

UNIFORM INSPECTION & COMMUNICATION STANDARDS 2010 - 2011

Brake Systems

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

honor the warranty, the customer will be allowed to examine the parts.

VIII. Classification of Parts

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

THE MAP PROCESS - OVERVIEW

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

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

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

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

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

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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**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.

Reasons to Suggest Repair or Replacement**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



BRAKE SYSTEM CHECKSHEET

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

Customer Interview:

Reason Code Explanation**Required**

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

Suggested/Optional

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

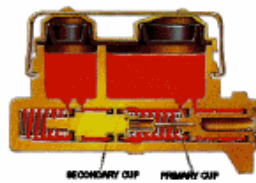


Your vehicle has been inspected following the Uniform Inspection and Communication Standards developed by the Motorist Assurance Program. MAP produces materials that give motorists the information and encouragement to take greater responsibility for their vehicles—through proper maintenance. We encourage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

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

Fig. 1: 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
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
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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

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

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

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

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		

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

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	Ā	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.		

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

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

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

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.		

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

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"" specifications, and the drum does not require reconditioning	1	Suggest replacement
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

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

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

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

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

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

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

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

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

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

FRICION 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

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

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
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

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

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

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

Condition	Code	Procedure
Attaching hardware broken	A	Require 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

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

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

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	A	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

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

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)	A	No service suggested or required. Further inspection may be necessary to determine cause
Flaking or chunking	B	Require replacement
Glazed (shiny)	A	No service suggested or required
Grooves or ridges	A	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

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

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)	A	No service suggested or required. Further inspection may be necessary to determine cause
Flaking or chunking	B	Require replacement
Glazed (shiny)	A	No service suggested or required
Grooves or ridges	A	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

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

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

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

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	A	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

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.		

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

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

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

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

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"" specifications, and rotor does not require reconditioning	1 Â	Suggest replacement 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

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

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

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

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

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

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

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

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

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

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

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 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 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

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 HARNESSSES

Condition	Code	Procedure
Application 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
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

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.

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

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 called it by a different name. With the advent of OBD-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

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 (ECU).

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

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

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

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.

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.
