required
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
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.**		
Seized	A	Require repair or replacement

CONTROL MODULES

NOTE: **Includes, but not limited to: IRCM, Coolant Fan Control Module (CFCM), AC Controller, Amplifier, Programmers, Control Heads, Power Modules, etc.**

Condition	Code	Procedure

Condition	Code	Procedure
Application incorrect	B	Require 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 broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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. Check for accepted cleaning procedure.**		
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation. Some components may be serviceable.**		
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
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

COOLANT

Condition	Code	Procedure

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Condition	Code	Procedure
Acidity (pH) incorrect	1	Suggest correction or replacement
At or beyond service interval	3	Suggest replacement
Contaminated	B	Require replacement or recycling. Further inspection required
NOTE: **Determine source of contamination and require correction prior to coolant replacement.**		
Fluid discolored	Â	No service suggested or required
NOTE: **Further testing necessary to determine condition of fluid.**		
Level incorrect	B	Require filling to proper level
NOTE: **Determine source of incorrect level and suggest repair.**		
Mixture incorrect	B	Require correction or replacement
Type incorrect	B	Require replacement

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

COOLING FAN CLUTCHES

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

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
Bearing noisy	A	Require replacement
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

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Condition	Code	Procedure
Seized	A	Require replacement
Slips (insufficient fan speed)	A	Require replacement
Thermal control incorrect	B	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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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

EVAPORATOR DRAIN TUBES

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

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Condition	Code	Procedure
Restricted	A	Require repair or replacement
Routed incorrectly	B	Require repair

EVAPORATOR FILTERS

Condition	Code	Procedure
Air flow obstruction	A	Require cleaning or replacement
At or beyond service interval	3	Suggest replacement
Microbial growth causing odor	A	Require replacement of filter
Missing	C	Require replacement

EVAPORATOR PRESSURE REGULATORS (EPRS)

Condition	Code	Procedure
Inoperative	A	Require repair or replacement

NOTE:
Inoperative includes intermittent operation.

EVAPORATORS

NOTE: **When replacing this component it is suggested to install or replace high and low side inline filters to prevent future component damage (see Code 5).**

Condition	Code	Procedure
Abrasion damage, affecting structural integrity	A	Require repair or replacement
Abrasion damage, not affecting structural integrity	Â	No service suggested or required
Air flow obstruction, affecting 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
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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 holes elongated, affecting performance	A	Require repair or replacement
Bracket holes elongated, not affecting performance	Â	No service suggested or required
Bracket loose, affecting performance	A	Require repair or replacement
Bracket loose, not affecting performance	1	Suggest repair or replacement
Bracket missing	C	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Corroded, not affecting structural integrity	Â	No service suggested or required
Evaporator foam seal leaking	A	Require replacement
Evaporator foam seal missing	C	Require replacement
Fitting type incorrect (such as compression fitting)	B	Require replacement
Flange leaking	A	Require repair or replacement
Leaking	B	Require repair or replacement

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Condition	Code	Procedure
Microbial growth causing odor	2	Suggest microbial odor removal
NOTE: **If the evaporator case is contaminated with debris, it may be necessary to remove the debris before applying microbial odor treatment.**		
Restricted internally	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

EXPANSION VALVES

NOTE: **Expansion valves indicated for use on R134a systems are acceptable for R12 systems.**

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
Corroded internally	1	Suggest replacement
Filter screen torn	A	Require replacement of screen
Inoperative	A	Require repair or replacement
NOTE: **Expansion valve operation may be affected by capillary tube location, corrosion, and insulation tape. Inoperative includes intermittent operation.**		
Leaking	B	Require replacement
Restricted	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

FUNCTION SELECTORS

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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Contaminated	2	Suggest require replacement
Leaking	B	Require repair or replacement

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Condition	Code	Procedure
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	Â	No service suggested or required
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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

FUSES, FUSIBLE LINKS AND CIRCUIT BREAKERS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Blown	A	Require replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
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
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Insulation damaged, conductors exposed	A	Suggest repair or replacement
Missing	C	Require replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
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

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Condition	Code	Procedure
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

FUSIBLE LINKS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Blown	A	Require replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
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
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Insulation damaged, conductors exposed	A	Suggest repair or replacement
Missing	C	Require replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
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

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GASKETS

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

HEATER CASES

Condition	Code	Procedure
Air control door binding	A	Require repair or replacement
Air control door broken	A	Require repair or replacement
Air control door leaking	A	Require repair or replacement
Air control door seized	A	Require repair or replacement
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
Cracked	2	Suggest repair or replacement
Drain hole restricted	A	Require repair
Drain plugged	A	Require repair
Duct disconnected	A	Require repair or replacement
Duct leaking	A	Require repair or replacement
Duct missing	C	Require replacement
Duct restricted	A	Require repair or replacement
Leaking	B	Require repair or replacement
Microbial growth causing odor	2	Suggest microbial odor removal
NOTE: **If the heater case is contaminated with debris, it may be necessary to remove the debris before applying microbial odor treatment.**		
Noisy	2	Suggest cleaning or repair
Restricted	A	Require cleaning, repair, or replacement

HEATER CONTROL VALVES

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
Binding	2	Suggest repair or replacement
Coolant leak	A	Require repair or replacement
Disconnected	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
Seized	A	Require repair or replacement
Vacuum leak	A	Require repair or replacement

HEATER CORES

Condition	Code	Procedure
Air flow obstruction	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
Connection leaking	A	Require repair or replacement
Corroded	1	Suggest repair or replacement
Disconnected	A	Require repair or replacement
Fins damaged, affecting performance	A	Require repair or replacement
Fins damaged, not affecting performance	Â	No service suggested or required

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

HEATER HOSES

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 repair or replacement
Hard (brittle)	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	Suggest replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Routed incorrectly	B	Suggest repair
Safety clip missing	C	Require replacement
Spongy	1	Suggest repair or replacement
Stripped	A	Require replacement
Surface cracks (dry-rotted)	1	Suggest repair or 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

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HIGH PRESSURE RELIEF VALVES (HPRV)

Condition	Code	Procedure
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

IDLERS

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware

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

IN-LINE FILTERS

Condition	Code	Procedure
Connection leaking	A	Require repair or replacement
Leaking	B	Require repair or replacement
Restricted	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

METAL FITTINGS

Condition	Code	Procedure
Abrasion damage, affecting structural integrity	A	Require repair or replacement
Abrasion damage, not affecting structural integrity	Â	No service suggested or required
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
Clamp corroded, not reusable	1	Suggest replacement
Connected incorrectly	A	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Corroded, not affecting structural integrity	Â	No service suggested or required
Cracked	B	Require repair or replacement
Fitting type incorrect (such as compression fitting)	B	Require replacement
Flange leaking	A	Require repair or replacement
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Leaking	B	Require repair or replacement
Melted	1	Suggest repair or replacement
Missing	C	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 missing	C	Require replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Routed incorrectly	B	Require repair
Swollen	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

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METAL LINES

Condition	Code	Procedure
Abrasion damage, affecting structural integrity	A	Require repair or replacement
Abrasion damage, not affecting structural integrity	Â	No service suggested or required
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
Clamp corroded, not reusable	1	Suggest replacement
Connected incorrectly	A	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Corroded, not affecting structural integrity	Â	No service suggested or required
Cracked	B	Require repair or replacement
Fitting type incorrect (such as compression fitting)	B	Require replacement
Flange leaking	A	Require repair or 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 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
Swollen	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

MIX AND AIR CONTROL DOORS (BLEND DOORS)

Condition	Code	Procedure
Air control door binding	A	Require repair or replacement
Air control door broken	A	Require repair or replacement
Air control door leaking	A	Require repair or replacement
Air control door seized	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
Cracked	2	Suggest repair or replacement
Drain hole restricted	A	Require repair
Drain plugged	A	Require repair
Duct disconnected	A	Require repair or replacement
Duct leaking	A	Require repair or replacement
Duct missing	C	Require replacement
Duct restricted	A	Require repair or replacement
Leaking	B	Require repair or replacement
Noisy	2	Suggest cleaning or repair
Odor	2	Suggest cleaning or repair

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Condition	Code	Procedure
Restricted	A	Require cleaning, repair, or replacement

ORIFACE TUBES

Condition	Code	Procedure
Application incorrect	B	Require replacement
Bypassing internally	A	Require repair or replacement
Filter screen torn	A	Require replacement
Installation incorrect	B	Require repair
Restricted	A	Require repair or replacement

O-RINGS

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

PILOT-OPERATED ABSOLUTES (POAS)

Condition	Code	Procedure
Connection damaged	B	Require repair or replacement
Fitting damaged	B	Require repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	B	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

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PLENUMS

Condition	Code	Procedure
Air control door binding	A	Require repair or replacement
Air control door broken	A	Require repair or replacement
Air control door leaking	A	Require repair or replacement
Air control door seized	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
Cracked	2	Suggest repair or replacement
Drain hole restricted	A	Require repair
Drain plugged	A	Require repair
Duct disconnected	A	Require repair or replacement
Duct leaking	A	Require repair or replacement
Duct missing	C	Require replacement
Duct restricted	A	Require repair or replacement

Condition	Code	Procedure
Leaking	B	Require repair or replacement
Noisy	2	Suggest cleaning or repair
Odor	2	Suggest cleaning or repair
Restricted	A	Require cleaning, repair, or replacement

PRESSURE CONTROL VALVES

Condition	Code	Procedure
Connection damaged	B	Require repair or replacement
Fitting damaged	B	Require repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	B	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

PRESSURE SENSORS

NOTE: **Includes, but not limited to, In-Car Temperature, Ambient Air Temperature, Sun Load Sensor, etc.**

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
Calibration incorrect	B	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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.**		
Missing	C	Require 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

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

PULLEYS

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
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
Bearing noisy	2	Suggest replacement
Bearing seized	A	Require repair or replacement
Bearing worn	1	Suggest replacement
Cracked	B	Require replacement
Loose	B	Require repair or replacement
Missing	C	Require replacement
Pulley damaged, affecting belt life	A	Require replacement

RADIATORS

Condition	Code	Procedure
Air flow obstruction	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
Drain inoperative	A	Require repair or replacement
Fins damaged, affecting performance	A	Require repair or replacement
Fins damaged, not affecting performance	Â	No service suggested or required
Internal oil cooler leaking	A	Require repair or replacement
Internal restrictions	B	Require 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	Â	No service suggested or required

RECEIVER-DRIERS

NOTE: **For VIRs, see Valves in Receiver (VIRs). When replacing this component it is suggested to install or replace high and low side inline filters to prevent future component**

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Condition	Code	Procedure
damage (see Code 5).	Â	Â
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, affecting performance	A	Require replacement
Desiccant at the end of its useful life (saturated with moisture)	1	Suggest repair or replacement
Desiccant bag deteriorated	A	Require replacement. Further inspection required
NOTE: **Inspect system to determine effects of desiccant bag deterioration.**		
Fusible plug leaking	A	Require replacement of plug
Leaking	B	Require replacement
Pressure relief device leaking	A	Require replacement of pressure relief device
Restricted	A	Require repair or replacement
Sight glass no longer transparent	2	Suggest replacement of drier
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Tubing connection leaking	A	Require repair or replacement

REFRIGERANT OIL

Condition	Code	Procedure
Contaminated	A	Require repair or replacement
Overfilled	B	Require repair
Underfilled	B	Require repair

REFRIGERANT

NOTE: **Refrigerants include any SNAP (Significant New Alternative Policy)-approved blends.**

Condition	Code	Procedure
Contaminated (other than refrigerant blends)	B	Require service to remove contamination
Different types of refrigerants in the same system (other than refrigerant blends)	B	Require repair
Overcharged	B	Require repair
Refrigerant type does not match fittings and label	B	Require repair
Undercharged	B	Require repair

RELAYS

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
Housing broken	A	Require replacement
Housing cracked	2	Suggest replacement

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Condition	Code	Procedure
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
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
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

SEALS

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

SERVICE PORTS

Condition	Code	Procedure
Application does not match refrigerant type	B	Require replacement
Leaking	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Valve cap leaking	A	Require repair or replacement of cap
Valve cap missing	C	Require replacement of valve cap
Valve core sticking	B	Require repair or replacement

SPRING LOCK COUPLINGS

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

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SUCTION THROTTLING VALVES (STVS)

Condition	Code	Procedure
Connection damaged	B	Require repair or replacement
Fitting damaged	B	Require repair or replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	B	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SWITCHES (ELECTRICAL)

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
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
NOTE: **Missing includes high pressure cut-off switches not installed during a retrofit from R12 to 134a.**		
Out of adjustment	B	Require repair or replacement
Pressure switch leaking	A	Require repair or replacement

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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
Won't return	A	Require repair or replacement
Worn	1	Suggest replacement

TENSIONERS

Condition	Code	Procedure
Alignment incorrect	B	Require repair or replacement
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
Bearing worn	1	Suggest replacement
Belt tension incorrect	B	Require adjustment or repair
Bracket cracked	A	Require repair or replacement
Housing cracked	B	Require repair or replacement
Missing	C	Require replacement
Noisy	2	Suggest replacement
Pulley damaged, affecting belt life	A	Require replacement
Seized	A	Require repair or replacement

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THERMISTORS AND PRESSURE SENSORS

NOTE: **Includes, but not limited to, In-Car Temperature, Ambient Air Temperature, Sun Load Sensor, etc.**

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
Calibration incorrect	B	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest repair or replacement

Condition	Code	Procedure
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Inoperative	A	Require repair or replacement
NOTE: **Includes inoperative, intermittent operation, or failure to perform all functions.**		
Missing	C	Require 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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	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
Cracked	B	Require replacement
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

VACUUM HOSES AND TUBES

Condition	Code	Procedure
Disconnected	A	Require repair
Leaking	A	Require repair or replacement
Leaking	A	Require repair or replacement
Melted	A	Require repair or replacement

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

VACUUM RESERVOIRS

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
Check valve leaking internally	A	Require replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Restricted	A	Require repair or replacement

VACUUM TUBES

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

VALVES IN RECEIVER (VIRS)

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
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	Â	No service suggested or required
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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 holes elongated, affecting performance	A	Require repair or replacement
Bracket holes elongated, not affecting performance	Â	No service suggested or required
Bracket loose, affecting performance	A	Require repair or replacement
Bracket loose, not affecting performance	1	Suggest repair or replacement
Bracket missing	C	Require replacement
Connection damaged	B	Require repair or replacement
Contaminated, affecting performance	A	Require replacement

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Condition	Code	Procedure
Corroded internally	1	Suggest replacement
Desiccant at the end of its useful life (saturated with moisture)	1	Suggest repair or replacement
Desiccant bag deteriorated	A	Require replacement. Further inspection required
NOTE: **Inspect system to determine effects of desiccant bag deterioration.**		
Filter screen torn	A	Require replacement of screen
Fitting damaged	B	Require repair or replacement
Fusible plug leaking	A	Require replacement of plug
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	B	Require repair or replacement
Pressure relief device leaking	A	Require replacement of pressure relief device
Restricted	A	Require repair or replacement
Sight glass no longer transparent	2	Suggest replacement of drier
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Tubing connection leaking	A	Require repair or replacement

WATER PUMPS (ELECTRIC AUXILIARY)

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, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest 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.**		
Leaking	B	Require repair or 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

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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
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

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
Circuit open	A	Require repair or replacement
Circuit resistance (voltage drop) out of specification	A	Require repair or replacement
Circuit shorted	A	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector melted, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Diode open	A	Require repair or replacement
Diode shorted	A	Require repair or replacement
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement
Protective shield (conduit) melted	2	Require replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Protective shield (conduit) missing	C	Require replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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

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

ACCUMULATOR

a servo action device in an automatic transmission that cushions the motion of a clutch; in an air conditioning system, a device that combines the suction throttling valve and POA valves as well as the receiver/dryer; a component used to store or hold liquid refrigerant in an air conditioning system that also contains a jesiccant; in a non-integral ABS system, a chamber that temporarily stores fluid during the pressure decrease phase of ABS operation; in an integral ABS system , a sealed vessel containing a thick flexible diaphragm that separates brake fluid from high-pressure nitrogen gas.

ACTUATOR

a control device that delivers mechanical action in response to a vacuum or electrical signal; anything that the engine control computer uses to do something, such as trigger fuel injection or fire a spark plug. Most actuators on a computercontrolled engine system are activated by grounding their circuits rather than by actively powering them, since that protects the computer from short circuits.

AERATION

to expose to the air or mix with air, as with a liquid; to charge a liquid with gas.

AIR CONDITIONING (A/C)

a system that cools and dehumidifies the air entering the passenger compartment of a vehicle.

AIR DUCT

a tube, channel or other tubular structure used to carry air to a specific location.

AMBIENT TEMPERATURE SWITCH

a switch that prevents air conditioner operation below a certain ambient temperature.

AMBIENT TEMPERATURE

the temperature of the air surrounding an object.

ATMOSPHERIC PRESSURE

the pressure exerted on an object by the weight of the earth's atmosphere. At sea level, 14.7 psi, less at higher altitudes.

ATOMIZATION

the breaking down of a fluid into a fine mist that can be suspended in air.

AUTOMATIC TEMPERATURE CONTROL SYSTEM

a climate control system that uses the heating and air conditioning systems to maintain the interior temperature selected by the vehicle's passengers.

AUXILIARY CLIMATE CONTROL DEVICES

specialized add-on heating units, or combination heating/cooling units, that operate with the truck engine turned off. They eliminate the need to leave engines idling solely to heat or cool the cab and sleeper compartment.

BIMETALLIC

two kinds of metal, with different thermal expansion rates, that when attached to one another, the resulting assembly will bend in the direction of the metal that expands the least.

BLEND DOOR

a door in the heating and air conditioning system that controls the temperature of the air going into the passenger compartment.

BLOWER MOTOR.

the electric motor which drives the fan that circulates air inside the vehicle passenger compartment.

BOILING POINT

the temperature at which a liquid turns to vapor.

CAPILLARY TUBE

a thin, gas-filled tube that senses the temperature of the evaporator and relays this information to the thermostat and/or expansion valve.

CARBON DIOXIDE (CO2)

a colorless, odorless, noncombustible gas, heavier than air; can be compressed into a super-cold solid known as dry ice; changes from solid to vapor at - 78.5Â°C.

CELSIUS

the basis of the metric system of temperature measurement in which water's boiling point is 100Â°C and its freezing point is 0 C.

CHARGE

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the electrical current that passes through the battery to restore it to full power; to fill, or bring up to the specific level, an A/C system with refrigerant; the required amount of refrigerant for an A/C system.

CHECK VALVE

a gate or valve that allows passage of a gas or liquid in one direction only.

CHLOROFLUOROCARBON (CFC)

any organic chemical compounds made up of carbon, chlorine and fluorine atoms, usually used in refrigeration. R12 is a CFC.

CLUTCH CYCLING SWITCH

a device that opens and closes the circuit that engages the air conditioning compressor clutch based on pressure or temperature.

COMPRESSOR

an engine driven device that compresses refrigerant gas and pumps it through the air conditioning system.

CONDENSATION

the process of a vapor becoming a liquid; the opposite of evaporation.

CONDENSE

to cool a vapor to below its boiling point, where it then condenses into a liquid.

CONDENSER

a device, similar to a radiator, in which the refrigerant loses heat and changes state from a high-pressure gas to a high pressure liquid as it dissipates heat to the surrounding air.

CORE PLUGS.

plugs that fill holes in a block or head left from the casting process. Also called freeze, welsh or expansion plugs.

CYCLING CLUTCH SYSTEM

an A/C system that controls temperature by switching the compressor clutch on and off.

DEGREE

used to designate temperature readings or 1 degree as a 1/360 part of a circle.

DEHUMIDIFY

to remove moisture (humidity) from the air.

DESICCANT

any hygroscopic material that removes and traps moisture, usually found in a bag in the accumulator or receiver/drier in air conditioning systems.

DIAPHRAGM

flexible, impermeable membrane on which pressure acts to produce mechanical movement; in automotive terminology, any disc-shaped device; can be as diverse as thin membranes that separate two chambers in a component, and large metal discs that activate clutch pressure plates.

DOWNFLOW RADIATOR

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a radiator in which coolant enters the top of the radiator and is drawn downward by gravity (see crossflow radiator).

DUAL-ZONE CLIMATE CONTROL

allows individualized control of heating and air conditioning. Most systems are adjustable for the driver and front passenger; others feature a third adjustment for rear passengers.

EVACUATE

the process of applying vacuum to a closed refrigeration system to remove air and moisture.

EVAPORATION

the process through which a liquid is turned into vapor.

EVAPORATOR

a heat exchanger, in which low-pressure refrigerant flows and changes state, absorbing heat from the surrounding air.

EXPANSION TUBE

used in some air conditioning systems, a component with a fixed opening through which refrigerant passes as it is metered into the evaporator core. Also called an orifice tube.

EXPANSION VALVE

used on some air conditioning systems, a temperature sensitive device that meters the flow of refrigerant into the evaporator core. Also called a thermostatic expansion valve (TXV).

FAHRENHEIT

a scale of temperature measurement with the boiling point of water at 212Â°F. In the metric system, water's boiling point is 100Â°Celsius.

FAIL-SAFE COOLING SYSTEM

a fail-safe cooling system allows a vehicle to be driven under limited power in the event that engine coolant is lost. In case of a ruptured hose, the engine operates in an emergency mode with limited power for driving a short distance (10-50 miles depending on the system). This eliminates the cost and inconvenience of having the vehicle towed to a service station and does not leave the customer stranded.

FAN CLUTCH

a device attached to a mechanically driven cooling fan that allows the fan to freewheel when the engine is cold or the vehicle is driven at speed.

FAN SHROUD

an enclosure that routes air through the radiator cooling fins.

FAN

a mechanically or electrically driven propeller that draws or pushes air through the radiator, condenser, heater core or evaporator core.

FIXED ORIFICE TUBE

a method of controlling refrigerant flow in an air conditioning system whereby the rate of flow is determined by the pressure difference across an orifice.

FREON

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DuPont registered trade name for R-12 (dichlorodifluoromethane).

GREENHOUSE GASES

gases, such as carbon dioxide, Nox, methane, and water vapor, that help capture heat from the sun in the lower atmosphere of the earth. As the amount of greenhouse gases in the atmosphere increases, more heat is captured, which can lead to global warming (the greenhouse effect).

HEAD PRESSURE

the pressure of the refrigerant at the compressor outlet.

HEAT EXCHANGER

device (e.g., a radiator) that is designed to transfer heat from the hot coolant that flows through it to the air blown through it by the fan.

HEATER CORE

a radiator-like device used to heat the inside of a vehicle. Hot coolant is pumped through it by the water pump, and heat from the coolant moves from the heater core to the passenger compartment as the blower fan forces air through it.

HIGH SIDE

the high-pressure half of an A/C system, usually refers to all components between the compressor outlet and the expansion valve or expansion tube. In this part of the A/C system, the refrigerant is in a liquid form.

HUMIDITY

moisture in air, usually referred to as relative humidity since the amount of moisture air can hold increases as temperature increases.

HVAC

acronym for Heating, Ventilation and Air Conditioning.

LATENT HEAT OF CONDENSATION

the amount of heat given off as a vapor changes state from a gas to a liquid without the temperature changing.

LATENT HEAT OF EVAPORATION

the amount of heat needed for a liquid to change state to a vapor without the temperature changing.

LEAK DETECTOR

a tool used to locate refrigerant leaks.

LOW SIDE

the suction side of an A/C system between the evaporator core inlet (after the expansion valve or expansion tube) and the compressor. In this part of the A/C system, the refrigerant is in a gas form.

MANIFOLD GAUGE SET

the set of gauges that attaches to the high and low side of the A/C system and used for diagnosis.

ORIFICE TUBE

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used in some air conditioning systems, a component with a fixed opening through which refrigerant passes as it is metered into the evaporator core. Also called an expansion tube.

ORIFICE

a precisely sized hole that controls the flow of fluid.

O-RING SEAL

a sealing ring, usually made of rubber and installed in a groove; a type of valve seal that fits into a valve stem groove under the valve keepers.

PAG

polyalkyline glycol oil (lubricant) used with A/C systems containing R- 134a refrigerant.

PHOSGENE GAS

a poisonous gas produced when R- 12 refrigerant is burned.

POROSITY

the condition of having pores through which fluids, gases or light can pass; tiny holes in casting caused by air bubbles.

POUNDS PER SQUARE INCH (PSI)

a unit of measure for pressure.

PRESSURE

the exertion of force upon a body, measured in pounds per square inch on a gauge.

PSI

measurement of pressure in pounds per square inch.

R12

the generic term for CFC refrigerant used in older A/C systems. Also called Freon.

R134A

generic term for a modern refrigerant that does not contain CFCs and does not harm the ozone layer.

RECEIVER/DRIER

an A/C system component into which high-pressure liquid refrigerant flows and is temporarily stored and dehydrated, usually located between the condenser outlet and expansion valve.

RECLAIM

to send refrigerant to an off-site facility where it is restored to its original purity so that it may be reused.

RECOVER

to remove refrigerant from a system and store it temporarily.

RECYCLE

to remove contaminants such as moisture, particulates, etc, from refrigerant and re-introduce it into the A/C system.

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REFRIGERANT CYCLE

the complete loop or circuit that refrigerant passes through as it changes state from a vapor, to a liquid, then back to a vapor.

REFRIGERANT OIL

either a mineral or synthetic oil designed specifically for A/C systems.

REFRIGERANT

a chemical compound used in an A/C system to remove heat from the evaporator and transfer it to the condenser.

SCHRADER VALVE

a spring operated valve used to open and close the service outlets in an A/C system. They are the service valves used to attach manifold gauges and to charge or evacuate the system.

SERVICE PORT

any of the various designs of fittings that allow service tools such as manifold gauges to be attached to an A/C system. See also Schrader valve.

SUCTION LINE

the low side tube and/or hose leading from the evaporator core outlet to the compressor inlet.

SUCTION

exists in a vessel when the pressure is lower than the atmospheric pressure.

SUPERHEAT SWITCH

a switch, usually mounted on the compressor on certain A/C systems that completes the circuit to the thermal limiter switch.

SUPERHEAT

the addition of more heat to a gas after it has already vaporized; the heat added to vaporized refrigerant after it has changed state from a liquid to a gas controlled by the expansion valve.

TENSIONER

a device used with a timing chain or belt to maintain its tension.

THERMOSTAT

a device installed in the cooling system that allows the engine to come to operating temperature quickly and then maintain a minimum operating temperature.

THERMOSTATIC EXPANSION VALVE (TXV)

used on some air conditioning systems, a temperature sensitive device that meters the flow of refrigerant into the evaporator core. Also called an expansion valve.

VACUUM

a pressure lower than atmospheric.

VAPOR

a substance in a gaseous state. Liquid becomes vapor when brought above the boiling point.

WATER PUMP

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a device used to circulate coolant through the engine.

WATER VALVE

a device used to control the flow of hot coolant to the heater core, usually operated by cable or vacuum.

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ROUTINE INSPECTION REFERENCE GUIDE

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

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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:

201 Park Washington Court

Falls Church, Virginia 22046

Tel: (703) 532-2027 * Fax: (202) 318-0378

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
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

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement
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 *always* 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.**

MAINTENANCE OVERVIEW

ANTIFREEZE/COOLANT

The main function of the Engine Cooling System is to carry heat away from the engine and maintain the desired operating temperature. This is accomplished by circulating antifreeze/coolant through the engine, where heat is generated, and carrying it to the radiator to be cooled.

Over the past decade internal combustion engines have become more fuel efficient; however, most of the energy in the gasoline (perhaps 70%) is converted into heat, and the cooling system keeps the engine from overheating by transferring this heat to the air. But the cooling system also has several other functions.

An automobile engine runs best at a fairly high temperature. When the engine is cold, components wear out faster, and the engine is less efficient and releases more pollutants into the atmosphere. The cooling system is designed to allow the engine to heat up as quickly as possible, and then to keep the engine at a constant temperature.

Modern automobiles operate in a wide variety of ambient temperatures, from well below freezing to well over 100 F. The fluid used to cool the engine must have a very low freezing point, a high boiling point, and it must have the ability to transfer a lot of heat.

An adequate amount of an antifreeze/coolant and water mixture is necessary to reduce the possibility of engine overheating and freezing, and to prevent rust and corrosion in the cooling system.

Water is one of the most effective fluids for holding heat, but water freezes at too high a temperature to be used in car engines. The fluid that most cars use is a mixture of water and ethylene glycol, also known as antifreeze. By adding ethylene glycol to water, the boiling and freezing points are improved significantly.

The temperature of the coolant can sometimes reach 250 to 275 F (121 to 135 C). Even with ethylene glycol added, these temperatures would boil the coolant. The cooling system is pressurized, which further raises the boiling point of the coolant. Most automobiles have around 14 to 15 pounds per square inch (psi), which raises the boiling point approximately 45 F so the coolant can endure the high temperatures produced in the engine.

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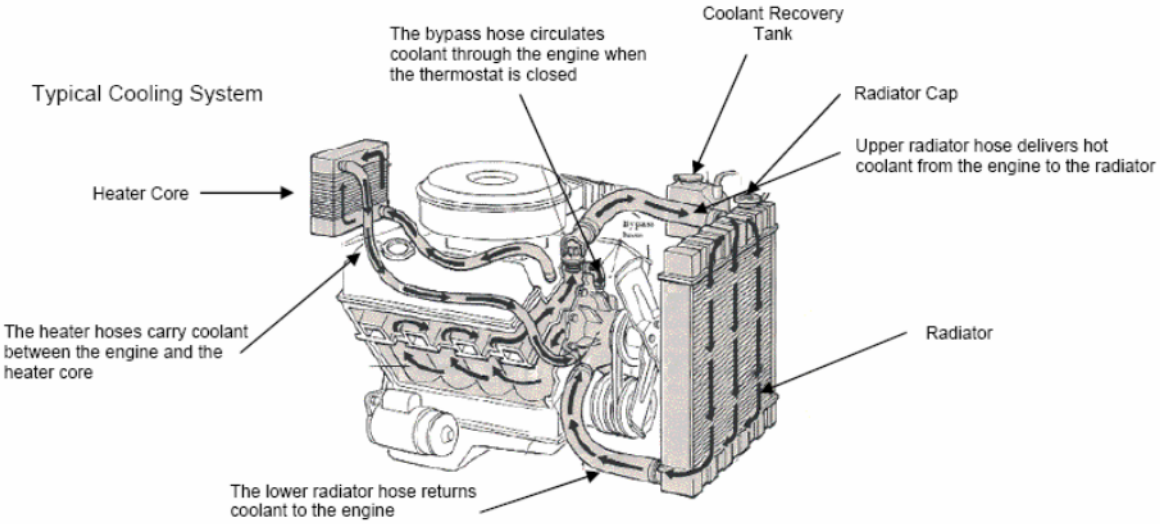

Fig. 1: Typical Cooling System

Hoses showing obvious signs of wear such as cracks, cuts, stiffness, bulges, excessive softness or abrasions should be replaced.

The National Automotive Radiator Service Association (NARSA) recommends a seven (7)-point preventative cooling system maintenance check at least once every two years. The program is designed to identify any areas that need attention, and consists of:

- a visual inspection of all cooling system components, including belts and hoses
- a radiator cap test to check for the recommended system pressure level
- a thermostat check for proper opening and closing
- a pressure test to identify any external leaks to the cooling system parts; including the radiator, water pump, engine coolant passages, radiator and heater hoses and heater core
- an internal leak test to check for combustion gas leakage into the cooling system
- an engine fan test for proper operation h a system power flush and refill with car manufacturer's recommended concentration of coolant

VISUAL INSPECTION

What you are looking for is the condition of the belts and hoses. The radiator hoses and heater hoses are easily inspected just by opening the hood and looking. You want to be sure that the hoses have no cracking or splitting and that there is no bulging or swelling at the ends. If there is any sign of problems, the hose should be replaced with the correct part number for the year, make and model of the vehicle. Never use a universal hose unless it is an emergency and a proper molded hose is not available.

Heater hoses are usually straight runs and are not molded, so a universal hose is fine to use and often is all that is available. Make sure that you use the proper inside diameter for the hose being replaced. For either the radiator hoses or the heater hoses, make sure that you route the replacement hose in the same way that the original hose was running. Position the hose away from any obstruction that can possibly damage it and always use new hose clamps. After you refill the cooling system with coolant, do a pressure test to make sure that there are no leaks.

RADIATOR CAP TEST

A radiator cap is designed to maintain pressure in the cooling system at a certain maximum pressure. If the cooling system exceeds that pressure, a valve in the cap opens to bleed the excessive pressure into the reserve tank. Once the engine has cooled off, a negative pressure begins to develop in the cooling system. When this happens, a second valve in the cap allows the coolant to be siphoned back into the radiator from the coolant reservoir. If the cap should fail, the engine can easily overheat. A pressure test of the radiator cap is a quick way to tell if the cap is doing its job. It should be able to hold its rated pressure for two minutes.

ENGINE FAN

The radiator cooling fan is an important part of the cooling system operation. While a fan is not really needed while a vehicle is traveling down the highway, it is extremely important when driving slowly or stopped with the engine running. In the past, the fan was attached to the engine and was driven by the fan belt. The speed of the fan was directly proportional to the speed of the engine; a viscous fan drive was developed in order to disengage the fan when it was not needed.

With computer controls, the engine-driven fans gave way to electric fans mounted directly on the radiator. A temperature sensor determined when the engine was beginning to run too hot and turned on the fan to draw air through the radiator to cool the engine. On many cars, there were two fans mounted side by side to make sure that the radiator had a uniform air flow for the width of the unit.

When the car is in motion, the speed of the air entering the grill is usually sufficient to keep the coolant at the proper temperature and the fans shut off. When the vehicle is stopped, there is no air flow and the fan is turned on when the engine reaches a designated temperature.

When the A/C is turned on the fan circuit would power the fans regardless of engine temperature. The air conditioning system always requires a good air flow through the condenser mounted in front of the radiator. If the air flow stopped, the air-conditioned air coming through the dash outlets would immediately start warming up.

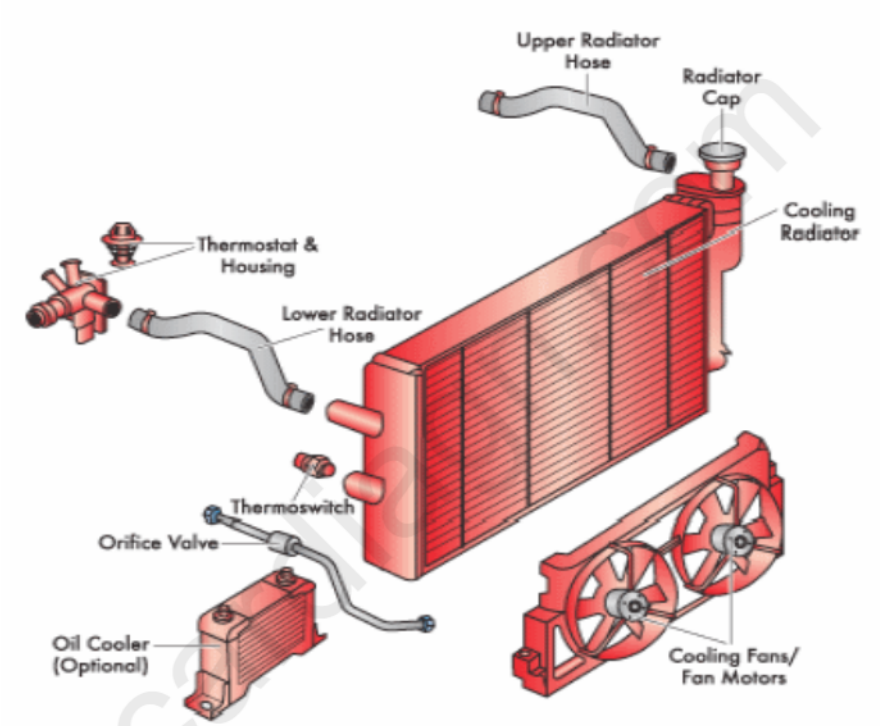

Fig. 2: Typical Cooling Fan

COOLING SYSTEM POWER FLUSH AND REFILL

Old coolant can be replaced by draining it out and replacing it with fresh coolant; however, power flushing will remove all the old coolant and pull out any sediment and scale along with it. Power flushing requires special equipment and generally requires the thermostat to be removed, the lower radiator hose disconnected, and the flush machine connected in line. Water and, sometimes, a cleaning agent are pumped through the cooling system in a reverse path from the normal coolant flow. When completed, the hose is reconnected and a new thermostat is installed. The cooling system is refilled with the appropriate amount of antifreeze to bring the coolant to the proper mixture of antifreeze and water. For most vehicles and most climates, the mixture is 50 / 50. In colder climates, more antifreeze is used, but must never exceed 75 percent antifreeze. Follow the vehicle manufacturers' procedures and recommendations.

BELTS (EXCEPT TIMING BELTS)

On most older vehicles, the water pump is driven by a V belt or serpentine belt on the front of the engine that is also responsible for driving the alternator, power steering pump and air conditioner compressor. These types of belts are easy to inspect and replace if they are worn. You are looking for dry cracking on the inside surface of the belt.

On later vehicles, the water pump is often driven by the timing belt. This belt usually has a specific life expectancy at which time it must be replaced to insure that it does not fail. Since the timing belt is inside the engine and will require partial engine disassembly to inspect, it is very important to replace it at the correct interval.

Low belt tension, contamination and belt vibration are common sources of belt noise. A screeching or squealing noise that occurs when pulling away from a stop normally indicates a lack of tension; check belt tension and automatic tensioners.

A grinding noise can result from damaged bearings, which must be replaced, aligned and lubricated to eliminate the noise and further damage. Vibration and noise can develop over time as drive components such as pulleys and spring tensioners wear, bearings and brackets loosen, or belts wear and stretch.

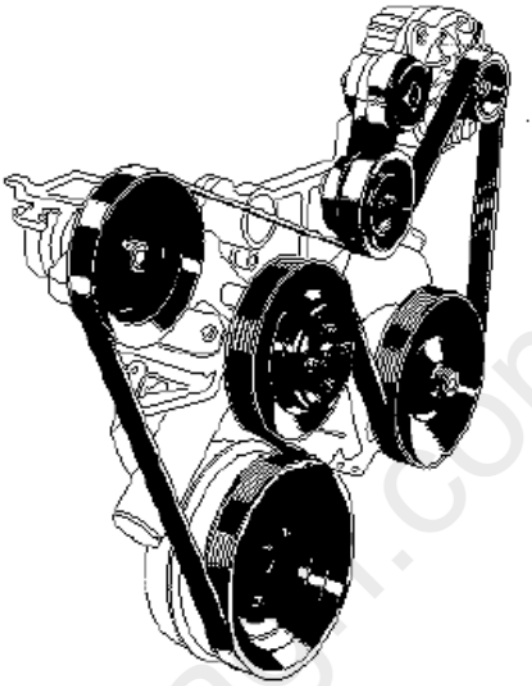

Fig. 3: Typical Accessory Drive Belt

The angle between belt span and pulley is the critical factor responsible for causing the "chirp" associated with misalignment noise. The presence of high humidity (or a damp belt) often increases the likelihood for misalignment noise to occur. Misalignment angle can result from many different combinations of pulley positions - parallel and angular are two typical examples.

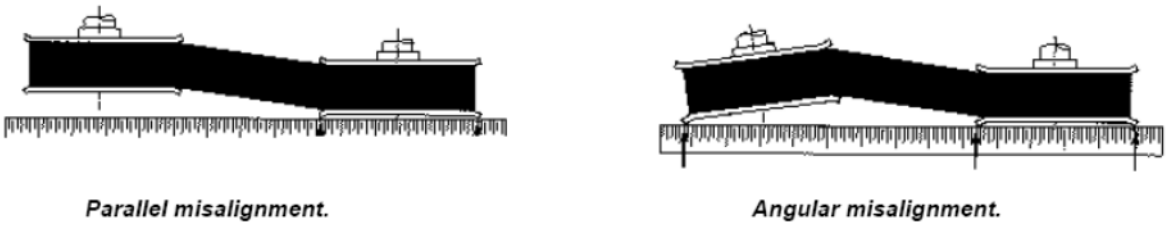

Fig. 4: Accessory Drive Belt Misalignment

Whenever a vehicle owner complains of belt noise, determine the type of noise and under what circumstances it occurs. The correction for a noise problem caused by belt misalignment is not likely to resolve a slip noise problem that may be caused by insufficient tension or other problem. The highest occurrence of belt noise due to misalignment comes from short belt spans entering large diameter pulleys. In the case of severe misalignment, repositioning of drive components may be required. Pulley alignment and tension must be correct for the drive to operate properly.

BELT TENSIONER

Belt tensioners are used to maintain constant tension on the belt, extending both belt and accessory drive bearing life.

NOTE: **A tensioner cannot be rebuilt since internal parts are not available. Never try to disassemble a tensioner unit. Injury may result.**

Fig. 5: Typical Accessory Dive Belt Tensioner

AUTOMATIC TRANSMISSION FLUID

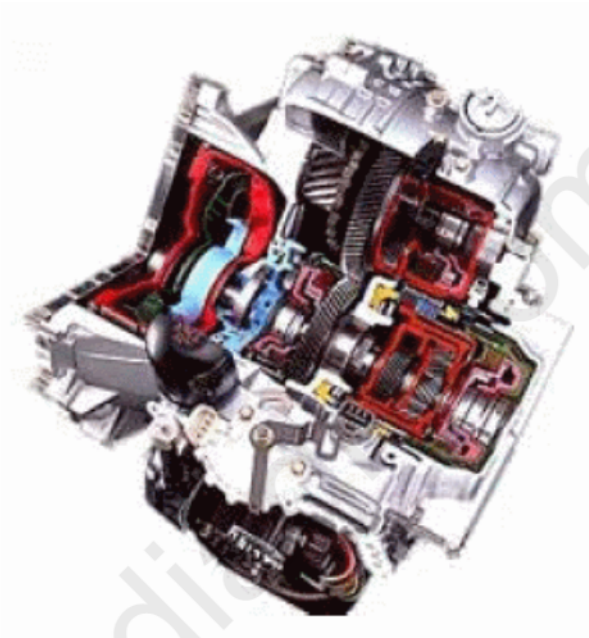

Fig. 6: Crosssection Of Automatic Transmission - Typical

Automatic transmission fluid (ATF) is the fluid used in vehicles with a self-shifting or automatic transmission. It is typically colored red or green to distinguish it from motor oil and other fluids in the vehicle. The fluid is a highly refined mineral oil optimized for the special requirements of an automatic transmission, such as valve operation, clutch and band operation, torque converter and gear lubrication. ATF is also used as a hydraulic medium in some power-assisted steering systems and as a lubricant in some 4WD transfer cases.

ATF usually contains an additive package with anti-foam additives, detergents and dispersants, anti-oxidation compounds, surfactants and petroleum dye. There are many specifications for ATF, such as the DEXRON and MERCON series, and the vehicle manufacturer will identify the ATF specification appropriate for each vehicle. The vehicle's owner's manual will typically list the ATF specification(s) that are recommended by the manufacturer. Some manufacturers will recommend different ATF products for different kinds of vehicle use, such as frequent trailer towing or vehicles that are used for longer periods between routine maintenance.

Overused ATF often has reduced lubrication properties and abrasive friction materials (from clutches and bands) suspended in it; failure to replace such fluid will accelerate transmission wear and could eventually ruin a transmission. Color is not an indication of the service life of an ATF as most ATF products will darken with use. The manufacturer's recommended service interval is a more reliable measure of ATF life.

AUTOMATIC TRANSMISSION FLUID EXCHANGE & FILTER REPLACEMENT

Automatic transmission fluid lubricates, cools and cleans internal components of the transmission. It also helps to maintain the hydraulic pressure necessary for the transmission to function. The additives in the transmission fluid can be depleted over time and should be replaced following the manufacturer's recommended service interval.

ENGINE OIL

The temperature range the oil is exposed to in most vehicles can be wide, ranging from cold ambient temperatures in the winter before the vehicle is started up to hot operating temperatures when the vehicle is fully warmed up in hot summer weather. A "specific" oil will have high viscosity when cold and a low viscosity at the engine's operating temperature. The difference in viscosities for any single-grade oil is too large between the extremes of temperature. To bring the difference in viscosities closer together, additives called viscosity index improvers are added to the oil. This creates "multi-grade" oil which has the viscosity of the first number when cold and the viscosity of the second number when hot. This allows one type of oil to be generally used all year.

In engines, there is inevitably some exposure of the oil to products of internal combustion, and microscopic particles from black soot accumulate in the oil during operation. Also the rubbing of metal engine parts inevitably produces some microscopic metallic particles from the wearing of the surfaces. Such particles could circulate in the oil and grind against the part surfaces causing wear. The oil filter removes many of the particles and sludge, but eventually the oil filter can become clogged, if used for extremely long periods. The motor oil and especially the additives also undergo thermal and mechanical degradation. For these reasons, the oil and the oil filter need to be periodically replaced.

Most vehicle manufacturers utilize a time/mileage-based schedule. Time-based intervals account for both the short trip driver who does fewer miles, but builds up more contaminates, as well as the long highway trips that are much easier on the oil. Many vehicle manufacturers list somewhat higher intervals for changing of oil and filter, with "severe" service requiring more frequent changes. This generally applies to vehicles that are mostly used in "Stopand- Go" driving conditions; experience extended periods of idling; or used for short trips of under 10 miles, where the oil does not get to full operating temperature and other adverse conditions.

Some vehicle manufacturers have installed engine Oil Life Monitors using computer calculations to estimate the oil's condition based on the factors which degrade it. Conditions such as RPMs, temperatures, and trip length are factored in to the equation; and one system adds an optical sensor for determining the clarity of the oil in the engine.

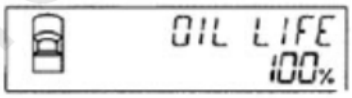

Fig. 7: Engine Oil Life Monitor Display Example

AIR FILTERS

The engine air filter prevents dirt from entering the engine's cylinders, where it would cause mechanical wear and oil contamination. Most fuel injected vehicles use a pleated paper filter element in the form of a flat panel. This filter is usually placed inside a plastic box connected to the throttle body with an intake tube. Older vehicles that use carburetors or throttle body fuel injection typically use a cylindrical air filter, usually a few inches high and between 6 and 16 inches in diameter, positioned above the carburetor or throttle body and may incorporate ducting to provide cool and/or warm inlet air, and secured with a metal or plastic lid.

A Pleated paper filter element is used for most automobile engine air cleaners, because they are efficient, easy to service, and cost-effective. The pleated-paper filter is sized appropriately for the airflow volumes encountered in a particular application and present only minor restriction to air flow until the filter has become clogged with dirt.

CABIN AIR FILTER

The cabin air filter is typically a pleated-paper filter that is placed in the outside-air intake for the vehicle's passenger compartment. Some of these filters are rectangular and similar in shape to the combustion air filter. Others are uniquely shaped to fit the available space of particular vehicles' outside-

air intakes. Clogged or dirty cabin air filters can significantly reduce airflow from the cabin vents, as well as introduce allergens into the cabin air stream.

BRAKE FLUID

The purpose of brake fluid is to:

1. Utilize hydraulic pressure to apply force on brake components that use a friction material to slow the vehicle
2. Protect the brake system from corrosion

Motor vehicle brake fluids are hygroscopic and absorb moisture when exposed to the atmosphere and in service. Water contamination from any source, including mechanical or accidental additions of free water, will appreciably lower the original boiling point of the brake fluid and increase its viscosity at low ambient temperatures. Water contamination may cause corrosion of brake cylinder bores and pistons, and may seriously affect the braking efficiency and safety of the brake actuating system. While moisture is definitely an issue with brake fluids, no consistent and accurate measurement identifying the percentage of moisture that is detrimental to brake fluid performance has been found in the literature. In addition, no specification exists for an in-use brake fluid boiling point that can be identified by a testing procedure and therefore no recommendation for replacement based on moisture content can be made with confidence.

It has been demonstrated that corrosion inhibitors in brake fluid deplete over time and can be severely depleted by 36 months. The depletion of corrosion inhibitors results in corrosion. Copper is not found in new brake fluid and is used as a brazing alloy in the brake lines, which represent a high surface area for brake fluid contact. Copper is the first metal to corrode in a brake system, and is a principle contaminate in brake fluid. Copper levels increase slowly and stably over time. The slow and steady increase in copper levels provides a means to predict the age of brake fluid under normal conditions. The age of the brake fluid can help determine when brake fluid should be serviced according to OEM recommendations when applicable. Copper can also directly affect ABS components as it can plate to the valve and valve seats.

Iron levels begin to sharply increase when the copper levels reach 150-250 ppm indicating corrosion of iron components. This also allows copper levels to be used to predict when iron levels will increase or the start of component corrosion and the depletion of corrosion inhibitors. Once iron corrosion begins copper acts as a catalyst to speed corrosion. At this point (iron corrosion) it is evident that the brake fluid no longer performs the intended purpose of protecting the system from corrosion.

A copper content of 200 ppm or greater indicates a depletion of corrosion inhibitors in the brake fluid and Brake Fluid Replacement is Required.

BATTERY

The automotive battery is an electrochemical device that produces voltage and delivers current. In an automotive battery the electrochemical action can be reversed, recharging the battery, providing many years of service. Batteries emit hydrogen gas while charging and the battery case cannot be completely sealed. Batteries (maintenance free) have small vents on the side forcing the gases to go through baffles to escape. This process allows the liquid to condense and flow back to the bottom of the battery.

The purpose of the battery is to supply current to the starter motor, provide current to the ignition system while cranking, to supply additional current when the demand is higher than the alternator can supply and to act as an electrical reservoir. Batteries are rated in cold cranking amps. This represents the current the battery can produce for 30 seconds at 0 degrees before the battery voltage drops below 7.2 volts.

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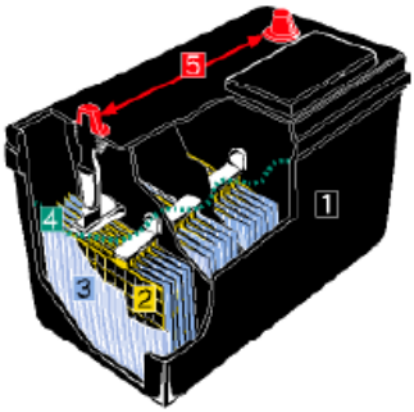

Fig. 8: Typical Battery Components

BATTERY CABLES

Battery cables are large diameter, multi-stranded wire which conveys the high current (250+ amps) necessary to operate the starter motor. Some battery cables will have a smaller wire, soldered to the terminal, which is used to either operate a smaller device or to provide an additional ground. When the smaller cable burns it indicates a high resistance in the heavy cable.

Even maintenance free batteries need periodic inspection and cleaning to insure they stay in good working order. Inspect the battery to see that it is clean and that it is held securely in its carrier. Some corrosion naturally collects around the battery. Electrolyte condensation contains corrosive sulfuric acid, which eats away the metal of battery terminals, cable ends and battery hold-down parts.

POWER STEERING

Power steering is a system for reducing the steering effort on cars by using an external power source to assist in turning the wheels. Most vehicles have power steering and the trend to front wheel drive, greater vehicle mass and wider tires means that modern vehicles would be extremely difficult to maneuver at low speeds (e.g. when parking) without assistance.

POWER STEERING FLUID

Power Steering Fluid is the hydraulic component in power steering systems and is charged with pressure transfer and component protection. It fails when it stops performing one of its tasks. When a fluid becomes oxidized, its resistance to flow is greater and it decreases its ability to protect components and transfer pressure. The more common failure mode of PSF is internal and external contamination, and excess particles in fluid promote component wear and can lead to component failures, including seals, shafts and gears.

Most power steering systems work by using a belt driven pump to provide hydraulic pressure to the system. This hydraulic pressure is generated by a rotary-vane pump which is driven by the vehicle's engine. As the speed of the engine increases, the pressure in the hydraulic fluid also increases, hence a relief valve is incorporated into the system to allow excess pressure to be bled away. Some of the hydraulic systems also include an electronic pressure valve which can reduce the hydraulic pressure of the power steering lines as the vehicle's speed increases (Variable assist power steering).

Electric Power Steering uses sensors to detect the motion and torque of the steering column and a computer module applies electric motor to provide power assist. This allows variable assist power steering to be applied depending on driving conditions. In the event of component failure, a mechanical linkage such as a rack and pinion serves as a back-up in a manner similar to that of hydraulic systems. Electric power steering is usually limited to smaller vehicles rather than trucks and SUVs. Electric systems have a significant advantage in fuel efficiency because there is no hydraulic pump constantly running, whether assistance is required or not.

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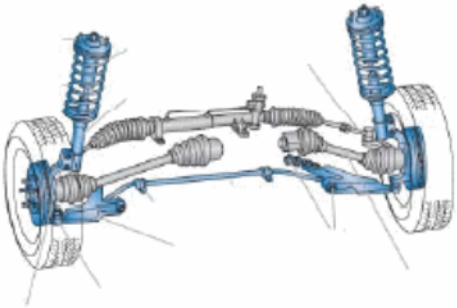

Fig. 9: Typical Front Suspension & Steering Components

WIPER BLADES

Worn wiper blades are dangerous. Ozone, airborne contaminants, oil, sunlight and dirt all act to weaken and reduce your wiper blades' ability to keep your view unobstructed. And exposure to sunlight and ozone cause the wiper blades to age, even if they're not used much. Weather also plays a critical role in your windshield wiper blades' deterioration. Freezing temperatures make the rubber in your wiper blades hard and brittle, which increases their tendency to crack or tear. Hot weather warps the rubber and prevents the blade from wiping your windshield cleanly.

Heavy use is hard on the wipers because dust, abrasives, road grime and bug juice wear away the cutting edge the blade needs to wipe cleanly. Even road dirt acts like an abrasive to wear away the flat surface necessary for a good squeegee effect. Rubber also deteriorates over time. As blades age, they lose their flexibility and are less able to wipe cleanly. They may develop a permanent set or curvature, which prevents full contact with your windshield.

A wiper blades ability to clean the glass depends on:

> The slope and area of the windshield: Windshields are sloped for improved aerodynamics and a "cab-forward" windshield with a lot of surface area directs more wind against the wipers, and can force the blades away from the windshield at high speeds unless the wiper system is designed to resist lift.
>
> The amount of spring tension on the wiper arm: This is important to keep the wiper blade in tight contact with the windshield and provide a squeegee effect.
>
> The number of pressure points or claws holding the blade: The more claws a blade has, the broader the area over which the pressure of the wiper arm is spread. More claws also provide increased flexibility so the blade can more easily follow the curvature of a large, sloping windshield for full side-to-side contact.

ROUTINE INSPECTION CHECKSHEET

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MOTORIST ASSURANCE PROGRAM

STANDARDS FOR AUTOMOTIVE REPAIR

QUALIFIED

MOTORIST ASSURANCE PROGRAM

STANDARDS FOR AUTOMOTIVE REPAIR

PARTICIPATING FACILITY

ROUTINE INSPECTION 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 AMRA/MAP*

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

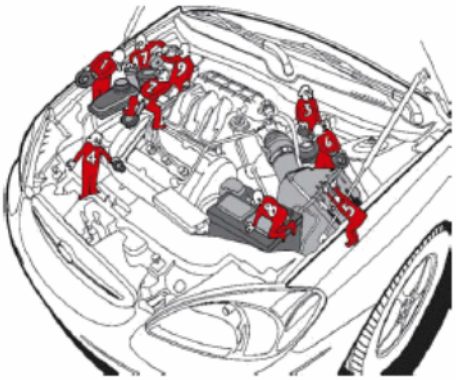
DISCLAIMER: This document may be used as a guide when performing vehicle inspection. This form is not to be used as an estimate form and may not comply with Local or State Laws. The Motorist Assurance Program is not responsible for the performance and accuracy of the motor vehicle inspection performed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

Fig. 10: Routine Inspection Checksheet (1 Of 2)

State Inspection Due___/___ **ROUTINE INSPECTION CHECKSHEET**

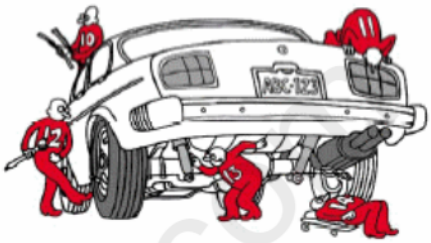
UNDERHOOD				
Component	OK	S	R	Condition
Coolant				
Coolant Hoses				
Belts (Except Timing Belt)				
Tensioner				
Transmission Fluid				
Engine Oil				
Engine Air Filter				
Cabin Air Filter				
Brake Fluid				
Clutch Fluid (M/T)				
Washer Fluid				
Battery				
Battery Hold Down				
Battery Box				
Battery Cables / Ends				
Power Steering Fluid				
Wiper Blades				
UNDER VEHICLE				
Shocks / Struts				
Exhaust				

Notes: _____



1. Coolant
2. Belts
3. Transmission Fluid
4. Engine Oil
5. Air Filter
6. Brake Fluid
7. Washer Fluid
8. Battery
9. Power Steering Fluid

Lights/Lamps	OK	S	R	Location
Headlights				
Parking				
Turn Signal				
Brake				
License Plate				



10. Wiper Blades
11. Lights
12. Tire Pressure
13. Shocks / Struts
14. Exhaust

CHECK TIRES

Tire Size (Placard) _____ Actual _____ TPMS Warning On ___ Off ___ n/a___

Tire Pressure			Wear Pattern / Damage			
Front Spec: _____	Before	After	OK	S	R	Wear Type
Left Front						
Right Front						
Rear Spec: _____						
Left Rear						
Right Rear						
Spare Tire						

Wear Type
1.) Edge wear
2.) Cupped
3.) Cut
4.) Irregular wear
5.) Other _____

Tread Depth	Left Front	Right Front	Left Rear	Right Rear

OK	Suggested 1, 2, 3, 4, 5	Required A, B, C

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Fig. 11: Routine Inspection Checksheet (2 Of 2)

ROUTINE INSPECTION - UICS

BRAKE SYSTEMS

NOTE: Some states may have specifications that differ from OEM. Check your local/state regulations. Where state or local laws are stricter, they take precedence over these guidelines.

BRAKE FLUID

NOTE: Most manufacturers prohibit the use of DOT 5 brake fluid in a system equipped with ABS. DOT 3, DOT 4, and DOT 5.1 brake fluids are clear or light amber in color. DOT 5 brake fluid is violet in color. Correct fluid type is normally stamped on the master cylinder cover.

NOTE: Fluid Flush - a process using a sufficient volume of fluid to help remove

contaminants and replacing the contaminated fluid with new fluid of the same type and specification. At times a chemical may be used to enhance removal.

NOTE: **Fluid Exchange/Replace - draining (evacuating) old fluid and replacing it with new fluid of the correct type and specification.**

Condition	Code	Procedure
At or beyond OEM service interval	3	Suggest fluid exchange/replacement
Brake fluid type incorrect	B	Require flushing and refilling
NOTE: **For example, DOT fluid lower than specified for the vehicle or silicone brake fluid (DOT 5) in an ABS system**		
Contaminated, for example, fluid other than brake fluid present	A	Require service
NOTE: **If a fluid other than brake fluid is present in the brake system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		
Contaminated, for example, fluid other than brake fluid present	B	Require service
NOTE: **If a fluid other than brake fluid is present in the brake system which DOES NOT affect the rubber parts, the required service is to flush and fill with the correct brake fluid.**		
Corrosion inhibitors depleted	B	Require fluid exchange/replacement
NOTE: **A copper content of 200 ppm or greater indicates a depletion of corrosion inhibitors in the brake fluid.**		
Fluid discolored	No Service Suggested or Required	
NOTE: **Further testing necessary to determine condition of fluid.**		
Hydraulic component overhaul or replacement	3	Suggest flushing and refilling
Rubber master cylinder cover gasket distorted and gummy	A	Require replacement of gasket
NOTE: **This condition may indicate contaminated brake fluid. Further inspection required.**		

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BULBS AND LEDS

NOTE: **Does not include soldered-in components.**

Condition	Code	Procedure

Condition	Code	Procedure
Application incorrect	B	Require replacement
NOTE: **Application incorrect includes wrong bulb coating or color.**		
Base burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base corroded, affecting performance	A	Require repair or replacement
Base corroded, not affecting performance	2	Suggest repair or replacement
Base loose, affecting performance	B	Require repair or replacement
Base loose, not affecting performance	1	Suggest repair or replacement
Burned out	A	Require replacement
Intermittent	A	Require replacement
Missing	C	Require replacement
Seized in socket	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
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

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HOSES

Condition	Code	Procedure
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
Blistered	B	Require replacement
Expansion affecting performance	A	Require Replacement
Fitting threads damaged	A	Require repair or replacement
Fitting threads stripped (threads missing)	A	Require replacement
Incorrectly secured	B	Require repair
Inner fabric (webbing) cut	B	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Outer covering is cracked to the extent that inner fabric of hose is visible	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly	B	Require repair

LENSES

Condition	Code	Procedure
Application incorrect	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
Broken, affecting performance	A	Require replacement
Broken, not affecting performance	No Service Suggested or Required	
Cracked	B	Require replacement
Discolored	A	Require replacement
Leaking	B	Require repair or replacement
Melted, affecting performance	A	Require replacement
Melted, not affecting performance	2	Suggest replacement
Missing	C	Require replacement

LUG NUT

Condition	Code	Procedure
Lug nut flats rounded	A	Require replacement of nut
Lug nut installed backward	B	Require repair
Lug nut mating surface dished	A	Require replacement of nut
Lug nut mating type incorrect	B	Require replacement of nut
Lug nut seized	A	Require replacement of nut and/or stud
Stud incorrect	B	Require replacement of stud
Threads damaged	A	Require repair or replacement of component with damaged threads
Threads stripped (threads missing)	A	Require replacement of component with stripped threads

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MASTER CYLINDER COVER GASKET

Condition	Code	Procedure
Rubber master cylinder cover gasket distorted and gummy	A	Require replacement of the gasket
NOTE: **This condition may indicate contaminated brake fluid. See Brake Fluid.**		

PARKING BRAKE CABLE

Condition	Code	Procedure
Cable improperly adjusted	B	Require cable adjustment
Cable or individual wires in the cable are broken	A	Require replacement of cable assembly
Cable sticking	A	Require cable lubrication
Cable stuck inside conduit and cannot be lubricated so that parking brake functions properly	A	Require replacement of cable assembly

VACUUM HOSES

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
Blistered	B	Require replacement
Fitting threads damaged	A	Require repair or replacement
Fitting threads stripped (threads missing)	A	Require replacement
Incorrectly secured	B	Require repair
Inner fabric (webbing) cut	B	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Outer covering is cracked to the extent that inner fabric of hose is visible	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly	B	Require repair

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WHEEL ATTACHMENT HARDWARE

NOTE: **For conditions noted below, also check condition of wheel stud holes. Proper lug nut torque is essential. Follow manufacturer's torque specifications and tightening sequence. DO NOT lubricate threads unless specified by the vehicle manufacturer.**

Condition	Code	Procedure
Bent	A	Require replacement
Broken	A	Require replacement

Condition	Code	Procedure
NOTE: **Some manufacturers require replacement of all studs on any wheel if two or more studs or nuts on the same wheel are broken or missing.**		
Loose	A	Require repair or replacement of affected component
Lug nut flats rounded	A	Require replacement of nut
Lug nut installed backward	B	Require repair
Lug nut mating surface dished	A	Require replacement of nut
Lug nut mating type incorrect	B	Require replacement of nut
Lug nut seized	A	Require replacement of nut and/or stud
Stud incorrect	B	Require replacement of stud
Threads damaged	A	Require repair or replacement of component with damaged threads
Threads stripped (threads missing)	A	Require replacement of component with stripped threads

WHEEL BEARINGS, RACES AND SEALS

NOTE: **When replacing or repacking wheel bearings, grease seal replacement is required. You are not required to replace these components in axle sets. Determine the need to replace based upon the individual component conditions.**

Condition	Code	Procedure
Axle seal on drive axle leaking	A	Require replacement of seal and inspection of axle, bearing, housing, and vent tube
Bearing end-play exceeds specifications	B	Require adjustment of bearing, if possible If proper adjustment cannot be obtained, require replacement of bearing and race assembly
Bearing rollers, balls or races are worn, pitted, or feel rough when rotated as an assembly or other damage affecting performance.	B	Require replacement of bearing and race assembly
Seal leaking	A	Require replacement of seal and inspection of bearings
NOTE: **Require inspection of mating and sealing surface and repair or replace as necessary. Check vent. A plugged vent may force fluid past the seal.**		
Seal missing	C	Require replacement

DRIVETRAIN AND TRANSMISSION

NOTE: **When a procedure states that a required or suggested repair or replacement is recommended, the basis for the recommendation MUST be explained to the customer. If the customer asks whether there are alternatives to the recommendation, generally acceptable repair/replacement options must be explained, whether performed or not by the shop.**

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NOTE: **Whenever transmission or drive-train service is performed that affects the suspension alignment, for example, removing the engine cradle, it is required that the alignment be checked and corrected if necessary.**

NOTE: **The conditions listed for the components included in this section assume that the problem has been isolated to the specific component through proper testing.**

AUTOMATIC TRANSMISSION FLUID

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
Burned	Further inspection required	
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	No Service Suggested or Required	
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Varnish deposits present on system components affecting performance	Further inspection required	

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CLUTCH MASTER CYLINDERS

Condition	Code	Procedure
Cover gasket distorted	A	Require replacement of cover gasket
Cover gasket gummy	A	Require replacement of cover gasket
NOTE: **This condition may indicate contaminated fluid. Further inspection required.**		
Cylinder leaking fluid from rear of bore	A	Require repair or replacement
Cylinder leaking fluid internally	A	Require replacement
Dust boot missing	C	Require replacement of dust boot
Dust boot punctured	A	Require replacement of dust boot
Dust boot torn	A	Require replacement of dust boot
Fluid level incorrect	B	Require fluid level adjustment
Housing damaged, affecting performance	A	Require repair or replacement
Master cylinder has residue in reservoir	2	Further inspection required
NOTE: **Do not replace master cylinder unless it exhibits conditions listed for replacement.**		
Pushrod out of adjustment	B	Require Repair or Replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

COOLER LINES

Condition	Code	Procedure
Abrasion damage, affecting structural integrity	A	Require repair or replacement
Abrasion damage, not affecting structural integrity	No Service Suggested or Required	
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
Clamp corroded, not reusable	1	Suggest replacement
NOTE: **If clamp removed, require replacement.**		
Connected incorrectly	A	Require repair
Corroded, affecting structural integrity	A	Require replacement
Corroded, not affecting structural integrity	No Service Suggested or Required	
Cracked	B	Require repair or replacement

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Condition	Code	Procedure
Fitting type incorrect (such as compression fitting)	B	Require replacement
Flange leaking	A	Require repair or 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 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
Routed incorrectly	B	Require repair
Swollen	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

COOLERS

Condition	Code	Procedure
Air flow obstruction	A	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
Connection leaking	A	Require repair or replacement
Contaminated	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	No Service Suggested or Required	
Internal restrictions	B	Require repair or replacement
Leaking	A	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	No Service Suggested or Required	

DIFFERENTIAL FLUID

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement

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Condition	Code	Procedure
NOTE: **Determine and correct cause.**		
Burned	Further inspection required	
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	No Service Suggested or Required	
NOTE: **Further testing necessary to determine condition of fluid.**		
fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Rubber master/ clutch cylinder cover gasket distorted or gummy	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Varnish deposits present on system components affecting performance	Further inspection required	

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DRAIN PLUGS AND GASKETS

Condition	Code	Procedure
Leaking	A	Require repair or replacement

Condition	Code	Procedure
NOTE: **Require inspection of mating and sealing surface and repair or replace as necessary.**		
Missing	C	Require replacement
Threads Damaged	A	Require repair or replacement

FILTERS AND SCREENS

Condition	Code	Procedure
At service interval	3	Suggest replacement
Bent, affecting performance	A	Require repair or replacement
Exceeding service interval	3	Suggest replacement
Missing	C	Require replacement
Near service interval	3	Suggest replacement
Restricted	A	Require repair or replacement
NOTE: **Further inspection may be required to determine the source of restriction or contamination.**		
Torn	A	Require replacement
Worn, affecting performance (metal or nylon screen type)	A	Require repair or replacement

FLUIDS AND LUBRICANTS

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
Burned	Further inspection required	
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		

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Condition	Code	Procedure
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	No Service Suggested or Required	
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Rubber master/ clutch cylinder cover gasket distorted or gummy	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Varnish deposits present on system components affecting performance	Further inspection required	

HOSES, LINES, AND TUBES

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 line or tube	A	Require replacement
Hard hose	1	Suggest 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	2	Suggest replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Routed incorrectly	2	Suggest replacement
Safety clip missing	C	Require replacement
Spongy	1	Suggest repair or replacement

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Condition	Code	Procedure
Stripped	A	Require replacement
Surface cracked (weather-checked)	1	Suggest repair or replacement
Swollen	B	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	1	Suggest repair or replacement

HYDRAULIC FLUID

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
Burned	Further inspection required	
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	No Service Suggested or Required	
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Rubber master/ clutch cylinder cover gasket distorted or gummy	A	Require service

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Condition	Code	Procedure
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Varnish deposits present on system components affecting performance	Further inspection required	

LUBRICANTS

Condition	Code	Procedure
Additive Depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
At service interval	3	Suggest replacement
Beyond service interval	3	Suggest replacement
Burned	Further inspection required	
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correctly specified hydraulic fluid.**		
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Near service interval	3	Suggest replacement
Oxidized	A	Require replacement of fluid
Rubber master cylinder cover gasket distorted and gummy	A	Require service
NOTE: **If a fluid other than brake fluid is present in the system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		

MANUAL TRANSMISSION FLUID

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement

Condition	Code	Procedure
NOTE: **Determine and correct cause.**		
Burned	Further inspection required	
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	No Service Suggested or Required	
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid discolored	No Service Suggested or Required	
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Rubber master/ clutch cylinder cover gasket distorted or gummy	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Varnish deposits present on system components affecting performance	Further inspection required	

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MOUNTS (ENGINE, TRANSAXLE AND TRANSMISSION)

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	No Service Suggested or Required	
Rubber deteriorated, affecting performance	A	Require replacement
Rubber deteriorated, not affecting performance	No Service Suggested or Required	
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

TRANSFER CASE FLUID

Condition	Code	Procedure
Additive depletion	A	Require replacement of fluid
Application incorrect	B	Require replacement
NOTE: **Determine and correct cause.**		
Burned	Further inspection required	
NOTE: **Fluid that is burned indicates a serious problem. Determine and correct the cause.**		
Contaminated, for example, fluid other than the specified fluid present	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct brake fluid.**		
Contaminated, for example, fluid other than the specified fluid present	B	Require service
NOTE: **If a fluid other than the specified fluid is present in the hydraulic system which DOES NOT affect the rubber parts, the required service is to flush and fill following OEM specified procedure with the correct hydraulic fluid.**		
Fluid at or beyond service interval	3	Suggest replacement
Fluid discolored	No Service Suggested or Required	

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Condition	Code	Procedure
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid incorrect	B	Require service
NOTE: **If a fluid other than the correctly specified fluid is present in the hydraulic system, the required service is to flush and fill with the correct hydraulic fluid.**		
Level incorrect	B	Require correction of fluid level
Oxidized	A	Require replacement of fluid
Rubber master/ clutch cylinder cover gasket distorted or gummy	A	Require service
NOTE: **If an incorrect fluid is present in the hydraulic system which DOES affect the rubber parts, the required service is to: 1) remove all components having rubber parts from the system, 2) flush lines, 3) repair or replace all components having rubber parts, and 4) fill with correct fluid.**		
Varnish deposits present on system components affecting performance	Further inspection required	

VACUUM HOSES

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 line or tube	A	Require replacement
Hard hose	1	Suggest 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, affecting performance	B	Require 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	Suggest replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Routed incorrectly	B	Suggest replacement
Safety clip missing	C	Require replacement
Spongy	1	Suggest repair or replacement
Stripped	A	Require replacement
Surface cracked (weather-checked)	1	Suggest repair or replacement

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Condition	Code	Procedure
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

ELECTRICAL SYSTEMS

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 0Ã‚Â° F (-17.8Ã‚Â° 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 32Ã‚Â° F (0Ã‚Â° C) can deliver for 30 seconds and maintain at least a voltage of 1.2 volts per cell (7.2 volts for a 12volt battery).

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

Condition	Code	Procedure
Battery frozen	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
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

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Condition	Code	Procedure
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
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

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Condition	Code	Procedure
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

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

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Condition	Code	Procedure
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 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	No Service Suggested or Required	
Broken, affecting performance	A	Require repair or replacement
Broken, not affecting performance	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
Water drain clogged	A	Require repair

BULBS, SEALED BEAMS AND LEDS

NOTE: **Does not include soldered-in components.**

Condition	Code	Procedure
Adjustment out of specification	B	Require repair or replacement
Application incorrect	B	Require replacement

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Condition	Code	Procedure
NOTE: **Application incorrect includes wrong bulb coating or color.**		
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
Base burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base corroded, affecting performance	A	Require repair or replacement
Base corroded, not affecting performance	2	Suggest repair or replacement
Base leaking	A	Require repair or replacement
Base loose, affecting performance	B	Require repair or replacement
Base loose, not affecting performance	1	Suggest repair or replacement
Base melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	No Service Suggested or Required	
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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
Burned out	A	Require replacement

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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
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Cracked	B	Require replacement
Intermittent	A	Require replacement
Lamp base melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Seized in socket	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
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

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FUSES, FUSIBLE LINKS AND CIRCUIT BREAKERS

Condition	Code	Procedure
Application incorrect	B	Require replacement
Blown	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Corroded, affecting performance	A	Require repair or replacement

Condition	Code	Procedure
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
Inoperative	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Insulation damaged, conductors exposed	A	Require repair or replacement
Insulation damaged, conductors not exposed	1	Suggest replacement
Missing	C	Require replacement
Routed incorrectly	B	Require repair
Secured incorrectly	B	Require repair
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation.**		
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

GROUND CABLES AND STRAPS

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
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Insulation damaged, exposing conductors	2	Suggest replacement
Loose	A	Require repair
Missing	C	Require replacement
Open	A	Require repair or replacement
Resistance high	A	Require repair or replacement
Terminal resistance (voltage drop) is out of specification	B	Require repair or replacement
Voltage drop out of specification	B	Require repair or replacement

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GROUND STRAPS

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
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Insulation damaged, exposing conductors	2	Suggest replacement
Loose	A	Require repair
Missing	C	Require replacement
Open	A	Require repair or replacement
Resistance high	A	Require repair or replacement
Terminal resistance (voltage drop) is out of specification	B	Require repair or replacement
Voltage drop out of specification	B	Require repair or replacement

LENSES

Condition	Code	Procedure
Adjustment out of specification	B	Require repair
Application incorrect	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
Broken, affecting performance	A	Require replacement
Broken, not affecting performance	No Service Suggested or Required	
Cracked	B	Require replacement
Discolored	A	Require replacement
Leaking	B	Require repair or replacement
Melted, affecting performance	A	Require replacement
Melted, not affecting performance	2	Suggest replacement
Missing	C	Require replacement

SEALED BEAMS

NOTE: **Does not include soldered-in components.**

Condition	Code	Procedure
Adjustment out of specification	B	Require repair or replacement
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware

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Condition	Code	Procedure
Attaching hardware not functioning	A	Require repair or replacement of hardware
Base burned, affecting performance	A	Require repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base burned, not affecting performance	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Base corroded, affecting performance	A	Require repair or replacement
Base corroded, not affecting performance	2	Suggest repair or replacement
Base leaking	A	Require repair or replacement
Base loose, affecting performance	B	Require repair or replacement
Base loose, not affecting performance	1	Suggest repair or replacement
Base melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Bracket bent, affecting performance	A	Require repair or replacement
Bracket bent, not affecting performance	No Service Suggested or Required	
Bracket broken, affecting performance	A	Require replacement
Bracket broken, not affecting performance	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
Burned out	A	Require replacement
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.**		

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Condition	Code	Procedure
Connector missing	C	Require replacement
Corroded, affecting performance	A	Require repair or replacement
Corroded, not affecting performance	2	Suggest repair or replacement
Cracked	B	Require replacement
Intermittent	A	Require replacement
Lamp base melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Seized in socket	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
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

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WASHER 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
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

Condition	Code	Procedure
NOTE: **Inoperative includes intermittent operation.**		
Leaking externally	A	Require repair or replacement
Leaking internally	A	Require repair or replacement
Noisy	2	Suggest repair or 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

WIPER ARMS AND BLADES

NOTE: **Windshield coatings or waxes can cause blades to not function as intended. Clean surface before making final judgment about blade 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
Attaching socket stripped	A	Require replacement
Bent	A	Require repair or replacement
Loose	2	Suggest repair or replacement
Missing	C	Require replacement
Noisy	2	Suggest repair or replacement
Size incorrect	2	Suggest replacement
Tension insufficient	B	Require repair or replacement
Torn	A	Require replacement
Worn, affecting performance	A	Require replacement

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Condition	Code	Procedure
Worn, not affecting performance	1	Suggest replacement

WIPER HOSES AND NOZZLES

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
Blocked	A	Require repair or replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
Oil-soaked (spongy)	1	Suggest replacement
Spray pattern incorrect	2	Suggest repair or replacement
Surface cracks (dry-rotted)	1	Suggest replacement

WIPER PUMP RESERVOIRS

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
Cap missing	C	Require replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement

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.**

ACCESSORY BELTS

Condition	Code	Procedure

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

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Condition	Code	Procedure
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 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

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 0Ã‚Â° F (-17.8Ã‚Â° 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 32Ã‚Â° F (0Ã‚Â° C) can deliver for 30 seconds and maintain at least a voltage of 1.2 volts per cell (7.2 volts for a 12volt battery).

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

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Condition	Code	Procedure
Battery frozen	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

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.

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Condition	Code	Procedure
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
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 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

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Condition	Code	Procedure
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
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

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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

Condition	Code	Procedure
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

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.**

COMBUSTION CHAMBER CLEANING

NOTE: **See CHEMICAL ENGINE DECARBONIZATION.**

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

Condition	Code	Procedure
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
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	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

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
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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 eroded, affecting performance	A	Require repair or replacement
Terminal eroded, not affecting performance	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 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

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 DECARBONIZATION

NOTE: **See CHEMICAL ENGINE DECARBONIZATION.**

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

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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
NOTE: **Determine cause, such as broken motor mount.**		
Leaking	B	Require 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.**		
Fluid discolored	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

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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
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

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Condition	Code	Procedure
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 SYSTEM CLEANING SERVICE

NOTE: See CHEMICAL ENGINE DECARBONIZATION.

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

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Condition	Code	Procedure
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 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

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Condition	Code	Procedure
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

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

INTAKE CLEANING

NOTE: See **CHEMICAL ENGINE DECARBONIZATION**.

O2 SENSORS

Condition	Code	Procedure

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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
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

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Condition	Code	Procedure
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
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 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

RADIATOR CAPS AND PRESSURIZED EXPANSION TANK CAPS

Condition	Code	Procedure
Application incorrect	B	Require replacement

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Condition	Code	Procedure
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

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	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

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

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Condition	Code	Procedure
Thermostat missing	C	Require replacement of thermostat
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require repair or replacement

THROTTLE BODY CLEANING

NOTE: See **CHEMICAL ENGINE DECARBONIZATION**.

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

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

EXHAUST SYSTEMS

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WARNING: **Federal EPA rules prohibit altering an exhaust system in any way that defeats the emission reduction components of a vehicle. Be sure to review and adhere to EPA policy on removing and replacing catalytic converters. Where state or local laws are stricter, they take precedence over these guidelines.**

NOTE: **Some exhaust systems are of a welded design. It is not required that the entire system be replaced. Determine the need to replace individual components based on conditions of component.**

EXHAUST AND TAIL PIPES

Condition	Code	Procedure
Broken bracket	A	Require repair or replacement
Pipe Bent Out Of Position	B	Require repair or replacement
Pipe Broken	A	Require repair or replacement
Pipe Cracked	B	Require repair or replacement
Pipe Leaking	A	Require replacement
Pipe Missing	C	Require replacement
Pipe Plugged	A	Require replacement
Pipe Weak Due To Corrosion, But No Leaks Present	1	Suggest replacement
Weld Broken	A	Require repair or replacement

HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS

NOTE: **AIR CONDITIONING SYSTEM FLUSHING utilizes chemicals or refrigerant to remove oil, debris and contaminants from the evaporator, condenser, hoses or metal lines.**

NOTE: **An INLINE FILTER, both high and low side, protects a/c components from residual debris in the system. An inline filter or suction screen is suggested when a condenser, evaporator, compressor, expansion valve, accumulator/drier, hoses or metal lines is replaced, or if debris is found in the system during an a/c repair. An inline filter is suggested to help prevent future component damage and increase system longevity.**

BELTS

Condition	Code	Procedure
Alignment incorrect	B	Further inspection required
NOTE: **Determine cause of incorrect alignment and require repair.**		
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
Serpentine belt routed incorrectly	B	Require repair
Tension out of specification	B	Require adjustment or replacement
Worn beyond adjustment range	B	Require replacement

Condition	Code	Procedure
Worn so it contacts bottom of pulley	A	Require replacement

CABIN AIR FILTERS

Condition	Code	Procedure
Air flow obstruction	A	Require cleaning or replacement
At or beyond service interval	3	Suggest replacement
Microbial growth causing odor	A	Require replacement of filter
Missing	C	Require replacement

COOLANT

Condition	Code	Procedure
Acidity (pH) incorrect	1	Suggest correction or replacement
At or beyond service interval	3	Suggest replacement
Contaminated	B	Require replacement or recycling. Further inspection required
NOTE: **Determine source of contamination and require correction prior to coolant replacement.**		
Fluid discolored	No Service Suggested or Required	
NOTE: **Further testing necessary to determine condition of fluid.**		
Level incorrect	B	Require filling to proper level
NOTE: **Determine source of incorrect level and suggest repair.**		
Mixture incorrect	B	Require correction or replacement
Type incorrect	B	Require replacement

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EVAPORATOR DRAIN TUBES

Condition	Code	Procedure
Disconnected	A	Require repair
Leaking	A	Require replacement
Missing	C	Require replacement
Restricted	A	Require repair or replacement
Routed incorrectly	B	Require repair

EVAPORATOR FILTERS

Condition	Code	Procedure
Air flow obstruction	A	Require cleaning or replacement
At or beyond service interval	3	Suggest replacement
Microbial growth causing odor	A	Require replacement of filter
Missing	C	Require replacement

IN-LINE FILTERS

Condition	Code	Procedure
Connection leaking	A	Require repair or replacement
Leaking	B	Require repair or replacement
Restricted	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

VACUUM HOSES AND TUBES

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

STEERING AND SUSPENSION, WHEEL ALIGNMENT, WHEELS AND TIRES

NOTE: **Steering and Suspension are complex systems made up of a variety of interdependent components and controls. For proper vehicle handling, ride, and tire wear, a thorough inspection is required whenever suspension work is being performed.**

NOTE: **Listed repair conditions assume that the problem has been isolated to the specific component by proper testing procedures. When replacing steering and/or suspension components which may affect an alignment angle, you are required to check and adjust alignment as needed. Refer to the OEM specifications for both ride height and alignment angle tolerances.**

NOTE: **Improper alignment geometry, and/or improper tire/wheel fitment may affect other systems such as Adaptive Cruise Control, Electronic Stability Control, Electronic Traction Control and Variable Ratio Steering. These systems may require attention after an alignment or suspension service is performed. Care must be taken to identify these vehicles/systems before any repair procedures are performed. Failure to follow OEM guidelines when servicing interrelated systems could result in an unsafe condition.**

CAUTION: **Do not use ride height altering or load compensating components, such as variable rate springs or coil over shocks on vehicles with height sensing or load sensing proportioning- valve equipped braking systems, unless these components are supplied as original equipment.**

HYDRAULIC HOSES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Blistered	B	Require replacement
Fitting threads damaged	A	Require repair or replacement
Fitting threads stripped (threads missing)	A	Require replacement
Inner fabric (webbing) cut	B	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Outer covering is cracked to the extent that inner fabric of hose is visible	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement
Secured incorrectly	B	Require repair

POWER STEERING BELTS

Condition	Code	Procedure
Alignment incorrect	B	Further inspection required
NOTE: **Determine cause of incorrect alignment and require repair.**		
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
Serpentine belt routed incorrectly	B	Require repair
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

POWER STEERING FLUID

Condition	Code	Procedure
50,000 miles or greater on OE fluid (in absence of published manufacturer interval)	5	Suggest Replacement
NOTE: **One time only fluid exchange**		
Additive Depletion	A	Require replacement of fluid
Fluid at or beyond service interval	3	Suggest fluid replacement

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Condition	Code	Procedure
Fluid contaminated (i.e. fluid other than power steering fluid present)	B	Require flushing and refilling of the system
NOTE: **Determine and correct source of contamination. OEM specifications must be followed for fluid type.**		
Fluid discolored	No Service Suggested or Required	
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid level incorrect	B	Require adjustment of fluid level
Fluid type incorrect	B	Require flushing and refilling with correct fluid
Oxidized	A	Require replacement of fluid

POWER STEERING HOSES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Blistered	B	Require replacement
Fitting threads damaged	A	Require repair or replacement
Fitting threads stripped (threads missing)	A	Require replacement
Inner fabric (webbing) cut	B	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Outer covering is cracked to the extent that inner fabric of hose is visible	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement
Secured incorrectly	B	Require repair

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SHOCK ABSORBERS, STRUT CARTRIDGES AND STRUT ASSEMBLIES

NOTE: **You are not required to replace shocks or struts in axle sets. However, when replacing a shock or strut due to the conditions that follow, you may suggest replacement of the other shock or strut on the same axle for one or more of the following: improved performance or preventive maintenance; part is close to the end of its useful life; to extend tire life; to balance ride and handling; or to improve stopping distance. When replacing steering and/or suspension components which may affect an alignment angle, you are required to check and adjust alignment as needed. Refer to the OEM specifications. Under no circumstances should**

a technician bend struts or strut housings. A vehicle's load-carrying and handling abilities are limited by its suspension, tires, brakes, and driveline. Installing coil over shocks or any other load assist device does not increase the vehicle's load capacity. See the vehicle owner's manual for more details. If vehicle is equipped with OEM coil over shocks, apply the conditions for coil springs from the Springs: Coil, Leaf, and Torsion Bar section of the Steering and Suspension guidelines. If the vehicle is equipped with add-on coil over shocks, you may suggest replacement with standard shocks for a spring-related condition.

Condition	Code	Procedure
50,000 miles or greater on OEM Shocks or Struts	1	Suggest Replacement
NOTE: **Applies only to OEM hydraulic fluid and/or gas charged shocks and struts, NOT electronically controlled units.**		
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require replacement
Body dented	A	Further inspection required
NOTE: **Require replacement of units where dents restrict shock or strut piston rod movement. If dents don't restrict movement, no service is suggested or required. Especially critical on mono-tube shocks.**		
Body punctured	A	Require replacement
Brake hose bracket bent	B	Require repair or replacement
Brake hose bracket missing	C	Require replacement
Brake hose bracket threads damaged	A	Require repair or replacement
Brake hose bracket threads stripped (threads missing)	C	Require replacement
Compression bumper missing	C	Require replacement of compression bumper
Compression bumper split	1	Suggest replacement of compression bumper
Damping (none)	A	Require replacement
Dust boot (bellows) missing	C	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of shock or strut (reason code 2). This condition can lead to damage of the piston rod, which causes piston rod seal wear.**		
Dust boot (bellows) split	A	Require replacement of boot

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Condition	Code	Procedure
NOTE: **If boot is not available as a separate component, suggest replacement of shock or strut (reason code 2). This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Dust boot (bellows) torn	A	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of shock or strut (reason code 2). This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Dust shield broken	2	Suggest replacement
NOTE: **This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Dust shield missing	2	Suggest replacement
NOTE: **This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Gland nut (strut housing cap) is not removable using appropriate tool	A	Require replacement of nut and/or housing
NOTE: **Only required if replacing cartridge.**		
Gland nut (strut housing cap) threads damaged	A	Require repair or replacement of nut
Housing dented	A	Further inspection required
NOTE: **Require replacement of units where dents restrict shock or strut piston rod movement. If dents don't restrict movement, no service is suggested or required. Especially critical on mono-tube shocks.**		
Housing punctured	A	Require replacement
Jounce bumper missing	C	Require replacement of jounce bumper
Jounce bumper split	1	Suggest replacement of jounce bumper
Leaking oil, enough for fluid to be running down the body	A	Require replacement
NOTE: **If the strut cartridge has been replaced previously, the oil on the strut housing may be filler oil. The technician must identify the source of the oil.**		
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
Piston rod has surface defect	2	Suggest replacement

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Condition	Code	Procedure
Piston rod threads damaged	A	Require repair or replacement
Piston rod threads stripped (threads missing)	A	Require replacement
Seized	A	Require replacement
Shock missing	C	Require replacement
Strut housing bent	A	Require replacement
Strut housing cap (gland nut) is not removable using appropriate tool	A	Require replacement of nut and/or housing
NOTE: **Only required if replacing cartridge.**		
Strut housing cap (gland nut) threads damaged	A	Require repair or replacement of nut
Strut housing cap (gland nut) threads stripped (threads missing)	A	Require replacement of nut
Strut housing severely corroded, affecting structural integrity	A	Require replacement
Strut housing threads damaged	A	Require repair or replacement
Strut housing threads stripped (threads missing)	A	Require replacement
Tire cupping	A	Further inspection required
NOTE: **Although shocks or struts may have contributed to tire cupping, an inspection is needed of the entire suspension system. If the shock or strut is found to be contributing to the tire cupping, require replacement.**		

STRUT RODS

Condition	Code	Procedure
Adjusting nut seized	A	Require repair or replacement of hardware
NOTE: **Only required if an alignment is being performed and adjustment of the strut in question is required.**		
Attaching (mating) hole oversized	A	Require repair or replacement of bracket or frame
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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Attaching point on bracket or frame corroded, affecting structural integrity	A	Require repair of bracket or frame
Bent, affecting performance	A	Require replacement

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Condition	Code	Procedure
Mating (attaching) hole oversized	A	Require repair or replacement of bracket or frame
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

TIRE PRESSURE MONITORING SYSTEM

NOTE: **A Tire Pressure Monitoring System (TPMS) is designed to detect and alert the driver should the air pressure level in one or more of the vehicle's tires, up to all four tires, fall below the manufacturer's recommended inflation pressure or another pre-set level.**

NOTE: **NHTSA does not consider installation of an aftermarket or replacement tire or rim that is not compatible with the TPMS to be a "make inoperative" situation under 49 U.S.C. 30122, provided that the entity does not disable the TPMS malfunction indicator.**

TIRE PRESSURE 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
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent failure.**		
Loose	B	Require repair or replacement
Missing (Non-OE Wheel and/or Tire Applications)	2	Suggest replacement if appropriate sensor is available
Missing (OE Wheel and Tire Applications)	C	Replacement Reqiuired
Not Responding	Further inspection required	
NOTE: **If sensor does not Wake Up, follow manufacturers recommended diagnostic procedure to determine cause**		

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TIRES

NOTE: **These guidelines do not apply to split rims. Some vehicle manufacturers restrict replacement of tires to specific brands, types, or sizes. High pressure temporary compact spare tires should not be used with any other rims or wheels, nor should standard tires, snow tires, wheel covers, or trim rings be used with high pressure compact spare rims or wheels. Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death. Only specially trained persons should de-mount or mount tires. Explosions of tire and wheel assembly can result from improper mounting, possibly causing serious injury or death. Consult the vehicle owner's manual or vehicle placard for correct size, speed rating, designation, and cold inflation pressure of the original tires. Do not exceed the maximum load or inflation capacity of the tire specified by the Tire and Rim Association When replacing tires, it is suggested that the replacement tires match or**

exceed the OEM speed rating designation. If tires of different speed rating designations are mixed on the same vehicle, the tires may vary in handling characteristics. Do not mix different speed rating designations on the same axle. Do not mix radials with non-radial tires on the same axle, as this may affect vehicle handling and stability. If radial tires and bias or bias-belted ply tires are mixed on the same vehicle, the radials must be on the rear. High-pressure temporary compact spare tires are exempt from this rule. Do not mix size or type (Run Flat, all season, performance, mud and snow) of tires on the same axle. If any flammable emergency tire inflation product has been used on a tire, consult inflation product, manufacturer's product information label for tire deflation procedures to avoid possible serious injury or death. In some vehicles, changing the tire diameter from factory-equipped size can affect drive ability, as well as the performance of ABS and other vehicle systems. Consult the vehicle manufacturer's specifications.

Condition	Code	Procedure
Air pressure incorrect	B	Require repair
Bead broken	A	Require replacement
Bead leaking, caused by tire	A	Require repair or replacement
Bead wire/cord exposed	A	Require replacement
Cord or belt material exposed	A	Require replacement
Cord ply separations	A	Require replacement
Directional/asymmetrical tires mounted incorrectly	B	Require remounting and/or repositioning
Irregular tread wear, affecting performance	2	Suggest replacement
NOTE: **Determine and correct cause of irregular tire wear.**		
Load ratings less than OEM specifications	B	Require replacement
Mixed tread types (all season, performance, mud and snow) on same axle	A	Require replacement
Number of punctures exceeds manufacturer's limit	B	Require replacement
Out of balance	B	Require rebalance of tire/wheel assembly
Ply separation	A	Require replacement
Pull or lead, caused by tire	A	Require repair or replacement
Radial and bias or bias-belted ply tires on same axle	B	Require repair or replacement
Radials are on the front and not on the rear	B	Require repair or replacement
NOTE: **If radials and bias or bias-belted ply tires are on the same vehicle, the radials must be on the rear axle, except for high-pressure temporary spares.**		
Run flat damage	A	Require replacement
Shoulder cut	A	Require replacement
Shoulder puncture	A	Require replacement
Shoulder with plug	A	Require replacement
Sidewall bulge	A	Require replacement
Sidewall cut	A	Require replacement
Sidewall indentation	No service required or suggested	

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Condition	Code	Procedure
Sidewall puncture	A	Require replacement
Sidewall with plug	A	Require replacement
Speed rating designations different on same axle	2	Suggest rotation or replacement
Tire and wheel assembly has excessive run-out	B	Require repair or replacement of appropriate part
NOTE: **Excessive is defined as enough to contribute to performance problems. Match mounting may correct run-out. If not, require replacement of appropriate part. Refer to manufacturer's specifications.**		
Tires with excessive diameter difference on an all-wheel drive vehicle or four-wheel drive vehicle	B	Require replacement
NOTE: **Excessive diameter difference is defined as exceeding manufacturer's specifications or, if no manufacturer's specifications exist, with more than 1/4"" diameter difference.**		
Tires with excessive diameter difference on the same side of a dual-wheel application	B	Require replacement
NOTE: **Excessive diameter difference is defined as exceeding manufacturer's specifications or, if no manufacturer's specifications exist, with more than 1/4"" diameter difference.**		
Tread area puncture larger in diameter than manufacturer's specifications	B	Require replacement
Tread missing pieces (chunking), exposing cord	A	Require replacement
Tread missing pieces (chunking), not exposing cord	1	Suggest replacement
Tread separations	A	Require replacement
Tube in tubeless tire	3	Suggest removal of tube
NOTE: **Most manufacturers do not recommend tubes in tubeless tires. Inspect tire and wheel . Assembly to determine the reason for a tube in tubeless tire. Recommendation for repair or replacement should be based upon condition of tires and! Or wheel listed in these guidelines.**		
Weather-checking	No service required or suggested	
Worn to tread wear indicators	B	Require replacement

VALVE STEMS

NOTE: **Most tire manufacturers suggest replacement of non-TPMS valve stems any time a new tire is installed. For TPMS valve stems, the manufacturer may require replacement of the valve stem, o-ring seals, washers, gaskets, valve cores, compression washers and/or locking nut.**

Condition	Code	Procedure
Bent	2	Suggest replacement
Broken	A	Require replacement

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Condition	Code	Procedure
Cap seized	A	Require repair or replacement
Cut, but not leaking	1	Suggest replacement
Deteriorated (cracking, dry rot)	1	Suggest replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
O-Ring leaking	A	Require replacement of O-Ring
Threads damaged	A	Require repair or replacement
Threads stripped	A	Require replacement
Valve cap missing	C	Require replacement of cap

WHEEL ATTACHMENT HARDWARE

NOTE: **For conditions noted below, also check condition of wheel stud holes. Proper lug nut torque is essential. Follow recommended torque specifications and tightening sequence. DO NOT lubricate threads unless specified by the vehicle manufacturer.**

Condition	Code	Procedure
Bent	A	Require replacement
Broken	A	Require replacement
NOTE: **Some manufacturers require replacement of all studs on that wheel if two or more studs or nuts on the same wheel are broken or missing.**		
Locking lug nut locking groove damaged	A	Require replacement
Loose	A	Require repair or replacement of affected component
Lug nut installed backward	B	Require repair or replacement
Lug nut mating surface distorted	A	Require replacement of nut
Lug nut mating type incorrect	B	Require replacement of nut
Lug nut missing	C	Require replacement
Lug nut rounded	A	Require replacement of nut
NOTE: **Only required if removing wheel.**		
Lug nut seized	A	Require replacement of nut
NOTE: **Only required if removing wheel.**		
Stud incorrect	B	Require replacement of stud
Stud missing	C	Require replacement
Threads damaged	A	Require repair or replacement of component with damaged threads
Threads stripped	A	Require replacement of component with stripped threads

WHEEL BEARINGS, RACES AND SEALS

NOTE: **When replacing or repacking wheel bearings, grease seal replacement is required. You are not required to replace these components in axle sets.**

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Determine the need to replace based upon the individual component conditions that follow.

Condition	Code	Procedure
Axle seal on drive axle leaking	A	Require replacement of seal and inspection of axle, bearing, housing, and vent tube
Bearing end-play exceeds specifications	B	Require adjustment of bearing, if possible If proper adjustment cannot be obtained, require replacement of bearing and race assembly
Bearing rollers, balls or races are worn, pitted, or feel rough when rotated as an assembly or other damage affecting performance.	B	Require replacement of bearing and race assembly
Seal leaking	A	Require replacement of seal and inspection of bearings
NOTE: **Require inspection of mating and sealing surface and repair or replace as necessary. Check vent. A plugged vent may force fluid past the seal.**		
Seal missing	C	Require replacement

WHEEL & TIRE SUPPLEMENT

Steering and suspension are complex systems made up of a variety of interdependent components. For proper vehicle handling, ride, and tire wear, a thorough inspection is required whenever suspension work is being performed. Conditions listed assume that the problem has been isolated to the specific component by proper testing procedures.

NOTE: **When replacing steering and/or suspension components that may affect an alignment angle, you are required to check and adjust alignment as needed. Refer to the OEM specifications.**

CAUTION: **Do not use ride height altering or load compensating components, such as variable rate springs and coil over shocks, on vehicles with height or load sensing proportioning valve-equipped braking systems, unless these components are original equipment.**

NOTE: **Depending on the air suspension design, there are some aftermarket products available to eliminate the air ride suspension on certain vehicles. If the system has been eliminated with one of these products, then no service is suggested or required.**

WARNING: **These guidelines do not apply to split rims.**

TIRES

When replacing tires, it is suggested that the replacement tires match or exceed the OEM speed rating designation. If tires of different speed rating designations are mixed on the same vehicle, the tires may vary in handling characteristics. Do not mix different speed rating designations on the same axle.

Consult the vehicle owner's manual or vehicle placard for correct tire size, service description, load index, speed rating and cold inflation pressure of the original tires. Do not exceed the maximum load or inflation capacity of the tire specified by the Tire and Rim Association (www.us-tra.org)

When replacing fewer than ALL tires on a vehicle, follow the vehicle manufacturer's recommendations as to the placement of the new tires. If it is not possible to follow the vehicle manufacturer's tire replacement recommendations, remember to replace tires on the same axle with the same size, construction, speed rating, and, if possible, similar tread pattern.

Do not mix radials with non-radial tires on the same axle, as this may affect vehicle handling and stability. If radial tires and non-radial tires are mixed on the same vehicle, the radials must be on the rear. If radial and non-radial tires are used on a vehicle equipped with dual rear tires, radial tires may be used on either axle. High-pressure temporary compact spare tires are exempt from this rule.

Do not mix size or type (all season, performance, mud and snow) of tires on the same axle. When replacing only two tires on front or rear drive vehicles, follow the vehicle manufacturer's recommendations concerning placement. If it is not possible to follow OE recommendations, it is preferable to place the two new tires on the rear for greater stability, greater adhesion affecting steering -- on other than dry pavement -- and overall safety, regardless of whether the vehicle is front or rear wheel drive.

It is particularly important to match all tire sizes and constructions on 4-wheel (4x4) and all-wheel (AWD) drive vehicles unless otherwise specified by vehicle manufacturer. Ideally, all four tires should be replaced at the same time. Some vehicle manufacturers restrict replacement of tires to specific brands, types, or sizes.

MOUNTING TIRES

Only specially trained persons should de-mount or mount tires. Explosions of tire and wheel assembly can result from improper mounting, possibly causing serious injury or death. High pressure temporary compact spare tires should not be used with any other rims or wheels, nor should standard tires, snow tires, wheel covers, or trim rings be used with high pressure compact spare rims or wheels.

Mount tires only on same or approved rim widths.

Attempting to mount a tire of one diameter on a wheel of a different diameter , bead taper or flange type may result in serious injury or death.

If any flammable emergency tire inflation product has been used in a tire, consult inflation product manufacturer's product information label for tire deflation procedures to avoid possible serious injury or death.

VEHICLE TIRE PLACARD

Since 1968, cars and light trucks sold in the United States have been required to have a tire information sticker, called a vehicle tire placard. The vehicle tire placard indicates the size of the original equipment tires (including the spare), cold inflation pressure for the tires on both axles as well as the spare, and load index or range. Depending on the vehicle, the vehicle tire placard will either be located on the edge of any door, the doorpost, glove box, fuel door or inside trunk lid. If the tire placard is missing, consult the owner's manual, vehicle manufacturer, or tire manufacturer regarding applicable tire information.

Always refer to the vehicle manufacturer's recommendations before replacing tires. Tires should always be replaced with the same size designation, or approved options, as recommended. Never choose a smaller size with less load carrying capacity than the size on the tire placard. (Some vehicle manufacturers require different-sized tires for either the front or rear axles.)

NOTE: **It is not always possible to select a replacement tire with exactly the same size as shown on the placard. Consult with a vehicle or tire manufacturer for replacement recommendations.**

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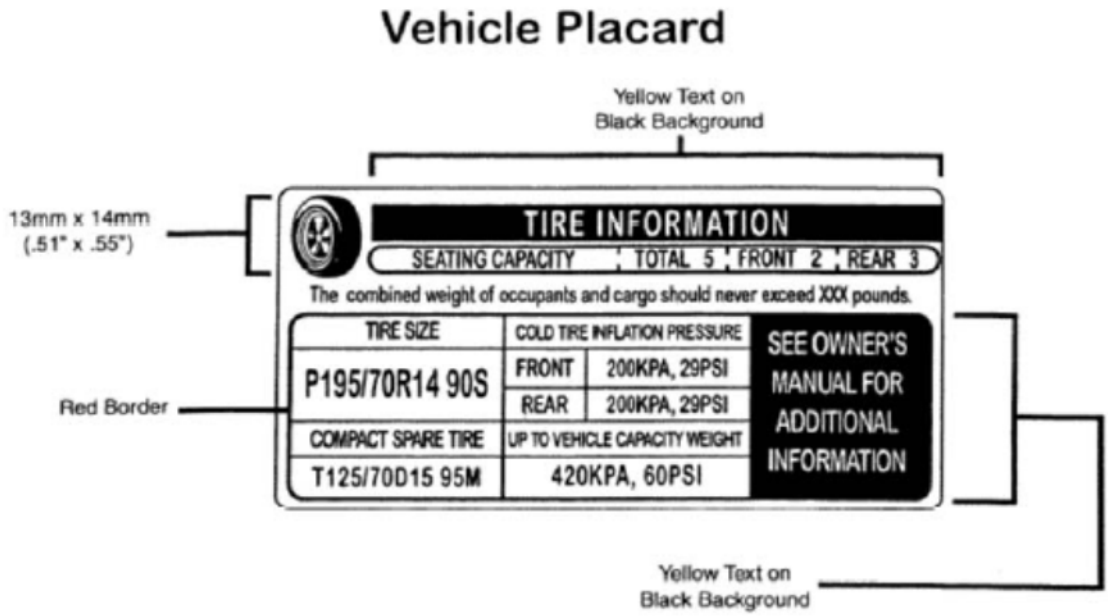

Fig. 12: Vehicle Tire Placard - Typical

TIRE ROTATION

The front tires on most vehicles tend to wear out faster than the rear tires. This is due to the effects of steering the vehicle and the weight transfer that occurs during braking. To ensure that all four tires wear evenly, it is important to rotate them on a regular basis. Tire rotation helps maintain balanced handling because it allows all four tires to wear at the same rate. Keep in mind, as tire wear reduces tread depth, it increases the tires' response to driver inputs. Consequently, by equalizing tire wear at all four corners, dry road performance is actually enhanced. Another advantage of regular rotation is that it allows the tires to be replaced in complete sets rather than in pairs. This maintains handling continuity. It also enables drivers to take advantage of the latest in tire technology, instead of trying to match a pair of older tires.

Most manufacturers list rotation intervals in the scheduled maintenance section of the vehicle service manual and/or the owner's manual. Tire rotation patterns can also be found in these books. If this information is unavailable for a particular vehicle, rotate the tires every 5-7,000 miles following the appropriate rotation sequence shown in the illustrations. After completing a tire rotation, be sure to reset inflation pressures to the manufacturer's recommended specifications indicated on the vehicle tire placard.

To ensure that the proper amount of clamping force is applied to each fastener, follow these guidelines:

- Make sure the area around the lug holes, as well as the wheel and hub mating surfaces are clean and dry. A wire brush can be used to remove corrosion and other debris. Wipe the areas clean using a shop rag.
- Inspect the bolt holes for damage. Do not use a wheel if the bolt holes are deformed.
- Inspect the wheel studs and lug nuts or lug bolts and bolt holes (depending on the vehicle) for damage. Replace or repair any damaged or worn components.
- Always follow a star pattern when tightening lugs.

WHEEL LUG NUT TORQUE & CLAMPING FORCE

Although proper wheel lug nut torque is important, it does not guarantee that the required clamping force will be achieved. For example, excessive corrosion on the wheel and hub mating surfaces will result in improper clamping force, even when the lugs are tightened with a calibrated torque wrench. Low clamping force can also occur if the threads are dirty. This is because dirt causes interference between the mating threads. As a result, the torque wrench will register the correct reading but the clamping force will be inadequate. To improve the chances of achieving the precise clamping force between the wheel and hub, proper torque must be applied to clean components in good condition. Specifications for wheel lug nut torque can be found in the `Tire and Wheel' section of most vehicle

service manuals. When specifications are indicated as a range, adjust the torque wrench to the middle of the range to compensate for normal variations in tool calibration.

POPULAR TIRE ROTATION PATTERNS

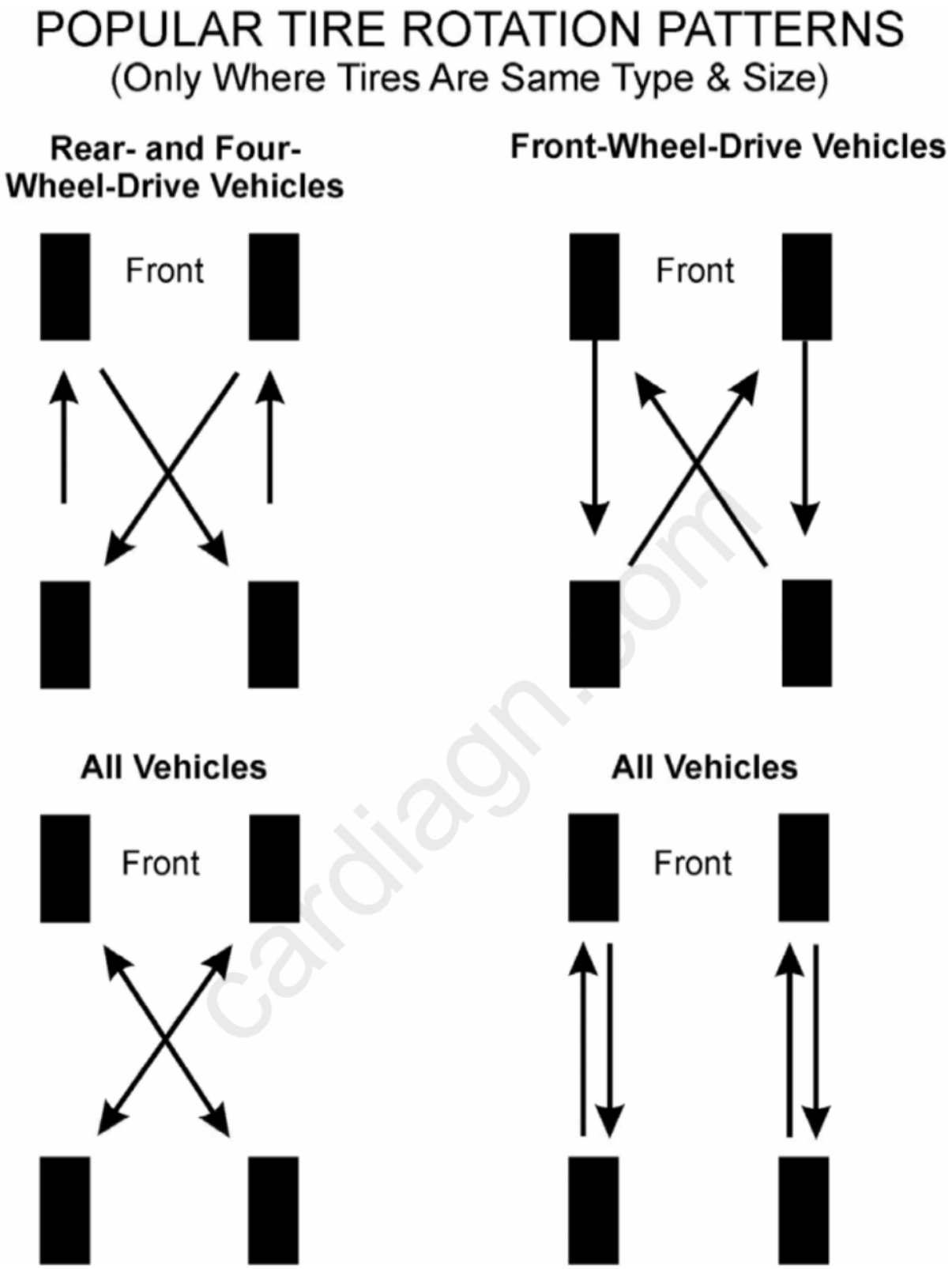

Fig. 13: Popular Tire Rotation Patterns - Without Dual Rear Wheels

Never rotate directional tires from side-to-side since this will reverse their direction of rotation. Directional tires can only be rotated from front to rear or vice versa. Directional tires are typically used on high-performance cars and can be identified by the arrows imprinted on the sidewall.

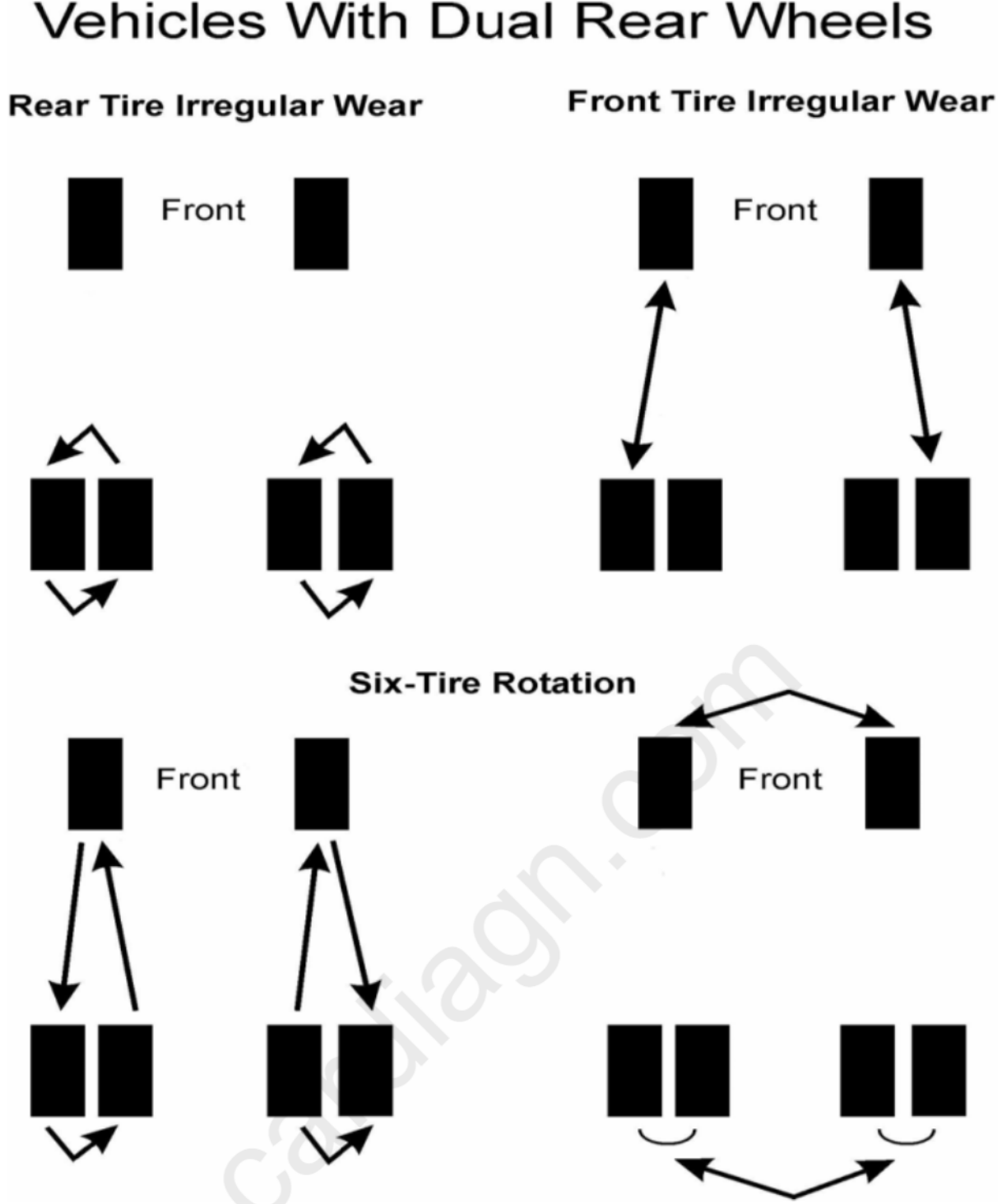

Fig. 14: Popular Tire Rotation Patterns - With Dual Rear Wheels

Some tires cannot be rotated in the manners described. Such tires include uni-directional tires and tires with asymmetric tread designs. Also, some vehicles may have different-sized tires mounted on the front and rear axles, and these different-sized tires also have rotation restrictions. Check your owner's manual or with a tire manufacturer or a tire dealer for proper recommendations for these specific cases.

WHEELS AND RIMS

The wheels on today's vehicles are made of steel, aluminum, or aluminum alloy (a combination of two or more metals). Steel wheels are the least expensive to produce, which is why they come as original equipment on many passenger cars and light trucks. The center section includes the bolt circle, or mounting holes, and is used to attach the wheel to the vehicle. The flange is the outermost lip of the rim, and is the area typically used for attaching wheel (balancing) weights. The rim is formed by rolling a strip of metal and then welding the two ends together. The interior section of the rim has a smaller diameter section called a drop center. This area provides the means for removing and installing a tire, since the bead is not designed to stretch. During removal or installation, most of the tire bead is pushed into the drop center so that the exposed portion can be pulled over the rim. The edges of the rim are flared to form the bead seats, which hold the tire and provide the airtight seal. Many rims include safety humps. These are small elevations on the inside of the bead seats. Safety humps help prevent the tire

from falling into the drop center during a blowout. This allows the driver to maintain better directional control of a vehicle running on one or more deflated tires.

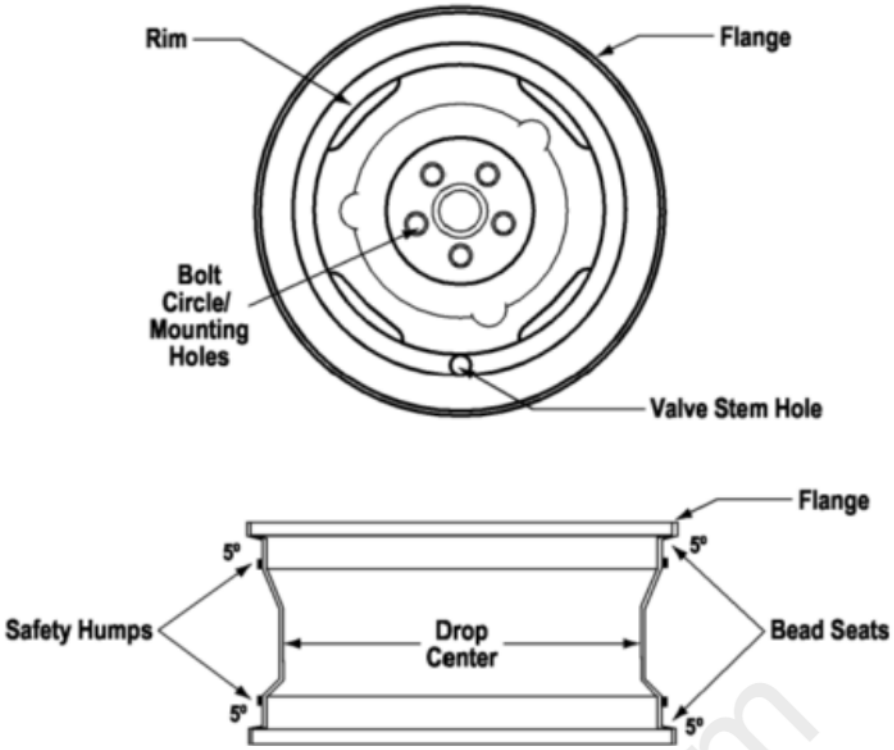

Fig. 15: Steel Wheel

WARNING: **Mounting a regular tire on a high-pressure compact spare wheel is not permitted. Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death. Mount tires only on approved rim widths. If the wheel identification stamp is not legible, or cannot be found, do not use the wheel until the size and type have been properly identified. Load, cold inflation pressure, and tire construction forces imposed on the rim/wheel must not exceed the rim/wheel manufacturer's recommendations, even if the tire is approved for a higher load or inflation. Wheels of different diameter, offset, or width cannot be mixed on the same axle. Bead seat tapers cannot be interchanged.**

TIRE PRESSURE MONITORING SYSTEMS

To avoid damaging sensors when mounting and demounting tires, it is beneficial to know where the sensors are located. Sensor assemblies are commonly attached to the valve stem, with the valve stem acting as an antenna to assist with transmitting RF signals. They may also be strapped to the drop center of the wheel. If this is the case, the sensor assembly should be located in-line with the valve stem.

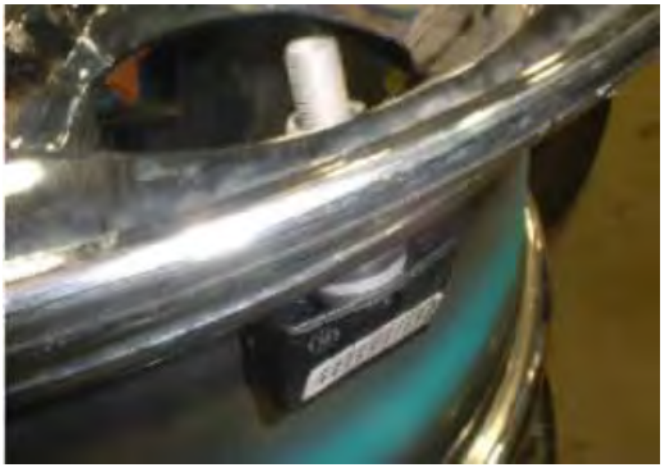

Fig. 16: Valve Stem Mounted Sensor

To avoid damaging sensors when demounting tires, do not break the bead within 45 of either side of sensor assembly locations. Be careful not to damage sensors when mounting tires as well. Sensors are not repairable and require replacement if damaged or when their battery is completely drained. It is recommended that the sensor be carefully "dropped into the tire" prior to demounting to avoid damage.

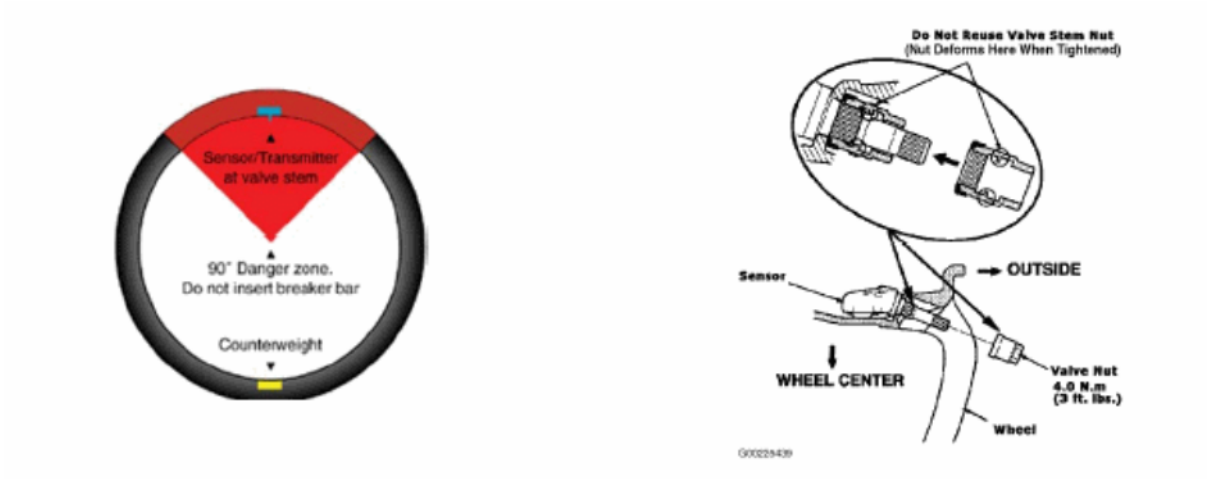

Fig. 17: Mounting Sensor

When reinstalling the sensor, it is suggested that the locknut, gasket and valve stem be replaced and torgued to the proper specification. It is also necessary to use the proper valve cap as it is also an integral part of the system.

It may be necessary to reprogram the TPMS when the tires are rotated, when a new sensor is installed, or after the vehicle loses power. This usually requires a scan tool and may involve the use of a special magnet. Refer to the vehicle service manual to properly reprogram the TPMS.

WHEELS & TIRES CHECKSHEET

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MOTORIST ASSURANCE PROGRAM
STANDARDS FOR AUTOMOTIVE REPAIR
QUALIFIED

MOTORIST ASSURANCE PROGRAM
STANDARDS FOR AUTOMOTIVE REPAIR

PARTICIPATING FACILITY
WELCOME! This facility adheres to MOTORIST ASSURANCE PROGRAM STANDARDS FOR AUTOMOTIVE REPAIR

WHEELS & TIRES 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 AMRA/MAP*

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. 18: Wheels & Tires Checksheet (1 Of 2)

WHEELS & TIRES CHECKSHEET

LEFT FRONT

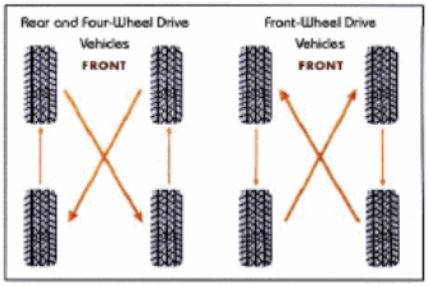
Component	OK	S	R	Condition
Lugs/Studs				
Tire Size Speed Rating _____				Spec_____ Actual_____
Run Flat				Y ____ N ____
Tread Depth				_____/32nds
Tire Pressure Placard _____				Before _____ After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition) Wheel Size				Spec_____ Actual_____

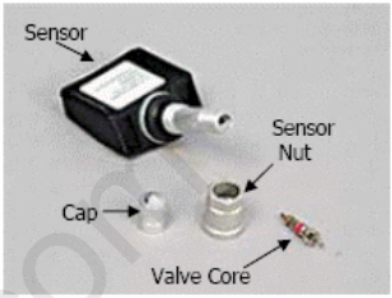
☐Edge wear ☐Cupped ☐Cut ☐Irregular wear

RIGHT FRONT

Component	OK	S	R	Condition
Lugs/Studs				
Tire Size Speed Rating _____				Spec_____ Actual_____
Run Flat				Y ____ N ____
Tread Depth				_____/32nds
Tire Pressure Placard _____				Before _____ After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition) Wheel Size				Spec_____ Actual_____

☐Edge wear ☐Cupped ☐Cut ☐Irregular wear





LEFT REAR

Component	OK	S	R	Condition
Lugs/Studs				
Tire Size Speed Rating _____				Spec_____ Actual_____
Run Flat				Y ____ N ____
Tread Depth				_____/32nds
Tire Pressure Placard _____				Before _____ After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition) Wheel Size				Spec_____ Actual_____

☐Edge wear ☐Cupped ☐Cut ☐Irregular wear

RIGHT REAR

Component	OK	S	R	Condition
Lugs/Studs				
Tire Size Speed Rating _____				Spec_____ Actual_____
Run Flat				Y ____ N ____
Tread Depth				_____/32nds
Tire Pressure Placard _____				Before _____ After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition) Wheel Size				Spec_____ Actual_____

☐Edge wear ☐Cupped ☐Cut ☐Irregular wear

OK	Suggested 1, 2, 3, 4, 5	Required A, B, C

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Fig. 19: Wheels & Tires Checksheet (2 Of 2)

WHEEL & TIRE - UICS

TIRE PRESSURE MONITORING SYSTEM

NOTE: A Tire Pressure Monitoring System (TPMS) is designed to detect and alert the driver should the air pressure level in one or more of the vehicle's tires, up to all four tires, fall below the manufacturer's recommended inflation pressure or another pre-set level.

NOTE: NHTSA does not consider installation of an aftermarket or replacement tire or rim that is not compatible with the TPMS to be a "make inoperative" situation under 49 U.S.C. 30122, provided that the entity does not disable the TPMS malfunction indicator.

TIRE PRESSURE 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
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent failure.**		
Loose	B	Require repair or replacement
Missing (Non-OE Wheel and/or Tire Applications)	2	Suggest replacement if appropriate sensor is available
Missing (OE Wheel and Tire Applications)	C	Replacement Reqiuired
Not Responding	Ã,Â	Further inspection required
NOTE: **If sensor does not Wake Up, follow manufacturers recommended diagnostic procedure to determine cause**		

TIRES

NOTE: **These guidelines do not apply to split rims. Some vehicle manufacturers restrict replacement of tires to specific brands, types, or sizes. High pressure temporary compact spare tires should not be used with any other rims or wheels, nor should standard tires, snow tires, wheel covers, or trim rings be used with high pressure compact spare rims or wheels. Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death. Only specially trained persons should de-mount or mount tires. Explosions of tire and wheel assembly can result from improper mounting, possibly causing serious injury or death. Consult the vehicle owner's manual or vehicle placard for correct size, speed rating, designation, and cold inflation pressure of the original tires. Do not exceed the maximum load or inflation capacity of the tire specified by the Tire and Rim Association When replacing tires, it is suggested that the replacement tires match or exceed the OEM speed rating designation. If tires of different speed rating designations are mixed on the same vehicle, the tires may vary in handling characteristics. Do not mix different speed rating designations on the same axle. Do not mix radials with non-radial tires on the same axle, as this may affect vehicle handling and stability. If radial tires and bias or bias-belted ply tires are mixed on the same vehicle, the radials must be on the rear. High-pressure temporary compact spare tires are exempt from this rule. Do not mix size or type (Run Flat, all season, performance, mud and snow) of tires on the same axle. If any flammable emergency tire inflation product has been used on a tire, consult inflation product, manufacturer's product information label for tire deflation procedures to avoid possible serious injury or death. In some vehicles, changing the tire diameter from factory-equipped size can affect drive ability, as well as the performance of ABS and other vehicle systems. Consult the vehicle manufacturer's specifications.**

Condition	Code	Procedure
Air pressure incorrect	B	Require repair
Bead broken	A	Require replacement
Bead leaking, caused by tire	A	Require repair or replacement
Bead wire/cord exposed	A	Require replacement
Cord or belt material exposed	A	Require replacement

Condition	Code	Procedure
Cord ply separations	A	Require replacement
Directional/asymmetrical tires mounted incorrectly	B	Require remounting and/or repositioning
Irregular tread wear, affecting performance	2	Suggest replacement

NOTE:
Determine and correct cause of irregular tire wear.

Load ratings less than OEM specifications	B	Require replacement
Mixed tread types (all season, performance, mud and snow) on same axle	A	Require replacement
Number of punctures exceeds manufacturer's limit	B	Require replacement
Out of balance	B	Require rebalance of tire/wheel assembly
Ply separation	A	Require replacement
Pull or lead, caused by tire	A	Require repair or replacement
Radial and bias or bias-belted ply tires on same axle	B	Require repair or replacement
Radials are on the front and not on the rear	B	Require repair or replacement

NOTE:
If radials and bias or bias-belted ply tires are on the same vehicle, the radials must be on the rear axle, except for high-pressure temporary spares.

Run flat damage	A	Require replacement
Shoulder cut	A	Require replacement
Shoulder puncture	A	Require replacement
Shoulder with plug	A	Require replacement
Sidewall bulge	A	Require replacement
Sidewall cut	A	Require replacement
Sidewall indentation	Ã‚Â	No service required or suggested
Sidewall puncture	A	Require replacement
Sidewall with plug	A	Require replacement
Speed rating designations different on same axle	2	Suggest rotation or replacement
Tire and wheel assembly has excessive run-out	B	Require repair or replacement of appropriate part

NOTE:
Excessive is defined as enough to contribute to performance problems. Match mounting may correct run-out. If not, require replacement of appropriate part. Refer to manufacturer's specifications.

Tires with excessive diameter difference on an all-wheel drive vehicle or four-wheel drive vehicle	B	Require replacement

NOTE:
Excessive diameter difference is defined as exceeding manufacturer's specifications or, if no manufacturer's specifications exist, with more than 1/4"" diameter difference.

Tires with excessive diameter difference on the same side of a dual-wheel application	B	Require replacement

NOTE:
Excessive diameter difference is defined as exceeding manufacturer's specifications or, if no manufacturer's specifications exist, with more than 1/4"" diameter difference.

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Condition	Code	Procedure
Tread area puncture larger in diameter than manufacturer's specifications	B	Require replacement
Tread missing pieces (chunking), exposing cord	A	Require replacement
Tread missing pieces (chunking), not exposing cord	1	Suggest replacement
Tread separations	A	Require replacement
Tube in tubeless tire	3	Suggest removal of tube
NOTE: **Most manufacturers do not recommend tubes in tubeless tires. Inspect tire and wheel . Assembly to determine the reason for a tube in tubeless tire. Recommendation for repair or replacement should be based upon condition of tires and! Or wheel listed in these guidelines.**		
Weather-checking	Ã,Â	No service required or suggested
Worn to tread wear indicators	B	Require replacement

WHEEL ALIGNMENT

NOTE: **Wheel alignment is defined as the measurement, analysis, and adjustment of steering and suspension angles to conform to manufacturer specifications. These angles usually include, but are not limited to: caster, camber, toe, and thrust angle. Where these angles are not adjustable and not in specification, component replacement or correction kits may be required. Errors in set-back and steering axis inclination (SAI) are often attributable to failed or damaged components and must be corrected prior to performing an alignment. Failure to replace or correct suggested parts or service may prevent a proper alignment. Before performing an alignment check, inspect and verify the following: Tire pressure and size . Vehicle loading . Ride height . Steering and suspension parts only if the inspection reveals that all the above are within published specifications, a wheel alignment check and a proper wheel alignment, if needed, may be performed. Under no circumstances should a technician bend or heat any steering or suspension component, unless specified by the vehicle manufacturer. All measurements and specifications must be noted on the inspection report.**

Condition	Code	Procedure
Beyond manufacturer's service interval	3	Suggest alignment check
Dog tracking, shown to be caused by faulty alignment	2	Suggest repair
Drift, shown to be caused by faulty alignment	A	Require alignment
Lead, shown to be caused by faulty alignment	A	Require alignment
Outside manufacturer's specifications	B	Require repair
Part has been changed, affecting alignment	A	Require alignment check
Pull, shown to be caused by faulty alignment	A	Require alignment
Steering wheel off-center	2	Suggest alignment
Tire wear, shown to be caused by faulty alignment	A	Require alignment
Wander, shown to be caused by faulty alignment	A	Require alignment

WHEEL ATTACHMENT HARDWARE

NOTE: **For conditions noted below, also check condition of wheel stud holes. Proper lug nut torque is essential. Follow recommended torque specifications and tightening sequence. DO NOT lubricate threads unless specified by the vehicle manufacturer.**

Condition	Code	Procedure
Bent	A	Require replacement

Condition	Code	Procedure
Broken	A	Require replacement
NOTE: **Some manufacturers require replacement of all studs on that wheel if two or more studs or nuts on the same wheel are broken or missing.**		
Locking lug nut locking groove damaged	A	Require replacement
Loose	A	Require repair or replacement of affected component
Lug nut installed backward	B	Require repair or replacement
Lug nut mating surface distorted	A	Require replacement of nut
Lug nut mating type incorrect	B	Require replacement of nut
Lug nut missing	C	Require replacement
Lug nut rounded	A	Require replacement of nut
NOTE: **Only required if removing wheel.**		
Lug nut seized	A	Require replacement of nut
NOTE: **Only required if removing wheel.**		
Stud incorrect	B	Require replacement of stud
Stud missing	C	Require replacement
Threads damaged	A	Require repair or replacement of component with damaged threads
Threads stripped	A	Require replacement of component with stripped threads

WHEELS (RIMS)

NOTE: **Mounting a regular tire on a high-pressure compact spare wheel is not permitted. Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death. If the wheel identification stamp is not legible, or cannot be found, do not use the wheel until the size and type have been properly identified. Wheels of different diameter, offset, or width cannot be mixed on the same axle. Bead seat tapers cannot be interchanged.**

Condition	Code	Procedure
Bead leaking, caused by wheel	A	Require repair or replacement
NOTE: **Do not attempt to correct a bent rim.**		
Bent hub mounting surface	A	Require replacement
Bent rim, causing vibration	2	Suggest replacement
NOTE: **Do not attempt to correct a bent rim.**		
Broken	A	Require replacement
Cast wheel porous, causing a leak	A	Require repair or replacement
Clip-on balance weight is incorrect type for rim flange	2	Suggest replacement of weight
Corrosion affecting structural integrity	A	Require replacement
Corrosion build-up on wheel mounting surface	A	Require repair
Cracked	B	Require replacement

Condition	Code	Procedure
Directional/asymmetrical wheels mounted incorrectly	B	Require remounting and/or repositioning
Load capacity less than OEM specifications	B	Require replacement
Mating surface distorted	A	Require replacement
Offset mismatched on same axle	B	Require replacement
Rivets leaking	A	Require replacement
Run-out beyond OEM specs	B	Require replacement
NOTE: **Some wire-spoke wheels may be repaired.**		
Stud holes elongated	A	Require replacement
NOTE: **Inspect wheel attaching hardware for damage.**		
Welded or brazed repair	2	Suggest replacement
Welds leaking	A	Require replacement
Wheel centering (pilot) hole incorrect	B	Require 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

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AUTOMOTIVE TERMINOLOGY & DEFINITIONS

ABRASIVE CLEANING

removing contaminants using a cleaning agent containing abrasive material. Cleaning that requires physical abrasion (e.g., glass bead blasting, wire brushing).

ADDITIVE

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

AEROSOL

a cloud consisting of particles dispersed in a gas or gases

AFTERMARKET

broad term that applies to any change after the original purchase, such as adding equipment. When applied to AFVs, it refers to conversion devices or kits for conventional fuel vehicles.

ALIGNMENT

an adjustment to bring parts or components into a line or proper coordination.

ALTERNATOR

a belt driven device that provides electrical current for the vehicle's charging system.

ANTIFREEZE

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

AQUAPLANING

the loss of traction that results when a tire loses sufficient grip on a wet roadway, the tire actually loses contact with the road surface and rides on a thin film of water.

AUTOMATIC TRANSMISSION FLUID (ATF)

the oil that is used in an automatic transmission.

BATTERY ACID

the sulfuric acid solution used as the electrolyte in a battery.

BATTERY CELL

the part of a battery made from two dissimilar metals and an acid solution. A cell stores chemical energy to be used later as electrical energy.

BATTERY SAVER

the battery saver system is an effective way to prevent complete battery discharge when the engine is shut down. Based on the preset time-limit, the system automatically disconnects the battery load when the battery is not being charged. Depressing the reset push button will enable the battery to be reconnected for additional periods of time. Critical systems can be set up to have battery power maintained.

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.

BEARING RACE

the machined surface of a bearing assembly against which the needles, balls or rollers ride. The outer race is also called a cup.

BEARING

part that supports and reduces friction between a stationary and moving part or two moving parts.

BLEEDER VALVE

a valve located on disc brake calipers, wheel cylinders and some master cylinders that allows air and fluid to be removed from the brake system.

BOILING POINT

the temperature at which a liquid turns to vapor.

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BRAKE DRAG

a condition that occurs when brake pads or shoes are in continuous contact with the disc brake rotors or brake drums.

BRAKE FLUSHING

a procedure to clean the brake hydraulic system with fresh, clean fluid that should be performed whenever new parts are installed, if there is any doubt as to the grade of fluid in the system, if a glycol fluid has been mixed with a silicone-based fluid, or if the fluid has been contaminated with petroleum or mineral based fluids.

BRAKE HOSE

flexible hoses that connect the brake lines on the chassis with the calipers or wheel cylinders, or the junction block on a solid axle.

BRAKE LINE

metal tubing that carries the brake fluid from the master cylinder to other brake system components.

CHARGE

the electrical current that passes through the battery to restore it to full power; to fill, or bring up to the specific level, an A/C system with refrigerant; the required amount of refrigerant for an A/C system.

CHARGING SYSTEM

the system that supplies electrical power for vehicle operation and recharges the battery.

CHEMICAL CLEANING

relies primarily on chemical action to remove dirt, grease, scale, paint or rust.

COLD CRANKING AMPS

the amount of cranking amperes that a battery can deliver in 30 seconds at OÃ,Â°F (- 18Ã,Â°C).

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.

CONDENSER

a device, similar to a radiator, in which the refrigerant loses heat and changes state from a high-pressure gas to a high pressure liquid as it dissipates heat to the surrounding air.

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.

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CORE PLUGS

plugs that fill holes in a block or head left from the casting process. Also called freeze, welsh or expansion plugs.

CORE

in automotive terminology, the main part of a heat exchanger, such as a radiator, evaporator or heater. Usually made of tubes, surrounded by cooling fins, used to transfer heat from the coolant to the air.

CORROSION INHIBITORS

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

CROSSFLOW RADIATOR

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

DIFFERENTIAL

gear assembly that transmits power from the driveshaft to the wheels; allows the outside wheel to turn faster than the inside when cornering.

DIGITAL VOLT/OHMMETER (DVOM)

an instrument that measures volts, ohms and amps and displays the results numerically.

DIRECTIONAL TIRE

tire with a tread pattern that is designed to give maximum traction by removing water from under the tread in such a way as to minimize the risk of aquaplaning. Directional tires must be installed to turn in a specific direction.

DOWNFLOW RADIATOR

a radiator in which coolant enters the top of the radiator and is drawn downward by gravity (see crossflow radiator).

DRIVETRAIN

all of the components that generate power and transfer it to the vehicle's wheels.

DUAL MASTER CYLINDER

a master cylinder that has one cylinder bore, but two pistons and two fluid reservoirs. Each piston applies hydraulic pressure to two wheels only. In the event one of the hydraulic circuits fails, the other provides enough braking power to stop the vehicle.

DUO-SERVO DRUM BRAKES

a drum brake design that provides increased stopping power due to the servo or self- energizing action of the brake shoes.

EGR VALVE

see 'exhaust gas recirculation (EGR) valve',

ELECTROLYTE

a material whose atoms become ionized (electrically charged) in solution. In automobiles, the battery electrolyte is a mixture of sulfuric acid and water.

ELECTRONIC AIR SUSPENSION

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electronic air suspension provides the comfort of riding on air with adjustable spring rates and capability to change ride height and load-carrying ability. Under normal driving conditions, an electronic air suspension vehicle rides at the same height as a traditionally sprung vehicle. With a heavy load, ride height is increased automatically. On current vehicles, the suspension lowers the ride height by 20 mm at highway speeds for improved aerodynamics, with about 2 percent better fuel economy. Lower ride height also can improve on-center feel of steering due to the change in suspension geometry and increased caster angle.

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.

EVAPORATOR

a heat exchanger, in which low-pressure refrigerant flows and changes state, absorbing heat from the surrounding air.

EXHAUST GAS RECIRCULATION (EGR)

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

EXHAUST GAS RECIRCULATION (EGR) VALVE

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

FAHRENHEIT

a scale of temperature measurement with the boiling point of water at 212Ã‚Â°F. In the metric system, water's boiling point is 100Ã‚Â°Celsius.

FAN CLUTCH

a device attached to a mechanically driven cooling fan that allows the fan to freewheel when the engine is cold or the vehicle is driven at speed.

FAN SHROUD

an enclosure that routes air through the radiator cooling fins.

FAN

a mechanically or electrically driven propeller that draws or pushes air through the radiator, condenser, heater core or evaporator core.

FILTER

a screen or filter element that can be made to filter specified sizes of particles from air or liquid.

FLOODING

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

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.

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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.

FRONT WHEEL DRIVE

the entire drivetrain is located at the front of and drives the front wheels of the vehicle.

FUSE

a metal circuit protection device that melts when there is a circuit overload or short.

FUSIBLE LINK

a smaller gauge wire that is included in an electrical circuit to provide circuit protection. The smaller gauge wire will melt when the circuit is overloaded.

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.

GENERATOR

a device that converts mechanical energy into electrical energy; SAE J1930 nomenclature for an alternator; a generating device that uses diode rectifiers to convert ac to dc.

HALFSHAFT

transfers power from the transaxle to the front wheels on a front-wheel drive vehicle. Also used on some vehicles with rear-wheel drive and independent rear suspension to transfer power from the differential to the rear wheels. Consists of a stub shaft that is splined into the differential side gear, another stub shaft that is splined into the wheel hub, an interconnecting shaft, and two CV-joints, which connect the interconnecting shaft to the stub shafts.

HEATER CORE

a radiator-like device used to heat the inside of a vehicle. Hot coolant is pumped through it by the water pump, and heat from the coolant moves from the heater core to the passenger compartment as the blower fan forces air through it.

HUB

mounting point for the wheelan an axle or spindle; the part of the synchronizer assembly that is splined to the transmission shaft; the center part of a wheel, gear, etc., that rides on a shaft.

HYDRAULIC PRESSURE

pressure exerted through a liquid.

HYDROMETER

an instrument used to measure the specific gravity of a solution.

IMPEDANCE

the total resistance of an electrical device measured in ohms.

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INCH POUND

one twelfth of a foot pound.

INDEPENDENT SUSPENSION

a suspension in which each wheel can travel up and down without directly affecting the position of the opposite wheel.

INNER BEARING RACE

inner part of a ball or roller bearing that provides a surface for the balls or rollers to rotate.

INTEGRATED CIRCUIT

an electrical circuit containing many interconnected amplifying devices and circuit elements formed on a single body or chip of semiconductor material; diodes, transistors and other electronic components mounted on semiconductor material and able to perform numerous functions.

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.

JAM NUT

a locknut.

KEEP-ALIVE MEMORY

a series of vehicle battery-powered memory locations in the microcomputer that store information on input failure, identified in normal operations for use in diagnostic routines; adapts some calibration parameters to compensate for changes in the vehicle system.

LEAF SPRING

a suspension spring consisting of a single flat plate made of steel or composite material or several steel plates bundled together.

LIGHT-DUTY VEHICLE

passenger cars and trucks with a gross vehicle weight rating of 8,500 or less.

LIMITED SLIP DIFFERENTIAL

a type of differential that uses clutches to supply a major portion of the drive torque to the wheel that has better traction when one wheel is slipping,

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.

LUBRICATION

the process of introducing a friction reducing substance between moving parts to reduce wear.

MACPHERSON STRUT

the principal device in the suspension of the same name, in which the spring, shock absorber and sometimes the steering knuckle are combined in a single unit.

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MALFUNCTION INDICATOR LIGHT (MIL)

also known as the CHECK ENGINE or SERVICE ENGINE SOON light on many vehicles. The MIL comes on when the ignition is first turned on (to check the bulb) and then goes out once the engine is started, unless a trouble code is stored in the computer. If the MIL is on when the vehicle is running, there has been a malfunction on one of the sensor or actuator circuits monitored by the computer, and a diagnosis will have to be made by retrieving the code.

MASTER CYLINDER

the primary fluid pressurizing device in some hydraulic systems. In automotive use, it is found in the brake and hydraulic clutch systems and is pedal-activated, either directly or through a vacuum assist unit.

MILLIMETER

the base of metric size measurement. One millimeter equals 0.039370-in. One inch is equal to 25.4 m m.

MULTIVISCOSITY OIL

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

OFF-ROAD

any non-stationary device, powered by an internal combustion engine or motor, used primarily off the highways to propel, move, or draw persons or property, and used in any of the following applications: marine vessels, construction/farm equipment, locomotives, utility and lawn and garden equipment, off-road motorcycles, and off-highway vehicles.

OHM

a unit of electrical resistance of a circuit in which an electromotive force of one volt maintains a current of one ampere, named after German physicist Georg Ohm.

OHMMETER

an instrument that measures electrical resistance in ohms.

OHM'S LAW

a basic law of electricity expressing the relationship between current, resistance and voltage in any electrical circuit. Ohm's law states that the voltage in a circuit is equal to the current multiplied by the resistance.

OIL COOLER

device used to remove heat from the engine or transmission oil. There are oil-to-air coolers and oil coolers that are incorporated into the vehicle's cooling system.

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.

ON-CAR BALANCING

the practice of spinning a wheel on the car to balance the wheel and all other rotational components together.

ORIGINAL EQUIPMENT MANUFACTURER (OEM)

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the original manufacturer of a vehicle or engine.

OSCILLOSCOPE

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

OUTER BEARING RACE

outer part of a bailor roller bearing that provides a surface for the balls or rollers to rotate. Can be integral with the bearing or a separate part.

OXIDATION

the process of combining with oxygen, resulting in rusting or burning. Rust is slow oxidation; fire is rapid oxidation.

PAG

polyalkyline glycol oil (lubricant) used with A/C systems containing R- 134a refrigerant.

PARALLEL CIRCUIT

a circuit with more than one path for the current to follow.

PARKING BRAKE

a system that applies the brakes mechanically through a series of linkages and cables. Depending on the vehicle, the parking brake system will either be actuated using a foot pedal or a hand-operated lever.

PASCAL'S LAW

the law of physics stating that liquids are noncompressible, and that a force applied to the top of a liquid in a closed container is exerted equally in all directions.

PCV SYSTEM

see 'positive crankcase ventilation system'.

PCV VALVE

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

PLAY

the relative movement between or among parts.

POLARITY

the condition of being positive or negative relative to a reference point or object; the particular state (positive or negative) with reference to the two magnetic poles.

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

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

POWER BRAKES

a system that uses vacuum or hydraulic pressure to assist the driver with brake application.

PSI

measurement of pressure in pounds per square inch.

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RADIAL RUNOUT

the out-of-roundness ot a wheel or tire.

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 WHEEL DRIVE

system where the driveline drives the rear wheels of the vehicle. Most often the engine is located in the front of the vehicle and a transmission and drive shaff connect to a drive axle, however there are also systems where the entire drive line is located toward the rear of the vehicle.

REAR WHEEL STEERING

a system used on a some vehicles to change the toe of the rear wheels to either steepen a sharp turn or enhance cornering on a shallower, faster one.

RESISTOR

an electrical device installed in a circuit to lower voltage and current flow.

RIDE HEIGHT

the dimension between a fixed point on the vehicle and the pavement. The fixed point varies according to vehicle and manufacturer. Also called vehicle height.

RUNOUT

wobble or deflection beyond a rotating part's normal plane of movement.

SCAN TOOL

microprocessor designed to communicate with a vehicle's on-board computer system to perform diagnostic and troubleshooting functions.

SEMICONDUCTOR

a material that is neither a good conductor of electricity nor a good insulator.

SENDING UNIT

a mechanical, electrical, hydraulic or electromechanical device which transmits information to a gauge or other receiving unit.

SERIES CIRCUIT

a circuit that has only one path for current to follow.

SERIES-PARALLEL CIRCUIT

a circuit that combines series and parallel circuits.

SERVO

a device, such as an electric motor or hydraulic piston, that is controlled by an amplified signal from a low power command device.

SHOCK ABSORBER

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a device used to dampen the oscillation of the suspension caused by irregularities in the road surface.

SHORT CIRCUIT

a condition that occurs in an electrical circuit when the current bypasses the intended load and takes a path with little or no resistance, such as another circuit or ground.

SPECIFIC GRAVITY

the ratio of the weight or mass of the given volume of a substance to that of an equal volume of another substance, e.g. - water for liquids and solids; air or hydrogen for gases, are used as standards.

SPONGINESS

the feel of a soft or mushy brake pedal usually caused by trapped air in the hydraulic system.

SPRUNG WEIGHT

the weight of all the vehicle components that are supported by the springs; see 'unsprung weight'.

STABILIZER BAR

a torsion-bar spring connecting the suspension on either side of the vehicle. When a vehicle rolls to the side in a turn, the suspension at the outside wheel compresses and the suspension at the inside wheel extends. The stabilizer bar that connects them twists to apply a counteracting force to hold the vehicle closer to level. Also called an anti-roll bar or sway bar.

STARTER

the electric motor that is used to start an engine.

STUD

a fastener that has screw threads at both ends.

TECHNICAL SERVICE BULLETIN (TSB)

information published by vehicle manufacturers that describe updated service procedures and service procedures that should be used to handle vehicle defects.

TENSIONER

a device used with a timing chain or belt to maintain its tension.

THERMOSTAT

a device installed in the cooling system that allows the engine to come to operating temperature quickly and then maintain a minimum operating temperature.

TIMING BELT

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

TOLERANCE

the difference between the allowable maximum and minimum dimensions of a mechanical part; the basis for determining the accuracy of a fitting.

TORQUE SEQUENCE

a specified order in which a component's mounting bolts should be tightened

TORQUE WRENCH

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a breaker bar or ratchet wrench with an indicator that measure the twisting effort applied to a fastener during tightening.

TORQUE

twisting effort on a shaft or bolt.

TWIN I-BEAM SUSPENSION

a type of independent front suspension and used on light trucks and vans. It consists of two I-beams supported by coil springs, and the steering knuckles/spindles, which are connected by king pins or ball joints. The inner end of the axle connects to the vehicle frame through a rubber bushing. A radius arm also connects to the frame through rubber bushings to control wheelbase and caster.

UNIVERSAL JOINT (U-JOINT)

a joint that allows the drives haft to transmit torque at different angles as the suspension moves up and down.

UNSPRUNG WEIGHT

the components of a vehicle that rest directly on the road surface without being supported by the suspension springs.

VACUUM

a pressure lower than atmospheric.

VOLT

unit of electromotive force. One volt of electromotive force applied steadily to a conductor of one-ohm resistance produces a current of one ampere.

VOLTAGE DROP

voltage lost by the passage of electrical current through resistance.

VOLTMETER

an instrument used to measure voltage in a circuit.

WATER PUMP

a device used to circulate coolant through the engine.

WHEEL ALIGNMENT

the adjustment of suspension and steering components to optimize steering control and minimize tire wear.

WHEEL BALANCE

the condition in which a wheel/tire assembly has equal weight around its center, preventing vibration at high speeds. Wheel balance can be static, such as on a bubble balancer, or dynamic, such as with a spin balancer.

WHEEL WEIGHTS

small weights, usually made of lead, attached either mechanically or by adhesive to a wheel/tire assembly to correct its balance.

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STEERING & SUSPENSION 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

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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:

201 Park Washington Court

Falls Church, Virginia 22046

Tel: (703) 532-2027 * Fax: (202) 318-0378

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
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

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement
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 *always* 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.**

WHEEL AND TIRE

Steering and suspension are complex systems made up of a variety of interdependent components. For proper vehicle handling, ride, and tire wear, a thorough inspection is required whenever suspension work is being performed. Conditions listed assume that the problem has been isolated to the specific component by proper testing procedures.

NOTE: **When replacing steering and/or suspension components that may affect an alignment angle, you are required to check and adjust alignment as needed. Refer to the OEM specifications.**

CAUTION: **Do not use ride height altering or load compensating components, such as variable rate springs and coil over shocks, on vehicles with height or load sensing proportioning valve-equipped braking systems, unless these components are original equipment.**

NOTE: **Depending on the air suspension design, there are some aftermarket products available to eliminate the air ride suspension on certain vehicles. If the system has been eliminated with one of these products, then no service is suggested or required.**

WARNING: **These guidelines do not apply to split rims.**

TIRES

When replacing tires, it is suggested that the replacement tires match or exceed the OEM speed rating designation. If tires of different speed rating designations are mixed on the same vehicle, the tires may vary in handling characteristics. Do not mix different speed rating designations on the same axle.

Consult the vehicle owner's manual or vehicle placard for correct tire size, service description, load index, speed rating and cold inflation pressure of the original tires. Do not exceed the maximum load or inflation capacity of the tire specified by the Tire and Rim Association (www.us-tra.org)

When replacing fewer than ALL tires on a vehicle, follow the vehicle manufacturer's recommendations as to the placement of the new tires. If it is not possible to follow the vehicle manufacturer's tire replacement recommendations, remember to replace tires on the same axle with the same size, construction, speed rating, and, if possible, similar tread pattern.

Do not mix radials with non-radial tires on the same axle, as this may affect vehicle handling and stability. If radial tires and non-radial tires are mixed on the same vehicle, the radials must be on the rear. If radial and non-radial tires are used on a vehicle equipped with dual rear tires, radial tires may be used on either axle. High-pressure temporary compact spare tires are exempt from this rule.

Do not mix size or type (all season, performance, mud and snow) of tires on the same axle. When replacing only two tires on front or rear drive vehicles, follow the vehicle manufacturer's recommendations concerning placement. If it is not possible to follow OE recommendations, it is preferable to place the two new tires on the rear for greater stability, greater adhesion affecting steering -- on other than dry pavement -- and overall safety, regardless of whether the vehicle is front or rear wheel drive.

It is particularly important to match all tire sizes and constructions on 4-wheel (4x4) and all-wheel (AWD) drive vehicles unless otherwise specified by vehicle manufacturer. Ideally, all four tires should be replaced at the same time. Some vehicle manufacturers restrict replacement of tires to specific brands, types, or sizes.

MOUNTING TIRES

Only specially trained persons should de-mount or mount tires. Explosions of tire and wheel assembly can result from improper mounting, possibly causing serious injury or death. High pressure temporary compact spare tires should not be used with any other rims or wheels, nor should standard tires, snow tires, wheel covers, or trim rings be used with high pressure compact spare rims or wheels.

Mount tires only on same or approved rim widths.

Attempting to mount a tire of one diameter on a wheel of a different diameter , bead taper or flange type may result in serious injury or death.

If any flammable emergency tire inflation product has been used in a tire, consult inflation product manufacturer's product information label for tire deflation procedures to avoid possible serious injury or death.

VEHICLE TIRE PLACARD

Since 1968, cars and light trucks sold in the United States have been required to have a tire information sticker, called a vehicle tire placard. The vehicle tire placard indicates the size of the original equipment tires (including the spare), cold inflation pressure for the tires on both axles as well as the spare, and load index or range. Depending on the vehicle, the vehicle tire placard will either be located on the edge of any door, the doorpost, glove box, fuel door or inside trunk lid. If the tire placard is missing, consult the owner's manual, vehicle manufacturer, or tire manufacturer regarding applicable tire information.

Always refer to the vehicle manufacturer's recommendations before replacing tires. Tires should always be replaced with the same size designation, or approved options, as recommended. Never choose a smaller size with less load carrying capacity than the size on the tire placard. (Some vehicle manufacturers require different-sized tires for either the front or rear axles.)

NOTE: **It is not always possible to select a replacement tire with exactly the same size as shown on the placard. Consult with a vehicle or tire manufacturer for replacement recommendations.**

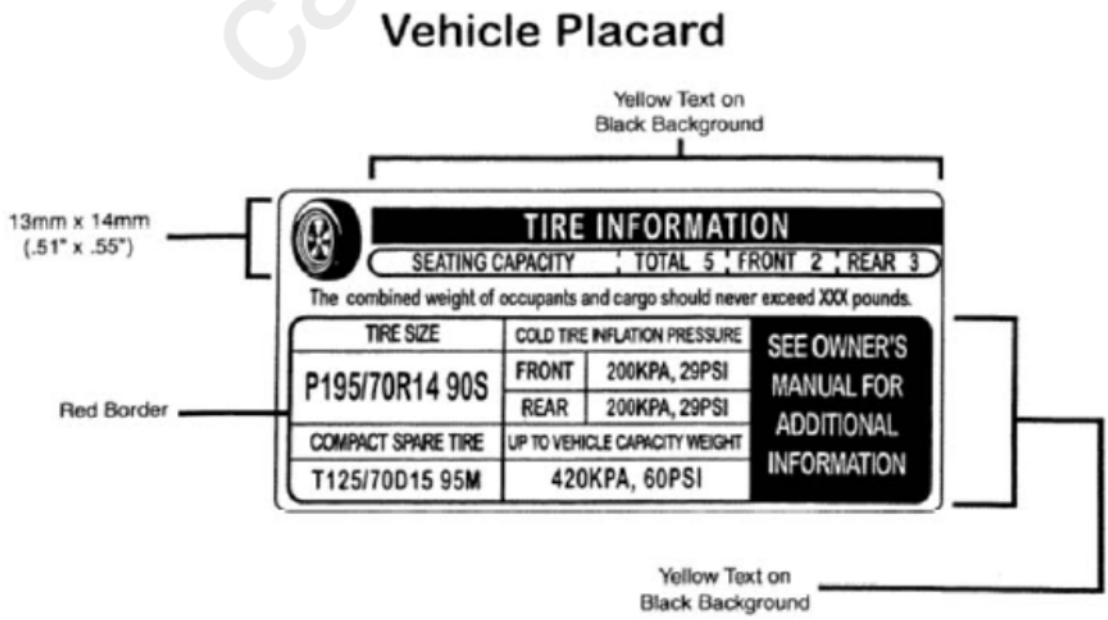

Fig. 1: Vehicle Tire Placard - Typical

TIRE ROTATION

The front tires on most vehicles tend to wear out faster than the rear tires. This is due to the effects of steering the vehicle and the weight transfer that occurs during braking. To ensure that all four tires wear evenly, it is important to rotate them on a regular basis. Tire rotation helps maintain balanced handling because it allows all four tires to wear at the same rate. Keep in mind, as tire wear reduces tread depth, it increases the tires' response to driver inputs. Consequently, by equalizing tire wear at all four corners, dry road performance is actually enhanced. Another advantage of regular rotation is that it allows the tires to be replaced in complete sets rather than in pairs. This maintains handling continuity. It also enables drivers to take advantage of the latest in tire technology, instead of trying to match a pair of older tires.

Most manufacturers list rotation intervals in the scheduled maintenance section of the vehicle service manual and/or the owner's manual. Tire rotation patterns can also be found in these books. If this information is unavailable for a particular vehicle, rotate the tires every 5-7,000 miles following the appropriate rotation sequence shown in the illustrations. After completing a tire rotation, be sure to reset inflation pressures to the manufacturer's recommended specifications indicated on the vehicle tire placard.

To ensure that the proper amount of clamping force is applied to each fastener, follow these guidelines:

- Make sure the area around the lug holes, as well as the wheel and hub mating surfaces are clean and dry. A wire brush can be used to remove corrosion and other debris. Wipe the areas clean using a shop rag.
- Inspect the bolt holes for damage. Do not use a wheel if the bolt holes are deformed.
- Inspect the wheel studs and lug nuts or lug bolts and bolt holes (depending on the vehicle) for damage. Replace or repair any damaged or worn components.
- Always follow a star pattern when tightening lugs.

WHEEL LUG NUT TORQUE & CLAMPING FORCE

Although proper wheel lug nut torque is important, it does not guarantee that the required clamping force will be achieved. For example, excessive corrosion on the wheel and hub mating surfaces will result in improper clamping force, even when the lugs are tightened with a calibrated torque wrench. Low clamping force can also occur if the threads are dirty. This is because dirt causes interference between the mating threads. As a result, the torque wrench will register the correct reading but the clamping force will be inadequate. To improve the chances of achieving the precise clamping force between the wheel and hub, proper torque must be applied to clean components in good condition. Specifications for wheel lug nut torque can be found in the `Tire and Wheel' section of most vehicle service manuals. When specifications are indicated as a range, adjust the torque wrench to the middle of the range to compensate for normal variations in tool calibration.

POPULAR TIRE ROTATION PATTERNS

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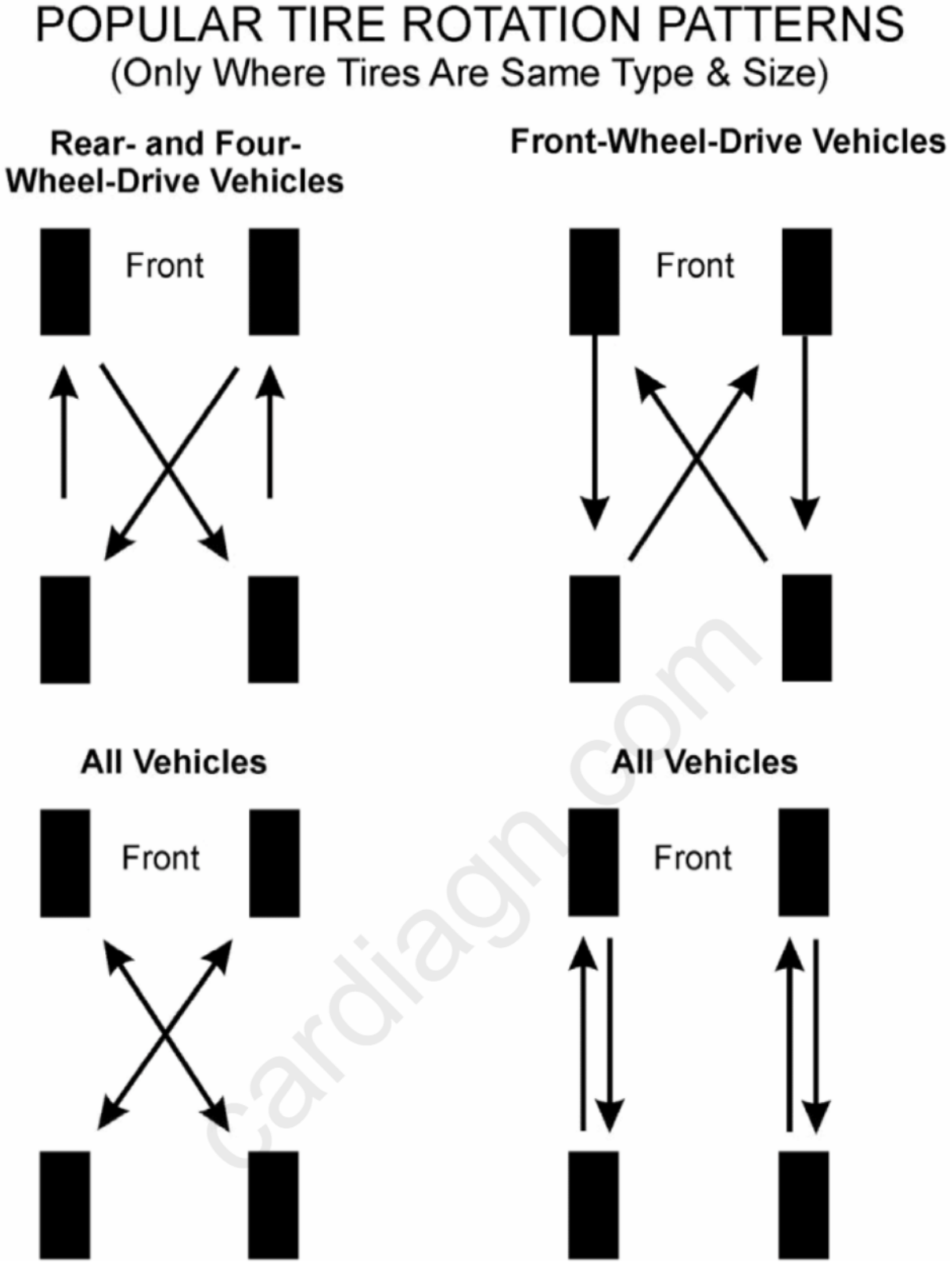

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Fig. 2: Popular Tire Rotation Patterns - Without Dual Rear Wheels

Never rotate directional tires from side-to-side since this will reverse their direction of rotation. Directional tires can only be rotated from front to rear or vice versa. Directional tires are typically used on high-performance cars and can be identified by the arrows imprinted on the sidewall.

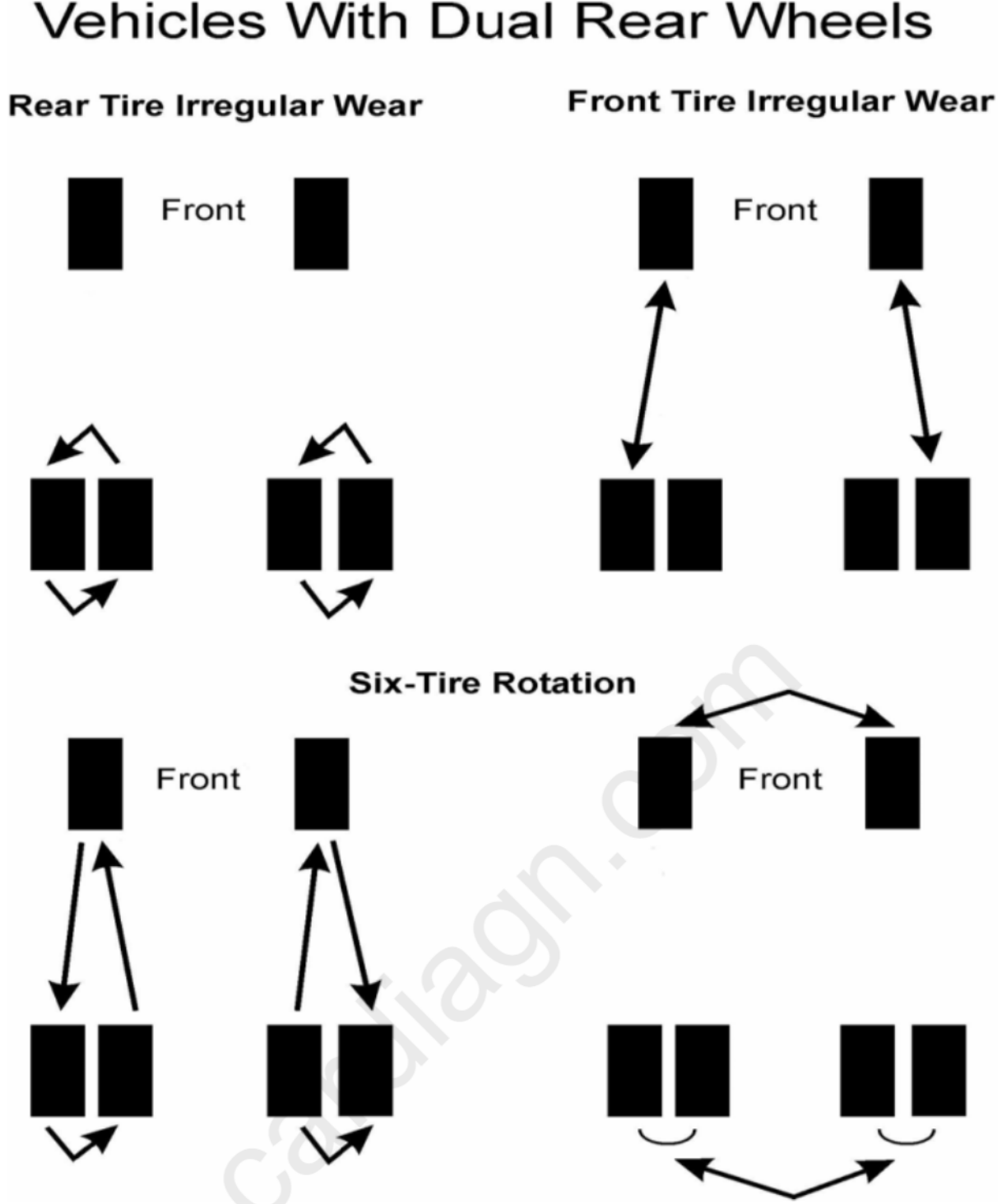

Fig. 3: Popular Tire Rotation Patterns - With Dual Rear Wheels

Some tires cannot be rotated in the manners described. Such tires include uni-directional tires and tires with asymmetric tread designs. Also, some vehicles may have different-sized tires mounted on the front and rear axles, and these different-sized tires also have rotation restrictions. Check your owner's manual or with a tire manufacturer or a tire dealer for proper recommendations for these specific cases.

WHEELS AND RIMS

The wheels on today's vehicles are made of steel, aluminum, or aluminum alloy (a combination of two or more metals). Steel wheels are the least expensive to produce, which is why they come as original equipment on many passenger cars and light trucks. The center section includes the bolt circle, or mounting holes, and is used to attach the wheel to the vehicle. The flange is the outermost lip of the rim, and is the area typically used for attaching wheel (balancing) weights. The rim is formed by rolling a strip of metal and then welding the two ends together. The interior section of the rim has a smaller diameter section called a drop center. This area provides the means for removing and installing a tire, since the bead is not designed to stretch. During removal or installation, most of the tire bead is pushed into the drop center so that the exposed portion can be pulled over the rim. The edges of the rim are flared to form the bead seats, which hold the tire and provide the airtight seal. Many rims include safety humps. These are small elevations on the inside of the bead seats. Safety humps help prevent the tire

from falling into the drop center during a blowout. This allows the driver to maintain better directional control of a vehicle running on one or more deflated tires.

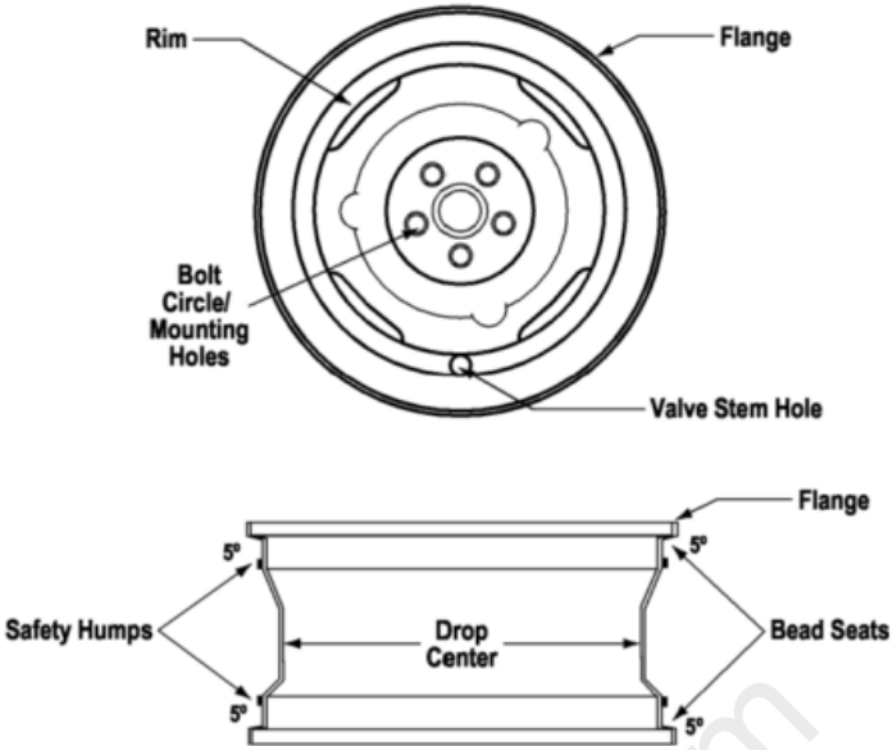

Fig. 4: Steel Wheel

WARNING: **Mounting a regular tire on a high-pressure compact spare wheel is not permitted. Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death. Mount tires only on approved rim widths. If the wheel identification stamp is not legible, or cannot be found, do not use the wheel until the size and type have been properly identified. Load, cold inflation pressure, and tire construction forces imposed on the rim/wheel must not exceed the rim/wheel manufacturer's recommendations, even if the tire is approved for a higher load or inflation. Wheels of different diameter, offset, or width cannot be mixed on the same axle. Bead seat tapers cannot be interchanged.**

TIRE PRESSURE MONITORING SYSTEMS

To avoid damaging sensors when mounting and demounting tires, it is beneficial to know where the sensors are located. Sensor assemblies are commonly attached to the valve stem, with the valve stem acting as an antenna to assist with transmitting RF signals. They may also be strapped to the drop center of the wheel. If this is the case, the sensor assembly should be located in-line with the valve stem.

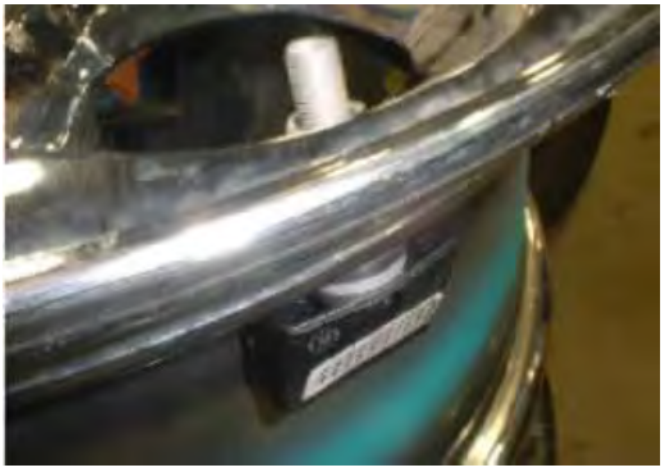

Fig. 5: Valve Stem Mounted Sensor

To avoid damaging sensors when demounting tires, do not break the bead within 45 of either side of sensor assembly locations. Be careful not to damage sensors when mounting tires as well. Sensors are not repairable and require replacement if damaged or when their battery is completely drained. It is recommended that the sensor be carefully "dropped into the tire" prior to demounting to avoid damage.

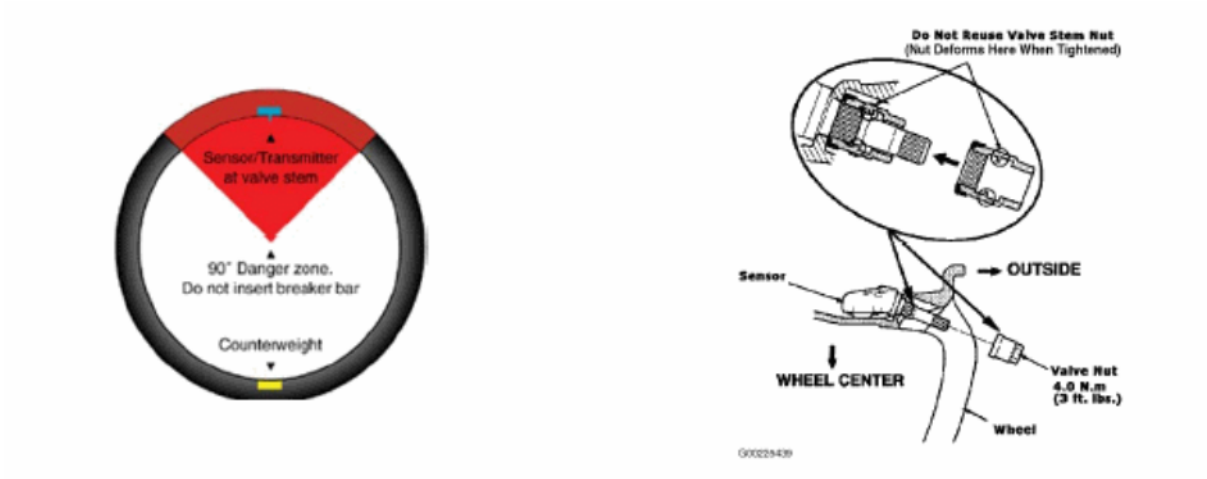

Fig. 6: Mounting Sensor

When reinstalling the sensor, it is suggested that the locknut, gasket and valve stem be replaced and torgued to the proper specification. It is also necessary to use the proper valve cap as it is also an integral part of the system.

It may be necessary to reprogram the TPMS when the tires are rotated, when a new sensor is installed, or after the vehicle loses power. This usually requires a scan tool and may involve the use of a special magnet. Refer to the vehicle service manual to properly reprogram the TPMS.

STEERING & SUSPENSION CHECKSHEET

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MOTORIST ASSURANCE PROGRAM

STANDARDS FOR AUTOMOTIVE REPAIR

STEERING & SUSPENSION CHECKSHEET

Date: _____

Name: _____

Address: _____

City: _____ **State:** _____ **Zip Code:** _____

Year: _____ **Make:** _____ **Model:** _____

Mileage: _____ **License:** _____ **VIN:** _____ **Eng Code:** _____

Customer Interview:

_____

_____

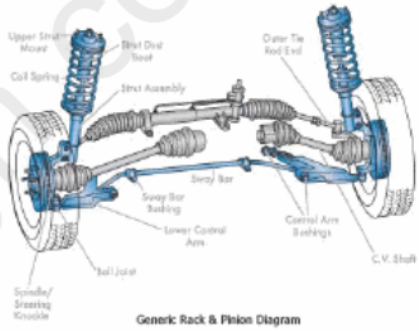
_____

_____

_____

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 AMRA/MAP*



Generic Rack & Pinion Diagram

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.

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Fig. 7: Steering & Suspension Checksheet (1 Of 2)

STEERING & SUSPENSION CHECKSHEET

UNDERHOOD/UNDER VEHICLE

Component	OK	S	R	Condition
Rack & Pinion Assy				
P/S Pump				
P/S Hoses				
P/S Fluid				
P/S Cooler				

Component	OK	S	R	Condition
Center / Drag Link				
Steering Gear				
Sway Bar/Bushings				
Idler Arm				
Pitman Arm				

LEFT FRONT

Component	OK	S	R	Condition
Link Pin / Bushings				
CV Joints				Inner Outer _____
CV Boots				Inner _____ Outer _____
Shock / Strut				_____
Spring / Mount				
Ball Joint Upper				Spec_____
Lower				Actual_____
Control Arm / Shaft				
Bushings				
Tie Rod End				Inner _____ Outer _____
Bearing / Spindle				

RIGHT FRONT

Component	OK	S	R	Condition
Link Pin / Bushings				
CV Joints				Inner Outer _____
CV Boots				Inner _____ Outer _____
Shock / Strut				_____
Spring / Mount				
Ball Joint Upper				Spec_____
Lower				Actual_____
Control Arm / Shaft				
Bushings				
Tie Rod End				Inner _____ Outer _____
Bearing / Spindle				

LEFT REAR

Component	OK	S	R	Condition
Link Pin / Bushings				
CV Joints				Inner _____ Outer _____
CV Boots				Inner _____ Outer _____
Shock / Strut				
Spring / Mount				
Ball Joint Upper				Spec_____
Lower				Actual_____
Control Arm / Shaft				
Bushings				
Tie Rod End				Inner _____ Outer _____
Bearing / Spindle				

RIGHT REAR

Component	OK	S	R	Condition
Link Pin / Bushings				
CV Joints				Inner _____ Outer _____
CV Boots				Inner _____ Outer _____
Shock / Strut				
Spring / Mount				
Ball Joint Upper				Spec_____
Lower				Actual_____
Control Arm / Shaft				
Bushings				
Tie Rod End				Inner _____ Outer _____
Bearing / Spindle				

OK	Suggested 1, 2, 3, 4, 5	Required A, B, C

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Fig. 8: Steering & Suspension Checksheet (2 Of 2)

WHEELS & TIRES CHECKSHEET

MOTORIST ASSURANCE PROGRAM
STANDARDS FOR AUTOMOTIVE REPAIR
QUALIFIED

MOTORIST ASSURANCE PROGRAM
STANDARDS FOR AUTOMOTIVE REPAIR

PARTICIPATING FACILITY
WELCOME! This facility adheres to MOTORIST ASSURANCE PROGRAM STANDARDS FOR AUTOMOTIVE REPAIR

WHEELS & TIRES 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 AMRA/MAP*

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

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Fig. 9: Wheels & Tires Checksheet (1 Of 2)

WHEELS & TIRES CHECKSHEET

LEFT FRONT

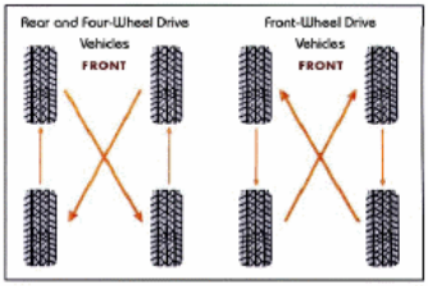
Component	OK	S	R	Condition
Lugs/Studs				
Tire Size Speed Rating _____				Spec_____ Actual_____
Run Flat				Y ____ N ____
Tread Depth				_____/32nds
Tire Pressure Placard _____				Before _____ After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition) Wheel Size				Spec_____ Actual_____

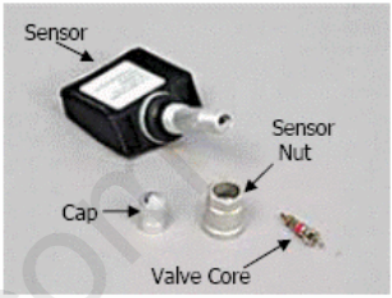
☐Edge wear ☐Cupped ☐Cut ☐Irregular wear

RIGHT FRONT

Component	OK	S	R	Condition
Lugs/Studs				
Tire Size Speed Rating _____				Spec_____ Actual_____
Run Flat				Y ____ N ____
Tread Depth				_____/32nds
Tire Pressure Placard _____				Before _____ After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition) Wheel Size				Spec_____ Actual_____

☐Edge wear ☐Cupped ☐Cut ☐Irregular wear





LEFT REAR

Component	OK	S	R	Condition
Lugs/Studs				
Tire Size Speed Rating _____				Spec_____ Actual_____
Run Flat				Y ____ N ____
Tread Depth				_____/32nds
Tire Pressure Placard _____				Before _____ After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition) Wheel Size				Spec_____ Actual_____

☐Edge wear ☐Cupped ☐Cut ☐Irregular wear

RIGHT REAR

Component	OK	S	R	Condition
Lugs/Studs				
Tire Size Speed Rating _____				Spec_____ Actual_____
Run Flat				Y ____ N ____
Tread Depth				_____/32nds
Tire Pressure Placard _____				Before _____ After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition) Wheel Size				Spec_____ Actual_____

☐Edge wear ☐Cupped ☐Cut ☐Irregular wear

OK	Suggested 1, 2, 3, 4, 5	Required A, B, C

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Fig. 10: Wheels & Tires Checksheet (2 Of 2)

STEERING AND SUSPENSION, WHEEL ALIGNMENT, WHEELS AND TIRES

NOTE: Steering and Suspension are complex systems made up of a variety of interdependent components and controls. For proper vehicle handling, ride, and tire wear, a thorough inspection is required whenever suspension work is being performed.

NOTE: Listed repair conditions assume that the problem has been isolated to the specific component by proper testing procedures. When replacing steering and/or suspension components which may affect an alignment angle, you are required to check and adjust alignment as needed. Refer to the OEM specifications for both ride height and alignment angle tolerances.

NOTE: Improper alignment geometry, and/or improper tire/wheel fitment may affect other systems such as Adaptive Cruise Control, Electronic Stability Control, Electronic Traction Control and Variable Ratio Steering. These systems may require attention after an alignment or suspension service is performed. Care must be taken to identify these vehicles/systems before any repair procedures are performed. Failure to follow OEM guidelines when servicing interrelated systems could result in an unsafe condition.

CAUTION: Do not use ride height altering or load compensating components, such as variable rate springs or coil over shocks on vehicles with height sensing or load sensing proportioning- valve equipped braking systems, unless these components are supplied as original equipment.

ACTIVE HANDLING

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

ACTIVE SUSPENSION CONTROL MODULES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require 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 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.		
Inoperative	B	Require repair or replacement

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Condition	Code	Procedure
NOTE: **Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.**		
Leaking	B	Require repair or replacement
Malfunctioning	A	Require replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.**		
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

ACTIVE VARIABLE RATIO STEERING

NOTE: **Besides electronically providing variable steering ratios, the computer is linked with the Vehicle Stability Control system to aid in directional stability. As the vehicle travels down the highway, road surfaces and wind gusts can affect the vehicle's directional stability. The vehicle may wander or dart to one side, (as many who have met a tractor-trailer unit on a windy day have experienced). Sensors on the vehicle detect this sudden, unintentional movement and the computer will stabilize the vehicle by moving the Active Steering electric motor and steering gear, all without the driver turning the steering wheel.**

NOTE: **Additionally, if the driver experiences a skid or slide because of poor road conditions, the Active Steering will react to information from the yaw rate and steering angle sensors to modify the steering angle of the front wheels and stabilize the vehicle. This occurs much faster than the driver can react. If the Active Steering correction is not adequate to control the skid or slide, then the Stability Control system is also activated.**

Condition	Code	Procedure
Improper Operation	Â	Â
NOTE: **Refer to manufacturers' service information.**		

ACTIVE YAW CONTROL

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

ADAPTIVE CRUISE CONTROL

NOTE: Similar to conventional cruise control. It maintains the vehicle's pre-set speed. However, beyond conventional cruise control, this system automatically adjusts speed to maintain proper distance between vehicles in the same lane. This is achieved through use of a radar or laser headway sensor, a digital signal processor and a longitudinal controller. If the lead vehicle slows down, or another object is detected, the system sends a signal to the engine and/or braking system to decelerate. Then, when the lane is clear, the system will re-accelerate the vehicle back to the set speed. Some OEM's require that the radar or laser headway sensor be calibrated to the thrustline of the vehicle.

ADVANCE TRAC

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

AIR BAGS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Collar cracked	A	Require replacement
End cap cracked	A	Require replacement

Condition	Code	Procedure
Inner fabric of bag damaged	A	Require replacement
Leaking	A	Require repair or replacement
Outer covering of air bag is cracked to the extent that inner fabric of air bag is visible	1	Suggest replacement
Piston cracked	A	Require replacement

AIR RIDE CONTROL MODULES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require 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 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.**		
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
Malfunctioning	A	Require replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.**		
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

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Condition	Code	Procedure
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 RIDE SUSPENSION TORSION SPRINGS (COUNTER BALANCING)

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Broken	A	Require replacement
Missing	C	Require replacement

AIR RIDE SUSPENSION

NOTE: **Depending on the air suspension design, there are some aftermarket products available to eliminate the air ride suspension on certain vehicles. If the system has been eliminated with one of these products, then no service is suggested or required.**

AIR RIDE TUBES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connected incorrectly	A	Require repair
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
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
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

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AIR SHOCKS AND AIR STRUTS

NOTE: **This section covers the air spring portion of the air shock or strut. For damping portion of shock or strut conditions and procedures, refer to the Shock Absorbers, Strut Cartridges, and Strut Assemblies section.**

Condition	Code	Procedure
Inner fabric of air bag damaged	A	Require replacement
Leaking	A	Require repair or replacement
Outer covering of air bag is cracked to the extent that inner fabric of air bag is visible	1	Suggest replacement

AIR SPRING 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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Blocked	A	Require repair or replacement
Connector bent	A	Require repair or replacement
Connector broken	A	Require replacement
Connector loose	A	Require repair or replacement
Inoperative	A	Require repair or replacement
Leaking	B	Require repair or replacement
Restricted	A	Require repair or replacement

AIR SPRINGS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Collar cracked	A	Require replacement
End cap cracked	A	Require replacement
Inner fabric of bag damaged	A	Require replacement
Leaking	A	Require repair or replacement
Outer covering of air bag is cracked to the extent that inner fabric of air bag is visible	1	Suggest replacement
Piston cracked	A	Require replacement

AIR SUSPENSION CONTROL VALVES

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

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Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Connector missing	C	Require replacement
Leaking	B	Require repair or replacement
Output incorrect	B	Require 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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

AIR SUSPENSION DRIERS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Contaminated, affecting performance	A	Require replacement
Desiccant bag deteriorated	A	Require replacement
NOTE: **Inspect system to determine effects of desiccant bag deterioration.**		
Leaking	B	Require replacement
Restricted	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

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Condition	Code	Procedure
Tubing connection leaking	A	Require repair or replacement

AXLE ACCELERATION SENSOR

NOTE: **When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.**

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure**		
Dust boot torn	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Housing cracked	B	Require replacement
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

BALL JOINTS

NOTE: **Before requiring or suggesting ball joint replacement, the approved OEM procedure must be used to measure ball joint wear. The measurement(s) obtained, along with the vehicle manufacturer's specifications, must be noted on the inspection report. Some states require that these measurements also appear on the invoice. The term ""perceptible movement,"" defined as any visible movement in any direction, has been the industry standard for determining the need for replacement of follower (non-load carrying) ball joints. Some vehicle manufacturers are now publishing specifications for follower ball joints that were previously diagnosed by the ""perceptible movement"" standard. Before requiring or suggesting any parts be replaced based on ""perceptible movement,"" consult your repair manual to determine if OEM specifications exist. You are not required to replace ball joints in axle sets. However, when replacing a ball joint due to wear exceeding manufacturer's specification, you may suggest replacement of the other ball joint if its measurement shows it is close to the end of its useful life, for preventive maintenance.**

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Further inspection required
NOTE: **If greaseable, grease ball joint. If problem persists or joint is non-greaseable, require replacement.**		
Grease boot cracked	2	Suggest replacement
NOTE: **Cracked grease boot will allow contaminants to enter the ball joint and will accelerate wear.**		
Grease boot missing	C	Require replacement

Condition	Code	Procedure
NOTE: **Lack of grease boot will allow contaminants to enter the ball joint and will accelerate wear.**		
Grease boot torn	A	Require replacement
NOTE: **Torn grease boot will allow contaminants to enter the ball joint and will accelerate wear.**		
Grease fitting broken	A	Require replacement of grease fitting
NOTE: **Some vehicles come from the factory with broken fittings. No service is suggested or required on these vehicles.**		
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Greaseable ball joint will not take grease	2	Suggest replacement of grease fitting
NOTE: **If the greaseable ball joint still will not take grease after replacing the grease fitting, suggest replacement of ball joint.**		
Nut on ball joint loose	A	Require repair or replacement
NOTE: **Check for bent stud or damaged taper hole.**		
Pre-load adjustment incorrect	B	Require repair or replacement
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud broken	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Wear exceeds manufacturer's specifications	B	Require replacement

BODY ACCELERATION SENSOR

NOTE: **When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.**

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware

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Condition	Code	Procedure
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure**		
Dust boot torn	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Housing cracked	B	Require replacement
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

BUSHINGS

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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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Deteriorated, affecting performance	A	Require repair or replacement
NOTE: **If condition is caused by oil-soaking, further inspection is required to determine source of oil.**		
Distorted, affecting performance	A	Require repair or replacement
Leaking (fluid-filled type)	A	Require replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: **If noise isolated to bushing, suggest repair or replacement. Use only approved lubricant on rubber bushings. Petroleum-based lubricants may damage rubber bushings.**		
Oil-soaked, affecting performance	A	Require replacement
NOTE: **Further inspection required to determine source of oil.**		
Rubber separating from internal metal sleeve on bonded bushing	A	Require replacement
Seized	A	Require replacement
Shifted (out of position)	B	Require repair or replacement
Split	A	Require replacement
Surface cracking (weather-checked)	Â	No service suggested or required

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CENTER LINKS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Binding	A	Further inspection required
NOTE: **If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.**		
Grease boot cracked	2	Require replacement of boot

Condition	Code	Procedure
NOTE: **If boot is not available as a separate component, suggest replacement of center link (reason code 2). Cracked grease boot will allow contaminants to enter the joint and will accelerate wear.**		
Grease boot missing	C	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of center link (reason code 2). Lack of grease boot will allow contaminants to enter the joint and will accelerate wear**		
Grease boot torn	A	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of center link (reason code 2). Torn grease boot will allow contaminants to enter the joint and will accelerate wear .**		
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement
NOTE: **If seal is not available as a separate component, suggest replacement of center link (reason code 2). Lack of grease seal will allow contaminants to enter the joint and will accelerate wear.**		
Grease seal torn	A	Require replacement
NOTE: **If seal is not available as a separate component, suggest replacement of center link (reason code 2). Torn grease seal will allow contaminants to enter the joint and will accelerate wear.**		
Greaseable center link will not take grease	2	Suggest replacement of grease fitting
NOTE: **If greaseable center link still will not take grease after replacing the grease fitting, suggest replacement of center link.**		
Looseness (perceptible horizontal movement)	1	Suggest replacement
NOTE: **If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Looseness that is excessive	B	Require replacement
NOTE: **Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.**		

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Condition	Code	Procedure
CAUTION: **Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud broken	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud loose in taper hole	A	Require repair or replacement
NOTE: **Check for damaged taper hole.**		
Taper hole elongated	A	Require replacement
NOTE: **Check for damaged stud.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Wear exceeds manufacturer's specifications	B	Require replacement

COMPRESSORS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector bent	A	Require repair or replacement
Connector broken	A	Require replacement
Connector loose	A	Require repair or replacement
Does not build pressure	A	Require replacement
Excessive run time	B	Require replacement
Inoperative	A	Require replacement
NOTE: **Inoperative includes intermittent operation.**		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Noisy (abnormal)	2	Suggest replacement

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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
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

CONTINUOUS DAMPING CONTROL

NOTE: **A semi-active suspension system which continuously adjusts damping levels according to road conditions and vehicle dynamics, (such as speed, turning and cornering, as well as driver inputs). An ECU processes driver inputs and data from sensors. The sensors include accelerometers mounted on the vehicle body and suspension position sensors, which feed steering wheel angle, vehicle speed, brake pressure and other chassis control data to the ECU. The ECU processes sensor data and sends signals which adjust the damping level of each shock.**

CONTROL ARM SHAFTS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Shaft bushing surface undersized (worn)	B	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

CONTROL ARMS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware

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Condition	Code	Procedure
Ball joint hole oversized (loose interference or press fit)	B	Further inspection required
NOTE: **If oversized ball joint is available, require replacement orb all joint. If oversized ball joint is not available, require replacement of control arm.**		
Bent, affecting performance	B	Require replacement
Bushing hole oversized	B	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Holes distorted	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

CONTROL MODULES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require 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 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.**		
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
Malfunctioning	A	Require replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.**		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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

DISTANCE REGULATION CONTROL MODULE

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
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.**		
Dust boot missing	C	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure**		
Dust boot split	A	Require replacement of boot

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Condition	Code	Procedure
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Dust boot torn	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Housing cracked	B	Require replacement
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.**		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Malfunctioning	A	Require replacement
NOTE: **includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.**		
Missing	C	Require replacement
Output signal incorrect	B	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, 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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

DISTANCE REGULATION SENSOR

NOTE: **OEM may require this sensor be calibrated to the vehicle thrustline.**

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

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Condition	Code	Procedure
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure**		
Dust boot torn	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Housing cracked	B	Require replacement
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement

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Condition	Code	Procedure
Wire lead shorted	A	Require repair or replacement

DRAG LINKS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Binding	A	Further inspection required
NOTE: **If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.**		
Grease boot cracked	2	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of drag link (reason code 2). Cracked grease boot will allow contaminants to enter the joint and will accelerate wear.**		
Grease boot missing	C	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of drag link (reason code 2). Lack of grease boot will allow contaminants to enter the joint and will accelerate wear.**		
Grease boot torn	A	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of drag link (reason code 2). Torn grease boot will allow contaminants to enter the joint and will accelerate wear.**		
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement
NOTE: **If seal is not available as a separate component, suggest replacement of drag link (reason code 2). Lack of grease seal will allow contaminants to enter the joint and will accelerate wear.**		
Grease seal torn	A	Require replacement
NOTE: **If seal is not available as a separate component, suggest replacement of drag link (reason code 2). Torn grease seal will allow contaminants to enter the joint and will accelerate wear.**		
Greaseable drag link will not take grease	2	Suggest replacement of grease fitting

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Condition	Code	Procedure
NOTE: **If greaseable center link still will not take grease after replacing the grease fitting, suggest replacement of drag link.**		
Looseness (perceptible horizontal movement)	1	Suggest replacement
NOTE: **If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Looseness that is excessive	B	Require replacement
NOTE: **Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.**		
CAUTION: **Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud broken	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud loose in taper hole	A	Require repair or replacement
NOTE: **Check for damaged taper hole.**		
Taper hole elongated	A	Require replacement
NOTE: **Check for damaged stud.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Wear exceeds manufacturer's specifications	B	Require replacement

DYNAMIC STABILITY CONTROL

NOTE: **An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.**

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Condition	Code	Procedure
NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.		
NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.		

DYNAMIC STABILITY TRACTION CONTROL

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

ELECTRONIC RIDE CONTROL SHOCKS AND STRUTS

NOTE: This section covers the electronic damping control portion of the electronic shock or strut. For damping portion of shock or strut conditions and procedures, refer to the Shock Absorbers, Strut Cartridges, and Strut Assemblies section.

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector bent	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector loose	A	Require repair or replacement
Electronic valve control inoperative	A	Require replacement
NOTE: It is acceptable to replace with a non-electronically controlled unit, where available.		
Terminal bent	A	Require repair or replacement

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Condition	Code	Procedure
Terminal broken	A	Require repair or replacement
Terminal corroded	A	Require repair or replacement
Terminal loose	A	Require repair or replacement

ELECTRONIC STABILITY CONTROL

NOTE: **An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.**

NOTE: **On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.**

ELECTRONIC SUSPENSION SYSTEM

NOTE: **(Typical) A semi-active suspension system which continuously adjusts damping levels according to road conditions and vehicle dynamics, (such as speed, turning and cornering, as well as driver inputs). An ECU processes driver inputs and data from sensors. The sensors include accelerometers mounted on the vehicle body and suspension position sensors, which feed steering wheel angle, vehicle speed, brake pressure and other chassis control data to the ECU. The ECU processes sensor data and sends signals which adjust the damping level of each shock.**

FLEX COUPLERS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Flex coupler binding	A	Require repair or replacement of coupler
Flex coupler loose	A	Require repair or replacement of coupler
Flex coupler missing parts	A	Require repair or replacement of coupler
Flex coupler soft/ spongy	A	Require replacement of coupler
Flex coupler tom	A	Require replacement of coupler
Steering coupler shield cracked	2	Suggest replacement
Steering coupler shield missing	C	Require replacement
Steering coupler shield torn	2	Suggest replacement
U-joint binding	A	Require repair or replacement of joint
U-joint loose	A	Require repair or replacement of joint

GASKETS

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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.**		

HEIGHT SENSORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Dust boot missing	C	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure**		
Dust boot split	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Dust boot torn	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Housing cracked	B	Require replacement
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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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
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

HYDRAULIC HOSES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Blistered	B	Require replacement
Fitting threads damaged	A	Require repair or replacement
Fitting threads stripped (threads missing)	A	Require replacement
Inner fabric (webbing) cut	B	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Outer covering is cracked to the extent that inner fabric of hose is visible	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement
Secured incorrectly	B	Require repair

HYDRAULIC POWER STEERING 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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement

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Condition	Code	Procedure
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Pulley bent	A	Require repair or replacement of pulley
Pulley missing	C	Require replacement of pulley
Pump output out of manufacturer's specifications	A	Require repair or replacement
Remote reservoir leaking	A	Require replacement of reservoir
Reservoir cap broken	A	Require replacement of cap
Reservoir cap missing	C	Require replacement of cap
Seized	A	Require 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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

HYDRAULIC SUSPENSION HOSES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Blistered	B	Require replacement
Fitting threads damaged	A	Require repair or replacement
Fitting threads stripped (threads missing)	A	Require replacement
Inner fabric (webbing) cut	B	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Outer covering is cracked to the extent that inner fabric of hose is visible	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement
Secured incorrectly	B	Require repair

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HYDRAULIC SUSPENSION 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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Fluid at or beyond service interval	3	Suggest fluid change
Fluid contaminated	B	Require flushing and refilling of the system
NOTE: **Determine and correct source of contamination. OEM specifications must be followed for fluid type.**		
Fluid contaminated	B	Require flushing and refilling of the system
NOTE: **Determine and correct source of contamination. OEM specifications must be followed for fluid type.**		
Fluid level incorrect	B	Require adjustment of fluid level
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Pulley bent	A	Require repair or replacement of pulley
Pulley missing	C	Require replacement of pulley
Pump output out of manufacturer's specifications	A	Require repair or replacement
Remote reservoir leaking	A	Require replacement of reservoir
Reservoir cap broken	A	Require replacement of cap
Reservoir cap missing	C	Require replacement of cap
Seized	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

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IDLER ARMS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Further inspection required

Condition	Code	Procedure
NOTE: **If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.**		
Grease boot cracked	B	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of idler arm (reason code 2). Cracked grease boot will allow contaminants to enter joint and will accelerate wear.**		
Grease boot missing	C	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of idler arm (reason code 2). Lack of grease boot will allow contaminants to enter joint and will accelerate wear.**		
Grease boot torn	A	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of idler arm (reason code 2). Torn grease boot will allow contaminants to enter joint and will accelerate wear.**		
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement of seal
NOTE: **If seal is not available as a separate component, suggest replacement of idler arm (reason code 2). Missing grease seal will allow contaminants to enter joint and will accelerate wear.**		
Grease seal torn	A	Require replacement of seal
NOTE: **If seal is not available as a separate component, suggest replacement of idler arm (reason code 2). Torn grease seal will allow contaminants to enter joint and will accelerate wear.**		
Greaseable joint will not take grease	2	Suggest replacement of grease fitting
NOTE: **If greaseable joint will not take grease after replacing the grease fitting, suggest replacement of idler arm.**		
Looseness at frame bracket end	B	Require repair or replacement
NOTE: **If manufacturer's procedures and specifications exist, use those procedures and specifications; otherwise, use an approved inspection method such as the dry park check.**		
NOTE: **Looseness is defined as movement that creates excessive toe change.**		
Looseness at link end (perceptible horizontal movement)	1	Suggest replacement

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Condition	Code	Procedure
NOTE: **If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Looseness at link end that is excessive	B	Require replacement
NOTE: **Excessive looseness is defined as significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.**		
CAUTION: **Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Mounted out of position (center link not parallel)	B	Require repositioning
Nut on stud loose	A	Require repair or replacement
NOTE: **Check for bent stud or damaged taper hole.**		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud broken	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Taper hole elongated	A	Require replacement
NOTE: **Check for damaged stud.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Wear exceeds manufacturer's specifications	B	Require replacement

INTERMEDIATE SHAFT U-JOINTS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware

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Condition	Code	Procedure
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Flex coupler binding	A	Require repair or replacement of coupler
Flex coupler loose	A	Require repair or replacement of coupler
Flex coupler missing parts	A	Require repair or replacement of coupler
Flex coupler soft/ spongy	A	Require replacement of coupler
Flex coupler tom	A	Require replacement of coupler
Steering coupler shield cracked	2	Suggest replacement
Steering coupler shield missing	C	Require replacement
Steering coupler shield torn	2	Suggest replacement
U-joint binding	A	Require repair or replacement of joint
U-joint loose	A	Require repair or replacement of joint

KING PINS

NOTE: **You are not required to replace king pins in axle sets. However, when replacing a king pin due to wear exceeding manufacturer's specifications, you may suggest replacement of the other king pin on the axle if its measurement shows it is close to the end of its useful life.**

Condition	Code	Procedure
Bearing balls pitted	A	Require replacement
Bearing balls worn	A	Require replacement
Bearing races pitted	A	Require replacement
Bearing races worn	A	Require replacement
Bearing rollers pitted	A	Require replacement
Bearing rollers worn	A	Require replacement
Bearing seal bent	2	Suggest replacement of seal or bearing
Bearing seal missing	C	Require replacement of seal if available separately or bearing and seal together
Bearing seal torn	A	Require replacement of seal if available separately or bearing and seal together
Binding	A	Require repair or replacement of affected parts
End caps missing	C	Require replacement of missing part, if available; otherwise, replace king pin
End play exceeds specifications	B	Require repair
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting will not seal	A	Require replacement of grease fitting
Locating pins missing	C	Require replacement of missing part, if available; otherwise, replace king pin
Looseness exceeds manufacturer's specifications	B	Require replacement of worn parts
Seized	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Will not take grease	2	Suggest replacement of grease fitting

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Condition	Code	Procedure
NOTE: **If king pin will not take grease after replacement of grease fitting, suggest replacement of king pin.**		

MODULES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require 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 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.**		
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
Malfunctioning	A	Require replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.**		
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

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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

PITMAN ARMS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Binding	A	Further inspection required
NOTE: **If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.**		
Grease boot cracked	2	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of pitman arm (reason code 2). Cracked grease boot will allow contaminants to enter joint and will accelerate wear.**		
Grease boot missing	C	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of pitman arm (reason code 2). Lack of grease boot will allow contaminants to enter joint and will accelerate wear.**		
Grease boot torn	A	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of pitman arm (reason code 2). Tom grease boot will allow contaminants to enter joint and will accelerate wear.**		
Grease fitting broken	A	Require replacement grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement of seal
NOTE: **If seal is not available as a separate component, suggest replacement of pitman arm (reason code 2). Lack of grease seal will allow contaminants to enter joint and will accelerate wear.**		
Grease seal torn	A	Require replacement of seal

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Condition	Code	Procedure
NOTE: **If seal is not available as a separate component, suggest replacement of pitman arm (reason code 2). Tom grease seal will allow contaminants to enter joint and will accelerate wear.**		
Looseness (perceptible horizontal movement)	1	Suggest replacement
NOTE: **If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Looseness that is excessive	B	Require replacement
NOTE: **Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.**		
CAUTION: **Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Nut on stud loose	A	Require repair or replacement
NOTE: **Check for bent stud or damaged taper hole.**		
Seized	A	Require replacement
Splines damaged	A	Require repair or replacement
Splines stripped (splines missing)	A	Require replacement
Stud bent	B	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud broken	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud loose in taper hole	A	Require repair or replacement
NOTE: **Check for damaged taper hole.**		
Taper hole elongated	A	Require replacement
NOTE: **Check for damaged stud.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: **Check for damaged taper hole.**		

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POWER STEERING BELTS

Condition	Code	Procedure
Alignment incorrect	B	Further inspection required
NOTE: **Determine cause of incorrect alignment and require repair.**		
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
Serpentine belt routed incorrectly	B	Require repair
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

POWER STEERING COOLERS

Condition	Code	Procedure
Air flow obstruction	A	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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connection leaking	A	Require repair or replacement
Contaminated	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	Â	No service suggested or required
Internal restrictions	B	Require 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	Â	No service suggested or required

POWER STEERING FLUID

Condition	Code	Procedure
50,000 miles or greater on OE fluid (in absence of published manufacturer interval)	5	Suggest Replacement
NOTE: **One time only fluid exchange**		
Additive Depletion	A	Require replacement of fluid
Fluid at or beyond service interval	3	Suggest fluid replacement

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Condition	Code	Procedure
Fluid contaminated (i.e. fluid other than power steering fluid present)	B	Require flushing and refilling of the system
NOTE: **Determine and correct source of contamination. OEM specifications must be followed for fluid type.**		
Fluid discolored	Â	No Service Suggested or Required
NOTE: **Further testing necessary to determine condition of fluid.**		
Fluid level incorrect	B	Require adjustment of fluid level
Fluid type incorrect	B	Require flushing and refilling with correct fluid
Oxidized	A	Require replacement of fluid

POWER STEERING HOSES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Blistered	B	Require replacement
Fitting threads damaged	A	Require repair or replacement
Fitting threads stripped (threads missing)	A	Require replacement
Inner fabric (webbing) cut	B	Require replacement
Leaking	A	Require replacement
Missing	C	Require replacement
Outer covering is cracked to the extent that inner fabric of hose is visible	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement
Secured incorrectly	B	Require repair

POWER STEERING LINES (STEEL)

NOTE: **When replacing steel power steering lines, be sure to use a replacement product that meets or exceeds OEM specifications.**

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Corroded, affecting structural integrity	A	Require replacement

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Condition	Code	Procedure
Fitting incorrect (for example, compression fitting)	B	Require replacement
Flare type incorrect	B	Require repair or replacement
Leaking	A	Require repair or replacement
Line material incorrect (copper, etc.)	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement
Rust-pitted, not affecting structural integrity	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

POWER STEERING 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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Pulley bent	A	Require repair or replacement of pulley
Pulley missing	C	Require replacement of pulley
Pump output out of manufacturer's specifications	A	Require repair or replacement
Remote reservoir leaking	A	Require replacement of reservoir
Reservoir cap broken	A	Require replacement of cap
Reservoir cap missing	C	Require replacement of cap
Seized	A	Require 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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement

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

POWER STEERING PUMPS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Binding	A	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Fluid at or beyond service interval	3	Suggest fluid change
Fluid contaminated	B	Require flushing and refilling of the system
Fluid level incorrect	B	Require adjustment of fluid level
Leaking	B	Require repair or replacement
Leaking	A	Require repair or replacement
Noisy	2	Suggest repair or replacement
Noisy	2	Suggest repair or replacement
Pulley bent	A	Require repair or replacement of pulley
Pulley bent	A	Require repair or replacement of pulley
Pulley missing	C	Require replacement of pulley
Pulley missing	C	Require replacement of pulley
Pump output out of manufacturer's specifications	A	Require repair or replacement
Pump output out of manufacturer's specifications	A	Require repair or replacement
Remote reservoir leaking	A	Require replacement of reservoir
Remote reservoir leaking	A	Require replacement of reservoir
Reservoir cap broken	A	Require replacement of cap
Reservoir cap broken	A	Require replacement of cap
Reservoir cap missing	C	Require replacement of cap

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Condition	Code	Procedure
Reservoir cap missing	C	Require replacement of cap
Seized	A	Require replacement
Seized	A	Require 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 damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

RADAR SENSOR

NOTE: **OEM may require this sensor be calibrated to the vehicle thrustline.**

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure**		
Dust boot torn	A	Require replacement of boot

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Condition	Code	Procedure
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Housing cracked	B	Require replacement
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

RADIUS ARMS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Corroded, affecting structural integrity	a	Require replacement
Holes distorted	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

RELAY RODS

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

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Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Binding	A	Further inspection required
NOTE: **If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.**		
Grease boot cracked	B	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of relay rod (reason code 2). Cracked grease boot will allow contaminants to enter the joint and will accelerate wear.**		
Grease boot missing	C	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of relay rod (reason code 2). Lack of grease boot will allow contaminants to enter the joint and will accelerate wear.**		
Grease boot torn	A	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of center link (reason code 2). Torn grease boot will allow contaminants to enter the joint and will accelerate wear.**		
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement of seal
NOTE: **If seal is not available as a separate component, suggest replacement of relay rod (reason code 2). Lack of grease seal will allow contaminants to enter the joint and will accelerate wear.**		
Grease seal torn	A	Require replacement of seal
NOTE: **If seal is not available as a separate component, suggest replacement of relay rod (reason code 2). Torn grease seal will allow contaminants to enter the joint and will accelerate wear.**		
Greaseable relay rod will not take grease	2	Suggest replacement of grease fitting
NOTE: **If greaseable relay rod still will not take grease after replacing the grease fitting, suggest replacement of relay rod.**		
Looseness (perceptible horizontal movement)	1	Suggest replacement

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Condition	Code	Procedure
NOTE: **If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Looseness that is excessive	B	Require replacement
NOTE: **Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.**		
CAUTION: **Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud broken	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud loose in taper hole	A	Require repair or replacement
NOTE: **Check for damaged taper hole.**		
Taper hole elongated	A	Require replacement
NOTE: **Check for damaged stud.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Wear exceeds manufacturer's specifications	B	Require replacement

RELAYS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware

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Condition	Code	Procedure
Housing broken	A	Require replacement
Housing cracked	2	Suggest replacement
Inoperative	A	Require 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

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require 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
NOTE: **Inoperative includes intermittent operation or out of specification.**		
Leaking (vacuum/fluid/air)	A	Require replacement
Out of adjustment	B	Further inspection required
NOTE: **Follow OEM recommended adjustment procedures. Repair or replace if out of specification.**		
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

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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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

SHOCK ABSORBERS, STRUT CARTRIDGES AND STRUT ASSEMBLIES

NOTE: **You are not required to replace shocks or struts in axle sets. However, when replacing a shock or strut due to the conditions that follow, you may suggest replacement of the other shock or strut on the same axle for one or more of the following: improved performance or preventive maintenance; part is close to the end of its useful life; to extend tire life; to balance ride and handling; or to improve stopping distance. When replacing steering and/or suspension components which may affect an alignment angle, you are required to check and adjust alignment as needed. Refer to the OEM specifications. Under no circumstances should a technician bend struts or strut housings. A vehicle's load-carrying and handling abilities are limited by its suspension, tires, brakes, and driveline. Installing coil over shocks or any other load assist device does not increase the vehicle's load capacity. See the vehicle owner's manual for more details. If vehicle is equipped with OEM coil over shocks, apply the conditions for coil springs from the Springs: Coil, Leaf, and Torsion Bar section of the Steering and Suspension guidelines. If the vehicle is equipped with add-on coil over shocks, you may suggest replacement with standard shocks for a spring-related condition.**

Condition	Code	Procedure
50,000 miles or greater on OEM Shocks or Struts	1	Suggest Replacement
NOTE: **Applies only to OEM hydraulic fluid and/or gas charged shocks and struts, NOT electronically controlled units.**		
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require replacement
Body dented	A	Further inspection required
NOTE: **Require replacement of units where dents restrict shock or strut piston rod movement. If dents don't restrict movement, no service is suggested or required. Especially critical on mono-tube shocks.**		

Condition	Code	Procedure
Body punctured	A	Require replacement
Brake hose bracket bent	B	Require repair or replacement
Brake hose bracket missing	C	Require replacement
Brake hose bracket threads damaged	A	Require repair or replacement
Brake hose bracket threads stripped (threads missing)	C	Require replacement
Compression bumper missing	C	Require replacement of compression bumper
Compression bumper split	1	Suggest replacement of compression bumper
Damping (none)	A	Require replacement
Dust boot (bellows) missing	C	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of shock or strut (reason code 2). This condition can lead to damage of the piston rod, which causes piston rod seal wear.**		
Dust boot (bellows) split	A	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of shock or strut (reason code 2). This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Dust boot (bellows) torn	A	Require replacement of boot
NOTE: **If boot is not available as a separate component, suggest replacement of shock or strut (reason code 2). This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Dust shield broken	2	Suggest replacement
NOTE: **This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Dust shield missing	2	Suggest replacement
NOTE: **This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Gland nut (strut housing cap) is not removable using appropriate tool	A	Require replacement of nut and/or housing
NOTE: **Only required if replacing cartridge.**		
Gland nut (strut housing cap) threads damaged	A	Require repair or replacement of nut
Housing dented	A	Further inspection required
NOTE: **Require replacement of units where dents restrict shock or strut piston rod movement. If dents don't restrict movement, no service is suggested or required. Especially critical on mono-tube shocks.**		
Housing punctured	A	Require replacement

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Condition	Code	Procedure
Jounce bumper missing	C	Require replacement of jounce bumper
Jounce bumper split	1	Suggest replacement of jounce bumper
Leaking oil, enough for fluid to be running down the body	A	Require replacement
NOTE: **If the strut cartridge has been replaced previously, the oil on the strut housing may be filler oil. The technician must identify the source of the oil.**		
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
Piston rod has surface defect	2	Suggest replacement
Piston rod threads damaged	A	Require repair or replacement
Piston rod threads stripped (threads missing)	A	Require replacement
Seized	A	Require replacement
Shock missing	C	Require replacement
Strut housing bent	A	Require replacement
Strut housing cap (gland nut) is not removable using appropriate tool	A	Require replacement of nut and/or housing
NOTE: **Only required if replacing cartridge.**		
Strut housing cap (gland nut) threads damaged	A	Require repair or replacement of nut
Strut housing cap (gland nut) threads stripped (threads missing)	A	Require replacement of nut
Strut housing severely corroded, affecting structural integrity	A	Require replacement
Strut housing threads damaged	A	Require repair or replacement
Strut housing threads stripped (threads missing)	A	Require replacement
Tire cupping	A	Further inspection required
NOTE: **Although shocks or struts may have contributed to tire cupping, an inspection is needed of the entire suspension system. If the shock or strut is found to be contributing to the tire cupping, require replacement.**		

SPINDLES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent	B	Require replacement

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Condition	Code	Procedure
Broken	A	Require replacement
Pinch bolt bent	B	Require replacement
Pinch bolt incorrect	B	Require replacement with bolt that meets OEM design
Pinch bolt loose	B	Require repair
Pinch bolt missing	C	Require replacement
Pinch bolt tabs deformed (gap closer together than allowed by OEM specification, typically minimum .032"" gap before clamping)	B	Require replacement
NOTE: **Steering knuckle deformation can cause pinch bolt breakage.**		
Race seat area undersized	B	Require replacement
Scored	A	Require repair or replacement
Taper hole elongated	A	Require replacement
NOTE: **Check for damaged stud.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SPRINGS, COIL, LEAF AND TORSION BARS

NOTE: **When springs are replaced, it is suggested, but not required, that both springs on an axle be replaced to maintain equal height from side to side and to provide a balanced ride and proper handling. When variable rate springs are installed in place of conventional coil springs, they must be installed in axle sets to ensure proper handling, uniform ride, and proper chassis height. Erroneous height measurements may result from: improper tire inflation, non-standard tire or wheel size, and heavy load in vehicle or trunk.**

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Broken (all springs except secondary leave(s) on multi-leaf springs)	A	Require replacement
Coil clash	Â	Further inspection required
NOTE: **Require ride height check and inspection of strike out Jounce) bumper. If vehicle is within manufacturer's height specifications, no service is suggested or required.**		
Coil spring insulator deteriorated	2	Suggest replacement of insulator
Coil spring insulator missing	C	Require replacement of insulator
Coil spring insulator split	2	Suggest replacement of insulator

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Condition	Code	Procedure
Coil spring plastic coating deteriorated - rust present	A	Refer to manufacturer's service requirements
NOTE: **Some manufacturers require replacement under these conditions.**		
Composite spring damaged	Â	Further inspection required
NOTE: **Check vehicle ride height. If ride height is OK, no service is suggested or required.**		
Cracked (all springs except composite leaf and secondary leave(s) on multileaf springs)	A	Require replacement
Installed incorrectly	B	Require repair
Leaf spring insulators missing	C	Require replacement of insulators
Secondary leaf on multi-leaf spring broken	1	Suggest repair or replacement
Secondary leaf on multi-leaf spring cracked	1	Suggest repair or replacement
Torsion bar adjuster bent	A	Require repair or replacement of adjuster
NOTE: **Only required if ride height needs to be adjusted.**		
Torsion bar adjuster seized	A	Require repair or replacement of adjuster
NOTE: **Only required if ride height needs to be adjusted.**		
Torsion bar adjuster threads damaged	A	Require repair or replacement of part with damaged threads
NOTE: **Only required if ride height needs to be adjusted.**		
Torsion bar adjuster threads stripped (threads missing)	A	Require replacement of part with stripped threads
Vehicle suspension height not within OEM specifications	A	Require adjustment or replacement

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STABILITRAC

NOTE: **An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.**

NOTE: **On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.**

NOTE: **When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.**

STABILITY MANAGEMENT SYSTEM

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

STEERING ANGLE SENSOR

NOTE: OEM may require this sensor be calibrated to the vehicle thrustline. Sensor must be reset when replacing / servicing steering rack assembly.

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement
NOTE: Determine cause and correct prior to replacement of part.		
Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure		
Dust boot torn	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Housing cracked	B	Require replacement

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Condition	Code	Procedure
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

STEERING ARMS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent	B	Require replacement
Broken	A	Require replacement
Pinch bolt bent	B	Require replacement
Pinch bolt incorrect	B	Require replacement with bolt that meets OEM design
Pinch bolt loose	B	Require repair
Pinch bolt missing	C	Require replacement
Pinch bolt tabs deformed (gap closer together than allowed by OEM specification, typically minimum .032"" gap before clamping)	B	Require replacement
NOTE: **Steering knuckle deformation can cause pinch bolt breakage.**		
Race seat area undersized	B	Require replacement
Scored	A	Require repair or replacement
Taper hole elongated	A	Require replacement

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Condition	Code	Procedure
NOTE: **Check for damaged stud.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

STEERING COUPLERS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Flex coupler binding	A	Require repair or replacement of coupler
Flex coupler loose	A	Require repair or replacement of coupler
Flex coupler missing parts	A	Require repair or replacement of coupler
Flex coupler soft/ spongy	A	Require replacement of coupler
Flex coupler tom	A	Require replacement of coupler
Steering coupler shield cracked	2	Suggest replacement
Steering coupler shield missing	C	Require replacement
Steering coupler shield torn	2	Suggest replacement
U-joint binding	A	Require repair or replacement of joint
U-joint loose	A	Require repair or replacement of joint

STEERING DAMPERS

NOTE: **The following procedures are only required if the vehicle was originally equipped from the factory with a steering damper. If the steering damper is an add-on unit, then the unit may be removed (and not replaced), based on customer's informed decision.**

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require replacement
Damper body dented	A	Further inspection required

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Condition	Code	Procedure
NOTE: **Require replacement of units where dents restrict damper piston rod movement. If dents don't restrict movement, no service is suggested or required. Especially critical on mono-tube dampers.**		
Damper body punctured	A	Require replacement
Damping (none)	A	Require replacement
Dust boot (bellows) missing	C	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of steering damper (reason code 2). This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Dust boot (bellows) split	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of steering damper (reason code 2). This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Dust shield broken	2	Suggest replacement
NOTE: **This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Dust shield missing	2	Suggest replacement
NOTE: **This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.**		
Leaking oil, enough for fluid to be running down the body	A	Require replacement
Loose	A	Require repair or replacement
Missing	C	Require replacement
Noise	2	Further inspection required
NOTE: **If noise is isolated to damper, suggest replacement.**		
Piston rod bent	A	Require replacement
Piston rod broken	A	Require replacement
Piston rod has surface defect	2	Suggest replacement
Piston rod threads damaged	A	Require repair or replacement
Piston rod threads stripped (threads missing), affecting performance	A	Require replacement
NOTE: **Only required if condition affects structural integrity or if unit needs to be serviced.**		
Seized	A	Require replacement

STEERING GEARS (EXCEPT RACK AND PINION)

Condition	Code	Procedure

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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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Fluid contaminated	B	Require flushing and refilling of the system
NOTE: **Determine and correct source of contamination. OEM specifications must be followed for fluid type.**		
Gasket leaking	A	Require repair or replacement of gasket
Housing leaking	A	Require replacement
Hydraulic fittings leaking	A	Require repair or replacement of fittings
Inadequate power assist	A	Further inspection required
NOTE: **If steering gear is source of inadequate assist, require repair or replacement.**		
Lash exceeds manufacturer's specifications	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.**		
Seal leaking	A	Require repair or replacement of seal and / or mating part
Splines damaged	A	Require repair or replacement of splines
Splines stripped	A	Require replacement of splines
Steering coupler shield cracked	2	Suggest replacement
Steering coupler shield missing	C	Require 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

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Condition	Code	Procedure
Threads damaged	A	Require repair or replacement of part with damaged threads
Threads stripped (threads missing)	A	Require replacement of part with stripped threads
Unequal power assist	A	Require repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

STEERING GEARS, RACK AND PINION

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Balance tube blocked	A	Require repair or replacement of balance tube
Balance tube missing	C	Require replacement of balance tube
Balance tube restricted	A	Require repair or replacement of balance tube
Bellows boot clamp missing	C	Require replacement of clamp
Bellows boot cracked (not through)	2	Suggest replacement of bellows boot
Bellows boot missing	C	Require replacement of bellows boot
Bellows boot not sealing	A	Require repair or replacement of bellows boot
Bellows boot torn	A	Require replacement of bellows boot
Bellows boot twisted (from toe adjustment)	B	Require repair
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Connector missing	C	Require replacement
Fitting leaking	A	Require repair or replacement
Fitting missing	A	Require replacement of fitting
Fitting threads damaged	A	Require repair or replacement of part with damaged threads
Fitting threads stripped (threads missing)	A	Require replacement of part with stripped threads
Fluid contaminated	B	Require flushing and refilling of the system
NOTE: **Determine and correct source of contamination. OEM specifications must be followed for fluid type.**		
Gasket leaking	A	Require repair or replacement

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Condition	Code	Procedure
Housing cracked, affecting structural integrity	B	Require replacement
Housing leaking	A	Require replacement
Inadequate power assist	A	Further inspection required
NOTE: **If steering gear is source of inadequate assist, require repair or replacement.**		
Lash exceeds manufacturer's specifications	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: **Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.**		
Seal leaking	A	Require repair or replacement
Splines damaged	A	Require repair or replacement
Splines stripped (splines missing)	A	Require replacement
Steel line blocked	A	Require repair or replacement of line
Steel line leaking	A	Require repair or replacement of line
Steel line missing	C	Require replacement of line
Steel line restricted	A	Require repair or replacement of line
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 of part with damaged threads
Threads stripped (threads missing)	A	Require replacement of part with stripped threads
Unequal power assist	A	Require repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

STEERING KNUCKLES

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent	B	Require replacement
Broken	A	Require replacement
Pinch bolt bent	B	Require replacement

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Condition	Code	Procedure
Pinch bolt incorrect	B	Require replacement with bolt that meets OEM design
Pinch bolt loose	B	Require repair
Pinch bolt missing	C	Require replacement
Pinch bolt tabs deformed (gap closer together than allowed by OEM specification, typically minimum .032"" gap before clamping)	B	Require replacement
NOTE: **Steering knuckle deformation can cause pinch bolt breakage.**		
Race seat area undersized	B	Require replacement
Scored	A	Require repair or replacement
Taper hole elongated	A	Require replacement
NOTE: **Check for damaged stud.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

STRIKE OUT BUMPERS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Missing	C	Require replacement
Split	A	Suggest replacement

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STRUT BEARING PLATE ASSEMBLIES

NOTE: **When the following guidelines indicate replacement of bearing, only the bearing should be replaced if it is available separately; otherwise, replace the bearing plate assembly.**

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Axial or radial movement exceeds vehicle manufacturer's specifications	B	Require replacement
Bearing binding	A	Require replacement of bearing

Condition	Code	Procedure
Bearing missing	C	Require replacement of bearing
Bearing seized	A	Require replacement of bearing
Bent, affecting performance	B	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Holes distorted	A	Require replacement
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

STRUT RODS

Condition	Code	Procedure
Adjusting nut seized	A	Require repair or replacement of hardware
NOTE: **Only required if an alignment is being performed and adjustment of the strut in question is required.**		
Attaching (mating) hole oversized	A	Require repair or replacement of bracket or frame
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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Attaching point on bracket or frame corroded, affecting structural integrity	A	Require repair of bracket or frame
Bent, affecting performance	A	Require replacement
Mating (attaching) hole oversized	A	Require repair or replacement of bracket or frame
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SUSPENSION PUMPS (HYDRAULIC)

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Fluid at or beyond service interval	3	Suggest fluid change
Fluid contaminated	B	Require flushing and refilling of the system

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Condition	Code	Procedure
NOTE: **Determine and correct source of contamination. OEM specifications must be followed for fluid type.**		
Fluid level incorrect	B	Require adjustment of fluid level
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Pulley bent	A	Require repair or replacement of pulley
Pulley missing	C	Require replacement of pulley
Pump output out of manufacturer's specifications	A	Require repair or replacement
Remote reservoir leaking	A	Require replacement of reservoir
Reservoir cap broken	A	Require replacement of cap
Reservoir cap missing	C	Require replacement of cap
Seized	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SWAY BAR LINKS

Condition	Code	Procedure
Attaching (mating) hole distorted	A	Require repair or replacement of bracket or control arm
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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Ball and socket has looseness (perceptible vertical movement)	1	Suggest replacement
NOTE: **If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Ball and socket has looseness that is excessive	B	Require replacement
NOTE: **Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method.**		
CAUTION: **Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.** Â	Â	Â
Bent	B	Require replacement
Broken	A	Require replacement
Bushing cracked	A	Require replacement

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Condition	Code	Procedure
Bushing deteriorated, affecting performance	A	Require repair or replacement
NOTE: **If condition is caused by oil-soaking, further inspection is required to determine source of oil.**		
Bushing distorted, affecting performance	A	Require repair or replacement
Bushing missing	C	Require replacement
Bushing oil-soaked, affecting performance	A	Require replacement
NOTE: **Further inspection required to determine source of oil.**		
Bushing shows surface cracking (weather-checked)	Â	No service suggested or required
Bushing split	A	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Grease boot cracked	2	Suggest replacement
NOTE: **Cracked grease boot will allow contaminants to enter the joint and will accelerate wear .**		
Grease boot missing	C	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sway bar link (reason code 2). Lack of grease boot will allow contaminants to enter the joint and will accelerate wear.**		
Grease boot torn	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sway bar link (reason code 2). Lack of grease boot will allow contaminants to enter the joint and will accelerate wear.**		
Mating (attaching) hole distorted	A	Require repair or replacement of bracket or control arm
Missing	C	Require replacement
Nut on stud loose	A	Require repair
NOTE: **Check for bent stud or damaged mating hole.**		
Stud bent	B	Require replacement
NOTE: **Check for damaged mating hole.**		
Stud broken	A	Require replacement
NOTE: **Check for damaged mating hole.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: **Check for damaged mating hole.**		

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SWAY BAR MOUNTING BUSHINGS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Deteriorated, affecting performance	A	Require repair or replacement
NOTE: **If condition is caused by oil-soaking, further inspection is required to determine source of oil.**		
Distorted, affecting performance	A	Require repair or replacement
Leaking (fluid-filled type)	A	Require replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: **If noise isolated to bushing, suggest repair or replacement. Use only approved lubricant on rubber bushings. Petroleum-based lubricants may damage rubber bushings.**		
Oil-soaked, affecting performance	A	Require replacement
NOTE: **Further inspection required to determine source of oil.**		
Rubber separating from internal metal sleeve on bonded bushing	A	Require replacement
Seized	A	Require replacement
Shifted (out of position)	B	Require repair or replacement
Split	A	Require replacement
Surface cracking (weather-checked)	Â	No service suggested or required

SWAY BARS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent	B	Require replacement
Broken	A	Require replacement

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Condition	Code	Procedure
Sway bar corroded at point of attachment to frame bushing	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require 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	2	Suggest repair or replacement
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Burned, not affecting performance	1	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
NOTE: **Determine cause and correct prior to repair or replacement of part.**		
Melted, not affecting performance	2	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
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

TIE ROD ENDS (INNER AND OUTER)

Condition	Code	Procedure
Adjusting sleeve bent	B	Require replacement of sleeve
Adjusting sleeve clamps out of position	B	Require repair

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Condition	Code	Procedure
Adjusting sleeve corroded, affecting structural integrity	A	Require replacement of sleeve
Adjusting sleeve missing	C	Require replacement of sleeve
Adjusting sleeve seized	A	Require repair or replacement
NOTE: **Only required if toe needs to be adjusted.**		
Adjusting sleeve threads damaged	A	Require repair or replacement of sleeve
Adjusting sleeve threads stripped (threads missing)	A	Require replacement of sleeve
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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent	A	Require replacement
Binding	A	Further inspection required
NOTE: **If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.**		
Grease boot cracked	2	Suggest replacement of boot
NOTE: **If boot is not available separately, suggest replacement of tie rod end (reason code 2). Cracked grease boot will allow contaminants to enter joint and will accelerate wear.**		
Grease boot missing	C	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of tie rod end (reason code 2). Lack of grease boot will allow contaminants to enter joint and will accelerate wear.**		
Grease boot torn	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of tie rod end (reason code 2). Torn grease boot will allow contaminants to enter joint and will accelerate wear.**		
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement of seal
NOTE: **If seal is not available separately, suggest replacement of tie rod end (reason code 2). Lack of grease seal will allow contaminants to enter joint and will accelerate wear.**		
Grease seal torn	A	Require replacement of seal

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Condition	Code	Procedure
NOTE: **If seal is not available separately, suggest replacement of tie rod end (reason code 2), wear. Torn grease seal will allow contaminants to enter joint and will accelerate wear.**		
Greaseable tie rod end won't take grease	2	Suggest replacement of grease fitting
NOTE: **If greaseable tie rod end will not take grease after replacing the grease fitting, suggest replacement of tie rod end.**		
Looseness (perceptible horizontal movement)	1	Suggest replacement
NOTE: **If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Looseness exceeds manufacturer's specifications	B	Require replacement
Looseness that is excessive	B	Require replacement
NOTE: **Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.**		
CAUTION: **Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Noisy	2	Further inspection required
NOTE: **If greaseable, grease joint. If problem persists or joint is non-greaseable, suggest replacement.**		
Nut on stud loose	A	Require repair or replacement
NOTE: **Check for bent stud or damaged taper hole.**		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: **Check for damaged taper hole.**		
Stud broken	A	Require replacement
NOTE: **Check for damaged taper hole.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: **Check for damaged taper hole.**		

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TIRE PRESSURE MONITORING SYSTEM

NOTE: **A Tire Pressure Monitoring System (TPMS) is designed to detect and alert the driver should the air pressure level in one or more of the vehicle's tires, up to all four tires, fall below the manufacturer's recommended inflation pressure or another pre-set level.**

NOTE: **NHTSA does not consider installation of an aftermarket or replacement tire or rim that is not compatible with the TPMS to be a "make inoperative" situation under 49 U.S.C. 30122, provided that the entity does not disable the TPMS malfunction indicator.**

TIRE PRESSURE 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
Inoperative	A	Require repair or replacement
NOTE: **Inoperative includes intermittent failure.**		
Loose	B	Require repair or replacement
Missing (Non-OE Wheel and/or Tire Applications)	2	Suggest replacement if appropriate sensor is available
Missing (OE Wheel and Tire Applications)	C	Replacement Reqiuired
Not Responding	Â	Further inspection required
NOTE: **If sensor does not Wake Up, follow manufacturers recommended diagnostic procedure to determine cause**		

TIRES

NOTE: **These guidelines do not apply to split rims. Some vehicle manufacturers restrict replacement of tires to specific brands, types, or sizes. High pressure temporary compact spare tires should not be used with any other rims or wheels, nor should standard tires, snow tires, wheel covers, or trim rings be used with high pressure compact spare rims or wheels. Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death. Only specially trained persons should de-mount or mount tires. Explosions of tire and wheel assembly can result from improper mounting, possibly causing serious injury or death. Consult the vehicle owner's manual or vehicle placard for correct size, speed rating, designation, and cold inflation pressure of the original tires. Do not exceed the maximum load or inflation capacity of the tire specified by the Tire and Rim Association When replacing tires, it is suggested that the replacement tires match or exceed the OEM speed rating designation. If tires of different speed rating designations are mixed on the same vehicle, the tires may vary in handling characteristics. Do not mix different speed rating designations on the same axle. Do not mix radials with non-radial tires on the same axle, as this may affect vehicle handling and stability. If radial tires and bias or bias-belted ply tires are mixed on the same vehicle, the radials must be on the rear. High-pressure temporary compact spare tires are exempt from this rule. Do not mix size or type (Run Flat, all season, performance, mud and snow) of tires on the same axle. If any flammable**

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emergency tire inflation product has been used on a tire, consult inflation product, manufacturer's product information label for tire deflation procedures to avoid possible serious injury or death. In some vehicles, changing the tire diameter from factory-equipped size can affect drive ability, as well as the performance of ABS and other vehicle systems. Consult the vehicle manufacturer's specifications.

Condition	Code	Procedure
Air pressure incorrect	B	Require repair
Bead broken	A	Require replacement
Bead leaking, caused by tire	A	Require repair or replacement
Bead wire/cord exposed	A	Require replacement
Cord or belt material exposed	A	Require replacement
Cord ply separations	A	Require replacement
Directional/asymmetrical tires mounted incorrectly	B	Require remounting and/or repositioning
Irregular tread wear, affecting performance	2	Suggest replacement
NOTE: **Determine and correct cause of irregular tire wear.**		
Load ratings less than OEM specifications	B	Require replacement
Mixed tread types (all season, performance, mud and snow) on same axle	A	Require replacement
Number of punctures exceeds manufacturer's limit	B	Require replacement
Out of balance	B	Require rebalance of tire/wheel assembly
Ply separation	A	Require replacement
Pull or lead, caused by tire	A	Require repair or replacement
Radial and bias or bias-belted ply tires on same axle	B	Require repair or replacement
Radials are on the front and not on the rear	B	Require repair or replacement
NOTE: **If radials and bias or bias-belted ply tires are on the same vehicle, the radials must be on the rear axle, except for high-pressure temporary spares.**		
Run flat damage	A	Require replacement
Shoulder cut	A	Require replacement
Shoulder puncture	A	Require replacement
Shoulder with plug	A	Require replacement
Sidewall bulge	A	Require replacement
Sidewall cut	A	Require replacement
Sidewall indentation	Â	No service required or suggested
Sidewall puncture	A	Require replacement
Sidewall with plug	A	Require replacement
Speed rating designations different on same axle	2	Suggest rotation or replacement
Tire and wheel assembly has excessive run-out	B	Require repair or replacement of appropriate part
NOTE: **Excessive is defined as enough to contribute to performance problems. Match mounting may correct run-out. If not, require replacement of appropriate part. Refer to manufacturer's specifications.**		
Tires with excessive diameter difference on an all-wheel drive vehicle or four-wheel drive vehicle	B	Require replacement

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Condition	Code	Procedure
NOTE: **Excessive diameter difference is defined as exceeding manufacturer's specifications or, if no manufacturer's specifications exist, with more than 1/4"" diameter difference.**		
Tires with excessive diameter difference on the same side of a dual-wheel application	B	Require replacement
NOTE: **Excessive diameter difference is defined as exceeding manufacturer's specifications or, if no manufacturer's specifications exist, with more than 1/4"" diameter difference.**		
Tread area puncture larger in diameter than manufacturer's specifications	B	Require replacement
Tread missing pieces (chunking), exposing cord	A	Require replacement
Tread missing pieces (chunking), not exposing cord	1	Suggest replacement
Tread separations	A	Require replacement
Tube in tubeless tire	3	Suggest removal of tube
NOTE: **Most manufacturers do not recommend tubes in tubeless tires. Inspect tire and wheel . Assembly to determine the reason for a tube in tubeless tire. Recommendation for repair or replacement should be based upon condition of tires and! Or wheel listed in these guidelines.**		
Weather-checking	Â	No service required or suggested
Worn to tread wear indicators	B	Require replacement

TORQUE SENSOR

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require 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

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

TORSION SPRINGS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Broken	A	Require replacement
Missing	C	Require replacement

TRACK BAR BUSHINGS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Deteriorated, affecting performance	A	Require repair or replacement
NOTE: **If condition is caused by oil-soaking, further inspection is required to determine source of oil.**		
Distorted, affecting performance	A	Require repair or replacement
Leaking (fluid-filled type)	A	Require replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: **If noise isolated to bushing, suggest repair or replacement. Use only approved lubricant on rubber bushings. Petroleum-based lubricants may damage rubber bushings.**		
Oil-soaked, affecting performance	A	Require replacement
NOTE: **Further inspection required to determine source of oil.**		
Rubber separating from internal metal sleeve on bonded bushing	A	Require replacement

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Condition	Code	Procedure
Seized	A	Require replacement
Shifted (out of position)	B	Require repair or replacement
Split	A	Require replacement
Surface cracking (weather-checked)	Â	No service suggested or required

TRACK BARS

Condition	Code	Procedure
Attaching (mating) hole distorted	A	Require repair or replacement of bracket or frame
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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Grease boot cracked	2	Suggest replacement of boot
NOTE: **If boot is not available separately, suggest replacement of tie rod end (reason code 2). Cracked grease boot will allow contaminants to enter joint and will accelerate wear .**		
Grease boot missing	C	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of track bar (reason code 2). Lack of grease boot will allow contaminants to enter joint and will accelerate wear.**		
Grease boot torn	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of track bar (reason code 2). Torn grease boot will allow contaminants to enter joint and will accelerate wear.**		
Holes distorted	A	Require replacement
Looseness (perceptible horizontal movement)	1	Suggest replacement
NOTE: **If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Looseness that is excessive	B	Require replacement
NOTE: **Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures 'for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.**		

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Condition	Code	Procedure
CAUTION: **Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.**		
Mating (attaching) hole distorted	A	Require repair or replacement of bracket or frame
Nut on stud loose	A	Require repair or replacement of nut
NOTE: **Check for bent stud or damaged mating hole.**		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: **Check for damaged mating hole.**		
Stud broken	A	Require replacement
NOTE: **Check for damaged mating hole.**		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: **Check for damaged mating hole.**		
Wear exceeds manufacturer's specifications	B	Require replacement

TRAILING ARM BUSHINGS

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
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Deteriorated, affecting performance	A	Require repair or replacement
NOTE: **If condition is caused by oil-soaking, further inspection is required to determine source of oil.**		
Distorted, affecting performance	A	Require repair or replacement
Leaking (fluid-filled type)	A	Require replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: **If noise isolated to bushing, suggest repair or replacement. Use only approved lubricant on rubber bushings. Petroleum-based lubricants may damage rubber bushings.**		

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Condition	Code	Procedure
Oil-soaked, affecting performance	A	Require replacement
NOTE: **Further inspection required to determine source of oil.**		
Rubber separating from internal metal sleeve on bonded bushing	A	Require replacement
Seized	A	Require replacement
Shifted (out of position)	B	Require repair or replacement
Split	A	Require replacement
Surface cracking (weather-checked)	Â	No service suggested or required

TRAILING ARMS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Ball joint hole oversized (loose interference or press fit)	B	Further inspection required
NOTE: **If oversized ball joint is available, require replacement of ball joint. If oversized ball joint is not available, require replacement of control arm.**		
Bent, affecting performance	B	Require replacement
Bushing hole oversized	B	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Holes distorted	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

VALVE STEMS

NOTE: **Most tire manufacturers suggest replacement of non-TPMS valve stems any time a new tire is installed. For TPMS valve stems, the manufacturer may require replacement of the valve stem, o-ring seals, washers, gaskets, valve cores, compression washers and/or locking nut.**

Condition	Code	Procedure
Bent	2	Suggest replacement
Broken	A	Require replacement
Cap seized	A	Require repair or replacement
Cut, but not leaking	1	Suggest replacement
Deteriorated (cracking, dry rot)	1	Suggest replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
O-Ring leaking	A	Require replacement of O-Ring

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Condition	Code	Procedure
Threads damaged	A	Require repair or replacement
Threads stripped	A	Require replacement
Valve cap missing	C	Require replacement of cap

VEHICLE DYNAMICS CONTROL

NOTE: **An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.**

NOTE: **On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.**

NOTE: **When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.**

VEHICLE SPEED SENSOR

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement
NOTE: **Determine cause and correct prior to replacement of part.**		
Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure**		
Dust boot torn	A	Require replacement of boot
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		

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Condition	Code	Procedure
Housing cracked	B	Require replacement
NOTE: **If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.**		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	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 burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

VEHICLE STABILITY ASSIST

NOTE: **An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.**

NOTE: **On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.**

NOTE: **When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.**

VEHICLE STABILITY/SKID CONTROL

NOTE: **An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.**

NOTE: **On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering**

behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

WARNING LAMPS

Condition	Code	Procedure
Bulb burned out	A	Require replacement
Warning light does not come on during bulb check	Â	Further inspection required to determine cause
Warning light flashes	Â	Further inspection required to determine cause
Warning light is intermittent	Â	Further inspection required to determine cause
Warning light stays on after initial bulb check	Â	Further inspection required to determine cause

WHEEL ALIGNMENT

NOTE: Wheel alignment is defined as the measurement, analysis, and adjustment of steering and suspension angles to conform to manufacturer specifications. These angles usually include, but are not limited to: caster, camber, toe, and thrust angle. Where these angles are not adjustable and not in specification, component replacement or correction kits may be required. Errors in set-back and steering axis inclination (SAI) are often attributable to failed or damaged components and must be corrected prior to performing an alignment. Failure to replace or correct suggested parts or service may prevent a proper alignment. Before performing an alignment check, inspect and verify the following: Tire pressure and size . Vehicle loading . Ride height . Steering and suspension parts only if the inspection reveals that all the above are within published specifications, a wheel alignment check and a proper wheel alignment, if needed, may be performed. Under no circumstances should a technician bend or heat any steering or suspension component, unless specified by the vehicle manufacturer. All measurements and specifications must be noted on the inspection report.

Condition	Code	Procedure
Beyond manufacturer's service interval	3	Suggest alignment check
Dog tracking, shown to be caused by faulty alignment	2	Suggest repair
Drift, shown to be caused by faulty alignment	A	Require alignment
Lead, shown to be caused by faulty alignment	A	Require alignment
Outside manufacturer's specifications	B	Require repair
Part has been changed, affecting alignment	A	Require alignment check
Pull, shown to be caused by faulty alignment	A	Require alignment
Steering wheel off-center	2	Suggest alignment
Tire wear, shown to be caused by faulty alignment	A	Require alignment
Wander, shown to be caused by faulty alignment	A	Require alignment

WHEEL ATTACHMENT HARDWARE

NOTE: For conditions noted below, also check condition of wheel stud holes. Proper lug nut torque is essential. Follow recommended torque specifications and tightening sequence. DO NOT lubricate threads unless specified by the vehicle manufacturer.

Condition	Code	Procedure
Bent	A	Require replacement
Broken	A	Require replacement
NOTE: **Some manufacturers require replacement of all studs on that wheel if two or more studs or nuts on the same wheel are broken or missing.**		
Locking lug nut locking groove damaged	A	Require replacement
Loose	A	Require repair or replacement of affected component
Lug nut installed backward	B	Require repair or replacement
Lug nut mating surface distorted	A	Require replacement of nut
Lug nut mating type incorrect	B	Require replacement of nut
Lug nut missing	C	Require replacement
Lug nut rounded	A	Require replacement of nut
NOTE: **Only required if removing wheel.**		
Lug nut seized	A	Require replacement of nut
NOTE: **Only required if removing wheel.**		
Stud incorrect	B	Require replacement of stud
Stud missing	C	Require replacement
Threads damaged	A	Require repair or replacement of component with damaged threads
Threads stripped	A	Require replacement of component with stripped threads

WHEEL BEARINGS, RACES AND SEALS

NOTE: **When replacing or repacking wheel bearings, grease seal replacement is required. You are not required to replace these components in axle sets. Determine the need to replace based upon the individual component conditions that follow.**

Condition	Code	Procedure
Axle seal on drive axle leaking	A	Require replacement of seal and inspection of axle, bearing, housing, and vent tube
Bearing end-play exceeds specifications	B	Require adjustment of bearing, if possible If proper adjustment cannot be obtained, require replacement of bearing and race assembly
Bearing rollers, balls or races are worn, pitted, or feel rough when rotated as an assembly or other damage affecting performance.	B	Require replacement of bearing and race assembly
Seal leaking	A	Require replacement of seal and inspection of bearings
NOTE: **Require inspection of mating and sealing surface and repair or replace as necessary. Check vent. A plugged vent may force fluid past the seal.**		
Seal missing	C	Require replacement

WHEELS (RIMS)

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NOTE: **Mounting a regular tire on a high-pressure compact spare wheel is not permitted. Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death. If the wheel identification stamp is not legible, or cannot be found, do not use the wheel until the size and type have been properly identified. Wheels of different diameter, offset, or width cannot be mixed on the same axle. Bead seat tapers cannot be interchanged.**

Condition	Code	Procedure
Bead leaking, caused by wheel	A	Require repair or replacement
NOTE: **Do not attempt to correct a bent rim.**		
Bent hub mounting surface	A	Require replacement
Bent rim, causing vibration	2	Suggest replacement
NOTE: **Do not attempt to correct a bent rim.**		
Broken	A	Require replacement
Cast wheel porous, causing a leak	A	Require repair or replacement
Clip-on balance weight is incorrect type for rim flange	2	Suggest replacement of weight
Corrosion affecting structural integrity	A	Require replacement
Corrosion build-up on wheel mounting surface	A	Require repair
Cracked	B	Require replacement
Directional/asymmetrical wheels mounted incorrectly	B	Require remounting and/or repositioning
Load capacity less than OEM specifications	B	Require replacement
Mating surface distorted	A	Require replacement
Offset mismatched on same axle	B	Require replacement
Rivets leaking	A	Require replacement
Run-out beyond OEM specs	B	Require replacement
NOTE: **Some wire-spoke wheels may be repaired.**		
Stud holes elongated	A	Require replacement
NOTE: **Inspect wheel attaching hardware for damage.**		
Welded or brazed repair	2	Suggest replacement
Welds leaking	A	Require replacement
Wheel centering (pilot) hole incorrect	B	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
Attaching hardware threads damaged	A	Require repair or replacement of hardware

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Condition	Code	Procedure
Attaching hardware threads stripped (threads missing)	A	Require 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 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	Require 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

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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

ACTIVE SUSPENSION SYSTEM

active suspension systems move each wheel up and down to control body motion in response to road abnormalities. The system responds to inputs from the road and the driver. With an active suspension, a vehicle can simultaneously provide the smooth ride of a soft suspension along with the superior handling associated with a firm suspension.

ACTIVE TILT CONTROL

active tilt control winds up the stabilizer bars in the front and rear suspension to resist body lean while cornering. Because active control is used only as needed, vehicle spring rates and stabilizer bar stiffness can be reduced, improving normal ride characteristics. In addition, this system has potential to increase low-speed, off-road traction on 4WD vehicles.

ACTIVE VARIABLE RATIO STEERING

electronically provides variable steering ratios. A computer is linked with the vehicle stability control system to aid in directional stability of the vehicle. As the vehicle travels down the highway, road surfaces and wind gusts can affect the vehicle directional stability. The car may wander a little or dart to one side, as many who have met a tractor-trailer unit on a windy day have experienced. Sensors on the car detect this sudden unintentional movement and the computer will stabilize the car by moving the Active Steering electric motor and steering gear. The driver doesn't turn the steering wheel at all.

AIR SPRING

a suspension device made up of a flexible bladder containing compressed air. The air spring takes the place of a :onvent;onal coil or leaf spring. Air is supplied by an on-board ;ompressor, usually with auxiliary equipment to sense vehicle leight and modify the pressure in the air spring as needed.

AIR SUSPENSION

instead of steel coil or leaf springs, some vehicles have a bellows-like unit at each corner that contains pressurized air. As a rule, air suspensions can produce a softer ride.

ALIGNMENT

an adjustment to bring parts or components into a line or proper coordination.

ALL-WHEEL DRIVE

the method of providing traction to any of the wheels of a vehicle, as conditions require. Depending on the system, it may be full-time or part-time.

ANTI-ROLL BAR

see 'stabilizer bar'.

ASPECT RATIO

the relationship between the height of a tire from bead to tread, and the tread width, usually expressed as a percentage of the tread width.

AUTOMATIC RIDE CONTROL

automatic ride control adjusts vehicle shock absorber resistance (damping) in response to driver inputs such as steering and braking and for changes in road surface. During maneuvers such as hard braking or quick lane changes, the system increases suspension damping to improve dynamic stability. Damping is automatically decreased during steady driving, so that bumps and potholes are absorbed rather than being transmitted to the occupants. Some systems also allow the driver to select suspension settings: soft, normal or firm (sport).

AXIAL LOAD

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a type of load placed on a bearing that is parallel to the axis of the rotating shaft.

AXIAL PLAY

movement of a component parallel to the axis of rotation.

AXIAL

round, on or along an axis; having the same direction or being parallel to the axis of rotation.

AXIS

a real or imaginary straight line on which or around which an object rotates.

BALANCE

a condition of equal weight distribution within a component or among components; the act of equalizing the weight distribution, such as balancing a tire or an engine's reciprocating assembly.

BALL JOINT

a suspension component that provides a pivot point, allowing the steering knuckle to move up and down as well as turn. In response to steering input. The ball fits into a socket housing that is attached to the control arm and the stud on the other end of the ball is attached to the steering knuckle. A dust cover is installed over the ball and socket assembly to keep dirt out and lubricant in.

BEAD

the steel reinforced inner edge of a tire, which fits inside and seals against the wheel rim.

BOOT

protective rubber cover with accordion pleats used to contain lubricants and exclude contaminating dirt, water and grime, located at each end of the rack-and- pinion assembly and FWD CV-joints.

BUMP STEER

a steering problem in which a vehicle tends to the left or the right after a bump, without steering wheel input from the driver. This is usually caused by some steering misalignment or damage that permits change of toe when the suspension works up and down.

BUSHING

a liner, usually removable, for a bearing; an anti-friction liner used in place of a bearing; a type of bearing that is used to support rotating shafts.

CAMBER

the attitude of a wheel/tire assembly in which, when viewed from the front, the distance between the tops and bottoms of the tires are different. If the distance between the tops is greater than between the bottoms, positive camber is present. If the distance between the tops is less than between the bottoms, negative camber is present.

CASTER

angle formed between the kingpin axis and a vertical axis as viewed from the side of the vehicle. Caster is considered positive when the top of the kingpin axis is behind the vertical axis, that is, tilted toward the rear of the vehicle.

CENTER LINK

a steering linkage component which attaches the Pitman arm to the idler arm, tie-rod or crosslink.

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COIL SPRING

spring steel rod wound into a coil that supports the vehicle's weight while allowing suspension movement.

COLLAPSIBLE STEERING COLUMN

a steering column that is designed to collapse, to prevent the column from heavily impacting the driver during an accident.

CONSTANT VELOCITY (CV) JOINT

a flexible coupling between two shafts that allows each shaft to maintain the same speed regardless of operating angle.

CONTROL ARM

a suspension component that connects the vehicle frame to the steering knuckle or axle housing and allows the up and down movement of the wheels.

COTTER PIN.

a safety component made from soft steel, used to keep a nut from loosening on a bolt or stud. The cotter pin is inserted through a hole in the bolt or stud and through slots in the nut (see 'castellated nut'), then the ends of the cotter pin are spread to lock it in position.

CROSSMEMBER

part of the vehicle frame structure, arranged transversely and attached to the frame rails at each side of the vehicle. Can be removable or welded in place.

DAMPEN

to slow or reduce oscillations or movement.

DEAD AXLE

a load-supporting axle that does not transmit power; an axle that does not rotate, but merely forms a base on which to attach the wheels.

DIRECTIONAL STABILITY

the ability of a car to travel in a straight line on a flat surface with a minimum of driver control.

DIRECTIONAL TIRE

tire with a tread pattern that is designed to give maximum traction by removing water from under the tread in such a way as to minimize the risk of aquaplaning. Directional tires must be installed to turn in a specific direction.

DOWNFORCE

negative aerodynamic lift.

DRAG COEFFICIENT

drag divided by the product of dynamic pressure and projected area. A factor representing the drag acting on a body (as an automobile or airfoil).

DRAG LINK

a steering linkage component that connects the pitman arm and the steering arm.

DRAG

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horizontal aerodynamic retarding force on a vehicle parallel to the relative wind direction.

DYNAMIC BALANCING

balancing a part while it is in motion.

ELECTRICALLY POWERED STEERING

electrically powered steering uses an electric motor to drive either the power steering hydraulic pump or the steering linkage directly. The power steering function is therefore independent of engine speed, resulting in significant energy savings.

ELECTRONIC AIR SUSPENSION

electronic air suspension provides the comfort of riding on air with adjustable spring rates and capability to change ride height and load-carrying ability. Under normal driving conditions, an electronic air suspension vehicle rides at the same height as a traditionally sprung vehicle. With a heavy load, ride height is increased automatically. On current vehicles, the suspension lowers the ride height by 20 mm at highway speeds for improved aerodynamics, with about 2 percent better fuel economy. Lower ride height also can improve on-center feel of steering due to the change in suspension geometry and increased caster angle.

ELECTRONIC LEVEL CONTROL.

a suspension system that uses air springs to maintain vehicle ride height. Height sensors are used to signal a control unit when the vehicle is riding low or high. In response to this signal, compressed air is either sent to or vented from the air springs.

HALFSHAFT

transfers power from the transaxle to the front wheels on a front-wheel drive vehicle. Also used on some vehicles with rear-wheel drive and independent rear suspension to transfer power from the differential to the rear wheels. Consists of a stub shaft that is splined into the differential side gear, another stub shaft that is splined into the wheel hub, an interconnecting shaft, and two CV-joints, which connect the interconnecting shaft to the stub shafts.

HARMONIC VIBRATION

periodic motion or vibration along a straight line. The severity depends on the frequency or amplitude.

HEIGHT SENSOR

a component used in an air suspension system to signal a control unit when the vehicle is riding low or high. In response to this signal, compressed air is either sent to or vented from the air springs.

HUB

mounting point for the wheelan an axle or spindle; the part of the synchronizer assembly that is splined to the transmission shaft; the center part of a wheel, gear, etc., that rides on a shaft.

IDLER ARM

a conventional steering system component consisting of an arm that swivels in a bushing on a shaft, which is attached to the frame. The idler arm is mounted on the right side of the vehicle and is the same length and set at the same angle as the Pitman arm. Its function is to hold the right end of the center link level with the left end, which is moved by the pitman arm, and transfer the steering motion to the right side tie-rod.

INCLUDED ANGLE

the sum of the angle of camber and steering axis inclination; the sum of two intersecting angles.

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INDEPENDENT SUSPENSION

a suspension in which each wheel can travel up and down without directly affecting the position of the opposite wheel.

INTEGRAL POWER STEERING

a power steering system in which the power cylinder and control valve are contained in one housing.

INTELLIGENT VEHICLE HIGHWAY SYSTEM (IVHS)

the Intelligent Vehicle Highway System (IVHS) provides a variety of information to the vehicle and driver through cooperation of automotive electronics, communications, controls and systems engineering technologies. IVHS has two areas of interest to car and truck makers: (1)telematics and (2)active safety warning and control systems. Several features are: Telematics: Navigation systems Traffic messaging Emergency messaging and security tracking (e.g. RESCU - Remote Emergency Satellite Cellular Unit) Short range communications/ automatic toll collection Active Safety Warning and Control Systems Collision warning/avoidance - Backup and parking aids - Side vision aid - Vision enhancement - (all weather/night vision) - Adaptive cruise control - Lane departure control

INTERACTIVE VEHICLE DYNAMICS (IVD)

interactive Vehicle Dynamics is designed to minimize loss of vehicle control due to loss of traction. The IVD system could be activated when a vehicle is taking a turn too quickly or when encountering an icy patch.

JAM NUT

a locknut.

KINGPIN

the pivot shaft for the steering knuckle on most early axles and some modern heavy-duty axles.

KNUCKLE

the suspension component that connects the upper and lower control arms or the strut and lower control arm. On rear wheel drive vehicles, it usually incorporates the front wheel spindle and on front wheel drive vehicles it has an opening where the halfshaft passes through. A steering arm is attached to the knuckle, where the tie-rod end is connected. Also called a steering knuckle.

LANE-DEPARTURE WARNING SYSTEM

Issues a warning when the vehicle edges off course and reaches the highway lane markers. Introduced on the 2005 Infiniti FX and available on the 2006 Infiniti M45, the system developed by Iteris can detect lane dividers even in rainy weather. It delivers a noticeable sound when the vehicle starts to move into an adjacent lane, whether due to inattention, drowsiness or distraction.

LATERAL RUNOUT

side-to-side movement or wobble in a wheel or tire.

LEAF SPRING

a suspension spring consisting of a single flat plate made of steel or composite material or several steel plates bundled together.

LOW TIRE PRESSURE WARNING

a low tire pressure warning system alerts the driver if the air pressure in a tire becomes too low. Typically, a light on the instrument panel will be illuminated to warn of the low-pressure condition.

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MACPHERSON STRUT

the principal device in the suspension of the same name, in which the spring, shock absorber and sometimes the steering knuckle are combined in a single unit.

MEMORY STEER

a steering condition where the steering wheel and wheels want to return to a position other than center. This can be caused by tightening rubber bonded socket tie-rod ends when the steering wheel is not centered, binding in the upper strut mounts, or binding in a steering component or ball joint.

ON-CAR BALANCING

the practice of spinning a wheel on the car to balance the wheel and all other rotational components together.

PARALLELOGRAM STEERING LINKAGE

a type of conventional steering linkage consisting of a pitman arm, center link, idler arm and tierod assemblies to connect to the steering knuckles. The pitman arm, center link and idler arm form three sides of a parallelogram.

PITMAN ARM

a steering system component mounted on the steering box shaft and transfers the gearbox motion to the steering linkage.

PLUNGER JOINT

the inboard CV-joint on a halfshaft, so called because the joint moves in and out in response to the suspension's up and down movement, which causes the distance between the transaxle and the wheel to change. The movement takes place within the joint, with the tripod rollers or double offset ball bearings moving in and out on elongated grooves in the yoke or outer race.

PRESS FIT

when a part is slightly larger than a hole it must be forced together with a press.

PULL

a steering condition where the vehicle driver has to maintain constant pressure on the steering wheel to keep the vehicle moving straight.

RACK-AND-PINION STEERING

a type of steering mechanism that replaces the pitman arm, center link and idler arm on gearbox steering. The steering column ends in a pinion gear that moves the driven rack to the left and right. The rack ends contain ball studs connected to the outer tie-rod ends and steering knuckles.

RADIAL LOAD

load applied at 90 degrees to an axis of rotation.

RADIAL RUNOUT

the out-of-roundness ot a wheel or tire.

RADIAL

branching out in all directions from a common center; perpendicular to the shaft or bearing bore.

RADIUS ARM

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a suspension component that is connected to a twin I-beam or solid axle at one end and to the vehicle frame through bushings at the other. The radius arm braces the I-beam or axle and keeps it at a right angle to the vehicle frame.

REAR WHEEL STEERING

a system used on a some vehicles to change the toe of the rear wheels to either steepen a sharp turn or enhance cornering on a shallower, faster one.

RIDE HEIGHT

the dimension between a fixed point on the vehicle and the pavement. The fixed point varies according to vehicle and manufacturer. Also called vehicle height.

ROLLING RESISTANCE

retarding force, parallel to the direction of travel, caused by tire resistance along the ground.

RUNOUT

wobble or deflection beyond a rotating part's normal plane of movement.

SAI

see 'steering axis inclination',

SCRUB RADIUS

the distance between the point at which the tire's vertical centerpoint intersects the road, and the steering axis inclination (SAI) intersects the road.

SHACKLE

the attachment to the frame for one end of a leaf spring. The shackle allows the spring to change in length as the vehicle encounters uneven road surfaces.

SHIM

thin sheets of material, usually metal, used as spacers to control the distance between parts.

SHOCK ABSORBER

a device used to dampen the oscillation of the suspension caused by irregularities in the road surface.

SHORT AND LONG ARM SUSPENSION

a suspension system in which the upper control arm is shorter than the lower control arm, allowing the wheel to deflect in a vertical direction with minimal change in camber.

SPINDLE

a shaft used to attach the wheel assembly on non-drive axles.

SPRING

a suspension system component that supports the vehicle and absorbs shock caused by uneven road surfaces; a device that returns to its original form after being forced out of shape.

SPROCKET

a toothed wheel used to engage a chain or ribbed belt.

SPRUNG WEIGHT

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the weight of all the vehicle components that are supported by the springs; see 'unsprung weight'.

STABILIZER BAR

a torsion-bar spring connecting the suspension on either side of the vehicle. When a vehicle rolls to the side in a turn, the suspension at the outside wheel compresses and the suspension at the inside wheel extends. The stabilizer bar that connects them twists to apply a counteracting force to hold the vehicle closer to level. Also called an anti-roll bar or sway bar.

STATIC BALANCE

balance at rest; still balance; the equal distribution of weight of the wheel and tire around the axis of rotation such that the wheel assembly has no tendency to rotate by itself regardless of its position.

STEERING ARM

the steering system component that links the steering knuckle to the tie-rod assembly.

STEERING AXIS INCLINATION

the angle between true vertical and an imaginary line running through the rotational center of the ball joint(s).

STEERING COLUMN

the housing, steering shaft, bearings and related components between the steering wheel and the steering gear.

STEERING GEAR

the assembly located at the end of the steering column, which contains the gears and other components that multiply the driver turning force.

STEERING KNUCKLE

the suspension component that connects the upper and lower control arms or the strut and lower control arm. On rear wheel drive vehicles, it usually incorporates the front wheel spindle and on front wheel drive vehicles it has an opening where the halfshaft passes through. A steering arm is attached to the steering knuckle, where the tie-rod end is connected.

STEERING LINKAGE

all of the components that connect the steering gear to the front wheels.

STRUT ROD

on vehicles where the lower control arm is attached to the frame at one pivot point, a strut rod is used to brace the control arm against the vehicle frame.

STUD

a fastener that has screw threads at both ends.

SWAY BAR

see 'stabilizer bar',

THRUST ANGLE

the difference between the thrust line and the geometric centerline of the vehicle.

THRUST LINE ALIGNMENT

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aligning the front wheels to the thrust line during a wheel alignment, when rear wheel toe cannot be adjusted to specification.

THRUST LINE

an imaginary line that divides the total toe angle of the rear wheels.

THRUST LOAD

load placed on a part that is parallel to the center of the axis.

TIE-ROD END

a ball and socket joint that connects the tie-rod to the steering knuckle arm and to the center link or steering rack.

TIE-ROD

steering linkage member which connects the steering knuckle arm with the centerlink or the steering rack.

TIRE ROTATION

the practice of moving a set of tires to different positions on the vehicle to equalize wear and extend the life of the tires.

TIRE SLIP

see 'wheel slip'.

TOE

the direction in which a wheel tends to roll, a major factor in tire wear.

TOE-IN

a condition that exists if the tire's line of forward direction intersects the extended centerline of the vehicle.

TOE-OUT ON TURNS

the designed angle of the steering arm on the steering knuckle, which causes the inside front wheel to turn at a sharper angle than the outside front wheel during a turn. The specification is checked using the turntables on wheel alignment machine. Toe-out on turns is not an adjustable angle, and if it is incorrect it is most likely due to a bent steering arm.

TOE-OUT

a condition that exists if the tire's line of forward direction and the vehicle centerline are angled apart.

TRACK

the distance between the centers of the treads of parallel wheels.

TRACKING

travel of the rear wheels in a parallel path with the front wheels.

TWIN I-BEAM SUSPENSION

a type of independent front suspension and used on light trucks and vans. It consists of two I-beams supported by coil springs, and the steering knuckles/spindles, which are connected by king pins or ball joints. The inner end of the axle connects to the vehicle frame through a rubber

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bushing. A radius arm also connects to the frame through rubber bushings to control wheelbase and caster.

UNSPRUNG WEIGHT

the components of a vehicle that rest directly on the road surface without being supported by the suspension springs.

VARIABLE ASSIST POWER STEERING

a power steering system that uses valves and speed sensors to vary the amount of steering assist according to engine or road speed. At slow speeds more steering assist is delivered and steering the wheels is easier; necessary for parking, etc.. At higher speeds, steering assist is reduced and more steering effort is required to steer the car, giving the driver greater feel of the road. Also known as Speed-sensitive power steering.

VEHICLE HEIGHT

see 'ride height'.

WHEEL ALIGNMENT

the adjustment of suspension and steering components to optimize steering control and minimize tire wear.

WHEEL BALANCE

the condition in which a wheel/tire assembly has equal weight around its center, preventing vibration at high speeds. Wheel balance can be static, such as on a bubble balancer, or dynamic, such as with a spin balancer.

WHEEL OFFSET

the dimensional difference between a wheel's centerline and the plane of the axle flange mounting surface.

WHEEL SLIP

a measurement (in percentage) of the friction between the tire and road surface; at zero slip the tire rotates freely, while at 100% slip the tire is locked up and is pushed along the road surface by the moving vehicle. Also called tire slip.

WHEEL SPEED SENSOR

a permanent magnetic sensor that sends information to the computer in an ABS system regarding wheel speed.

WHEEL WEIGHTS

small weights, usually made of lead, attached either mechanically or by adhesive to a wheel/tire assembly to correct its balance.

WORM GEAR

a gear into which teeth are cut, resembling the threads of a screw.

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