

*** SUSPENSION UNIFORM INSPECTION GUIDELINES ***

Article Text

1993 Volkswagen EuroVan
For Volkswagen Technical Site
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Saturday, March 18, 2000 10:16PM

ARTICLE BEGINNING

GENERAL INFORMATION

Steering & Suspension Systems - (Including Wheels & Tires)

All Makes & Models

Updated: January, 1997

MAP UNIFORM INSPECTION GENERAL GUIDELINES

OVERVIEW OF MOTORIST ASSURANCE PROGRAM

The Motorist Assurance Program (MAP) 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.

The Motorist Assurance Program was established as an industry-wide effort to address concerns raised by regulators, the media and consumers questioning our ethics and methods of doing business. The automotive repair industry had been bombarded by months of negative stories in the media and scrutiny from state and federal regulators who focused on how the need for repairs is determined. MAP was formed as an industry response to this issue.

Our 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 responsibility for their vehicles - through proper, manufacturer-recommended, maintenance. We encourage participating service and repair shops (including franchisees and dealers) to adopt a Pledge to their Customers and the Motorist Assurance Program developed Standards of Service. All participating service providers have agreed to subscribe to this Pledge and to adhere to the promulgated Standards of Service which demonstrates 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 according to industry guidelines. After learning that neither the car manufacturers nor any other source had complete guidelines, leading industry organizations, along with other industry participants banded together to address this challenging task. During the past two and a half years, they successfully developed industry inspection guidelines for the following systems: Exhaust, Brakes, ABS, Steering and Suspension, Engine Maintenance and Performance, HVAC, and Electrical systems. Guidelines for Drive Train and Transmission are currently being promulgated. Revisions to the inspection guidelines for Exhaust, Brakes/ABS and Steering and Suspension Systems, which were issued two years ago, are now being published for implementation beginning spring 1997. Participating shops utilize these Uniform Inspection Guidelines as part of the inspection process and for communicating their findings to their customers.

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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 concerned with auto repair and/or consumer protection are conducted. Feedback from these representatives are brought back to members, 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 arbitration through MAP/BBB-CARE in cooperation with the Council of Better Business Bureaus and individual participating Bureaus. MAP "piloted" in Indianapolis and Pittsburgh during spring, 1996 - and publicized "roll-outs" in New Jersey, Detroit (MI), Chicago (IL) and Richmond (VA) were conducted. To put some "teeth" in the program, and 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. In addition, a committee of service providers had been working diligently developing standards for newspaper, television and Internet advertising.

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.hunter.com/map.htm or contact us at:

808 17th Street, NW Suite 200
Washington, D.C. 20006
Ph. (202) 466-7050 Fax (202) 223-9569

OVERVIEW OF SERVICE REQUIREMENTS & SUGGESTIONS

It is MAP policy that all exhaust, brake, ABS, steering and suspension, wheel alignment, tires and wheels, driveline, engine performance and maintenance and heating, ventilation and air conditioning services be offered and performed under the guidelines 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 needs expressed by the customer.

This section lists the various parts and conditions that indicate required or suggested service or part replacement. Although this list is extensive, it is not inclusive. In addition to this list, a technician may make a suggestion. This suggestion must be based on substantial and informed experience or the vehicle manufacturer's recommended service interval.

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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 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 to address a customer's need, convenience or request. If a customer's vehicle has one of these conditions, the procedure may only be 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 customer declines to authorize a service or repair indicated in the MAP Uniform Inspection Guidelines as "required," a MAP shop may refuse service on that system, if proceeding with the work could create or continue an unsafe or unsatisfactory condition.

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

PART REPLACEMENT CODE IDENTIFICATION

NOTE: Refer to the following tables for definitions of the codes listed in the condition/procedure tables for the specific components that may need to be replaced.

A - PART NO LONGER PERFORMS INTENDED PURPOSE

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UAAA;
3 Reasons to Require Repair 3 Reasons to Suggest Repair 3
3 or Replacement 3 or Replacement 3
AAA`
3 A - Part no longer performs 3 1 - Part is close to the end of 3
3 intended purpose 3 its useful life (just above 3
3 3 discard specifications, or 3
3 3 weak; failure likely to 3
3 3 occur soon, etc.) 3
AAU

B - PART DOES NOT MEET DESIGN SPEC., REGARDLESS OF PERFORMANCE
UAAA;
3 Reasons to Require Repair 3 Reasons to Suggest Repair 3
3 or Replacement 3 or Replacement 3
AAA`
3 B - Part does not meet a design 3 2 - To address a customer need, 3
3 specification (regardless 3 convenience, or request (to 3
3 of performance) 3 stiffen ride, enhance 3
3 3 performance, eliminate noise 3
3 3 etc.) 3
AAU

C - PART IS MISSING
UAAA;
3 Reasons to Require Repair 3 Reasons to Suggest Repair 3
3 or Replacement 3 or Replacement 3
AAA`
3 C - Part is missing 3 3 - To comply with maintenance 3
3 3 recommended by the vehicle's 3
3 3 Original Equipment 3
3 3 Manufacturer (OEM) 3
3 3 4 - Technician's recommendation 3
3 3 based on substantial and 3
3 3 informed experience 3
AAU

STEERING & SUSPENSION

**SERVICE PROCEDURES REQUIRED & SUGGESTED FOR PROPER
VEHICLE OPERATION**

Steering and suspension are complex systems made up of a variety of interdependent components. For proper vehicle handling, ride, and tire wear, a thorough inspection is required whenever suspension work is being performed.

Conditions listed assume that the problem has been isolated to the specific component by proper testing procedures.

NOTE: When replacing steering and/or suspension components which may affect an alignment angle, you are required to check and adjust alignment as needed. Refer to the OEM specifications.

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CAUTION: DO NOT use ride height altering or load compensating components, such as variable rate springs and coil over shocks, on vehicles with height or load sensing proportioning valve-equipped braking systems, unless these components are original equipment.

AIR RIDE SUSPENSION

NOTE: Depending on the air suspension design, there are some aftermarket products available to eliminate the air ride suspension on certain vehicles. If the system has been eliminated with one of these products, then no service is suggested or required.

AIR RIDE SUSPENSION - AIR SHOCKS & AIR STRUTS

NOTE: This section covers the air spring portion of the air shock or strut. For dampening portion of shock or strut conditions and procedures, refer to the "Shock Absorbers, Strut Cartridges, and Strut Assemblies" section.

AIR RIDE SUSPENSION - AIR SHOCKS & AIR STRUTS

Condition	Code	Procedure
Inner fabric of air bag damaged	A	Require replacement.
Leaking	A	Require repair or replacement.
Outer covering of air bag is cracked to the extent that inner fabric of air bag is visible	A,1	Suggest replacement.

AIR RIDE SUSPENSION - AIR SPRING VALVES

AIR RIDE SUSPENSION - AIR SPRING VALVES

Condition	Code	Procedure
Attaching hardware incorrect	A	Require replacement of incorrect part.
Attaching hardware loose	A	Require repair or replacement of loose part.
Attaching hardware missing	C	Require replacement of missing part.

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Attaching hardware threads 3 A 3 Require repair or replacement of
damaged 3 3 part with damaged threads.
AA
Attaching hardware threads 3 A 3 Require replacement of part with
stripped (threads missing) 3 3 stripped threads.
AA
Blocked 3 A 3 Require repair or replacement.
AA
Connector bent 3 A 3 Require repair or replacement.
AA
Connector broken 3 A 3 Require replacement.
AA
Connector loose 3 A 3 Require repair or replacement.
AA
Inoperative 3 A 3 Require repair or replacement.
AA
Leaking 3 A 3 Require repair or replacement.
AA
Restricted 3 A 3 Require repair or replacement.
AA

AIR RIDE SUSPENSION - AIR SPRINGS

AIR RIDE SUSPENSION - AIR SPRINGS

AA
Condition 3 Code 3 Procedure
AA
Attaching hardware broken 3 A 3 Require replacement of broken
3 3 part.
AA
Attaching hardware 3 A 3 Require replacement of incorrect
incorrect 3 3 part.
AA
Attaching hardware loose 3 A 3 Require repair or replacement of
3 3 loose part.
AA
Attaching hardware missing 3 C 3 Require replacement of missing
3 3 part.
AA
Attaching hardware threads 3 A 3 Require repair or replacement of
damaged 3 3 part with damaged threads.
AA
Attaching hardware threads 3 A 3 Require replacement of part with
stripped (threads missing) 3 3 stripped threads.
AA
Collar cracked 3 A 3 Require replacement.
AA
End cap cracked 3 A 3 Require replacement.
AA
Inner fabric of bag damaged 3 A 3 Require replacement.
AA
Leaking 3 A 3 Require repair or replacement.

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```
Outer covering of air bag 3 A,1 3 Suggest replacement.
  is cracked to the extent 3 3
  that inner fabric of air 3 3
  bag is visible 3 3
Piston cracked 3 A 3 Require replacement.
```

AIR RIDE SUSPENSION - COMPRESSORS

AIR RIDE SUSPENSION - COMPRESSORS

```
Condition 3 Code 3 Procedure
Attaching hardware bent 3 B 3 Require repair or replacement of
  bent part.
Attaching hardware broken 3 A 3 Require replacement of broken
  part.
Attaching hardware loose 3 A 3 Require repair or replacement of
  loose part.
Attaching hardware missing 3 C 3 Require replacement of missing
  part.
Attaching hardware threads 3 A 3 Require repair or replacement of
  damaged 3 3 part with damaged threads.
Attaching hardware threads 3 A 3 Require replacement of part with
  stripped (threads missing) 3 3 stripped threads.
Connector bent 3 A 3 Require repair or replacement.
Connector broken 3 A 3 Require replacement.
Connector loose 3 A 3 Require repair or replacement.
Does not build pressure 3 A 3 Further inspection required.
  3 3 See note (1) below.
Excessive run time 3 B 3 Further inspection required.
  3 3 See note (2) below.
Inoperative 3 A 3 Require replacement.
Leaking 3 A 3 Require repair or replacement.
Missing 3 C 3 Require replacement.
```

NOTE: (1) If failure to build pressure is traced to the compressor,

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require replacement.

- (2) If excessive run time is traced to the compressor, require replacement.

AA

AIR RIDE SUSPENSION - HEIGHT SENSORS

AIR RIDE SUSPENSION - HEIGHT SENSORS

AA

Condition	3	Code	3	Procedure
Attaching hardware bent	3	B	3	Require repair or replacement of bent part.
Attaching hardware broken	3	A	3	Require replacement of broken part.
Attaching hardware corroded affecting structural integrity	3	A	3	Require replacement of corroded part.
Attaching hardware loose	3	A	3	Require repair or replacement of loose part.
Attaching hardware missing	3	C	3	Require replacement of missing part.
Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads.
Attaching hardware threads stripped (threads missing)	3		3	Require replacement of part with stripped threads.
Dust boot missing	3	B,2	3	Suggest replacement. See note (1).
Dust boot split	3	B,2	3	Suggest replacement. See note (1).
Dust boot torn	3	B,2	3	Suggest replacement. See note (1).
Housing cracked	3	A	3	Require replacement.
Lead routing incorrect	3	B	3	Require re-routing according to vehicle manufacturer's specs.
Loose	3	B	3	Require adjustment to vehicle manufacturer's specifications.
Missing	3	C	3	Require replacement.
Output signal incorrect	3	A	3	Require repair or replacement.
Wire lead damaged	3	A	3	Require repair or replacement.

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NOTE: (1) This condition can lead to damage of the sliding magnet,
which, in turn, causes premature sensor failure.

AIR RIDE SUSPENSION - MODULES

AIR RIDE SUSPENSION - MODULES

Condition	Code	Procedure
Attaching hardware loose	A	Require repair or replacement of loose part.
Attaching hardware missing	C	Require replacement of missing part.
Attaching hardware threads damaged	A	Require repair or replacement of part with damaged threads.
Attaching hardware threads stripped (threads missing)	A	Require replacement of part with stripped threads.
Housing cracked	B,2	Suggest repair or replacement.
Inoperative	A	Require replacement.
Missing	C	Require replacement.

AIR RIDE SUSPENSION - RELAYS (COMPRESSOR)

AIR RIDE SUSPENSION - RELAYS (COMPRESSOR)

Condition	Code	Procedure
Housing cracked	B,2	Suggest replacement. See note (1).
Intermittent	A	Require replacement.
Missing	C	Require replacement.
Output signal incorrect	A	Require replacement.

NOTE: (1) If moisture enters the relay, it can reduce life expectancy or impair function.

AIR RIDE SUSPENSION - SWITCHES (ON/OFF)

AIR RIDE SUSPENSION - SWITCHES (ON/OFF)

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Condition	Code	Procedure
Broken	A	Require replacement.
Missing	C	Require replacement.
Output signal incorrect	A	Require replacement.

AIR RIDE SUSPENSION - TORSION SPRINGS (COUNTER BALANCING)

AIR RIDE SUSPENSION - TORSION SPRINGS (COUNTER BALANCING)

Condition	Code	Procedure
Attaching hardware bent	B	Require repair or replacement of bent part.
Attaching hardware broken	A	Require replacement of broken part.
Attaching hardware incorrect	A	Require replacement of incorrect part.
Attaching hardware loose	A	Require repair or replacement of loose part.
Attaching hardware missing	C	Require replacement of missing part.
Attaching hardware threads damaged	A	Require repair or replacement of part with damaged threads.
Attaching hardware threads stripped (threads missing)	A	Require replacement of part with stripped threads.
Broken	A	Require replacement.
Missing	C	Require replacement.

AIR RIDE SUSPENSION - TUBING

AIR RIDE SUSPENSION - TUBING

Condition	Code	Procedure
Attaching hardware incorrect	A	Require replacement of incorrect part.
Attaching hardware loose	A	Require repair or replacement of loose part.

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Attaching hardware missing	3	C	3	Require replacement of missing part.
Blocked	3	A	3	Require repair or replacement.
Fitting incorrect	3	B	3	Require replacement.
Leaking	3	A	3	Require repair or replacement.
Line type incorrect	3	B	3	Require replacement.
Missing	3	C	3	Require replacement.
Restricted	3	A	3	Require repair or replacement.
Routed incorrectly	3	B	3	Require routing correction.

AIR RIDE SUSPENSION - WARNING LAMPS

AIR RIDE SUSPENSION - WARNING LAMPS

Condition	3	Code	3	Procedure
Bulb burned out	3	A	3	Require replacement.
Warning light does not come on during bulb check	3		3	
Warning light flashes	3		3	
Warning light is intermittent	3		3	Further inspection required to determine cause.
Warning light stays on after initial bulb check	3		3	

AIR RIDE SUSPENSION - WIRING HARNESSSES

AIR RIDE SUSPENSION - WIRING HARNESSSES

Condition	3	Code	3	Procedure
Connector bent	3	A	3	
Connector broken	3	A	3	
Connector loose	3	A	3	Require repair or replacement.
Damaged (cut, burned, or chafed)	3	A	3	

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Excessive resistance	3	B	3	
Fuse blown	3	A	3	
Fusible link blown	3	A	3	Require replacement.
Open	3	A	3	
Poor ground	3	A	3	Require repair or replacement.
Routed incorrectly	3	B	3	Require re-routing according to vehicle manufacturer's specs.
Shorted	3	A	3	
Terminal bent	3	A	3	
Terminal broken	3	A	3	Require repair or replacement.
Terminal corroded	3	A	3	
Terminal loose	3	A	3	

BALL JOINTS

Before requiring or suggesting ball joint replacement, the approved OEM procedure must be used to measure ball joint wear. The measurement(s) obtained, along with the vehicle manufacturer's specifications, must be noted on the inspection report. Some states require that these measurements also appear on the invoice.

NOTE: The term "perceptible movement," defined as any visible movement in any direction, has been the industry standard for determining the need for replacement of follower ball joints. Some vehicle manufacturers are now publishing specifications for follower ball joints that were previously diagnosed by the "perceptible movement" standard. Before requiring or suggesting any parts be replaced based on "perceptible movement," consult your repair manual to determine if OEM specifications exist.

You are not required to replace ball joints in axle sets. However, when replacing a ball joint due to wear exceeding manufacturer's specification, you may suggest replacement of the other ball joint if its measurement shows it is close to the end of its useful life, for preventive maintenance.

BALL JOINTS

Condition	3	Code	3	Procedure
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Attaching hardware bent	3 B	3 Require repair or replacement of bent part if available; otherwise, replace ball joint.
Attaching hardware broken	3 A	3 Require replacement of broken part if available; otherwise, replace ball joint.
Attaching hardware corroded affecting structural integrity	3 A	3 Require replacement of broken part if available; otherwise, replace ball joint.
Attaching hardware incorrect	3 A	3 Require replacement of incorrect part if available; otherwise, replace ball joint.
Attaching hardware loose	3 A	3 Require repair or replacement of loose part if available; otherwise, replace ball joint.
Attaching hardware missing	3 C	3 Require replacement of missing part if available; otherwise, replace ball joint.
Attaching hardware threads damaged	3 A	3 Require repair or replacement of part with damaged threads if available; otherwise, replace ball joint.
Attaching hardware threads stripped (threads missing)	3 A	3 Require replacement of part with stripped threads if available; otherwise, replace ball joint.
Binding	3 A	3 Further inspection required. See note (1) below.
Grease boot cracked	3 B,2	3 Suggest replacement. See note (2).
Grease boot missing	3 B,2	3 Suggest replacement. See note (3).
Grease boot torn	3 B,2	3 Suggest replacement. See note (4).
Grease fitting broken	3 A	3 Require replacement of grease fitting.
Grease fitting missing	3 C	3 Require replacement of grease fitting.
Grease fitting won't seal	3 A	3 Require replacement of grease fitting.

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Greaseable ball joint will not take grease	3	B,2	3	Suggest replacement of grease fitting. See note (5) below.
Nut on ball joint loose	3	A	3	Require repair or replacement. See note (6) below.
Pre-load adjustment incorrect	3	B	3	Require repair or replacement.
Seized	3	A	3	Require replacement.
Stud bent	3	B	3	Require replacement. See note (7).
Stud broken	3	A	3	Require replacement. See note (7).
Threads damaged	3	A	3	Require repair or replacement.
Threads stripped (threads missing)	3	A	3	Require replacement. See note (7).
Wear exceeds manufacturer's specifications	3	B	3	Require replacement.

- NOTE: (1) If greaseable, grease ball joint. If problem persists or joint is non-greaseable, require replacement.
(2) Cracked grease boot will allow contaminants to enter the ball joint and will accelerate wear.
(3) Lack of grease boot will allow contaminants to enter the ball joint and will accelerate wear.
(4) Torn grease boot will allow contaminants to enter the ball joint and will accelerate wear.
(5) If the greaseable ball joint still will not take grease after replacing the grease fitting, suggest replacement of ball joint.
(6) Check for bent stud or damaged taper hole.
(7) Check for damaged taper hole.

BUSHINGS

BUSHINGS

Condition	3	Code	3	Procedure
Attaching hardware bent	3	B	3	Require repair or replacement of bent part if available; otherwise, replace bushing.
Attaching hardware broken	3	A	3	Require replacement of broken part if available; otherwise, replace bushing.

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Attaching hardware corroded ³ affecting structural integrity	³ ³ ³	A	³ ³ ³	Require replacement of corroded part if available; otherwise, replace bushing.
AA				
Attaching hardware incorrect	³ ³ ³	A	³ ³ ³	Require replacement of incorrect part if available; otherwise, replace bushing.
AA				
Attaching hardware loose	³ ³ ³	A	³ ³ ³	Require repair or replacement of loose part if available; otherwise, replace bushing.
AA				
Attaching hardware missing	³ ³ ³	C	³ ³ ³	Require replacement of missing part if available; otherwise, replace bushing.
AA				
Attaching hardware threads damaged	³ ³ ³ ³	A	³ ³ ³ ³	Require repair or replacement of part with damaged threads if available; otherwise, replace bushing.
AA				
Attaching hardware threads stripped (threads missing) ³	³ ³ ³	A	³ ³ ³	Require replacement of part with stripped threads if available; otherwise, replace bushing.
AA				
Binding	³ ³ ³	A	³ ³ ³	Require repair or replacement.
AA				
Deteriorated, affecting performance	³ ³ ³	A	³ ³ ³	Require repair or replacement.
AA				
Distorted, affecting performance	³ ³ ³	A	³ ³ ³	Require repair or replacement.
AA				
Leaking (fluid-filled type) ³	³ ³ ³	A	³ ³ ³	Require replacement.
AA				
Missing	³ ³ ³	A	³ ³ ³	Require replacement.
AA				
Noisy	³ ³ ³	B,2	³ ³ ³	Further inspection required. See note (1) and caution below.
AA				
Rubber separating from internal metal sleeve on bonded bushing	³ ³ ³ ³	A	³ ³ ³ ³	Require replacement.
AA				
Seized	³ ³ ³	A	³ ³ ³	Require replacement.
AA				
Shifted (out of position)	³ ³ ³	B	³ ³ ³	Require repair or replacement.
AA				
Split	³ ³ ³	A	³ ³ ³	Require replacement.
AA				
Surface cracking (weather-checked)	³ ³ ³		³ ³ ³	No service suggested or required.

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NOTE: (1) If noise isolated to bushing, suggest repair or replacement.

CAUTION: Use only approved lubricant on rubber bushings. Petroleum-based lubricants may damage rubber bushings.

CENTER LINKS

CENTER LINKS

Condition	3	Code	3	Procedure
Attaching hardware incorrect	3	A	3	Require replacement of incorrect part, if available; otherwise, replace center link.
Attaching hardware loose	3	A	3	Require repair or replacement of loose part, if available; otherwise, replace center link.
Attaching hardware missing	3	C	3	Require replacement of missing part, if available; otherwise, replace center link.
Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads, if available; otherwise, replace center link.
Attaching hardware threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads, if available; otherwise, replace center link.
Bent	3	B	3	Require replacement.
Binding	3	A	3	Further inspection required. See note (1) below.
Grease boot cracked	3	B,2	3	Suggest replacement. See note (2).
Grease boot missing	3	B,2	3	Suggest replacement. See note (3).
Grease boot torn	3	B,2	3	Suggest replacement. See note (4).
Grease fitting broken	3	A	3	Require replacement of grease fitting.
Grease fitting missing	3	C	3	Require replacement of grease fitting.
Grease fitting won't seal	3	A	3	Require replacement of grease

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3 3 fitting.

AAAAAA Grease seal missing 3 B,2 3 Suggest replacement. See note (5).

AAAAAA Grease seal torn 3 B,2 3 Suggest replacement. See note (6).

AAAAAA Looseness (perceptible 3 A,1 3 Suggest replacement. See note (7).
horizontal movement) 3 3

AAAAAA CAUTION: DO NOT use pliers or pry bar to check ball and socket
movement. Use only moderate hand pressure.

AAAAAA Looseness that is excessive 3 B 3 Require replacement. See notes (8)
3 3 and (9), caution below.

AAAAAA CAUTION: DO NOT use pliers or pry bar to check ball and socket
movement. Use only moderate hand pressure.

AAAAAA Seized 3 A 3 Require replacement.

AAAAAA Stud bent 3 B 3 Require replacement. See note (10)

AAAAAA Stud broken 3 A 3 Require replacement. See note (10)

AAAAAA Stud loose in taper hole 3 A 3 Require repair or replacement.
3 3 See note (10) below.

AAAAAA Taper hole elongated 3 A 3 Require replacement. See note (11)

AAAAAA Threads damaged 3 A 3 Require repair or replacement.

AAAAAA Threads stripped (threads 3 A 3 Require replacement. See note (10)
missing) 3 3

AAAAAA Wear exceeds manufacturer's 3 B 3 Require replacement.
specifications 3 3

AAAAAA NOTE: (1) If greaseable, grease joint. If problem persists or joint is
non-greaseable, require replacement.

(2) Cracked grease boot will allow contaminants to enter the joint and will accelerate wear.

(3) Lack of grease boot will allow contaminants to enter the joint and will accelerate wear.

(4) Torn grease boot will allow contaminants to enter the joint and will accelerate wear.

(5) Lack of grease seal will allow contaminants to enter the joint and will accelerate wear.

(6) Torn grease seal will allow contaminants to enter the joint and will accelerate wear.

(7) If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.

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- (8) Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity.
- (9) If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.
- (10) Check for damaged taper hole.
- (11) Check for damaged stud.

AA

CONTROL ARM SHAFTS

CONTROL ARM SHAFTS

AA

Condition	3	Code	3	Procedure
Attaching hardware broken	3	A	3	Require replacement of broken part, if available; otherwise, replace shaft.
Attaching hardware loose	3	A	3	Require repair or replacement of loose part, if available; otherwise, replace shaft.
Attaching hardware missing	3	C	3	Require replacement of missing part, if available; otherwise, replace shaft.
Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads, if available; otherwise, replace shaft.
Attaching hardware threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads, if available; otherwise, replace shaft.
Bent	3	B	3	Require replacement.
Shaft bushing surface undersized (worn)	3	B	3	Require replacement.
Threads damaged	3	A	3	Require repair or replacement.
Threads stripped (threads missing)	3	A	3	Require replacement.

AA

CONTROL ARMS

CONTROL ARMS

AA

Condition	3	Code	3	Procedure
Attaching hardware bent	3	B	3	Require repair or replacement of bent part, if available; otherwise, replace control arm.
Attaching hardware broken	3	A	3	Require replacement of broken part, if available; otherwise, replace control arm.

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AA			
Attaching hardware corroded ³ affecting structural integrity	3	A	3 Require replacement of corroded part, if available; otherwise, replace control arm.
AA			
Attaching hardware incorrect	3	A	3 Require replacement of incorrect part, if available; otherwise, replace control arm.
AA			
Attaching hardware loose	3	A	3 Require repair or replacement of loose part, if available; otherwise, replace control arm.
AA			
Attaching hardware missing	3	C	3 Require replacement of missing part, if available; otherwise, replace control arm.
AA			
Attaching hardware threads damaged	3	A	3 Require repair or replacement of part with damaged threads, if available; otherwise, replace control arm.
AA			
Attaching hardware threads stripped (threads missing)	3	A	3 Require replacement of part with stripped threads, if available; otherwise, replace control arm.
AA			
Bent	3	B	3 Require replacement.
AA			
Bushing hole oversized	3	B	3 Require replacement.
AA			
Ball joint hole oversized (loose interference or press fit)	3	B	3 Further inspection required. See note (1) below.
AA			
Corroded, affecting structural integrity	3	A	3 Require replacement.
AA			
Holes distorted	3	A	3 Require replacement.
AA			
Threads damaged	3	A	3 Require repair or replacement.
AA			
Threads stripped (threads missing)	3	A	3 Require replacement.
AA			
NOTE: (1) If oversized ball joint is available, require replacement of ball joint. If oversized ball joint is not available, require replacement of control arm.			
AA			

DRAG LINKS

DRAG LINKS

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Condition	Code	Procedure
Attaching hardware incorrect	A	Require replacement of incorrect part, if available; otherwise, replace drag link.
Attaching hardware loose	A	Require repair or replacement of loose part, if available; otherwise, replace drag link.
Attaching hardware missing	C	Require replacement of missing part, if available; otherwise, replace drag link.
Attaching hardware threads damaged	A	Require repair or replacement of part with damaged threads, if available; otherwise, replace drag link.
Attaching hardware threads stripped (threads missing)	A	Require replacement of part with stripped threads, if available; otherwise, replace drag link.
Bent	B	Require replacement.
Binding	A	Further inspection required. See note (1) below.
Grease boot cracked	B,2	Suggest replacement. See note (2).
Grease boot missing	B,2	Suggest replacement. See note (3).
Grease boot torn	B,2	Suggest replacement. See note (4).
Grease fitting broken	A	Require replacement of grease fitting.
Grease fitting missing	C	Require replacement of grease fitting.
Grease fitting won't seal	A	Require replacement of grease fitting.
Grease seal missing	B,2	Suggest replacement. See note (5).
Grease seal torn	B,2	Suggest replacement. See note (4).
Looseness (perceptible horizontal movement)	A,1	Suggest replacement. See note (6).

CAUTION: DO NOT use pliers or pry bar to check ball and socket

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movement. Use only moderate hand pressure.

Looseness that is excessive³ B ³ Require replacement. See notes (6)

³ and (7), caution below.

CAUTION: DO NOT use pliers or pry bar to check ball and socket

movement. Use only moderate hand pressure.

Seized ³ A ³ Require replacement.

Stud bent ³ B ³ Require replacement. See note (8).

Stud broken ³ A ³ Require replacement. See note (8).

Stud loose in taper hole ³ A ³ Require repair or replacement.

³ See note (8) below.

Taper hole elongated ³ A ³ Require replacement. See note (9).

Threads damaged ³ A ³ Require repair or replacement.

Threads stripped (threads ³ A ³ Require replacement. See note (8).

missing) ³ ³

Wear exceeds manufacturer's³ B ³ Require replacement.

specifications ³ ³

NOTE: (1) If greaseable, grease joint. If problem persists or joint is

non-greaseable, require replacement.

(2) Cracked grease boot will allow contaminants to enter the

joint and will accelerate wear.

(3) Lack of grease boot will allow contaminants to enter the

joint and will accelerate wear.

(4) Torn grease boot will allow contaminants to enter the joint

and will accelerate wear.

(5) Missing grease seal will allow contaminants to enter the

joint and will accelerate wear.

(6) If manufacturer's procedures for inspection exist, use those

procedures; otherwise, use an approved inspection method

such as the dry park check.

(7) Excessive looseness is defined as being significant enough

to affect vehicle handling or structural integrity.

(8) Check for damaged taper hole.

(9) Check for damaged stud.

ELECTRONIC RIDE CONTROL SHOCKS & STRUTS

NOTE: This section covers the electronic damping control portion of the electronic shock or strut. For dampening portion of shock or strut conditions and procedures, refer to the "Shock Absorbers, Strut Cartridges, and Strut Assemblies" section.

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ELECTRONIC RIDE CONTROL SHOCKS & STRUTS

Condition	Code	Procedure
Connector bent	A	Require repair or replacement.
Connector broken	A	Require repair or replacement.
Connector loose	A	Require repair or replacement.
Electronic valve control inoperative	B,2	Suggest replacement. See note (1).
Terminal bent	A	Require repair or replacement.
Terminal broken	A	Require repair or replacement.
Terminal corroded	A	Require repair or replacement.
Terminal loose	A	Require repair or replacement.

NOTE: (1) It is acceptable to replace with a non-electronically controlled unit, where available.

IDLER ARMS

IDLER ARMS

Condition	Code	Procedure
Attaching hardware broken	A	Require replacement of broken part, if available; otherwise, replace idler arm.
Attaching hardware incorrect	A	Require replacement of incorrect part, if available; otherwise, replace idler arm.
Attaching hardware loose	A	Require repair or replacement of loose part, if available; otherwise, replace idler arm.
Attaching hardware missing	C	Require replacement of missing part, if available; otherwise, replace idler arm.
Attaching hardware threads damaged	A	Require repair or replacement of part with damaged threads, if available; otherwise, replace idler arm.

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AA

Attaching hardware threads 3 A 3 Require replacement of part with
stripped (threads missing)3 3 stripped threads, if available;
3 3 otherwise, replace idler arm.

AA

Binding 3 A 3 Further inspection required.
3 3 See note (1) below.

AA

Grease boot cracked 3 B,2 3 Suggest replacement. See note (2).

AA

Grease boot missing 3 B,2 3 Suggest replacement. See note (3).

AA

Grease boot torn 3 B,2 3 Suggest replacement. See note (4).

AA

Grease fitting broken 3 A 3 Require replacement of grease
3 3 fitting.

AA

Grease fitting missing 3 C 3 Require replacement of grease
3 3 fitting.

AA

Grease fitting won't seal 3 A 3 Require replacement of seal.

AA

Grease seal missing 3 B,2 3 Suggest replacement. See note (5).

AA

Grease seal torn 3 B,2 3 Suggest replacement. See note (4).

AA

Greaseable joint will not 3 B,2 3 Suggest replacement of grease
take grease 3 3 fitting. See note (6) below.

AA

Looseness at frame bracket 3 B 3 Require repair or replacement.
end 3 3 See notes (7) and (8) below.

AA

Looseness at link end 3 A,1 3 Suggest replacement. See note (7).
(perceptible horizontal 3 3
movement) 3 3

AA

CAUTION: DO NOT use pliers or pry bar to check ball and socket
movement. Use only moderate hand pressure.

AA

Looseness at link end that 3 B 3 Require replacement. See notes (7)
is excessive 3 3 and (9) and caution below.

AA

CAUTION: DO NOT use pliers or pry bar to check ball and socket
movement. Use only moderate hand pressure.

AA

Mounted out of position 3 B 3 Require repositioning.
(center link not parallel)3 3

AA

Nut on stud loose 3 A 3 Require repair or replacement.
3 3 See note (10) below.

AA

Seized 3 A 3 Require replacement.

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Stud bent	3	B	3	Require replacement. See note (11)
Stud broken	3	A	3	Require replacement. See note (11)
Taper hole elongated	3	A	3	Require replacement. See note (12)
Threads damaged	3	A	3	Require repair or replacement.
Threads stripped (threads missing)	3	A	3	Require replacement. See note (11)
Wear exceeds manufacturer's specifications	3	B	3	Require replacement.

- NOTE: (1) If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.
- (2) Cracked grease boot will allow contaminants to enter joint and will accelerate wear.
- (3) Lack of grease boot will allow contaminants to enter joint and will accelerate wear.
- (4) Torn grease boot will allow contaminants to enter joint and will accelerate wear.
- (5) Missing grease seal will allow contaminants to enter joint and will accelerate wear.
- (6) If greaseable joint will not take grease after replacing the grease fitting, suggest replacement of idler arm.
- (7) If manufacturer's procedures and specifications exist, use those procedures and specifications; otherwise, use an approved inspection method such as the dry park check.
- (8) Looseness is defined as movement that creates excessive toe change.
- (9) Excessive looseness is defined as significant enough to affect vehicle handling or structural integrity.
- (10) Check for bent stud or damaged taper hole.
- (11) Check for damaged taper hole.
- (12) Check for damaged stud.

KING PINS

You are not required to replace king pins in axle sets. However, when replacing a king pin due to wear exceeding manufacturer's specifications, you may suggest replacement of the other king pin on the axle if its measurement shows it is close to the end of its useful life.

KING PINS

Condition	3	Code	3	Procedure
Bearing balls pitted	3	A	3	Require replacement.

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AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Bearing balls worn           3 A 3 Require replacement.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Bearing races pitted        3 A 3 Require replacement.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Bearing races worn          3 A 3 Require replacement.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Bearing rollers pitted      3 A 3 Require replacement.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Bearing rollers worn        3 A 3 Require replacement.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Bearing seal bent           3 B,2 3
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Bearing seal missing        3 B,2 3 Suggest replacement of seal or
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Bearing seal torn           3 B,2 3 bearing.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Binding                       3 A 3 Require repair or replacement of
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
End caps missing            3 C 3 Require replacement of missing
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
End play exceeds            3 B 3 Require repair.
specifications              3 3
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Grease fitting broken       3 A 3
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Grease fitting missing      3 C 3 Require replacement of grease
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Grease fitting won't seal  3 A 3 fitting.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Locating pins missing       3 C 3 Require replacement of missing
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Looseness exceeds          3 B 3 Require replacement of worn parts.
manufacturer's specs       3 3
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Seized                      3 A 3 Require replacement.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Threads damaged             3 A 3 Require repair or replacement.
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Threads stripped (threads  3 A 3 Require replacement.
missing)                    3 3
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Will not take grease        3 B,2 3 Suggest replacement of grease
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
fitting. See note (1) below.

```

NOTE: (1) If king pin will not take grease after replacement of grease fitting, suggest replacement of king pin.

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Looseness (perceptible horizontal movement) 3 A,1 3 Suggest replacement. See note (7)

CAUTION: DO NOT use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.

Looseness that is excessive 3 B 3 Require replacement. See notes (7) and (8), caution below.

CAUTION: DO NOT use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.

Nut on stud loose 3 A 3 Require repair or replacement. See note (9) below.

Seized 3 A 3 Require replacement.

Splines damaged 3 A 3 Require repair or replacement.

Splines stripped (splines missing) 3 A 3 Require replacement.

Stud bent 3 B 3 Require replacement. See note (10)

Stud broken 3 A 3 Require replacement. See note (10)

Stud loose in taper hole 3 A 3 Require repair or replacement. See note (10) below.

Taper hole elongated 3 A 3 Require replacement. See note (11)

Threads damaged 3 A 3 Require repair or replacement.

Threads stripped (threads missing) 3 A 3 Require replacement. See note (10)

- NOTE: (1) If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.
(2) Cracked grease boot will allow contaminants to enter joint and will accelerate wear.
(3) Lack of grease boot will allow contaminants to enter joint and will accelerate wear.
(4) Torn grease boot will allow contaminants to enter joint and will accelerate wear.
(5) Lack of grease seal will allow contaminants to enter joint and will accelerate wear.
(6) Torn grease seal will allow contaminants to enter joint and will accelerate wear.
(7) If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.
(8) Excessive looseness is defined as being significant enough

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to affect vehicle handling or structural integrity.

(9) Check for bent stud of damaged taper hole.

(10) Check for damaged taper hole.

(11) Check for damaged stud.

AA

POWER STEERING HOSES

POWER STEERING HOSES

AA

Condition	3	Code	3	Procedure
Blistered	3	B	3	Require replacement.
Blocked	3	A	3	Require repair or replacement.
Fitting threads damaged	3	A	3	Require repair or replacement.
Fitting threads stripped (threads missing)	3	A	3	Require replacement.
Inner fabric (webbing) cut	3	A	3	Require replacement.
Leaking	3	A	3	Require repair or replacement.
Missing	3	C	3	Require replacement.
Outer covering is cracked to the extent that the inner fabric of hose is visible	3	B	3	Require replacement.
Restricted	3	A	3	Require repair or replacement.

POWER STEERING (HYDRAULIC) PUMPS

If diagnosis has determined that complete disassembly is necessary to determine the extent of the system failure, the suggestion may be made to rebuild or replace the power steering pump. Repair or replacement of the following components may be required if performed as part of a power steering pump overhaul or rebuild service to meet a minimum rebuild standard.

POWER STEERING (HYDRAULIC) PUMPS

AA

Condition	3	Code	3	Procedure
Attaching hardware bent	3	B	3	Require repair or replacement of bent part.
Attaching hardware broken	3	A	3	Require replacement of broken

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3 3 part.
AAAAAA
Attaching hardware loose 3 A 3 Require repair or replacement of
3 3 loose part.
AAAAAA
Attaching hardware missing 3 C 3 Require replacement of missing
3 3 part.
AAAAAA
Attaching hardware threads 3 A 3 Require repair or replacement of
damaged 3 3 part with damaged threads.
AAAAAA
Attaching hardware threads 3 A 3 Require replacement of part with
stripped (threads missing) 3 3 stripped threads.
AAAAAA
Belt alignment incorrect 3 B 3 Further inspection required.
3 3 See note (1) below.
AAAAAA
Belt cracked 3 A,1 3 Suggest replacement.
AAAAAA
Belt frayed 3 A,1 3 Suggest replacement.
AAAAAA
Belt missing 3 C 3 Require replacement.
AAAAAA
Belt noisy 3 B,2 3 Further inspection required.
3 3 See note (2) below.
AAAAAA
Belt plies separated 3 A 3 Require replacement.
AAAAAA
Belt tension out of spec 3 B 3 Require adjustment or replacement.
AAAAAA
Belt worn beyond adjustment 3 B 3 Require replacement.
range 3 3
AAAAAA
Belt worn so it contacts 3 A 3 Require replacement.
bottom of pulley 3 3
AAAAAA
Binding 3 A 3 Require repair or replacement.
AAAAAA
Fluid at or beyond service 3 C,3 3 Suggest fluid change.
interval 3 3
AAAAAA
Fluid contaminated 3 B 3 Require flushing and refilling of
3 3 the system. See note (3) below.
AAAAAA
Fluid level incorrect 3 B 3 Require adjustment of fluid level.
AAAAAA
Inadequate assist 3 A 3 Further inspection required.
3 3 See note (4) below.
AAAAAA
Leaking 3 A 3 Require repair or replacement.
AAAAAA
Noise 3 B,2 3 Further inspection required.

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	3		3	See note (5) below.
Pulley bent	3	A	3	Require repair or replacement of pulley.
Pulley missing	3	C?	3	Require replacement of pulley.
Remote reservoir leaking	3	A	3	Require replacement of reservoir.
Reservoir cap broken	3	A	3	Require replacement of cap.
Reservoir cap missing	3	C	3	Require replacement of cap.
Seized	3	A	3	Require replacement.
Threads damaged	3	A	3	Require repair or replacement.
Threads stripped (threads missing)	3	A	3	Require replacement.

- NOTE: (1) Determine cause of incorrect alignment and require repair.
(2) Determine cause of noise and suggest repair.
(3) Determine and correct source of contamination. OEM specifications must be followed for fluid type.
(4) If pump is source of inadequate assist, require repair or replacement.
(5) If noise is isolated to pump, suggest repair or replacement.

RADIUS ARMS

Condition	3	Code	3	Procedure
Attaching hardware broken	3	A	3	Require replacement of broken part.
Attaching hardware incorrect	3	A	3	Require replacement of incorrect part.
Attaching hardware loose	3	A	3	Require repair or replacement of loose part.
Attaching hardware missing	3	C	3	Require replacement of missing part.
Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads.
Attaching hardware threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads.

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Bent	3	B	3	Require replacement.
Corroded, affecting structural integrity	3	A	3	Require replacement.
Holes distorted	3	A	3	Require replacement.
Threads damaged	3	A	3	Require repair or replacement.
Threads stripped (threads missing)	3	A	3	Require replacement.

RELAY RODS

RELAY RODS

Condition	3	Code	3	Procedure
Attaching hardware incorrect	3	A	3	Require replacement of incorrect part, if available; otherwise, replace relay rod.
Attaching hardware loose	3	A	3	Require repair or replacement of loose part, if available; otherwise, replace relay rod.
Attaching hardware missing	3	C	3	Require replacement of missing part, if available; otherwise, replace relay rod.
Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads, if available; otherwise, replace relay rod.
Attaching hardware threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads, if available; otherwise, replace relay rod.
Bent	3	B	3	Require replacement.
Binding	3	A	3	Further inspection required. See note (1) below.
Grease boot cracked	3	B,2	3	Suggest replacement. See note (2).
Grease boot missing	3	B,2	3	Suggest replacement. See note (3).
Grease boot torn	3	B,2	3	Suggest replacement. See note (4).

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Grease fitting broken 3 A 3

AA

Grease fitting missing 3 C 3 Require replacement grease fitting.

Grease fitting won't seal 3 A 3

AA

Grease seal missing 3 B,2 3 Suggest replacement. See note (5).

AA

Grease seal torn 3 B,2 3 Suggest replacement. See note (6).

AA

Looseness (perceptible horizontal movement) 3 A,1 3 Suggest replacement. See note (7).

AA

CAUTION: DO NOT use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.

AA

Looseness that is excessive 3 B 3 Require replacement. See notes (7) and (8) and caution below.

AA

CAUTION: DO NOT use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.

AA

Seized 3 A 3 Require replacement.

AA

Stud bent 3 B 3 Require replacement. See note (9).

AA

Stud broken 3 A 3 Require replacement. See note (9).

AA

Stud loose in taper hole 3 A 3 Require repair or replacement. See note (9).

AA

Taper hole elongated 3 A 3 Require replacement. See note (10)

AA

Threads damaged 3 A 3 Require repair or replacement.

AA

Threads stripped (threads missing) 3 A 3 Require replacement. See note (9).

AA

Wear exceeds manufacturer's specifications 3 B 3 Require replacement.

AA

- NOTE: (1) If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.
- (2) Cracked grease boot will allow contaminants to enter the joint and will accelerate wear.
- (3) Lack of grease boot will allow contaminants to enter the joint and will accelerate wear.
- (4) Torn grease boot will allow contaminants to enter the joint and will accelerate wear.
- (5) Lack of grease seal will allow contaminants to enter joint and will accelerate wear.
- (6) Torn grease seal will allow contaminants to enter joint and

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Attaching hardware corroded ³ affecting structural integrity	³ ³ ³	A	³ ³ ³	Require replacement of corroded part, if available; otherwise, replace shock or strut.
AA				
Attaching hardware incorrect	³ ³ ³	A	³ ³ ³	Require replacement of incorrect part, if available; otherwise, replace shock or strut.
AA				
Attaching hardware loose	³ ³ ³	A	³ ³ ³	Require repair or replacement of loose part, if available; otherwise, replace shock or strut.
AA				
Attaching hardware missing	³ ³ ³	C	³ ³ ³	Require replacement of missing part, if available; otherwise, replace shock or strut.
AA				
Attaching hardware threads damaged	³ ³ ³	A	³ ³ ³	Require repair or replacement of part with damaged threads, if available; otherwise, replace shock or strut.
AA				
Attaching hardware threads stripped (threads missing) ³	³ ³ ³	A	³ ³ ³	Require replacement of part with stripped threads, if available; otherwise, replace shock or strut.
AA				
Binding	³ ³ ³	A	³ ³ ³	Require replacement.
AA				
Body dented	³ ³ ³	A	³ ³ ³	Further inspection required. See note (1) below.
AA				
Body punctured	³ ³ ³	A	³ ³ ³	Require replacement.
AA				
Brake hose bracket bent	³ ³ ³	B	³ ³ ³	Require repair or replacement.
AA				
Brake hose bracket missing	³ ³ ³	C	³ ³ ³	Require replacement.
AA				
Brake hose bracket threads damaged	³ ³ ³	C	³ ³ ³	Require repair or replacement.
AA				
Brake hose bracket threads stripped (threads missing) ³	³ ³ ³	C	³ ³ ³	Require replacement.
AA				
Compression bumper missing	³ ³ ³	C	³ ³ ³	Require replacement of compression bumper.
AA				
Compression bumper split	³ ³ ³	A,1	³ ³ ³	Suggest replacement of compression bumper.
AA				
Damping (none)	³ ³ ³	A	³ ³ ³	Require replacement.
AA				
Dust boot (bellows) split	³ ³ ³	B,2	³ ³ ³	Suggest replacement of boot. See note (2) below.

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AA

Dust boot (bellows) missing³ B,2³ Suggest replacement of boot.

³ ³ See (3) note below.

AA

Dust boot (bellows) torn³ B,2³ Suggest replacement of boot.

³ ³ See note (4) below.

AA

Dust shield broken³ B,2³ Suggest replacement. See note (4).

AA

Dust shield missing³ B,2³ Suggest replacement. See note (4).

AA

Gland nut (strut housing³ A³ Require replacement of nut and/or

cap) is not removable³ ³ housing. See note (5) below.

using appropriate tool³ ³

AA

Gland nut (strut housing³ A³ Require repair or replacement of

cap) threads damaged³ ³ nut.

AA

Gland nut (strut housing³ A³ Require replacement of nut.

cap) threads stripped³ ³

(threads missing)³ ³

AA

Housing dented³ A³ Further inspection required.

³ ³ See note (6) below.

AA

Housing punctured³ A³ Require replacement.

AA

Jounce bumper missing³ C³ Require replacement of jounce

³ ³ bumper.

AA

Jounce bumper split³ 1?³ Suggest replacement of jounce

³ ³ bumper.

AA

Leaking oil, enough for³ A³ Require replacement. See caution

fluid to be running down³ ³ below.

the body³ ³

AA

CAUTION: If the strut cartridge has been replaced previously, the oil

on the strut housing may be filler oil. The technician must

identify the source of the oil.

AA

Noise³ B,2³ Further inspection required.

³ ³ See note (7) below.

AA

Piston rod bent³ A³ Require replacement.

AA

Piston rod broken³ A³ Require replacement.

AA

Piston rod has surface³ B,2³ Suggest replacement.

defect³ ³

AA

Piston rod threads damaged³ A³ Require repair or replacement.

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Piston rod threads stripped ³ (threads missing)	3	A	3	Require replacement.
Seized	3	A	3	Require replacement.
Shock missing	3	C	3	Require replacement.
Strut housing bent	3	A	3	Require replacement.
Strut housing cap (gland nut) is not removable using appropriate tool	3	A	3	Require replacement of nut and/or housing. See note (5) below.
Strut housing cap (gland nut) threads damaged	3	A	3	Require repair or replacement of nut.
Strut housing cap (gland nut) threads stripped (threads missing)	3	A	3	Require replacement of nut.
Strut housing severely corroded, affecting structural integrity	3	A	3	Require replacement.
Strut housing threads damaged	3	A	3	Require repair or replacement.
Strut housing threads stripped (threads missing) ³	3	A	3	Require replacement.
Tire cupping	3	A	3	Further inspection required. See note (8) below

- NOTE: (1) Require replacement of units where dents restrict shock or strut piston rod movement. If dents don't restrict movement, no service is suggested or required. Especially critical on mono-tube shocks.
- (2) This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.
- (3) This condition can lead to damage of the piston rod, which causes piston rod seal wear.
- (4) This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.
- (5) Only required if replacing cartridge.
- (6) Require replacement of units where dents restrict shock or strut piston rod movement. If dents don't restrict movement, no service is suggested or required. Especially critical on mono-tube shocks.
- (7) If noise is isolated to shock or strut, suggest replacement.
- (8) Although shocks or struts may have contributed to tire cupping, an inspection is needed of the entire suspension

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Condition	3	Code	3	Procedure
Attaching hardware bent	3	B	3	Require repair or replacement of bent part.
Attaching hardware broken	3	A	3	Require replacement of broken part.
Attaching hardware corroded affecting structural integrity	3	A	3	Require replacement of corroded part.
Attaching hardware incorrect	3	A	3	Require replacement of incorrect part.
Attaching hardware loose	3	A	3	Require repair or replacement of loose part.
Attaching hardware missing	3	C	3	Require replacement of missing part.
Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads.
Attaching hardware threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads.
Broken (all springs except secondary leave(s) on multi-leaf springs)	3	A	3	Require replacement.
Coil clash	3		3	Require ride height check. See note (1) below.
Coil spring insulator deteriorated	3	B,2	3	Suggest replacement of insulator.
Coil spring insulator missing	3	B,2	3	Suggest replacement of insulator.
Coil spring insulator split	3	B,2	3	Suggest replacement of insulator.
Coil spring plastic coating deteriorated - rust present	3	A	3	Refer to manufacturer's service requirements. See note (2) below.
Composite spring damaged	3	A	3	Further inspection required. See note (3) below.
Cracked (all springs except composite leaf and secondary leave(s) on	3	A	3	Require replacement.

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multi-leaf springs)	3	3	
Installed incorrectly	3	B	3 Require repair.
Leaf spring insulators missing	3	B,2	3 Suggest replacement of insulators.
Secondary leaf on multi-leaf spring broken	3	A,1	3 Suggest repair or replacement
Secondary leaf on multi-leaf spring cracked	3	A,1	3 Suggest repair or replacement
Torsion bar adjuster bent	3	A	3 Require repair or replacement of adjuster. See note (4) below.
Torsion bar adjuster seized	3	A	3 Require repair or replacement of adjuster. See note (4) below.
Torsion bar adjuster threads damaged	3	A	3 Require repair or replacement of part with damaged threads. See note (4) below.
Torsion bar adjuster threads stripped (threads missing)	3	A	3 Require replacement of part with stripped threads.
Vehicle suspension height not within OEM specs	3	B	3 Require adjustment or replacement.

- NOTE: (1) If vehicle is within manufacturer's height specifications, no service is suggested or required.
(2) Some manufacturers require replacement under these conditions.
(3) Check vehicle ride height. If ride height is OK, no service is suggested or required.
(4) Only required if ride height needs to be adjusted.

STEEL POWER STEERING LINES

CAUTION: When replacing steel power steering lines, be sure to use a replacement product that meets or exceeds OEM design specifications.

STEEL POWER STEERING LINES

Condition	3	Code	3	Procedure
Attaching hardware bent	3	B	3	Require repair or replacement of bent part.

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Attaching hardware broken	3	A	3	Require replacement of broken part.
Attaching hardware loose	3	A	3	Require repair or replacement of loose part.
Attaching hardware missing	3	C	3	Require replacement of missing part.
Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads.
Attaching hardware threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads.
Blocked	3	A	3	Require repair or replacement.
Fitting incorrect (such as compression fitting)	3	B	3	Require replacement.
Flare type incorrect	3	B	3	Required replacement.
Leaking	3	A	3	Require tightening or replacement.
Line type incorrect	3	B	3	Require replacement.
Restricted	3	A	3	Require replacement.
Routed incorrectly	3	B	3	Require routing correction.
Rust-pitted	3	A,1	3	Suggest replacement.
Rust pitted affecting structural integrity	3	A	3	Require replacement.

STEERING ARMS

STEERING ARMS

Condition	3	Code	3	Procedure
Attaching hardware bent	3	B	3	Require repair or replacement of bent part.
Attaching hardware broken	3	A	3	Require replacement of broken part.
Attaching hardware incorrect	3	A	3	Require replacement of incorrect part.
Attaching hardware loose	3	A	3	Require repair or replacement of

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	3		3	loose part.
Attaching hardware missing	3	C	3	Require replacement of missing part.
Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads.
Attaching hardware threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads.
Bent	3	B	3	Require replacement.
Broken	3	A	3	Require replacement.
Taper hole elongated	3	A	3	Require replacement. See note (1).
Threads damaged	3	A	3	Require repair or replacement.
Threads stripped (threads missing)	3	A	3	Require replacement.

NOTE: (1) Check for damaged stud.

STEERING DAMPERS

The following procedures are only required if the vehicle was originally equipped from the factory with a steering damper. If the steering damper is an add-on unit, then the unit may be removed instead of repairing or replacing.

STEERING DAMPERS

Condition	3	Code	3	Procedure
Attaching hardware bent	3	B	3	Require repair or replacement of bent part, if available; otherwise, replace steering damper.
Attaching hardware broken	3	A	3	Require replacement of broken part, if available; otherwise, replace steering damper.
Attaching hardware corroded affecting structural integrity	3	A	3	Require replacement of corroded part, if available; otherwise, replace steering damper.
Attaching hardware incorrect	3	A	3	Require replacement of incorrect part, if available; otherwise, replace steering damper.

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Attaching hardware loose	3	A	3	Require repair or replacement of loose part, if available; otherwise, replace steering damper.
Attaching hardware missing	3	C	3	Require replacement of missing part, if available; otherwise, replace steering damper.
Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads, if available; otherwise, replace steering damper.
Attaching hardware threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads, if available; otherwise, replace steering damper.
Binding	3	A	3	Require replacement.
Damper body dented	3	A	3	Further inspection required. See note (1) below.
Damper body punctured	3	A	3	Require replacement.
Damping (none)	3	A	3	Require replacement.
Dust boot (bellows) missing	3	B,2	3	Suggest replacement of boot. See note (2) below.
Dust boot (bellows) split	3	B,2	3	Suggest replacement of boot. See note (2) below.
Dust shield broken	3	B,2	3	Suggest replacement. See note (2).
Dust shield missing	3	B,2	3	Suggest replacement. See note (2).
Leaking oil, enough for fluid to be running down the body	3	A	3	Require replacement.
Loose	3	A	3	Require repair or replacement.
Missing	3	C	3	Require replacement.
Noise	3	B,2	3	Further inspection required. See note (3) below.
Piston rod bent	3	A	3	Require replacement.

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Piston rod broken 3 A 3 Require replacement.
Piston rod has surface 3 B,2 3 Suggest replacement.
defect 3 3
Piston rod threads stripped 3 A 3 Require replacement.
(threads missing) 3 3
Piston rod threads damaged 3 A 3 Require repair or replacement.
Seized 3 A 3 Require replacement.
NOTE: (1) Require replacement of units where dents restrict damper
piston rod movement. If dents don't restrict movement, no
service is suggested or required. Especially critical on
mono-tube dampers.
(2) This condition can lead to damage of the piston rod, which,
in turn, causes premature piston rod seal wear.
(3) If noise is isolated to damper, suggest replacement.

STEERING GEARS (EXCEPT RACK & PINION)

If diagnosis has determined that complete disassembly is necessary to determine the extent of the system failure, the suggestion may be made to rebuild or replace the power steering pump. Repair or replacement of the following components may be required, if performed as part of a power steering pump overhaul or rebuild service to meet a minimum rebuild standard.

STEERING GEARS (EXCEPT RACK & PINION)
Condition 3 Code 3 Procedure
Attaching hardware broken 3 A 3 Require replacement of broken
part.
Attaching hardware loose 3 A 3 Require repair or replacement of
loose part.
Attaching hardware missing 3 C 3 Require replacement of missing
part.
Attaching hardware threads 3 A 3 Require repair or replacement of
damaged 3 3 part with damaged threads.
Attaching hardware threads 3 A 3 Require replacement of part with
stripped (threads missing) 3 3 stripped threads.
Binding 3 A 3 Require repair or replacement
Flex coupler binding 3 A 3 Require repair or replacement of

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	3	3	coupler.
Flex coupler loose	3 A	3	Require repair or replacement of coupler.
Flex coupler missing parts	3 A	3	Require repair or replacement of coupler.
Flex coupler soft/spongy	3 A	3	Require replacement of coupler.
Flex coupler torn	3 A	3	Require replacement of coupler.
Fluid contaminated	3 B	3	Require flushing and refilling of the system. See note (1) below.
Gasket leaking	3 A	3	Require repair or replacement of gasket.
Housing leaking	3 A	3	Require replacement.
Hydraulic fittings leaking	3 A	3	Require repair or replacement of fittings.
Inadequate power assist	3 A	3	Further inspection required. See note (2) below.
Lash exceeds manufacturer's specifications	3 B	3	Require repair or replacement.
Seal leaking	3 A	3	Require repair or replacement of seal and/or mating part.
Splines damaged	3 A	3	Require repair or replacement of splines.
Splines stripped	3 A	3	Require replacement of splines.
Steering coupler shield cracked	3 B,2	3	Suggest replacement.
Steering coupler shield missing	3 C	3	Require replacement.
Threads damaged	3 A	3	Require repair or replacement of part with damaged threads.
Threads stripped (threads missing)	3 A	3	Require replacement of part with stripped threads.
U-joint binding	3 A	3	Require repair or replacement of joint.

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U-joint loose	3	A	3	Require repair or replacement of joint.
---------------	---	---	---	---

Unequal power assist	3	A	3	Require repair or replacement.
----------------------	---	---	---	--------------------------------

NOTE: (1) Determine and correct source of contamination.
 OEM specifications must be followed for fluid type.
 (2) If steering gear is source of inadequate assist, require repair or replacement.

STEERING GEARS: RACK & PINION

If diagnosis has determined that complete disassembly is necessary to determine the extent of the system failure, the suggestion may be made to rebuild or replace the power steering pump. Repair or replacement of the following components may be required, if performed as part of a power steering pump overhaul or rebuild service to meet a minimum rebuild standard.

STEERING GEARS: RACK & PINION

Condition	3	Code	3	Procedure
-----------	---	------	---	-----------

Attaching hardware broken	3	A	3	Require replacement of broken part.
---------------------------	---	---	---	-------------------------------------

Attaching hardware loose	3	A	3	Require repair or replacement of loose part.
--------------------------	---	---	---	--

Attaching hardware missing	3	C	3	Require replacement of missing part.
----------------------------	---	---	---	--------------------------------------

Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads.
------------------------------------	---	---	---	---

Attaching hardware threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads.
---	---	---	---	--

Balance tube blocked	3	A	3	Require repair or replacement of balance tube.
----------------------	---	---	---	--

Balance tube missing	3	C	3	Require replacement of balance tube.
----------------------	---	---	---	--------------------------------------

Balance tube restricted	3	A	3	Require repair or replacement of balance tube.
-------------------------	---	---	---	--

Bellows boot clamp missing	3	C	3	Require replacement of clamp.
----------------------------	---	---	---	-------------------------------

Bellows boot cracked (not through)	3	B,2	3	Suggest replacement of bellows boot.
------------------------------------	---	-----	---	--------------------------------------

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Bellows boot missing	3	C	3	Require replacement of bellows boot.
Bellows boot not sealing	3	A	3	Require repair or replacement of bellows boot.
Bellows boot torn	3	A	3	Require replacement of bellows boot.
Bellows boot twisted (from toe adjustment)	3	B	3	Require repair.
Fitting leaking	3	A	3	Require repair or replacement.
Fitting missing	3	A	3	Require replacement of fitting.
Fitting threads damaged	3	A	3	Require repair or replacement of part with damaged threads.
Fitting threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads.
Flex coupler binding	3	A	3	Require repair or replacement of coupler.
Flex coupler loose	3	A	3	Require repair or replacement of coupler.
Flex coupler missing parts	3	A	3	Require repair or replacement of coupler.
Flex coupler soft/spongy	3	A	3	Require replacement of coupler.
Flex coupler torn	3	A	3	Require replacement of coupler.
Fluid contaminated	3	B	3	Require flushing and refilling of the system. See note (1) below.
Gasket leaking	3	A	3	Require repair or replacement.
Hard steering on cold start-up	3	A,1	3	Suggest repair or replacement. See note (2) below.
Housing cracked, affecting structural integrity	3	B	3	Require replacement.
Housing leaking	3	A	3	Require replacement.
Inadequate power assist	3	A	3	Further inspection required. See note (3) below.

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Lash exceeds manufacturer's specifications	3	B	3	Require repair or replacement.
AA				
Seal leaking	3	A	3	Require repair or replacement.
AA				
Splines damaged	3	A	3	Require repair or replacement.
AA				
Splines stripped (splines missing)	3	A	3	Require replacement.
AA				
Steel line blocked	3	A	3	Require repair or replacement of
AA				
Steel line leaking	3	A	3	line.
AA				
Steel line missing	3	C	3	Require replacement of line.
AA				
Steel line restricted	3	A	3	Require repair or replacement of
AA				
Steering coupler shield cracked	3	B,2	3	Suggest replacement.
AA				
Steering coupler shield missing	3	C	3	Require replacement.
AA				
Steering coupler shield torn	3	B,2	3	Suggest replacement.
AA				
Threads damaged	3	A	3	Require repair or replacement of
AA				
Threads stripped (threads missing)	3	A	3	part with damaged threads.
AA				
U-joint binding	3	A	3	Require replacement of part with
AA				
U-joint loose	3	A	3	stripped threads.
AA				
Unequal power assist	3	A	3	Require repair or replacement of
AA				
NOTE: (1) Determine and correct source of contamination.				
Follow OE specifications for fluid type.				
(2) Indicates internal wear.				
(3) If steering gear is source of inadequate assist, require				
repair or replacement.				
AA				

STEERING KNUCKLES

STEERING KNUCKLES

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Condition	Code	Procedure
Attaching hardware bent	B	Require repair or replacement of bent part.
Attaching hardware broken	A	Require replacement of broken part.
Attaching hardware incorrect	A	Require replacement of incorrect part.
Attaching hardware loose	A	Require repair or replacement of loose part.
Attaching hardware missing	C	Require replacement of missing part.
Attaching hardware threads damaged	A	Require repair or replacement of part with damaged threads.
Attaching hardware threads stripped (threads missing)	A	Require replacement of part with stripped threads.
Bent	B	Require replacement.
Broken	A	Require replacement.
Pinch bolt incorrect	B	Require replacement with bolt that meets OE design.
Pinch bolt loose	B	Require repair.
Pinch bolt missing	B	Require replacement.
Pinch bolt tabs deformed (pinched together), .032" or more before clamping	B	Require replacement. See note (1) below.
Taper hole elongated	A	Require replacement. See note (2).
Threads damaged	A	Require repair or replacement.
Threads stripped (threads missing)	A	Require repair or replacement.

NOTE: (1) Steering knuckle deformation can cause pinch bolt breakage.
(2) Check for damaged stud.

STRIKE OUT BUMPERS

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STRIKE OUT BUMPERS

Condition	Code	Procedure
Attaching hardware broken	A	Require replacement of broken part.
Attaching hardware corroded affecting structural integrity	A	Require replacement of corroded part.
Attaching hardware loose	A	Require repair or replacement of loose part.
Attaching hardware missing	C	Require replacement of missing part.
Attaching hardware threads damaged	A	Require repair or replacement of part with damaged threads.
Attaching hardware threads stripped (threads missing)	A	Require replacement of part with stripped threads.
Missing	C	Require replacement.
Split	A,1	Suggest replacement.

STRUT RODS

STRUT RODS

Condition	Code	Procedure
Adjusting nut seized	A	Require repair or replacement. See note (1) below.
Attaching hardware bent	B	Require repair or replacement of bent part, if available; otherwise, replace strut rod.
Attaching hardware broken	A	Require replacement of broken part, if available; otherwise, replace strut rod.
Attaching hardware incorrect	A	Require replacement of incorrect part, if available; otherwise, replace strut rod.
Attaching hardware loose	A	Require repair or replacement of loose part, if available; otherwise, replace strut rod.

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AA

Attaching hardware missing 3 C 3 Require replacement of missing
3 3 part, if available; otherwise,
3 3 replace strut rod.

AA

Attaching hardware threads 3 A 3 Require repair or replacement of
damaged 3 3 part with damaged threads, if
3 3 available; otherwise, replace
3 3 strut rod.

AA

Attaching hardware threads 3 A 3 Require replacement of part with
stripped (threads missing) 3 3 stripped threads, if available;
3 3 otherwise, replace strut rod.

AA

Attaching (mating) hole 3 A 3 Require repair or replacement of
oversized 3 3 frame.

AA

Attaching point on frame 3 A 3 Require repair of frame.
corroded, affecting 3 3
structural integrity 3 3

AA

Bent 3 A 3 Require replacement.

AA

Mating (attaching) hole 3 A 3 Require repair or replacement of
oversized 3 3 frame.

AA

Threads damaged 3 A 3 Require repair or replacement.

AA

Threads stripped (threads 3 A 3 Require replacement.
missing) 3 3

AA

NOTE: (1) Only required if an alignment is being performed.

AA

STRUT UPPER BEARING PLATE ASSEMBLIES

NOTE: When the following guidelines indicate replacement of bearing, only the bearing should be replaced if it is available separately; otherwise, replace the bearing plate assembly.

STRUT UPPER BEARING PLATE ASSEMBLIES

AA

Condition 3 Code 3 Procedure

AA

Attaching hardware broken 3 A 3 Require replacement of broken
3 3 part, if available; otherwise,
3 3 replace bearing plate assembly.

AA

Attaching hardware loose 3 A 3 Require repair or replacement of
3 3 loose part, if available;
3 3 otherwise, replace bearing plate

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	3	3	assembly.
Attaching hardware missing	3 C	3	Require replacement of missing
	3	3	part, if available; otherwise,
	3	3	replace bearing plate assembly.
Attaching hardware threads	3 A	3	Require repair or replacement of
damaged	3	3	part with damaged threads, if
	3	3	available; otherwise, replace
	3	3	bearing plate assembly.
Attaching hardware threads	3 A	3	Require replacement of part with
stripped (threads missing)	3	3	stripped threads, if available;
	3	3	otherwise, replace bearing plate
	3	3	assembly.
Bearing axial or radial	3 B	3	Require replacement of bearing.
movement exceeds vehicle	3	3	
manufacturer's specs	3	3	
Bearing binding	3 A	3	Require replacement of bearing.
Bearing missing	3 C	3	Require replacement of bearing.
Bearing seized	3 A	3	Require replacement of bearing.
Bent	3 B	3	Require replacement.
Holes distorted	3 A	3	Require replacement.
Missing	3 C	3	Require replacement.
Severely corroded,	3 A	3	Require replacement.
affecting structural	3	3	
integrity	3	3	

SWAY BAR LINKS

SWAY BAR LINKS

Condition	3 Code	3	Procedure
Attaching hardware	3 A	3	Require replacement of incorrect
incorrect	3	3	part, if available; otherwise,
	3	3	replace link.
Attaching hardware loose	3 A	3	Require repair or replacement of
	3	3	loose part, if available;
	3	3	otherwise, replace link.
Attaching hardware missing	3 C	3	Require replacement of missing

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3 3 part, if available; otherwise,
3 3 replace link.

Attaching hardware threads 3 A 3 Require repair or replacement of
damaged 3 3 part with damaged threads, if
3 3 available; otherwise, replace
3 3 link.

Attaching hardware threads 3 A 3 Require replacement of part with
stripped (threads missing) 3 3 stripped threads, if available;
3 3 otherwise, replace link.

Ball and socket has 3 A,1 3 Suggest replacement. See note (1).
looseness (perceptible 3 3
vertical movement) 3 3

CAUTION: DO NOT use pliers or pry bar to check ball and socket
movement. Use only moderate hand pressure.

Ball and socket has 3 B 3 Require replacement. See notes (1)
looseness that is 3 3 and (2) and caution.
excessive 3 3

Bent 3 B 3 Require replacement.

Broken 3 A 3 Require replacement.

Corroded, affecting 3 A 3 Require replacement.
structural integrity 3 3

Grease boot cracked 3 B,2 3 Suggest replacement. See note (3).

Grease boot missing 3 B,2 3 Suggest replacement. See note (4).

Grease boot torn 3 B,2 3 Suggest replacement. See note (5).

Missing 3 C 3 Require replacement.

Nut on stud loose 3 A 3 Require repair. See note (6).

Stud bent 3 B 3 Require replacement. See note (7).

Stud broken 3 A 3 Require replacement. See note (7).

Threads damaged 3 A 3 Require repair or replacement.

Threads stripped (threads 3 A 3 Require replacement. See note (7).
missing) 3 3

NOTE: (1) If manufacturer's procedures for inspection exist, use those
procedures; otherwise, use an approved inspection method
such as the dry park check.

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TIE ROD ENDS (INNER & OUTER)

TIE ROD ENDS (INNER & OUTER)

Condition	3	Code	3	Procedure
Attaching hardware incorrect	3	A	3	Require replacement of incorrect part, if available; otherwise, replace tie rod end.
Attaching hardware loose	3	A	3	Require repair or replacement of loose part, if available; otherwise, replace tie rod end.
Attaching hardware missing	3	C	3	Require replacement of missing part, if available; otherwise, replace tie rod end.
Attaching hardware threads damaged	3	A	3	Require repair or replacement of part with damaged threads, if available; otherwise, replace tie rod end.
Attaching hardware threads stripped (threads missing)	3	A	3	Require replacement of part with stripped threads, if available; otherwise, replace tie rod end.
Adjusting sleeve bent	3	B	3	Require replacement of sleeve or tie rod end.
Adjusting sleeve clamps out of position	3	B	3	Require repair.
Adjusting sleeve corroded, affecting structural integrity	3	A	3	Require replacement of sleeve or tie rod end.
Adjusting sleeve missing	3	C	3	Require replacement of sleeve or tie rod end.
Adjusting sleeve seized	3	A	3	Require repair or replacement. See note (1) below.
Adjusting sleeve threads damaged	3	A	3	Require repair or replacement of sleeve or tie rod end.
Adjusting sleeve threads stripped (threads missing)	3	A	3	Require replacement of sleeve or tie rod end.
Binding	3	A	3	Further inspection required. See note (2) below.

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AAAAAA
Grease boot cracked 3 3 Suggest replacement. See note (3).
AAAAAA
Grease boot missing 3 3 Suggest replacement. See note (4).
AAAAAA
Grease boot torn 3 3 Suggest replacement. See note (5).
AAAAAA
Grease fitting broken 3 A 3 Require replacement of grease
3 3 fitting.
AAAAAA
Grease fitting missing 3 C 3 Require replacement of grease
3 3 fitting.
AAAAAA
Grease fitting won't seal 3 A 3 Require replacement of grease
3 3 fitting.
AAAAAA
Grease seal missing 3 B,2 3 Suggest replacement of seal.
3 3 See note (4) below.
AAAAAA
Grease seal torn 3 B,2 3 Suggest replacement of seal.
3 3 See note (5) below.
AAAAAA
Greaseable tie rod end 3 B,2 3 Suggest replacement of grease
will not take grease 3 3 fitting. See note (6) below.
AAAAAA
Looseness (perceptible 3 A,1 3 Suggest replacement. See note (7).
horizontal movement) 3 3
AAAAAA
CAUTION: DO NOT use pliers or pry bar to check ball and socket
movement. Use only moderate hand pressure.
AAAAAA
Looseness exceeds 3 B 3 Require replacement.
manufacturer's specs 3 3
AAAAAA
Looseness that is excessive 3 B 3 Require replacement. See notes (7)
3 3 and (8), caution.
AAAAAA
Nut on stud loose 3 A 3 Require repair or replacement of
3 3 nut. See note (9) below.
AAAAAA
Seized 3 A 3 Require replacement
AAAAAA
Stud bent 3 B 3 Require replacement. See note (10)
AAAAAA
Stud broken 3 A 3 Require replacement. See note (10)
AAAAAA
Threads damaged 3 A 3 Require repair or replacement.
AAAAAA
Threads stripped (threads 3 A 3 Require replacement. See note (10)
missing) 3 3
AAAAAA

NOTE: (1) Only required if toe needs to be adjusted.

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Grease boot cracked 3 B,2 3 Suggest replacement. See note (1).
AA
Grease boot missing 3 B,2 3 Suggest replacement. See note (2).
AA
Grease boot torn 3 B,2 3 Suggest replacement. See note (3).
AA
Holes distorted 3 A 3 Require replacement.
AA
Looseness (perceptible 3 A,1 3 Suggest replacement. See note (4)
horizontal movement) 3 3 below.
AA
CAUTION: DO NOT use pliers or pry bar to check ball and socket
movement. Use only moderate hand pressure.
AA
Looseness that is excessive 3 B 3 Require replacement. See notes (4)
3 3 and (5), caution.
AA
Nut on stud loose 3 A 3 Require repair or replacement of
3 3 nut. See note (6) below.
AA
Seized 3 A 3 Require replacement.
AA
Stud bent 3 B 3 Require replacement. See note (7).
AA
Stud broken 3 A 3 Require replacement. See note (7).
AA
Threads damaged 3 A 3 Require repair or replacement.
AA
Threads stripped (threads 3 A 3 Require replacement. See note (7).
missing) 3 3
AA
Wear exceeds manufacturer's 3 B 3 Require replacement.
specifications 3 3
AA

- NOTE: (1) Cracked grease boot will allow contaminants to enter joint and will accelerate wear.
(2) Lack of grease boot will allow contaminants to enter joint and will accelerate wear.
(3) Torn grease boot will allow contaminants to enter joint and will accelerate wear.
(4) If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.
(5) Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity.
(6) Check for bent stud or damaged taper hole.
(7) Check for damaged taper hole.

AA

TRAILING ARMS

TRAILING ARMS

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Condition	Code	Procedure
Attaching hardware broken	A	Require replacement of broken part, if available; otherwise, replace trailing arm.
Attaching hardware loose	A	Require repair or replacement of loose part, if available; otherwise, replace trailing arm.
Attaching hardware missing	C	Require replacement of missing part, if available; otherwise, replace trailing arm.
Attaching hardware threads damaged	A	Require repair or replacement of part with damaged threads, if available; otherwise, replace trailing arm.
Attaching hardware threads stripped (threads missing)	A	Require replacement of part with stripped threads, if available; otherwise, replace trailing arm.
Bent	B	Require replacement.
Bushing hole oversized	B	Require replacement.
Corroded, affecting structural integrity	A	Require replacement.
Holes distorted	A	Require replacement.
Threads damaged	A	Require repair or replacement.
Threads stripped (threads missing)	A	Require replacement.

WHEEL ALIGNMENT

WHEEL ALIGNMENT

Wheel alignment is defined as the measurement, analysis, and adjustment of steering and suspension angles to conform to OEM specifications. These angles usually include, but are not limited to: caster, camber, toe, and thrust angle. Where these angles are not adjustable and not in specification, component replacement or correction kits may be required. Errors in set-back and steering axis inclination (SAI) are often attributable to failed or damaged components and must be corrected prior to performing an alignment.

Failure to replace or correct suggested or required parts or

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service may prevent a proper alignment.

Before performing an alignment check, inspect and verify the following:

- * Tire pressure and size
- * Vehicle loading
- * Ride height
- * Steering and suspension parts

Only if the inspection reveals that all the above are within published specifications, should a wheel alignment check and an alignment, if needed, be performed.

CAUTION: Under no circumstances should a technician bend or heat any steering or suspension component, unless specified by the vehicle manufacturer, for example, Ford forged twin "I" beam axles. All measurements and suggestions must be noted on the inspection report.

WHEEL ALIGNMENT

Condition	Code	Procedure
Dog tracking, shown to be caused by faulty alignment	B,2	Suggest repair.
Lead, shown to be caused by faulty alignment	B	Require alignment.
Part has been changed that may affect alignment	B	Require alignment check.
Pull, shown to be caused by faulty alignment	B	Require alignment.
Steering wheel off-center	B,2	Suggest alignment.
Tire wear, shown to be caused by faulty alignment	B	Require alignment.
Wander, shown to be caused by faulty alignment	B	Require alignment.

WHEEL BEARINGS, RACES, & 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, & SEALS

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Condition	3	Code	3	Procedure
Rear axle seal on rear-wheel drive leaking	3	A	3	Require replacement of seal and inspection of axle, bearing, housing, and vent tube
Seal bent	3	A,1	3	Suggest replacement.
Seal leaking	3	A	3	Require replacement of seal and inspection of bearings.
Seal missing	3	C	3	Require replacement.
Seal torn	3	A	3	Require replacement.
Wheel bearing assembly feels rough when rotated	3	A	3	Require replacement of bearing assembly.
Wheel bearing balls are pitted	3	A	3	Require replacement of bearing assembly.
Wheel bearing balls are worn	3	A	3	Require replacement of bearing assembly.
Wheel bearing end-play exceeds vehicle manufacturer's specs	3	A	3	Require adjustment of bearing, if possible. If proper adjustment cannot be obtained, require repair or replacement of worn component.
Wheel bearing race is loose in the hub bore	3	A	3	Require replacement of hub assembly and wheel bearings.
Wheel bearing races are pitted	3	A	3	Require replacement of bearing assembly.
Wheel bearing races are worn	3	A	3	Require replacement of bearing assembly.
Wheel bearing rollers are pitted	3	A	3	Require replacement of bearing assembly.
Wheel bearing rollers are worn	3	A	3	Require replacement of bearing assembly.

WHEELS & TIRES

TIRES

WARNING: These guidelines do not apply to split rims.

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Some vehicle manufacturers restrict replacement of tires to specific brands, types, or sizes.

High pressure temporary compact spare tires should not be used with any other rims or wheels, nor should standard tires, snow tires, wheel covers, or trim rings be used with high pressure compact spare rims or wheels.

Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death.

Only specially trained persons should de-mount or mount tires. Explosions of tire and wheel assembly can result from improper mounting, possibly causing serious injury or death.

Consult the vehicle owner's manual or vehicle placard for correct size, speed rating, designation, and cold inflation pressure of the original tires. DO NOT exceed the maximum load or inflation capacity of the tire specified by the Tire and Rim Association

When replacing tires, it is suggested that the replacement tires match or exceed the OEM speed rating designation. If tires of different speed rating designations are mixed on the same vehicle, the tires may vary in handling characteristics. DO NOT mix different speed rating designations on the same axle.

DO NOT mix radials with non-radial tires on the same axle, as this may affect vehicle handling and stability. If radial tires and bias or bias-belted ply tires are mixed on the same vehicle, the radials must be on the rear. High-pressure temporary compact spare tires are exempt from this rule.

DO NOT mix size or type (all season, performance, mud and snow) of tires on the same axle.

TIRES

Condition	Code	Procedure
Air pressure incorrect	B	Require repair
Bead broken	A	Require replacement.
Bead leaking, caused by tire	A	Require repair or replacement.
Bead wire/cord exposed	A	Require replacement.
Cord or belt material exposed	A	Require replacement.
Cord ply separations	A	Require replacement.
Directional/asymmetrical tires mounted incorrectly	B	Require remounting and/or repositioning.
Irregular tread wear, affecting performance	A	Suggest replacement. See note (1) below.
Load ratings less than OEM	B	Require replacement.

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specifications	3	3	
Mixed tire size designations on same axle	3	A	3 Require rotation or replacement.
Mixed tread types (all season, performance, mud and snow) on same axle	3	A	3 Require rotation or replacement.
Number of punctures exceeds manufacturer's limit	3	B	3 Require replacement.
Out of balance	3	B	3 Require rebalance of tire/wheel assembly.
Ply separation	3	A	3 Require replacement.
Pull or lead, caused by tire	3	A	3 Require rotation or replacement.
Radial and bias or bias-belted ply tires on same axle	3	B	3 Require rotation or replacement.
Radials are on the front and not on the rear	3	B	3 Require rotation or replacement. See note (2).
Run flat damage	3	A	3 Require replacement.
Shoulder cut	3	A	3 Require replacement.
Shoulder puncture	3	A	3 Require replacement.
Shoulder with plug	3	A	3 Require replacement.
Sidewall bulge	3	A	3 Require replacement.
Sidewall cut	3	A	3 Require replacement.
Sidewall indentation	3		3 No service required/suggested.
Sidewall puncture	3	A	3 Require replacement.
Sidewall with plug	3	A	3 Require replacement.
Speed rating designations different on same axle	3	B	3 Suggest rotation or replacement.
Tire and wheel assembly has excessive run-out	3	B	3 Require repair or replacement of appropriate part. See note (3) below.
Tires with more than 1/4"	3	B	3 Require replacement.

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diameter difference on a four-wheel drive vehicle	3	3	
Tread area puncture larger in diameter than tire manufacturer's specifications			
	3	B	3 Require replacement.
Tread missing pieces (chunking), exposing cord			
	3	A	3 Require replacement.
Tread missing pieces (chunking), not exposing cord			
	3	A	3 Suggest replacement.
Tread separations			
	3	A	3 Require replacement.
Tube in tubeless tire			
	3	C,3	3 Suggest removal of tube.
	3		3 See note (4) below.
Weather-checking			
	3		3 No service required/suggested.
Worn to tread wear indicators			
	3	B	3 Require replacement.

NOTE: (1) Determine and correct cause of irregular tire wear.
(2) If radials and bias or bias-belted ply tires are on the same vehicle, the radials must be on the rear axle, except for high-pressure temporary spares.
(3) Excessive is defined as enough to contribute to performance problems. Match mounting may correct run-out. If not, require replacement of appropriate part. Refer to manufacturer's specifications.
(4) Most manufacturers do not recommend tubes in tubeless tires. Inspect tire and wheel assembly to determine the reason for a tube in tubeless tire. Recommendation for repair or replacement should be based upon condition of tires and/or wheel listed in these guidelines.

VALVE STEMS

VALVE STEMS	3	Code	3	Procedure
Condition	3		3	
Bent	3	A,1	3	Suggest replacement.
Broken	3	A	3	Require replacement.
Cut, but not leaking	3	A,1	3	Suggest replacement.
Deteriorated (cracking, dry rot)	3	A,1	3	Suggest replacement.
Leaking	3	A	3	Require repair/replacement.

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Missing	3	C	3	Require replacement.
Threads damaged	3	A	3	Require repair/replacement.
Threads stripped (threads missing)	3	A	3	Require replacement.
Valve cap missing	3	C	3	Require replacement of cap.
Weather-checking	3	A,1	3	Suggest replacement.
Won't take air	3	A	3	Require repair/replacement.

WHEEL ATTACHMENT HARDWARE

For conditions noted below, also check conditions 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 ATTACHMENT HARDWARE

Condition	3	Code	3	Procedure
Bent	3	A	3	Require replacement.
Broken	3	A	3	Require replacement.
	3		3	See note (1) below.
Loose	3	B	3	Require repair or replacement
	3		3	of affected component.
Lug nut installed backward	3	B	3	Require repair.
Lug nut mating type incorrect	3	B	3	Require replacement of nut.
Lug nut mating surface dished	3	A	3	Require replacement of nut.
Lug nut flats rounded	3	A	3	Require replacement of nut.
	3		3	See note (2) below.
Lug nut seized	3	A	3	Require replacement of nut
	3		3	and/or stud. See note (2) below.
Stud incorrect	3	B	3	Require replacement of stud.
Threads damaged	3	A	3	Require repair or replacement of
	3		3	component with damaged threads.

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Threads stripped (threads missing) 3 A 3 Require replacement of component with stripped threads.

NOTE: (1) Some manufacturers require replacement of all studs on that wheel if two or more studs or nuts on the same wheel are broken or missing.

(2) Only required if removing wheel.

WHEELS

WARNING: Mounting a regular tire on a high-pressure compact spare wheel is not permitted. Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death. If the wheel identification stamp is not legible, or cannot be found, DO NOT use the wheel until the size and type have been properly identified. Wheels of different diameter, offset, or width cannot be mixed on the same axle. Bead seat tapers cannot be interchanged.

WHEELS

Condition	Code	Procedure
Bead leaking, caused by wheel rim flange	A	Require repair or replacement. See caution below.
CAUTION: DO NOT attempt to correct a bent wheel rim.		
Bent wheel hub mounting surface	A	Require replacement.
Bent wheel rim, causing vibration	B,2	Suggest replacement. See caution above.
Broken	A	Require replacement.
Cast wheel porous, causing a leak	A	Require repair or replacement.
Clip-on balance weight is incorrect type for wheel rim flange	B,2	Suggest replacement.
Corrosion, affecting structural integrity	A	Require replacement.
Corrosion build-up on wheel hub mounting surface	A	Require repair.

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Cracked 3 A 3 Require replacement.
Directional/asymmetrical 3 B 3 Require remounting and/or
wheels mounted incorrectly 3 3 repositioning.
Load capacity less than 3 B 3 Require replacement.
OEM specifications 3 3
Offset mismatched on same 3 B 3 Require replacement.
axle 3 3
Rivets leaking 3 A 3 Require replacement.
Run-out beyond OEM specs 3 B 3 Require replacement.
Stud holes elongated 3 A 3 Require replacement. See note (1)
Welded or brazed repair 3 B,2 3 Suggest replacement.
Welds leaking 3 A 3 Require replacement.
Wheel hub centering (pilot) 3 B 3 Require replacement.
hole incorrect 3 3
NOTE: (1) Inspect wheel attaching hardware for damage.

END OF ARTICLE