

# Uniform Inspection and Communication Standards

## BRAKE SYSTEMS

### OVERVIEW

The Motorist Assurance Program is the consumer outreach effort of the Automotive Maintenance and Repair Association, Inc. (AMRA). Participation in the Motorist Assurance Program is drawn 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.

To assure auto repair customers recourse if they were not satisfied with a repair transaction, the Motorist Assurance Program offers mediation and arbitration through the Better Business Bureau and other non-profit organizations. MAP conducted pilot programs in twelve states before announcing the program nationally in October 1998. During the pilots, participating repair shops demonstrated their adherence to the Pledge and Standards and agreed to follow the UICS in communicating the results of their inspection to their customers.

To put some "teeth" in the program, an accreditation requirement for shops was initiated. The requirements are stringent, and a self-policing method has been incorporated which includes the "mystery shopping" of outlets.

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](http://www.motorist.org) or contact us at:

7101 Wisconsin Avenue

Bethesda, MD 20814

Phone (301) 634-4955 - Fax (202) 318-0378

January 2002

Map@motorist.org

## OVERVIEW OF SERVICE REQUIREMENTS AND SUGGESTIONS

It is MAP policy that all exhaust, brake, steering, suspension, wheel alignment, drive-line, 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.

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.

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.

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**

- A - Part no longer performs intended purpose
- B - Part does not meet a design specification (regardless of performance)
- C - Part is missing

**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**

- 1 - Part is close to the end of its useful life (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

**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.**

## **SERVICE PROCEDURES REQUIRED AND SUGGESTED FOR PROPER VEHICLE OPERATION**

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 (G SENSOR OR LATERAL)

### Accelerometers (G Sensor or Lateral)

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.

## ACCUMULATORS

### Accumulators

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

## ANCHOR PINS

See Backing Plates.

## 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). **WARNING:** 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.

## BACKING PLATES

## 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.

## BRAKE FLUID

**CAUTION: 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 required for the brake system is stamped on the master cylinder cover.

### Brake Fluid

Condition	Code	Procedure
Beyond service interval	3	Suggest flushing and refilling with correct fluid.
Brake fluid type incorrect	B	Require flushing and refilling with correct fluid. See note below.
NOTE: For example, DOT fluid lower than specified for the vehicle or silicone brake fluid (DOT 5 or 5.1) in an ABS system.		
Contaminated, for example, fluid other than brake fluid present	A or B	Require service. See note below.
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 with denatured alcohol or brake cleaner, 3) repair or replace all components having rubber parts, and 4) flush and fill with correct brake fluid. (Code A)		
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. (Code B)		
Hydraulic component overhaul or replacement	3	Suggest flushing and refilling with correct fluid.
Rubber master cylinder cover gasket	A	Require replacement of gasket. See

distorted and gummy

note below.

NOTE: This condition may indicate contaminated brake fluid.

## BRAKE FRICTION MATERIAL

See Friction Material.

## BRAKE PADS

See Friction Material.

## BRAKE PEDALS

### 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 SHOES

See Fraction Material.

## BRAKE SHOE HARDWARE

See also Self-Adjusting Systems.

### Brake Shoe Hardware

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 STOPLIGHT SWITCHES

### Brake Stoplight Switches

--	--	--

<b>Condition</b>	<b>Code</b>	<b>Procedure</b>
Bent	B	Require replacement.
Broken	A	Require replacement.
Connector broken	A	Require repair or replacement.
Connector (Weatherpack type) leaking	A	Require repair or replacement.
Connector melted	A	Require replacement. See note below.
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. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement.
Terminal corroded, affecting performance	B	Require repair or replacement.
Terminal corroded, not affecting performance	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.

## **BULB SOCKETS**

### **Bulb Sockets**

<b>Condition</b>	<b>Code</b>	<b>Procedure</b>
Attaching hardware broken	A	Require 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. See note below.

NOTE: Determine cause and correct prior to repair or replacement of socket.

Burned, not affecting performance	2	Suggest repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of socket.		
Connector broken	A	Require repair or replacement.
Connector missing	C	Require replacement.
Connector (Weatherpack type) leaking	A	Require repair or replacement.
Connector melted	A	Suggest repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Corroded, affecting performance	A	Require repair or replacement.
Corroded, not affecting performance	2	Suggest repair or replacement.
Leaking	A	Require repair or replacement.
Melted	A	Require replacement. See note below.
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. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement.
Terminal corroded, affecting performance	A	Require repair or replacement.
Terminal corroded, not affecting performance	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.**

### Bulbs and LEDs

Condition	Code	Procedure
Application incorrect	B	Require replacement. See note below.
NOTE: Application incorrect includes wrong bulb coating or color.		
Base burned, affecting performance	A	Require repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Base burned, not affecting performance	2	Suggest repair or replacement. See note

		below.
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. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement. See note below.
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

### 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 bent	A	Require removal or replacement. See note below.

NOTE: Removal is acceptable if shim is not OE.

Shim (OE standard) missing	C	Require replacement. See note below.
NOTE: Aftermarket shims may be suggested to reduce noise.		
Shim out of position	B	Require removal or replacement. See note below.
NOTE: Removal is acceptable if shim is not OE.		
Shim worn	A	Require removal or replacement. See note below.
NOTE: Removal is acceptable if shim is not OE.		
Slider pin (bolt) bent	B	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

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).

**CAUTION: When installing loaded calipers, it is required that friction material be matched in axle sets for consistent braking characteristics.**

### Calipers

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. See note below.
NOTE: Only required if the hydraulic system must be opened.		
Bleeder screw plugged	A	Require repair or replacement of bleeder screw. See note below.
NOTE: Only required if the hydraulic system must be opened.		
Bleeder screw seized	A	Require replacement of caliper. See note below.
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 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 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.
Mounting pin threads stripped (threads missing)	A	Require repair or replacement of component with stripped threads.
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		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.

## CONTROLLERS

See Electronic Controllers.

## DIGITAL RATIO AXLE CONTROLLERS AND BUFFERS (DRAC AND DRAB)

### Digital Ratio Axle Controllers and Buffers (DRAC and DRAB)

Condition	Code	Procedure
Connector broken	A	Require repair or replacement.

Connector (Weatherpack type) leaking	A	Require repair or replacement.
Connector melted	A	Require replacement. See note below.
NOTE: Determine cause and correct prior to replacement of part.		
Connector missing	C	Require replacement.
Missing	C	Require replacement.
Output signal incorrect	B	Require repair or replacement.
Terminal burned, affecting performance	A	Require repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement.
Terminal corroded, affecting performance	A	Require repair or replacement.
Terminal corroded, not affecting performance	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

See Switches.

## DRUMS

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.

### Drums

Condition	Code	Procedure
Balance weight missing		No service suggested or required.
Bell-mouthed, affecting performance	A	Require reconditioning or replacement.
Cooling fin broken		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. See note below.
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. See note below.
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 PUMPS AND MOTORS

Copied fuel pump conditions from engine UIGs & deleted pulsator from leaking conditions.

### 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 broken	A	Require repair or replacement.

Connector (Weatherpack type) leaking	A	Require repair or replacement.
Connector melted	A	Require repair or replacement. See note below.
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. See note below.
NOTE: Inoperative includes intermittent operation or out of OEM specifications.		
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. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement.
Terminal corroded, affecting performance	A	Require repair or replacement.
Terminal corroded, not affecting performance	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

### Electronic Controllers

Condition	Code	Procedure
Application incorrect	B	Require replacement.
Attaching hardware missing	C	Require replacement of hardware.
Attaching hardware threads	A	Require repair or replacement of hardware.

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

## FLUID

See Brake Fluid.

## FLUID LEVEL SENSOR SWITCHES

See Switches.

## FOUR WHEEL DRIVE SWITCHES

See Switches.

## FRICTION MATERIAL

**NOTE:** Original Equipment Manufacturer (OEM) specifications designate replacement at different thicknesses.

**CAUTION:** It is required that friction material be matched in axle sets for consistent braking characteristics.

### Friction Material

Condition	Code	Procedure
Contaminated, for example, fluid that leaked from caliper, wheel cylinder, or axle seal	A	Require replacement. See note below
NOTE: Identify and repair cause of contamination prior to replacing friction material.		
Cracked through	B	Require replacement.
Flaking or chunking	B	Require replacement.
Glazed (shiny)		No service suggested or required.
Grooves or ridges		No service suggested or required. See note below.
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.
Shoe table or web cracked	A	Require replacement.
Shoe table or web worn, affecting performance	A	Require replacement.
Surface cracking		No service suggested or required. Further inspection may be necessary to determine cause.
Tapered wear	B	Suggest replacement See note below.
NOTE: Some vehicles use pads that are tapered by design. Refer to specific vehicle application. If not normal, require replacement of pads and correction of cause.		
Thickness of one pad is greater than opposite pad in the same caliper (uneven wear)		Replacement of friction material not suggested or required. Further inspection required. See Calipers and Caliper Hardware. See note below.
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. See caution below.
CAUTION: The pad wear indicator light may come on due to other electrical problems.		
Wear indicator device (mechanical) bent		Further inspection required. See note below.
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		Further inspection required. See note below.
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		Further inspection required. See note below.
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. See note below.

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

See Accelerometers.

## HOSES

### Hoses

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware.
Attaching hardware missing	C	Require replacement of hardware.
Attaching hardware not functioning	A	Require repair or replacement of hardware.
Blistered	B	Require replacement.
Fitting threads damaged	A	Require repair or replacement.
Fitting threads stripped (threads missing)	A	Require replacement.
Incorrectly secured	B	Require repair.
Inner fabric (webbing) cut	B	Require replacement.
Leaking	A	Require replacement.
Missing	C	Require replacement.
Outer covering is cracked to the extent that inner fabric of hose is visible	B	Require replacement.
Restricted	A	Require replacement.
Routed incorrectly	B	Require repair.

## 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.

### Hydraulic Modulators

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

Attaching hardware missing	C	Require replacement of hardware.
Attaching hardware not functioning	A	Require repair or replacement of hardware.
Connector broken	A	Require repair or replacement.
Connector (Weatherpack type) leaking	A	Require repair or replacement.
Connector melted	A	Require replacement. See note below.
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 or out of OEM specification.		
Internal leak	A	Require repair or replacement.
Missing	C	Require replacement.
Terminal burned, affecting performance	A	Require repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement.
Terminal corroded, affecting performance	A	Require repair or replacement.
Terminal corroded, not affecting performance	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

Hydro-boosters and hydro-electric boosters combined.

### Hydro-Boosters

<b>Condition</b>	<b>Code</b>	<b>Procedure</b>
Attaching hardware broken	A	Require repair or replacement of hardware.
Attaching hardware missing	C	Require replacement of hardware.
Attaching hardware not functioning	A	Require repair or replacement of hardware.
Connector broken	A	Require repair or replacement.
Connector (Weatherpack type) leaking	A	Require repair or replacement.
Connector melted	A	Require replacement. See note below.
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.
Threads damaged	A	Require repair or replacement.
Terminal burned, affecting performance	A	Require repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement.
Terminal corroded, affecting performance	A	Require repair or replacement.
Terminal corroded, not affecting performance	2	Suggest repair or replacement.
Terminal loose, affecting performance	B	Require repair or replacement.
Terminal loose, not affecting performance	1	Suggest repair or replacement.
Threads stripped (threads missing)	A	Require replacement.

## **HYDRO-ELECTRIC BOOSTERS (POWERMASTER)**

See Hydro-Boosters.

## **IGNITION DISABLE SWITCHES**

See Switches.

## LATERAL ACCELERATION SWITCHES

See Accelerometers.

## LEDS

See Bulbs and LEDs.

## LENSES

### 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.
Broke n, not affecting performance		No service suggested or required.
Cracked	A	Require replacement.
Discolored	A	Require replacement.
Leaking	A	Require repair or replacement.
Melted, affecting performance	A	Require replacement.
Melted, not affecting performance	2	Suggest replacement.
Missing	C	Require replacement.

## MASTER CYLINDERS

### 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. See note below.
NOTE: This condition may be normal on some vehicles equipped with anti-lock brakes.		
Fluid level low		Further inspection required. See note below.
NOTE: Refer to OEM procedures for adjusting low fluid level. Inspect for brake hydraulic system 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.
Rubber master cylinder cover gasket distorted and gummy	A	Require replacement of the gasket. See note below.
NOTE: This condition may indicate contaminated brake fluid. See Brake Fluid.		

## MODULATORS

See Hydraulic Modulators.

## MOTORS

See Electrical Pumps and Motors.

## PARKING BRAKE SWITCHES

See Switches.

## 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.

### Parking Brake Systems

Condition	Code	Procedure
Attaching hardware broken	A	Require 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. See note below.

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.

## **PADS**

See Friction Material.

## **PEDAL TRAVEL SWITCHES**

See Switches.

## **PEDALS**

See Brake Pedals.

## **POWERMASTER**

See Hydro-Boosters.

## **PUMPS**

See Electrical Pumps and Motors.

## **PRESSURE DIFFERENTIAL SWITCHES**

See Switches.

## **PRESSURE SWITCHES**

See Switches.

## **RELAYS**

### **Relays**

<b>Condition</b>	<b>Code</b>	<b>Procedure</b>
Attaching hardware broken	A	Require 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. See note below.
NOTE: Inoperative includes intermittent operation or out of OEM specification.		
Missing	C	Require replacement.
Terminal broken	A	Require repair or replacement.
Terminal burned, affecting performance	A	Require repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement.
Terminal corroded, affecting performance	A	Require repair or replacement.
Terminal corroded, not affecting performance	2	Suggest repair or replacement.
Terminal loose, affecting performance	B	Require repair or replacement.
Terminal loose, not affecting performance	1	Suggest repair or replacement.

## ROTORS

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 they are being pressed or bolted onto an existing hub. It is not necessary to replace rotors in axle sets. 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.

### Rotors

Condition	Code	Procedure
Corrosion affecting structural integrity	A	Require replacement. See note below.
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 the rotor does not require reconditioning	1	Suggest replacement. See note below.
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. See note below.
NOTE: If OEM does not supply "machine to" specifications, you may machine to discard specifications.		
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. See note below.
NOTE: Scoring is defined as grooves or ridges in the friction contact surface. Some vehicle manufacturers require machining when scoring exceeds their allowable specifications.		
Thickness variation (parallelism) exceeds OEM specifications	B	Require reconditioning or replacement of rotor according to OEM specifications.

## SELF-ADJUSTING SYSTEMS

### Self-Adjusting Systems

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. See note below.

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

See Brake Shoe Hardware.

## SHOES

See Friction Material.

## SOCKETS

See Bulb Sockets.

## SPEED SENSORS (ELECTRONIC WHEEL AND VEHICLE)

### Speed Sensors (Electronic Wheel and Vehicle)

Condition	Code	Procedure
Air gap incorrect	B	Require adjustment or replacement. See note below.
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 broken	A	Require repair or replacement.
Connector (Weatherpack type) leaking	A	Require repair or replacement.
Connector melted	A	Require repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement.
Contaminated	A	Require repair or replacement. See note below.
NOTE: Determine source of contamination, such as metal particles or water. Require repair or replacement.		
Inoperative	B	Require repair or replacement. Further inspection required. See note below.

NOTE: Inoperative includes intermittent operation or out of OEM specification. Some components may be serviceable; check for accepted cleaning procedure.

Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications.
Leaking	A	Require repair or replacement.
Loose	A	Require repair or replacement.
Missing	C	Require replacement.
Resistance out of specification	B	Require repair or replacement.
Sensor housing cracked	2	Suggest replacement.
Terminal broken	A	Require repair or replacement.
Terminal burned, affecting performance	A	Require repair or replacement. See note below.

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

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

## STEEL BRAKE LINES

### 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.
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

See Brake Stoplight Switches.

## SWITCHES

### 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. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Burned, not affecting performance	2	Suggest repair or replacement. See note below.
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. See note below.
NOTE: Includes inoperative, intermittent operation, or failure to perform all functions.		

Melted, affecting performance	A	Require repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Melted, not affecting performance	2	Suggest repair or replacement. See note below.
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. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement.
Terminal corroded, affecting performance	A	Require repair or replacement.
Terminal corroded, not affecting performance	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

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

### 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.

## TOOTHED RINGS (TONE WHEEL)

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

### Toothed Rings (Tone Wheel)

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	B	Require replacement.
Loose	A	Require replacement of worn parts.
Missing	C	Require replacement.
Number of teeth incorrect	B	Require replacement.
Teeth broken	A	Require replacement.
Teeth damaged, affecting performance	A	Require replacement.

## VACUUM BOOSTERS

### 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. See note below.

NOTE: Inoperative includes intermittent operation or out of OEM specification.

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. See note below.

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 broken	A	Require repair or replacement.
Connector (Weatherpack type) leaking	A	Require repair or replacement.
Connector melted	A	Require replacement. See note below.

NOTE: Determine cause and correct prior to replacement of part.

Connector missing	C	Require replacement.
-------------------	---	----------------------

Leaking	A	Require replacement.
Terminal burned, affecting performance	A	Require repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement.
Terminal corroded, affecting performance	A	Require repair or replacement.
Terminal corroded, not affecting performance	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

See Hoses.

## VALVES

### 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.
Linkage disconnected (rear load valves)	C	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. See note below.

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

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

## WHEEL ATTACHING HARDWARE

For conditions noted below, also check condition of wheel stud holes.

**CAUTION: Proper lug nut torque is essential. Follow manufacturer's torque specifications and tightening sequence. DO NOT lubricate threads unless specified by the vehicle manufacturer.**

### Wheel Attaching Hardware

Condition	Code	Procedure
Bent	A	Require replacement.
Broken	A	Require replacement. See note below.
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	B	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 that follow.

### Wheel Bearings, Races, and Seals

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	B	Require replacement of bearing and race assembly.
Seal leaking	A	Require replacement of seal and inspection of bearings. See note below.
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.
Spindle worn	B	Require replacement of spindle and bearings.

## WHEEL CYLINDERS

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 that follow.

### Wheel Cylinders

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. See note below.
NOTE: Only required if the hydraulic system must be opened.		
Bleeder screw plugged	A	Require repair or replacement of bleeder screw. See note below.
NOTE: Only required if the hydraulic system must be opened.		
Bleeder screw seized	A	Require replacement. See note below.
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. See note below.
NOTE: Inspect for conditions related to wheel cylinder.		
Leaking	A	Require rebuilding or replacement. See note below.
NOTE: Leaking is defined as a drop or more. Dampness is normal.		
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.
Loose	B	Require repair or replacement.
Threads damaged	A	Require repair or replacement.
Threads stripped (threads missing)	A	Require replacement.

## WIRING HARNESSES

### Wiring Harnesses

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

		hardware.
Attaching hardware missing	C	Require replacement of hardware.
Attaching hardware not functioning	A	Require repair or replacement of hardware.
Connector broken	A	Require repair or replacement.
Connector (Weatherpack type) leaking	A	Require repair or replacement.
Connector melted	A	Require repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement.
Insulation damaged, conductors exposed	A	Require repair or replacement.
Insulation damaged, conductors not exposed	1	Suggest replacement.
Open	A	Require repair or replacement.
Protective shield (conduit) melted	2	Suggest repair or replacement. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Protective shield (conduit) missing	2	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. See note below.
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement.
Terminal corroded, affecting performance	A	Require repair or replacement.
Terminal corroded, not affecting performance	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.