

UNIFORM INSPECTION & COMMUNICATION STANDARDS 2010 - 2011

Steering & Suspension Systems

STEERING & SUSPENSION SYSTEMS

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

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

MAP STANDARDS OF SERVICE

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

I. Our recommendations are based upon the following definitions.

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

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

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

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

III. Appropriate Company Approved Inspection

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

IV. Written Estimates

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

V. Work Authorization

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

VI. Limited Warranty

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

VII. Returned Parts

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

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

VIII. Classification of Parts

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

THE MAP PROCESS - OVERVIEW

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

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

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

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

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

201 Park Washington Court

Falls Church, Virginia 22046

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

THE MAP PROCESS - OVERVIEW OF SERVICE REQUIREMENTS AND SUGGESTIONS

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

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

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

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

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

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

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

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

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

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

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement
A. Part no longer performs intended purpose B. Part does not meet a design specification (regardless of performance) C. Part is missing	1. Part is close to the end of its useful life B - Part does not meet a design specification (regardless of performance) (just above discard specifications, or weak; failure likely to occur soon, etc.) 2. To address a customer need, convenience, or request (to stiffen ride, enhance performance, eliminate noise, etc.) 3. To comply with maintenance recommended by the vehicle's Original Equipment Manufacturer (OEM) 4. Technician's recommendation based on substantial and informed experience 5. To comply with maintenance recommended by AMRA / MAP

Reasons to Require Repair or Replacement	Reasons to Suggest Repair or Replacement
NOTE: When a repair is required, the shop must refuse partial service to the system in question, if the repair creates or continues an unsafe condition.	NOTE: Suggested services are <i>always</i> optional. When presenting suggested repairs to the customer, you must present the facts, allowing the customer to draw their own conclusions and make an informed decision about how to proceed.

WHEEL AND TIRE

Steering and suspension are complex systems made up of a variety of interdependent components. For proper vehicle handling, ride, and tire wear, a thorough inspection is required whenever suspension work is being performed. Conditions listed assume that the problem has been isolated to the specific component by proper testing procedures.

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

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

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

WARNING: These guidelines do not apply to split rims.

TIRES

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

Consult the vehicle owner's manual or vehicle placard for correct tire size, service description, load index, speed rating and cold inflation pressure of the original tires. Do not exceed the maximum load or inflation capacity of the tire specified by the Tire and Rim Association (www.us-tra.org)

When replacing fewer than ALL tires on a vehicle, follow the vehicle manufacturer's recommendations as to the placement of the new tires. If it is not possible to follow the vehicle manufacturer's tire replacement recommendations, remember to replace tires on the same axle with the same size, construction, speed rating, and, if possible, similar tread pattern.

Do not mix radials with non-radial tires on the same axle, as this may affect vehicle handling and stability. If radial tires and non-radial tires are mixed on the same vehicle, the radials must be on the rear. If radial and non-radial tires are used on a vehicle equipped with dual rear tires, radial tires may be used on either axle. High-pressure temporary compact spare tires are exempt from this rule.

Do not mix size or type (all season, performance, mud and snow) of tires on the same axle. When replacing only two tires on front or rear drive vehicles, follow the vehicle manufacturer's recommendations concerning placement. If it is not possible to follow OE recommendations, it is preferable to place the two new tires on the rear for greater stability, greater adhesion affecting steering - on other than dry pavement -- and overall safety, regardless of whether the vehicle is front or rear wheel drive.

It is particularly important to match all tire sizes and constructions on 4-wheel (4x4) and all-wheel (AWD) drive vehicles unless otherwise specified by vehicle manufacturer. Ideally, all four tires should be replaced at the same time. Some vehicle manufacturers restrict replacement of tires to specific brands, types, or sizes.

MOUNTING TIRES

Only specially trained persons should de-mount or mount tires. Explosions of tire and wheel assembly can result from improper mounting, possibly causing serious injury or death. High pressure temporary compact spare tires should not be used with any other rims or wheels, nor should standard tires, snow tires, wheel covers, or trim rings be used with high pressure compact spare rims or wheels.

Mount tires only on same or approved rim widths.

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

If any flammable emergency tire inflation product has been used in a tire, consult inflation product manufacturer's product information label for tire deflation procedures to avoid possible serious injury or death.

VEHICLE TIRE PLACARD

Since 1968, cars and light trucks sold in the United States have been required to have a tire information sticker, called a vehicle tire placard. The vehicle tire placard indicates the size of the original equipment tires (including the spare), cold inflation pressure for the tires on both axles as well as the spare, and load index or range. Depending on the vehicle, the vehicle tire placard will either be located on the edge of any door, the doorpost, glove box, fuel door or inside trunk lid. If the tire placard is missing, consult the owner's manual, vehicle manufacturer, or tire manufacturer regarding applicable tire information.

Always refer to the vehicle manufacturer's recommendations before replacing tires. Tires should always be replaced with the same size designation, or approved options, as recommended. Never choose a smaller size with less load carrying capacity than the size on the tire placard. (Some vehicle manufacturers require different-sized tires for either the front or rear axles.)

NOTE: It is not always possible to select a replacement tire with exactly the same size as shown on the placard. Consult with a vehicle or tire manufacturer for replacement recommendations.

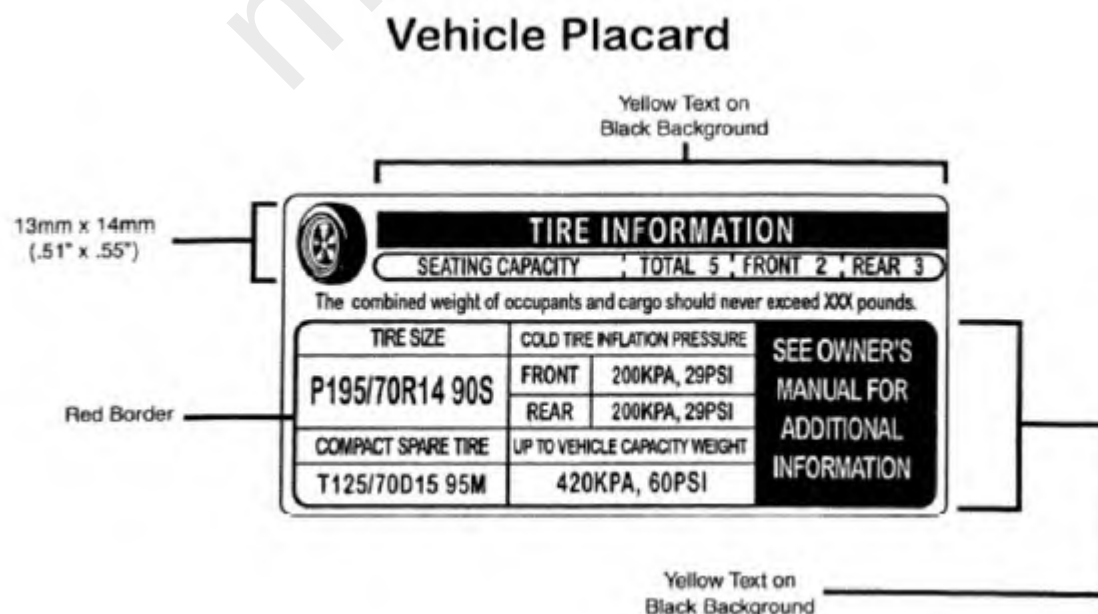


Fig.1: Vehicle Tire Placard - Typical

TIRE ROTATION

The front tires on most vehicles tend to wear out faster than the rear tires. This is due to the effects of steering the vehicle and the weight transfer that occurs during braking. To ensure that all four tires wear evenly, it is important to rotate them on a regular basis. Tire rotation helps maintain balanced handling because it allows all four tires to wear at the same rate. Keep in mind, as tire wear reduces tread depth, it increases the tires' response to driver inputs. Consequently, by equalizing tire wear at all four corners, dry road performance is actually enhanced. Another advantage of regular rotation is that it allows the tires to be replaced in complete sets rather than in pairs. This maintains handling continuity. It also enables drivers to take advantage of the latest in tire technology, instead of trying to match a pair of older tires.

Most manufacturers list rotation intervals in the scheduled maintenance section of the vehicle service manual and/or the owner's manual. Tire rotation patterns can also be found in these books. If this information is unavailable for a particular vehicle, rotate the tires every 5-7,000 miles following the appropriate rotation sequence shown in the illustrations. After completing a tire rotation, be sure to reset inflation pressures to the manufacturer's recommended specifications indicated on the vehicle tire placard.

To ensure that the proper amount of clamping force is applied to each fastener, follow these guidelines:

- Make sure the area around the lug holes, as well as the wheel and hub mating surfaces are clean and dry. A wire brush can be used to remove corrosion and other debris. Wipe the areas clean using a shop rag.
- Inspect the bolt holes for damage. Do not use a wheel if the bolt holes are deformed.
- Inspect the wheel studs and lug nuts or lug bolts and bolt holes (depending on the vehicle) for damage. Replace or repair any damaged or worn components.
- Always follow a star pattern when tightening lugs.

WHEEL LUG NUT TORQUE & CLAMPING FORCE

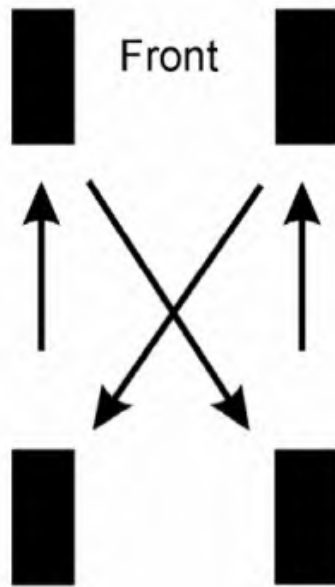
Although proper wheel lug nut torque is important, it does not guarantee that the required clamping force will be achieved. For example, excessive corrosion on the wheel and hub mating surfaces will result in improper clamping force, even when the lugs are tightened with a calibrated torque wrench. Low clamping force can also occur if the threads are dirty. This is because dirt causes interference between the mating threads. As a result, the torque wrench will register the correct reading but the clamping force will be inadequate. To improve the chances of achieving the precise clamping force between the wheel and hub, proper torque must be applied to clean components in good condition. Specifications for wheel lug nut torque can be found in the 'Tire and Wheel' section of most vehicle service manuals. When specifications are indicated as a range, adjust the torque wrench to the middle of the range to compensate for normal variations in tool calibration.

POPULAR TIRE ROTATION PATTERNS

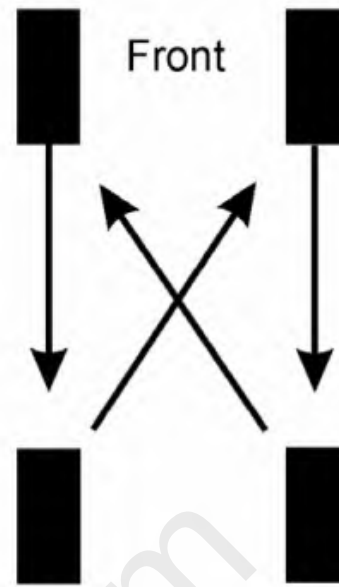
POPULAR TIRE ROTATION PATTERNS

(Only Where Tires Are Same Type & Size)

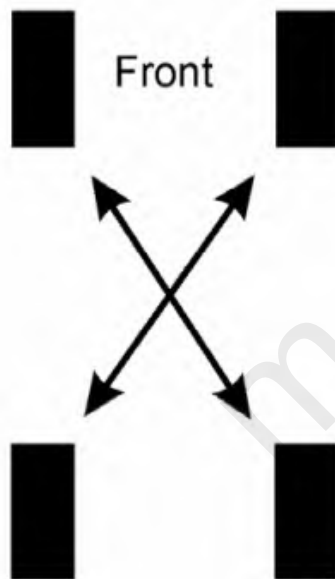
Rear- and Four-Wheel-Drive Vehicles



Front-Wheel-Drive Vehicles



All Vehicles



All Vehicles

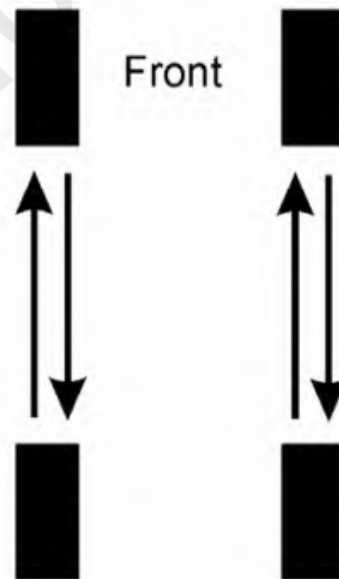
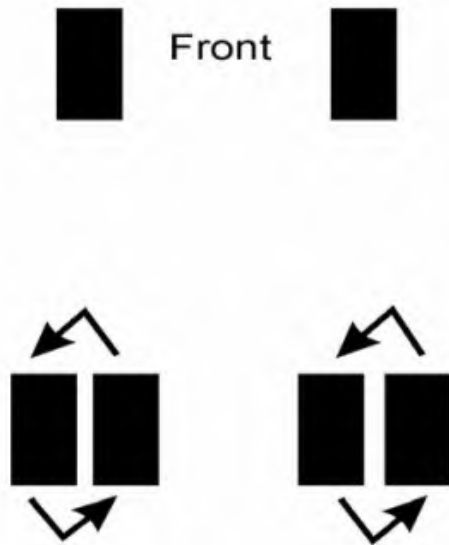


Fig. 2: Popular Tire Rotation Patterns - Without Dual Rear Wheels

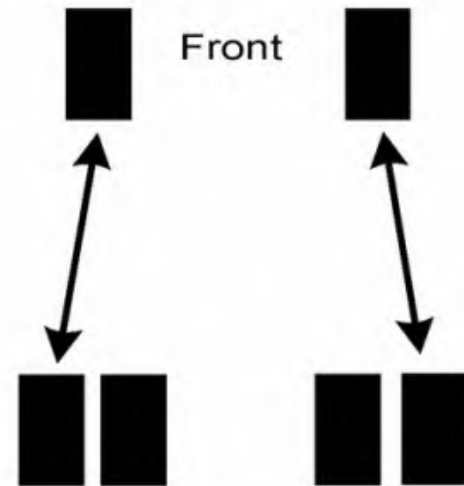
Never rotate directional tires from side-to-side since this will reverse their direction of rotation. Directional tires can only be rotated from front to rear or vice versa. Directional tires are typically used on high-performance cars and can be identified by the arrows imprinted on the sidewall.

Vehicles With Dual Rear Wheels

Rear Tire Irregular Wear



Front Tire Irregular Wear



Six-Tire Rotation

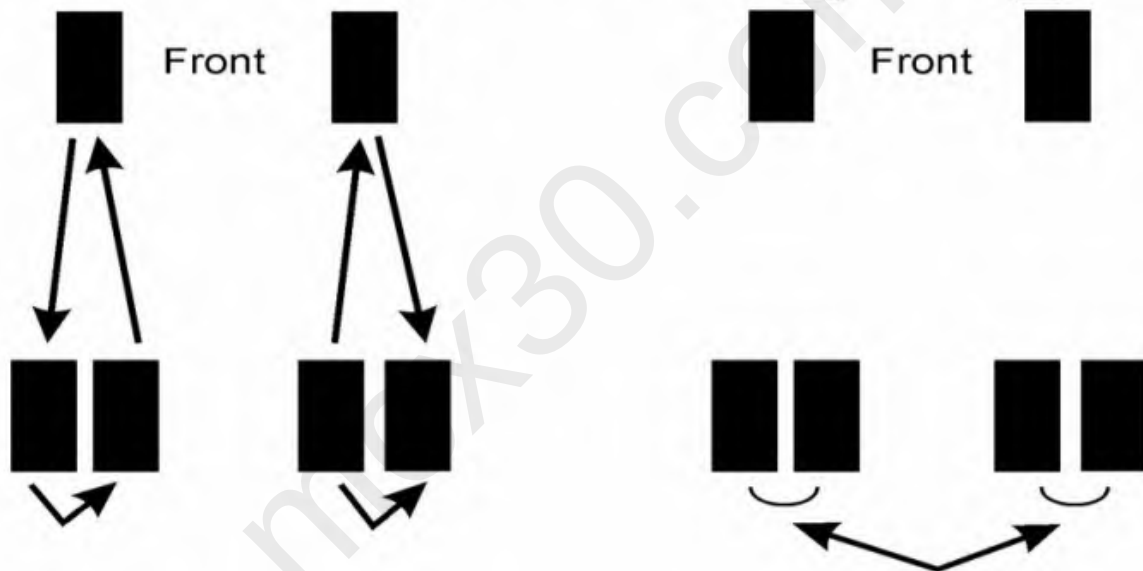


Fig. 3: Popular Tire Rotation Patterns - With Dual Rear Wheels

Some tires cannot be rotated in the manners described. Such tires include uni-directional tires and tires with asymmetric tread designs. Also, some vehicles may have different-sized tires mounted on the front and rear axles, and these different-sized tires also have rotation restrictions. Check your owner's manual or with a tire manufacturer or a tire dealer for proper recommendations for these specific cases.

WHEELS AND RIMS

The wheels on today's vehicles are made of steel, aluminum, or aluminum alloy (a combination of two or more metals). Steel wheels are the least expensive to produce, which is why they come as original equipment on many passenger cars and light trucks. The center section includes the bolt circle, or mounting holes, and is used to attach the wheel to the vehicle. The flange is the outermost lip of the rim, and is the area typically used for attaching wheel (balancing) weights. The rim is formed by rolling a strip of metal and then welding the two ends together. The interior section of the rim has a smaller diameter section called a drop center. This area provides the means for removing and installing a tire, since the bead is not designed to stretch. During removal or installation, most of the tire bead is pushed into the drop center so that the exposed portion can be pulled over the rim. The edges of the rim are flared to form the bead seats, which hold the tire and provide the airtight seal. Many rims include safety humps. These are small elevations on the inside of the bead seats. Safety humps help prevent the tire

from falling into the drop center during a blowout. This allows the driver to maintain better directional control of a vehicle running on one or more deflated tires.

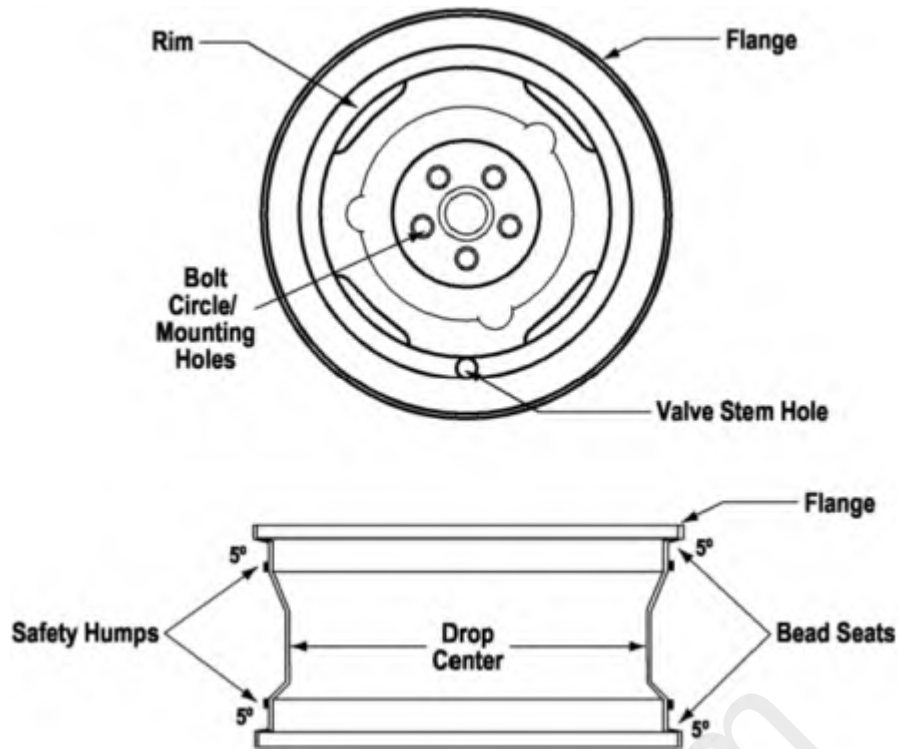


Fig. 4: Steel Wheel

WARNING: Mounting a regular tire on a high-pressure compact spare wheel is not permitted. Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death. Mount tires only on approved rim widths. If the wheel identification stamp is not legible, or cannot be found, do not use the wheel until the size and type have been properly identified. Load, cold inflation pressure, and tire construction forces imposed on the rim/wheel must not exceed the rim/wheel manufacturer's recommendations, even if the tire is approved for a higher load or inflation. Wheels of different diameter, offset, or width cannot be mixed on the same axle. Bead seat tapers cannot be interchanged.

TIRE PRESSURE MONITORING SYSTEMS

To avoid damaging sensors when mounting and demounting tires, it is beneficial to know where the sensors are located. Sensor assemblies are commonly attached to the valve stem, with the valve stem acting as an antenna to assist with transmitting RF signals. They may also be strapped to the drop center of the wheel. If this is the case, the sensor assembly should be located in-line with the valve stem.



Fig. 5: Valve Stem Mounted Sensor

To avoid damaging sensors when demounting tires, do not break the bead within 45° of either side of sensor assembly locations. Be careful not to damage sensors when mounting tires as well. Sensors are not repairable and require replacement if damaged or when their battery is completely drained. It is recommended that the sensor be carefully "dropped into the tire" prior to demounting to avoid damage.

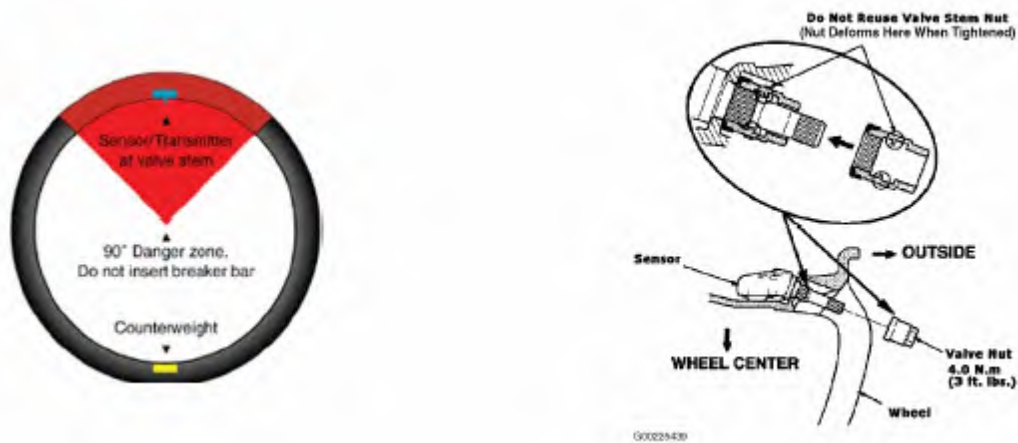


Fig. 6: Mounting Sensor

When reinstalling the sensor, it is suggested that the locknut, gasket and valve stem be replaced and torqued to the proper specification. It is also necessary to use the proper valve cap as it is also an integral part of the system.

It may be necessary to reprogram the TPMS when the tires are rotated, when a new sensor is installed, or after the vehicle loses power. This usually requires a scan tool and may involve the use of a special magnet. Refer to the vehicle service manual to properly reprogram the TPMS.

STEERING & SUSPENSION CHECKSHEET



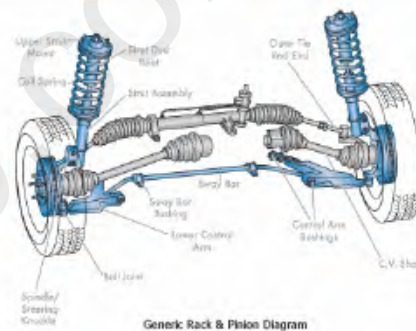
STEERING & SUSPENSION CHECKSHEET

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

Customer Interview:

Reason Code Explanation

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



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

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

Fig. 7: Steering & Suspension Checksheet (1 Of 2).

STEERING & SUSPENSION CHECKSHEET

UNDERHOOD/UNDER VEHICLE

Component	OK	S	R	Condition
Rack & Pinion Assy				
P/S Pump				
P/S Hoses				
P/S Fluid				
P/S Cooler				

Component	OK	S	R	Condition
Center / Drag Link				
Steering Gear				
Sway Bar/Bushings				
Idler Arm				
Pitman Arm				

LEFT FRONT

Component	OK	S	R	Condition
Link Pin / Bushings				
CV Joints				Inner _____ Outer _____
CV Boots				Inner _____ Outer _____
Shock / Strut				_____
Spring / Mount				
Ball Joint Upper				Spec _____
Lower				Actual _____
Control Arm / Shaft				
Bushings				
Tie Rod End				Inner _____ Outer _____
Bearing / Spindle				

RIGHT FRONT

Component	OK	S	R	Condition
Link Pin / Bushings				
CV Joints				Inner _____ Outer _____
CV Boots				Inner _____ Outer _____
Shock / Strut				_____
Spring / Mount				
Ball Joint Upper				Spec _____
Lower				Actual _____
Control Arm / Shaft				
Bushings				
Tie Rod End				Inner _____ Outer _____
Bearing / Spindle				

LEFT REAR

Component	OK	S	R	Condition
Link Pin / Bushings				
CV Joints				Inner _____ Outer _____
CV Boots				Inner _____ Outer _____
Shock / Strut				
Spring / Mount				
Ball Joint Upper				Spec _____
Lower				Actual _____
Control Arm / Shaft				
Bushings				
Tie Rod End				Inner _____ Outer _____
Bearing / Spindle				

RIGHT REAR

Component	OK	S	R	Condition
Link Pin / Bushings				
CV Joints				Inner _____ Outer _____
CV Boots				Inner _____ Outer _____
Shock / Strut				
Spring / Mount				
Ball Joint Upper				Spec _____
Lower				Actual _____
Control Arm / Shaft				
Bushings				
Tie Rod End				Inner _____ Outer _____
Bearing / Spindle				

OK

Suggested
1, 2, 3, 4, 5

Required
A, B, C

Automotive Maintenance & Repair Assn © 2009

Fig. 8: Steering & Suspension Checksheet (2 Of 2).

WHEELS & TIRES CHECKSHEET



WHEELS & TIRES CHECKSHEET

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

Customer Interview:

Reason Code Explanation

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



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

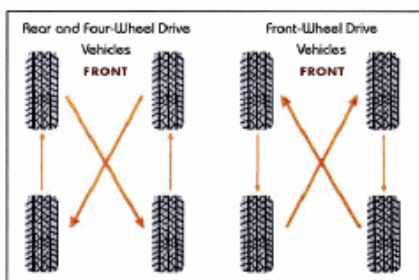
DISCLAIMER: This document may be used as a guide when performing vehicle inspection. This form is not to be used as an estimate form and may not comply with Local or State Laws. The Motorist Assurance Program is not responsible for the performance and accuracy of the motor vehicle inspection performed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

Fig. 9: Wheels & Tires Checksheet (1 Of 2)

WHEELS & TIRES CHECKSHEET

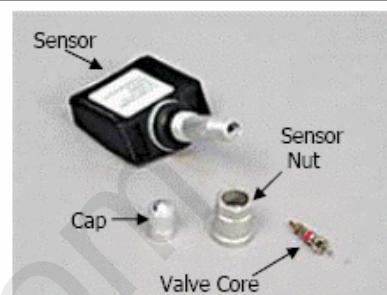
LEFT FRONT				
Component	OK	S	R	Condition
Lugs/Studs				
Tire Size				Spec _____
Speed Rating _____				Actual _____
Run Flat				Y _____ N _____
Tread Depth				_____/32nds
Tire Pressure				Before _____
Placard _____				After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition)				Spec _____
Wheel Size				Actual _____

☐ Edge wear ☐ Cupped ☐ Cut ☐ Irregular wear



RIGHT FRONT				
Component	OK	S	R	Condition
Lugs/Studs				
Tire Size				Spec _____
Speed Rating _____				Actual _____
Run Flat				Y _____ N _____
Tread Depth				_____/32nds
Tire Pressure				Before _____
Placard _____				After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition)				Spec _____
Wheel Size				Actual _____

☐ Edge wear ☐ Cupped ☐ Cut ☐ Irregular wear



LEFT REAR				
Component	OK	S	R	Condition
Lugs/Studs				
Tire Size				Spec _____
Speed Rating _____				Actual _____
Run Flat				Y _____ N _____
Tread Depth				_____/32nds
Tire Pressure				Before _____
Placard _____				After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition)				Spec _____
Wheel Size				Actual _____

☐ Edge wear ☐ Cupped ☐ Cut ☐ Irregular wear

RIGHT REAR				
Component	OK	S	R	Condition
Lugs/Studs				
Tire Size				Spec _____
Speed Rating _____				Actual _____
Run Flat				Y _____ N _____
Tread Depth				_____/32nds
Tire Pressure				Before _____
Placard _____				After _____
TPMS Sensor Nut Valve core / Cap Sensor				
Valve Stem				
Wheel (Condition)				Spec _____
Wheel Size				Actual _____

☐ Edge wear ☐ Cupped ☐ Cut ☐ Irregular wear

OK

Suggested
1, 2, 3, 4, 5

Required
A, B, C

Automotive Maintenance & Repair Assn © 2009

Fig. 10: Wheels & Tires Checksheet (2 Of 2)

STEERING AND SUSPENSION, WHEEL ALIGNMENT, WHEELS AND TIRES

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

NOTE: Listed repair conditions assume that the problem has been isolated to the specific component by proper testing procedures. When replacing steering and/or suspension components which may affect an alignment angle, you are required to check and adjust alignment as needed. Refer to the OEM specifications for both ride height and alignment angle tolerances.

NOTE: Improper alignment geometry, and/or improper tire/wheel fitment may affect other systems such as Adaptive Cruise Control, Electronic Stability Control, Electronic Traction Control and Variable Ratio Steering. These systems may require attention after an alignment or suspension service is performed. Care must be taken to identify these vehicles/systems before any repair procedures are performed. Failure to follow OEM guidelines when servicing interrelated systems could result in an unsafe condition.

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

ACTIVE HANDLING

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

ACTIVE SUSPENSION CONTROL MODULES

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement

NOTE:

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

Connector missing	C	Require repair
Contaminated	A	Require repair or replacement

NOTE:

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

Inoperative	B	Require repair or replacement
-------------	---	-------------------------------

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

ACTIVE VARIABLE RATIO STEERING

NOTE: Besides electronically providing variable steering ratios, the computer is linked with the Vehicle Stability Control system to aid in directional stability. As the vehicle travels down the highway, road surfaces and wind gusts can affect the vehicle's directional stability. The vehicle may wander or dart to one side, (as many who have met a tractor-trailer unit on a windy day have experienced). Sensors on the vehicle detect this sudden, unintentional movement and the computer will stabilize the vehicle by moving the Active Steering electric motor and steering gear, all without the driver turning the steering wheel.

NOTE: Additionally, if the driver experiences a skid or slide because of poor road conditions, the Active Steering will react to information from the yaw rate and steering angle sensors to modify the steering angle of the front wheels and stabilize the vehicle. This occurs much faster than the driver can react. If the Active Steering correction is not adequate to control the skid or slide, then the Stability Control system is also activated.

Condition	Code	Procedure
Improper Operation	Ä	Ä
NOTE: Refer to manufacturers' service information.		

ACTIVE YAW CONTROL

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

ADAPTIVE CRUISE CONTROL

NOTE: Similar to conventional cruise control. It maintains the vehicle's pre-set speed. However, beyond conventional cruise control, this system automatically adjusts speed to maintain proper distance between vehicles in the same lane. This is achieved through use of a radar or laser headway sensor, a digital signal processor and a longitudinal controller. If the lead vehicle slows down, or another object is detected, the system sends a signal to the engine and/or braking system to decelerate. Then, when the lane is clear, the system will re-accelerate the vehicle back to the set speed. Some OEM's require that the radar or laser headway sensor be calibrated to the thrustline of the vehicle.

ADVANCE TRAC

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

AIR BAGS

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Collar cracked	A	Require replacement
End cap cracked	A	Require replacement

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

AIR RIDE CONTROL MODULES

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require repair
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Malfunctioning	A	Require replacement
NOTE: Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement

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

AIR RIDE SUSPENSION TORSION SPRINGS (COUNTER BALANCING)

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Broken	A	Require replacement
Missing	C	Require replacement

AIR RIDE SUSPENSION

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

AIR RIDE TUBES

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connected incorrectly	A	Require repair
Insufficient clamping force, allowing hose to leak	A	Require repair or replacement
Leaking	A	Require repair or replacement
Melted	1	Suggest repair or replacement
Missing	C	Require replacement
Protective sleeves damaged	2	Suggest replacement of sleeves
Protective sleeves missing	C	Require replacement of sleeves
Restricted, affecting performance	A	Require repair or replacement
Restricted, not affecting performance	2	Suggest repair or replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement
Safety clip missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Type incorrect	2	Suggest repair or replacement

AIR SHOCKS AND AIR STRUTS

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

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

AIR SPRING VALVES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Blocked	A	Require repair or replacement
Connector bent	A	Require repair or replacement
Connector broken	A	Require replacement
Connector loose	A	Require repair or replacement
Inoperative	A	Require repair or replacement
Leaking	B	Require repair or replacement
Restricted	A	Require repair or replacement

AIR SPRINGS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Collar cracked	A	Require replacement
End cap cracked	A	Require replacement
Inner fabric of bag damaged	A	Require replacement
Leaking	A	Require repair or replacement
Outer covering of air bag is cracked to the extent that inner fabric of air bag is visible	1	Suggest replacement
Piston cracked	A	Require replacement

AIR SUSPENSION CONTROL VALVES

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

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Leaking	B	Require repair or replacement
Output incorrect	B	Require replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

AIR SUSPENSION DRIERS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Contaminated, affecting performance	A	Require replacement
Desiccant bag deteriorated	A	Require replacement
NOTE: Inspect system to determine effects of desiccant bag deterioration.		
Leaking	B	Require replacement
Restricted	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

Condition	Code	Procedure
Tubing connection leaking	A	Require repair or replacement

AXLE ACCELERATION SENSOR

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement
NOTE: Determine cause and correct prior to replacement of part.		
Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure		
Dust boot torn	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Housing cracked	B	Require replacement
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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

BALL JOINTS

NOTE: Before requiring or suggesting ball joint replacement, the approved OEM procedure must be used to measure ball joint wear. The measurement(s) obtained, along with the vehicle manufacturer's specifications, must be noted on the inspection report. Some states require that these measurements also appear on the invoice. The term ""perceptible movement,"" defined as any visible movement in any direction, has been the industry standard for determining the need for replacement of follower (non-load carrying) ball joints. Some vehicle manufacturers are now publishing specifications for follower ball joints that were previously diagnosed by the ""perceptible movement"" standard. Before requiring or suggesting any parts be replaced based on ""perceptible movement,"" consult your repair manual to determine if OEM specifications exist. You are not required to replace ball joints in axle sets. However, when replacing a ball joint due to wear exceeding manufacturer's specification, you may suggest replacement of the other ball joint if its measurement shows it is close to the end of its useful life, for preventive maintenance.

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Further inspection required

NOTE:
If greaseable, grease ball joint. If problem persists or joint is non-greaseable, require replacement.

Grease boot cracked	2	Suggest replacement
NOTE: Cracked grease boot will allow contaminants to enter the ball joint and will accelerate wear.		
Grease boot missing	C	Require replacement

Condition	Code	Procedure
NOTE: Lack of grease boot will allow contaminants to enter the ball joint and will accelerate wear.		
Grease boot torn	A	Require replacement
NOTE: Torn grease boot will allow contaminants to enter the ball joint and will accelerate wear.		
Grease fitting broken	A	Require replacement of grease fitting
NOTE: Some vehicles come from the factory with broken fittings. No service is suggested or required on these vehicles.		
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Greaseable ball joint will not take grease	2	Suggest replacement of grease fitting
NOTE: If the greaseable ball joint still will not take grease after replacing the grease fitting, suggest replacement of ball joint.		
Nut on ball joint loose	A	Require repair or replacement
NOTE: Check for bent stud or damaged taper hole.		
Pre-load adjustment incorrect	B	Require repair or replacement
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: Check for damaged taper hole.		
Stud broken	A	Require replacement
NOTE: Check for damaged taper hole.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: Check for damaged taper hole.		
Wear exceeds manufacturer's specifications	B	Require replacement

BODY ACCELERATION SENSOR

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware

Condition	Code	Procedure
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement
NOTE: Determine cause and correct prior to replacement of part.		
Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure		
Dust boot torn	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Housing cracked	B	Require replacement
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Deteriorated, affecting performance	A	Require repair or replacement
NOTE: If condition is caused by oil-soaking, further inspection is required to determine source of oil.		
Distorted, affecting performance	A	Require repair or replacement
Leaking (fluid-filled type)	A	Require replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: If noise isolated to bushing, suggest repair or replacement. Use only approved lubricant on rubber bushings. Petroleum-based lubricants may damage rubber bushings.		
Oil-soaked, affecting performance	A	Require replacement
NOTE: Further inspection required to determine source of oil.		
Rubber separating from internal metal sleeve on bonded bushing	A	Require replacement
Seized	A	Require replacement
Shifted (out of position)	B	Require repair or replacement
Split	A	Require replacement
Surface cracking (weather-checked)	A	No service suggested or required

CENTER LINKS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Binding	A	Further inspection required
NOTE: If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.		
Grease boot cracked	2	Require replacement of boot

Condition	Code	Procedure
NOTE: If boot is not available as a separate component, suggest replacement of center link (reason code 2). Cracked grease boot will allow contaminants to enter the joint and will accelerate wear.		
Grease boot missing	C	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of center link (reason code 2). Lack of grease boot will allow contaminants to enter the joint and will accelerate wear		
Grease boot torn	A	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of center link (reason code 2). Torn grease boot will allow contaminants to enter the joint and will accelerate wear .		
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement
NOTE: If seal is not available as a separate component, suggest replacement of center link (reason code 2). Lack of grease seal will allow contaminants to enter the joint and will accelerate wear.		
Grease seal torn	A	Require replacement
NOTE: If seal is not available as a separate component, suggest replacement of center link (reason code 2). Torn grease seal will allow contaminants to enter the joint and will accelerate wear.		
Greaseable center link will not take grease	2	Suggest replacement of grease fitting
NOTE: If greaseable center link still will not take grease after replacing the grease fitting, suggest replacement of center link.		
Looseness (perceptible horizontal movement)	1	Suggest replacement
NOTE: If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Looseness that is excessive	B	Require replacement
NOTE: Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.		

Condition	Code	Procedure
CAUTION: Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: Check for damaged taper hole.		
Stud broken	A	Require replacement
NOTE: Check for damaged taper hole.		
Stud loose in taper hole	A	Require repair or replacement
NOTE: Check for damaged taper hole.		
Taper hole elongated	A	Require replacement
NOTE: Check for damaged stud.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: Check for damaged taper hole.		
Wear exceeds manufacturer's specifications	B	Require replacement

COMPRESSORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector bent	A	Require repair or replacement
Connector broken	A	Require replacement
Connector loose	A	Require repair or replacement
Does not build pressure	A	Require replacement
Excessive run time	B	Require replacement
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Leaking	B	Require repair or replacement
Missing	C	Require replacement
Noisy (abnormal)	2	Suggest replacement

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

CONTINUOUS DAMPING CONTROL

NOTE: A semi-active suspension system which continuously adjusts damping levels according to road conditions and vehicle dynamics, (such as speed, turning and cornering, as well as driver inputs). An ECU processes driver inputs and data from sensors. The sensors include accelerometers mounted on the vehicle body and suspension position sensors, which feed steering wheel angle, vehicle speed, brake pressure and other chassis control data to the ECU. The ECU processes sensor data and sends signals which adjust the damping level of each shock.

CONTROL ARM SHAFTS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Shaft bushing surface undersized (worn)	B	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

CONTROL ARMS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware

Condition	Code	Procedure
Ball joint hole oversized (loose interference or press fit)	B	Further inspection required
NOTE: If oversized ball joint is available, require replacement orb all joint. If oversized ball joint is not available, require replacement of control arm.		
Bent, affecting performance	B	Require replacement
Bushing hole oversized	B	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Holes distorted	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

CONTROL MODULES

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require repair
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Malfunctioning	A	Require replacement
NOTE: Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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

DISTANCE REGULATION CONTROL MODULE

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: Determine cause and correct prior to replacement of part.		
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Dust boot missing	C	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure		
Dust boot split	A	Require replacement of boot

Condition	Code	Procedure
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Dust boot torn	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Housing cracked	B	Require replacement
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Malfunctioning	A	Require replacement
NOTE: includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.		
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

DISTANCE REGULATION SENSOR

NOTE: OEM may require this sensor be calibrated to the vehicle thrustline.

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

Condition	Code	Procedure
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement
NOTE: Determine cause and correct prior to replacement of part.		
Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure		
Dust boot torn	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Housing cracked	B	Require replacement
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement

Condition	Code	Procedure
Wire lead shorted	A	Require repair or replacement

DRAG LINKS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Binding	A	Further inspection required
NOTE: If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.		
Grease boot cracked	2	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of drag link (reason code 2). Cracked grease boot will allow contaminants to enter the joint and will accelerate wear.		
Grease boot missing	C	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of drag link (reason code 2). Lack of grease boot will allow contaminants to enter the joint and will accelerate wear.		
Grease boot torn	A	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of drag link (reason code 2). Torn grease boot will allow contaminants to enter the joint and will accelerate wear.		
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement
NOTE: If seal is not available as a separate component, suggest replacement of drag link (reason code 2). Lack of grease seal will allow contaminants to enter the joint and will accelerate wear.		
Grease seal torn	A	Require replacement
NOTE: If seal is not available as a separate component, suggest replacement of drag link (reason code 2). Torn grease seal will allow contaminants to enter the joint and will accelerate wear.		
Greaseable drag link will not take grease	2	Suggest replacement of grease fitting

Condition	Code	Procedure
NOTE: If greaseable center link still will not take grease after replacing the grease fitting, suggest replacement of drag link.		
Looseness (perceptible horizontal movement)	1	Suggest replacement
NOTE: If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Looseness that is excessive	B	Require replacement
NOTE: Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.		
CAUTION: Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: Check for damaged taper hole.		
Stud broken	A	Require replacement
NOTE: Check for damaged taper hole.		
Stud loose in taper hole	A	Require repair or replacement
NOTE: Check for damaged taper hole.		
Taper hole elongated	A	Require replacement
NOTE: Check for damaged stud.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: Check for damaged taper hole.		
Wear exceeds manufacturer's specifications	B	Require replacement

DYNAMIC STABILITY CONTROL

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

Condition	Code	Procedure
NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.		
NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.		

DYNAMIC STABILITY TRACTION CONTROL

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

ELECTRONIC RIDE CONTROL SHOCKS AND STRUTS

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

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector bent	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector loose	A	Require repair or replacement
Electronic valve control inoperative	A	Require replacement
NOTE: It is acceptable to replace with a non-electronically controlled unit, where available.		
Terminal bent	A	Require repair or replacement

Condition	Code	Procedure
Terminal broken	A	Require repair or replacement
Terminal corroded	A	Require repair or replacement
Terminal loose	A	Require repair or replacement

ELECTRONIC STABILITY CONTROL

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

ELECTRONIC SUSPENSION SYSTEM

NOTE: (Typical) A semi-active suspension system which continuously adjusts damping levels according to road conditions and vehicle dynamics, (such as speed, turning and cornering, as well as driver inputs). An ECU processes driver inputs and data from sensors. The sensors include accelerometers mounted on the vehicle body and suspension position sensors, which feed steering wheel angle, vehicle speed, brake pressure and other chassis control data to the ECU. The ECU processes sensor data and sends signals which adjust the damping level of each shock.

FLEX COUPLERS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Flex coupler binding	A	Require repair or replacement of coupler
Flex coupler loose	A	Require repair or replacement of coupler
Flex coupler missing parts	A	Require repair or replacement of coupler
Flex coupler soft/ spongy	A	Require replacement of coupler
Flex coupler tom	A	Require replacement of coupler
Steering coupler shield cracked	2	Suggest replacement
Steering coupler shield missing	C	Require replacement
Steering coupler shield torn	2	Suggest replacement
U-joint binding	A	Require repair or replacement of joint
U-joint loose	A	Require repair or replacement of joint

GASKETS

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

HEIGHT SENSORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: Determine cause and correct prior to replacement of part.		
Connector missing	C	Require replacement
Dust boot missing	C	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure		
Dust boot split	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Dust boot torn	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Housing cracked	B	Require replacement
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement

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

HYDRAULIC HOSES

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

HYDRAULIC POWER STEERING PUMPS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement

Condition	Code	Procedure
NOTE: Determine cause and correct prior to replacement of part.		
Connector missing	C	Require replacement
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Pulley bent	A	Require repair or replacement of pulley
Pulley missing	C	Require replacement of pulley
Pump output out of manufacturer's specifications	A	Require repair or replacement
Remote reservoir leaking	A	Require replacement of reservoir
Reservoir cap broken	A	Require replacement of cap
Reservoir cap missing	C	Require replacement of cap
Seized	A	Require replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

HYDRAULIC SUSPENSION HOSES

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

HYDRAULIC SUSPENSION PUMPS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Fluid at or beyond service interval	3	Suggest fluid change
Fluid contaminated	B	Require flushing and refilling of the system

NOTE:

Determine and correct source of contamination. OEM specifications must be followed for fluid type.

Fluid contaminated	B	Require flushing and refilling of the system
--------------------	---	--

NOTE:

Determine and correct source of contamination. OEM specifications must be followed for fluid type.

Fluid level incorrect	B	Require adjustment of fluid level
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Pulley bent	A	Require repair or replacement of pulley
Pulley missing	C	Require replacement of pulley
Pump output out of manufacturer's specifications	A	Require repair or replacement
Remote reservoir leaking	A	Require replacement of reservoir
Reservoir cap broken	A	Require replacement of cap
Reservoir cap missing	C	Require replacement of cap
Seized	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

IDLER ARMS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Further inspection required

Condition	Code	Procedure
NOTE: If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.		
Grease boot cracked	B	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of idler arm (reason code 2). Cracked grease boot will allow contaminants to enter joint and will accelerate wear.		
Grease boot missing	C	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of idler arm (reason code 2). Lack of grease boot will allow contaminants to enter joint and will accelerate wear.		
Grease boot torn	A	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of idler arm (reason code 2). Torn grease boot will allow contaminants to enter joint and will accelerate wear.		
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement of seal
NOTE: If seal is not available as a separate component, suggest replacement of idler arm (reason code 2). Missing grease seal will allow contaminants to enter joint and will accelerate wear.		
Grease seal torn	A	Require replacement of seal
NOTE: If seal is not available as a separate component, suggest replacement of idler arm (reason code 2). Torn grease seal will allow contaminants to enter joint and will accelerate wear.		
Greaseable joint will not take grease	2	Suggest replacement of grease fitting
NOTE: If greaseable joint will not take grease after replacing the grease fitting, suggest replacement of idler arm.		
Looseness at frame bracket end	B	Require repair or replacement
NOTE: If manufacturer's procedures and specifications exist, use those procedures and specifications; otherwise, use an approved inspection method such as the dry park check.		
NOTE: Looseness is defined as movement that creates excessive toe change.		
Looseness at link end (perceptible horizontal movement)	1	Suggest replacement

Condition	Code	Procedure
NOTE: If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Looseness at link end that is excessive	B	Require replacement
NOTE: Excessive looseness is defined as significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.		
CAUTION: Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Mounted out of position (center link not parallel)	B	Require repositioning
Nut on stud loose	A	Require repair or replacement
NOTE: Check for bent stud or damaged taper hole.		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: Check for damaged taper hole.		
Stud broken	A	Require replacement
NOTE: Check for damaged taper hole.		
Taper hole elongated	A	Require replacement
NOTE: Check for damaged stud.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: Check for damaged taper hole.		
Wear exceeds manufacturer's specifications	B	Require replacement

INTERMEDIATE SHAFT U-JOINTS

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

Condition	Code	Procedure
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Flex coupler binding	A	Require repair or replacement of coupler
Flex coupler loose	A	Require repair or replacement of coupler
Flex coupler missing parts	A	Require repair or replacement of coupler
Flex coupler soft/ spongy	A	Require replacement of coupler
Flex coupler tom	A	Require replacement of coupler
Steering coupler shield cracked	2	Suggest replacement
Steering coupler shield missing	C	Require replacement
Steering coupler shield torn	2	Suggest replacement
U-joint binding	A	Require repair or replacement of joint
U-joint loose	A	Require repair or replacement of joint

KING PINS

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

Condition	Code	Procedure
Bearing balls pitted	A	Require replacement
Bearing balls worn	A	Require replacement
Bearing races pitted	A	Require replacement
Bearing races worn	A	Require replacement
Bearing rollers pitted	A	Require replacement
Bearing rollers worn	A	Require replacement
Bearing seal bent	2	Suggest replacement of seal or bearing
Bearing seal missing	C	Require replacement of seal if available separately or bearing and seal together
Bearing seal torn	A	Require replacement of seal if available separately or bearing and seal together
Binding	A	Require repair or replacement of affected parts
End caps missing	C	Require replacement of missing part, if available; otherwise, replace king pin
End play exceeds specifications	B	Require repair
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting will not seal	A	Require replacement of grease fitting
Locating pins missing	C	Require replacement of missing part, if available; otherwise, replace king pin
Looseness exceeds manufacturer's specifications	B	Require replacement of worn parts
Seized	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Will not take grease	2	Suggest replacement of grease fitting

Condition	Code	Procedure
NOTE: If king pin will not take grease after replacement of grease fitting, suggest replacement of king pin.		

MODULES

Condition	Code	Procedure
Application incorrect	B	Require replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require repair
Contaminated	A	Require repair or replacement
NOTE: Determine source of contamination, such as engine coolant, fuel, metal particles, or water. Require repair or replacement.		
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation. Some components may be serviceable; check for accepted cleaning procedure.		
Leaking	B	Require repair or replacement
Malfunctioning	A	Require replacement
NOTE: Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specifications, or out of range.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

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

PITMAN ARMS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Binding	A	Further inspection required
NOTE: If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.		
Grease boot cracked	2	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of pitman arm (reason code 2). Cracked grease boot will allow contaminants to enter joint and will accelerate wear.		
Grease boot missing	C	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of pitman arm (reason code 2). Lack of grease boot will allow contaminants to enter joint and will accelerate wear.		
Grease boot torn	A	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of pitman arm (reason code 2). Torn grease boot will allow contaminants to enter joint and will accelerate wear.		
Grease fitting broken	A	Require replacement grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement of seal
NOTE: If seal is not available as a separate component, suggest replacement of pitman arm (reason code 2). Lack of grease seal will allow contaminants to enter joint and will accelerate wear.		
Grease seal torn	A	Require replacement of seal

Condition	Code	Procedure
NOTE: If seal is not available as a separate component, suggest replacement of pitman arm (reason code 2). Tom grease seal will allow contaminants to enter joint and will accelerate wear.		
Looseness (perceptible horizontal movement)	1	Suggest replacement
NOTE: If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Looseness that is excessive	B	Require replacement
NOTE: Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.		
CAUTION: Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Nut on stud loose	A	Require repair or replacement
NOTE: Check for bent stud or damaged taper hole.		
Seized	A	Require replacement
Splines damaged	A	Require repair or replacement
Splines stripped (splines missing)	A	Require replacement
Stud bent	B	Require replacement
NOTE: Check for damaged taper hole.		
Stud broken	A	Require replacement
NOTE: Check for damaged taper hole.		
Stud loose in taper hole	A	Require repair or replacement
NOTE: Check for damaged taper hole.		
Taper hole elongated	A	Require replacement
NOTE: Check for damaged stud.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: Check for damaged taper hole.		

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

POWER STEERING COOLERS

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

POWER STEERING FLUID

Condition	Code	Procedure
50,000 miles or greater on OE fluid (in absence of published manufacturer interval)	5	Suggest Replacement
NOTE: One time only fluid exchange		
Additive Depletion	A	Require replacement of fluid
Fluid at or beyond service interval	3	Suggest fluid replacement

Condition	Code	Procedure
Fluid contaminated (i.e. fluid other than power steering fluid present)	B	Require flushing and refilling of the system
NOTE: Determine and correct source of contamination. OEM specifications must be followed for fluid type.		
Fluid discolored	A	No Service Suggested or Required
NOTE: Further testing necessary to determine condition of fluid.		
Fluid level incorrect	B	Require adjustment of fluid level
Fluid type incorrect	B	Require flushing and refilling with correct fluid
Oxidized	A	Require replacement of fluid

POWER STEERING HOSES

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

POWER STEERING LINES (STEEL)

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

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Corroded, affecting structural integrity	A	Require replacement

Condition	Code	Procedure
Fitting incorrect (for example, compression fitting)	B	Require replacement
Flare type incorrect	B	Require repair or replacement
Leaking	A	Require repair or replacement
Line material incorrect (copper, etc.)	B	Require replacement
Restricted	A	Require replacement
Routed incorrectly (where failure is likely to occur)	B	Require repair or replacement
Rust-pitted, not affecting structural integrity	1	Suggest replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

POWER STEERING PUMPS - ELECTRIC

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: Determine cause and correct prior to replacement of part.		
Connector missing	C	Require replacement
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Pulley bent	A	Require repair or replacement of pulley
Pulley missing	C	Require replacement of pulley
Pump output out of manufacturer's specifications	A	Require repair or replacement
Remote reservoir leaking	A	Require replacement of reservoir
Reservoir cap broken	A	Require replacement of cap
Reservoir cap missing	C	Require replacement of cap
Seized	A	Require replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement

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

POWER STEERING PUMPS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Binding	A	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: Determine cause and correct prior to replacement of part.		
Connector missing	C	Require replacement
Fluid at or beyond service interval	3	Suggest fluid change
Fluid contaminated	B	Require flushing and refilling of the system
Fluid level incorrect	B	Require adjustment of fluid level
Leaking	B	Require repair or replacement
Leaking	A	Require repair or replacement
Noisy	2	Suggest repair or replacement
Noisy	2	Suggest repair or replacement
Pulley bent	A	Require repair or replacement of pulley
Pulley bent	A	Require repair or replacement of pulley
Pulley missing	C	Require replacement of pulley
Pulley missing	C	Require replacement of pulley
Pump output out of manufacturer's specifications	A	Require repair or replacement
Pump output out of manufacturer's specifications	A	Require repair or replacement
Remote reservoir leaking	A	Require replacement of reservoir
Remote reservoir leaking	A	Require replacement of reservoir
Reservoir cap broken	A	Require replacement of cap
Reservoir cap broken	A	Require replacement of cap
Reservoir cap missing	C	Require replacement of cap

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

RADAR SENSOR

NOTE: OEM may require this sensor be calibrated to the vehicle thrustline.

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement

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

Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot

NOTE:
If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure

Dust boot torn	A	Require replacement of boot
----------------	---	-----------------------------

Condition	Code	Procedure
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Housing cracked	B	Require replacement
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

RADIUS ARMS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Corroded, affecting structural integrity	a	Require replacement
Holes distorted	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

RELAY RODS

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

Condition	Code	Procedure
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Binding	A	Further inspection required

NOTE:

If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.

Grease boot cracked	B	Require replacement of boot
---------------------	---	-----------------------------

NOTE:

If boot is not available as a separate component, suggest replacement of relay rod (reason code 2). Cracked grease boot will allow contaminants to enter the joint and will accelerate wear.

Grease boot missing	C	Require replacement of boot
---------------------	---	-----------------------------

NOTE:

If boot is not available as a separate component, suggest replacement of relay rod (reason code 2). Lack of grease boot will allow contaminants to enter the joint and will accelerate wear.

Grease boot torn	A	Require replacement of boot
------------------	---	-----------------------------

NOTE:

If boot is not available as a separate component, suggest replacement of center link (reason code 2). Torn grease boot will allow contaminants to enter the joint and will accelerate wear.

Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement of seal

NOTE:

If seal is not available as a separate component, suggest replacement of relay rod (reason code 2). Lack of grease seal will allow contaminants to enter the joint and will accelerate wear.

Grease seal torn	A	Require replacement of seal
------------------	---	-----------------------------

NOTE:

If seal is not available as a separate component, suggest replacement of relay rod (reason code 2). Torn grease seal will allow contaminants to enter the joint and will accelerate wear.

Greaseable relay rod will not take grease	2	Suggest replacement of grease fitting
---	---	---------------------------------------

NOTE:

If greaseable relay rod still will not take grease after replacing the grease fitting, suggest replacement of relay rod.

Looseness (perceptible horizontal movement)	1	Suggest replacement
---	---	---------------------

Condition	Code	Procedure
NOTE: If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Looseness that is excessive	B	Require replacement
NOTE: Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.		
CAUTION: Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: Check for damaged taper hole.		
Stud broken	A	Require replacement
NOTE: Check for damaged taper hole.		
Stud loose in taper hole	A	Require repair or replacement
NOTE: Check for damaged taper hole.		
Taper hole elongated	A	Require replacement
NOTE: Check for damaged stud.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: Check for damaged taper hole.		
Wear exceeds manufacturer's specifications	B	Require replacement

RELAYS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware

Condition	Code	Procedure
Housing broken	A	Require replacement
Housing cracked	2	Suggest replacement
Inoperative	A	Require replacement
NOTE: Inoperative includes intermittent operation.		
Missing	C	Require replacement
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

SENSORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Connector missing	C	Require replacement
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent operation or out of specification.		
Leaking (vacuum/fluid/air)	A	Require replacement
Out of adjustment	B	Further inspection required
NOTE: Follow OEM recommended adjustment procedures. Repair or replace if out of specification.		
Terminal broken	A	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement

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

SHOCK ABSORBERS, STRUT CARTRIDGES AND STRUT ASSEMBLIES

NOTE: You are not required to replace shocks or struts in axle sets. However, when replacing a shock or strut due to the conditions that follow, you may suggest replacement of the other shock or strut on the same axle for one or more of the following: improved performance or preventive maintenance; part is close to the end of its useful life; to extend tire life; to balance ride and handling; or to improve stopping distance. When replacing steering and/or suspension components which may affect an alignment angle, you are required to check and adjust alignment as needed. Refer to the OEM specifications. Under no circumstances should a technician bend struts or strut housings. A vehicle's load-carrying and handling abilities are limited by its suspension, tires, brakes, and driveline. Installing coil over shocks or any other load assist device does not increase the vehicle's load capacity. See the vehicle owner's manual for more details. If vehicle is equipped with OEM coil over shocks, apply the conditions for coil springs from the Springs: Coil, Leaf, and Torsion Bar section of the Steering and Suspension guidelines. If the vehicle is equipped with add-on coil over shocks, you may suggest replacement with standard shocks for a spring-related condition.

Condition	Code	Procedure
50,000 miles or greater on OEM Shocks or Struts	1	Suggest Replacement
NOTE: Applies only to OEM hydraulic fluid and/or gas charged shocks and struts, NOT electronically controlled units.		
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require replacement
Body dented	A	Further inspection required
NOTE: Require replacement of units where dents restrict shock or strut piston rod movement. If dents don't restrict movement, no service is suggested or required. Especially critical on mono-tube shocks.		

Condition	Code	Procedure
Body punctured	A	Require replacement
Brake hose bracket bent	B	Require repair or replacement
Brake hose bracket missing	C	Require replacement
Brake hose bracket threads damaged	A	Require repair or replacement
Brake hose bracket threads stripped (threads missing)	C	Require replacement
Compression bumper missing	C	Require replacement of compression bumper
Compression bumper split	1	Suggest replacement of compression bumper
Damping (none)	A	Require replacement
Dust boot (bellows) missing	C	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of shock or strut (reason code 2). This condition can lead to damage of the piston rod, which causes piston rod seal wear.		
Dust boot (bellows) split	A	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of shock or strut (reason code 2). This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.		
Dust boot (bellows) torn	A	Require replacement of boot
NOTE: If boot is not available as a separate component, suggest replacement of shock or strut (reason code 2). This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.		
Dust shield broken	2	Suggest replacement
NOTE: This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.		
Dust shield missing	2	Suggest replacement
NOTE: This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.		
Gland nut (strut housing cap) is not removable using appropriate tool	A	Require replacement of nut and/or housing
NOTE: Only required if replacing cartridge.		
Gland nut (strut housing cap) threads damaged	A	Require repair or replacement of nut
Housing dented	A	Further inspection required
NOTE: Require replacement of units where dents restrict shock or strut piston rod movement. If dents don't restrict movement, no service is suggested or required. Especially critical on mono-tube shocks.		
Housing punctured	A	Require replacement

Condition	Code	Procedure
Jounce bumper missing	C	Require replacement of jounce bumper
Jounce bumper split	1	Suggest replacement of jounce bumper
Leaking oil, enough for fluid to be running down the body	A	Require replacement
NOTE: If the strut cartridge has been replaced previously, the oil on the strut housing may be filler oil. The technician must identify the source of the oil.		
Noisy	2	Further inspection required
NOTE: If noise is isolated to shock or strut, suggest replacement.		
Piston rod bent	A	Require replacement
Piston rod broken	A	Require replacement
Piston rod has surface defect	2	Suggest replacement
Piston rod threads damaged	A	Require repair or replacement
Piston rod threads stripped (threads missing)	A	Require replacement
Seized	A	Require replacement
Shock missing	C	Require replacement
Strut housing bent	A	Require replacement
Strut housing cap (gland nut) is not removable using appropriate tool	A	Require replacement of nut and/or housing
NOTE: Only required if replacing cartridge.		
Strut housing cap (gland nut) threads damaged	A	Require repair or replacement of nut
Strut housing cap (gland nut) threads stripped (threads missing)	A	Require replacement of nut
Strut housing severely corroded, affecting structural integrity	A	Require replacement
Strut housing threads damaged	A	Require repair or replacement
Strut housing threads stripped (threads missing)	A	Require replacement
Tire cupping	A	Further inspection required
NOTE: Although shocks or struts may have contributed to tire cupping, an inspection is needed of the entire suspension system. If the shock or strut is found to be contributing to the tire cupping, require replacement.		

SPINDLES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent	B	Require replacement

Condition	Code	Procedure
Broken	A	Require replacement
Pinch bolt bent	B	Require replacement
Pinch bolt incorrect	B	Require replacement with bolt that meets OEM design
Pinch bolt loose	B	Require repair
Pinch bolt missing	C	Require replacement
Pinch bolt tabs deformed (gap closer together than allowed by OEM specification, typically minimum .032" gap before clamping)	B	Require replacement
NOTE: Steering knuckle deformation can cause pinch bolt breakage.		
Race seat area undersized	B	Require replacement
Scored	A	Require repair or replacement
Taper hole elongated	A	Require replacement
NOTE: Check for damaged stud.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SPRINGS, COIL, LEAF AND TORSION BARS

NOTE: When springs are replaced, it is suggested, but not required, that both springs on an axle be replaced to maintain equal height from side to side and to provide a balanced ride and proper handling. When variable rate springs are installed in place of conventional coil springs, they must be installed in axle sets to ensure proper handling, uniform ride, and proper chassis height. Erroneous height measurements may result from: improper tire inflation, non-standard tire or wheel size, and heavy load in vehicle or trunk.

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Broken (all springs except secondary leave(s) on multi-leaf springs)	A	Require replacement
Coil clash	A	Further inspection required
NOTE: Require ride height check and inspection of strike out Jounce) bumper. If vehicle is within manufacturer's height specifications, no service is suggested or required.		
Coil spring insulator deteriorated	2	Suggest replacement of insulator
Coil spring insulator missing	C	Require replacement of insulator
Coil spring insulator split	2	Suggest replacement of insulator

Condition	Code	Procedure
Coil spring plastic coating deteriorated - rust present	A	Refer to manufacturer's service requirements
NOTE: Some manufacturers require replacement under these conditions.		
Composite spring damaged	Â	Further inspection required
NOTE: Check vehicle ride height. If ride height is OK, no service is suggested or required.		
Cracked (all springs except composite leaf and secondary leave(s) on multileaf springs)	A	Require replacement
Installed incorrectly	B	Require repair
Leaf spring insulators missing	C	Require replacement of insulators
Secondary leaf on multi-leaf spring broken	1	Suggest repair or replacement
Secondary leaf on multi-leaf spring cracked	1	Suggest repair or replacement
Torsion bar adjuster bent	A	Require repair or replacement of adjuster
NOTE: Only required if ride height needs to be adjusted.		
Torsion bar adjuster seized	A	Require repair or replacement of adjuster
NOTE: Only required if ride height needs to be adjusted.		
Torsion bar adjuster threads damaged	A	Require repair or replacement of part with damaged threads
NOTE: Only required if ride height needs to be adjusted.		
Torsion bar adjuster threads stripped (threads missing)	A	Require replacement of part with stripped threads
Vehicle suspension height not within OEM specifications	A	Require adjustment or replacement

STABILITRAC

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

STABILITY MANAGEMENT SYSTEM

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

STEERING ANGLE SENSOR

NOTE: OEM may require this sensor be calibrated to the vehicle thrustline. Sensor must be reset when replacing / servicing steering rack assembly.

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement
NOTE: Determine cause and correct prior to replacement of part.		
Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure		
Dust boot torn	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Housing cracked	B	Require replacement

Condition	Code	Procedure
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

STEERING ARMS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent	B	Require replacement
Broken	A	Require replacement
Pinch bolt bent	B	Require replacement
Pinch bolt incorrect	B	Require replacement with bolt that meets OEM design
Pinch bolt loose	B	Require repair
Pinch bolt missing	C	Require replacement
Pinch bolt tabs deformed (gap closer together than allowed by OEM specification, typically minimum .032" gap before clamping)	B	Require replacement
NOTE: Steering knuckle deformation can cause pinch bolt breakage.		
Race seat area undersized	B	Require replacement
Scored	A	Require repair or replacement
Taper hole elongated	A	Require replacement

Condition	Code	Procedure
NOTE: Check for damaged stud.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

STEERING COUPLERS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Flex coupler binding	A	Require repair or replacement of coupler
Flex coupler loose	A	Require repair or replacement of coupler
Flex coupler missing parts	A	Require repair or replacement of coupler
Flex coupler soft/ spongy	A	Require replacement of coupler
Flex coupler tom	A	Require replacement of coupler
Steering coupler shield cracked	2	Suggest replacement
Steering coupler shield missing	C	Require replacement
Steering coupler shield torn	2	Suggest replacement
U-joint binding	A	Require repair or replacement of joint
U-joint loose	A	Require repair or replacement of joint

STEERING DAMPERS

NOTE: The following procedures are only required if the vehicle was originally equipped from the factory with a steering damper. If the steering damper is an add-on unit, then the unit may be removed (and not replaced), based on customer's informed decision.

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require replacement
Damper body dented	A	Further inspection required

Condition	Code	Procedure
NOTE: Require replacement of units where dents restrict damper piston rod movement. If dents don't restrict movement, no service is suggested or required. Especially critical on mono-tube dampers.		
Damper body punctured	A	Require replacement
Damping (none)	A	Require replacement
Dust boot (bellows) missing	C	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of steering damper (reason code 2). This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.		
Dust boot (bellows) split	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of steering damper (reason code 2). This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.		
Dust shield broken	2	Suggest replacement
NOTE: This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.		
Dust shield missing	2	Suggest replacement
NOTE: This condition can lead to damage of the piston rod, which, in turn, causes premature piston rod seal wear.		
Leaking oil, enough for fluid to be running down the body	A	Require replacement
Loose	A	Require repair or replacement
Missing	C	Require replacement
Noise	2	Further inspection required
NOTE: If noise is isolated to damper, suggest replacement.		
Piston rod bent	A	Require replacement
Piston rod broken	A	Require replacement
Piston rod has surface defect	2	Suggest replacement
Piston rod threads damaged	A	Require repair or replacement
Piston rod threads stripped (threads missing), affecting performance	A	Require replacement
NOTE: Only required if condition affects structural integrity or if unit needs to be serviced.		
Seized	A	Require replacement

STEERING GEARS (EXCEPT RACK AND PINION)

Condition	Code	Procedure

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
NOTE: Determine cause and correct prior to replacement of part.		
Fluid contaminated	B	Require flushing and refilling of the system
NOTE: Determine and correct source of contamination. OEM specifications must be followed for fluid type.		
Gasket leaking	A	Require repair or replacement of gasket
Housing leaking	A	Require replacement
Hydraulic fittings leaking	A	Require repair or replacement of fittings
Inadequate power assist	A	Further inspection required
NOTE: If steering gear is source of inadequate assist, require repair or replacement.		
Lash exceeds manufacturer's specifications	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.		
Seal leaking	A	Require repair or replacement of seal and / or mating part
Splines damaged	A	Require repair or replacement of splines
Splines stripped	A	Require replacement of splines
Steering coupler shield cracked	2	Suggest replacement
Steering coupler shield missing	C	Require replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement

Condition	Code	Procedure
Threads damaged	A	Require repair or replacement of part with damaged threads
Threads stripped (threads missing)	A	Require replacement of part with stripped threads
Unequal power assist	A	Require repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

STEERING GEARS, RACK AND PINION

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Balance tube blocked	A	Require repair or replacement of balance tube
Balance tube missing	C	Require replacement of balance tube
Balance tube restricted	A	Require repair or replacement of balance tube
Bellows boot clamp missing	C	Require replacement of clamp
Bellows boot cracked (not through)	2	Suggest replacement of bellows boot
Bellows boot missing	C	Require replacement of bellows boot
Bellows boot not sealing	A	Require repair or replacement of bellows boot
Bellows boot torn	A	Require replacement of bellows boot
Bellows boot twisted (from toe adjustment)	B	Require repair
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement

NOTE:

Determine cause and correct prior to replacement of part.

Connector missing	C	Require replacement
Fitting leaking	A	Require repair or replacement
Fitting missing	A	Require replacement of fitting
Fitting threads damaged	A	Require repair or replacement of part with damaged threads
Fitting threads stripped (threads missing)	A	Require replacement of part with stripped threads
Fluid contaminated	B	Require flushing and refilling of the system

NOTE:

Determine and correct source of contamination. OEM specifications must be followed for fluid type.

Gasket leaking	A	Require repair or replacement
----------------	---	-------------------------------

Condition	Code	Procedure
Housing cracked, affecting structural integrity	B	Require replacement
Housing leaking	A	Require replacement
Inadequate power assist	A	Further inspection required
NOTE: If steering gear is source of inadequate assist, require repair or replacement.		
Lash exceeds manufacturer's specifications	B	Require repair or replacement
Malfunctioning	A	Require repair or replacement
NOTE: Includes inoperative, intermittent operation, failure to perform all functions, out of OEM specification, or out of range.		
Seal leaking	A	Require repair or replacement
Splines damaged	A	Require repair or replacement
Splines stripped (splines missing)	A	Require replacement
Steel line blocked	A	Require repair or replacement of line
Steel line leaking	A	Require repair or replacement of line
Steel line missing	C	Require replacement of line
Steel line restricted	A	Require repair or replacement of line
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Threads damaged	A	Require repair or replacement of part with damaged threads
Threads stripped (threads missing)	A	Require replacement of part with stripped threads
Unequal power assist	A	Require repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

STEERING KNUCKLES

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent	B	Require replacement
Broken	A	Require replacement
Pinch bolt bent	B	Require replacement

Condition	Code	Procedure
Pinch bolt incorrect	B	Require replacement with bolt that meets OEM design
Pinch bolt loose	B	Require repair
Pinch bolt missing	C	Require replacement
Pinch bolt tabs deformed (gap closer together than allowed by OEM specification, typically minimum .032" gap before clamping)	B	Require replacement
NOTE: Steering knuckle deformation can cause pinch bolt breakage.		
Race seat area undersized	B	Require replacement
Scored	A	Require repair or replacement
Taper hole elongated	A	Require replacement
NOTE: Check for damaged stud.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

STRIKE OUT BUMPERS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Missing	C	Require replacement
Split	A	Suggest replacement

STRUT BEARING PLATE ASSEMBLIES

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

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Axial or radial movement exceeds vehicle manufacturer's specifications	B	Require replacement
Bearing binding	A	Require replacement of bearing

Condition	Code	Procedure
Bearing missing	C	Require replacement of bearing
Bearing seized	A	Require replacement of bearing
Bent, affecting performance	B	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Holes distorted	A	Require replacement
Missing	C	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

STRUT RODS

Condition	Code	Procedure
Adjusting nut seized	A	Require repair or replacement of hardware
NOTE: Only required if an alignment is being performed and adjustment of the strut in question is required.		
Attaching (mating) hole oversized	A	Require repair or replacement of bracket or frame
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Attaching point on bracket or frame corroded, affecting structural integrity	A	Require repair of bracket or frame
Bent, affecting performance	A	Require replacement
Mating (attaching) hole oversized	A	Require repair or replacement of bracket or frame
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SUSPENSION PUMPS (HYDRAULIC)

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Fluid at or beyond service interval	3	Suggest fluid change
Fluid contaminated	B	Require flushing and refilling of the system

Condition	Code	Procedure
NOTE: Determine and correct source of contamination. OEM specifications must be followed for fluid type.		
Fluid level incorrect	B	Require adjustment of fluid level
Leaking	B	Require repair or replacement
Noisy	2	Suggest repair or replacement
Pulley bent	A	Require repair or replacement of pulley
Pulley missing	C	Require replacement of pulley
Pump output out of manufacturer's specifications	A	Require repair or replacement
Remote reservoir leaking	A	Require replacement of reservoir
Reservoir cap broken	A	Require replacement of cap
Reservoir cap missing	C	Require replacement of cap
Seized	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SWAY BAR LINKS

Condition	Code	Procedure
Attaching (mating) hole distorted	A	Require repair or replacement of bracket or control arm
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Ball and socket has looseness (perceptible vertical movement)	1	Suggest replacement
NOTE: If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Ball and socket has looseness that is excessive	B	Require replacement
NOTE: Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method.		
CAUTION: Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.	Â	Â
Bent	B	Require replacement
Broken	A	Require replacement
Bushing cracked	A	Require replacement

Condition	Code	Procedure
Bushing deteriorated, affecting performance	A	Require repair or replacement
NOTE: If condition is caused by oil-soaking, further inspection is required to determine source of oil.		
Bushing distorted, affecting performance	A	Require repair or replacement
Bushing missing	C	Require replacement
Bushing oil-soaked, affecting performance	A	Require replacement
NOTE: Further inspection required to determine source of oil.		
Bushing shows surface cracking (weather-checked)	Â	No service suggested or required
Bushing split	A	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Grease boot cracked	2	Suggest replacement
NOTE: Cracked grease boot will allow contaminants to enter the joint and will accelerate wear .		
Grease boot missing	C	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sway bar link (reason code 2). Lack of grease boot will allow contaminants to enter the joint and will accelerate wear.		
Grease boot torn	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of sway bar link (reason code 2). Lack of grease boot will allow contaminants to enter the joint and will accelerate wear.		
Mating (attaching) hole distorted	A	Require repair or replacement of bracket or control arm
Missing	C	Require replacement
Nut on stud loose	A	Require repair
NOTE: Check for bent stud or damaged mating hole.		
Stud bent	B	Require replacement
NOTE: Check for damaged mating hole.		
Stud broken	A	Require replacement
NOTE: Check for damaged mating hole.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: Check for damaged mating hole.		

SWAY BAR MOUNTING BUSHINGS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Deteriorated, affecting performance	A	Require repair or replacement
NOTE: If condition is caused by oil-soaking, further inspection is required to determine source of oil.		
Distorted, affecting performance	A	Require repair or replacement
Leaking (fluid-filled type)	A	Require replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: If noise isolated to bushing, suggest repair or replacement. Use only approved lubricant on rubber bushings. Petroleum-based lubricants may damage rubber bushings.		
Oil-soaked, affecting performance	A	Require replacement
NOTE: Further inspection required to determine source of oil.		
Rubber separating from internal metal sleeve on bonded bushing	A	Require replacement
Seized	A	Require replacement
Shifted (out of position)	B	Require repair or replacement
Split	A	Require replacement
Surface cracking (weather-checked)	A	No service suggested or required

SWAY BARS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent	B	Require replacement
Broken	A	Require replacement

Condition	Code	Procedure
Sway bar corroded at point of attachment to frame bushing	A	Require repair or replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

SWITCHES

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

TIE ROD ENDS (INNER AND OUTER)

Condition	Code	Procedure
Adjusting sleeve bent	B	Require replacement of sleeve
Adjusting sleeve clamps out of position	B	Require repair

Condition	Code	Procedure
Adjusting sleeve corroded, affecting structural integrity	A	Require replacement of sleeve
Adjusting sleeve missing	C	Require replacement of sleeve
Adjusting sleeve seized	A	Require repair or replacement
NOTE: Only required if toe needs to be adjusted.		
Adjusting sleeve threads damaged	A	Require repair or replacement of sleeve
Adjusting sleeve threads stripped (threads missing)	A	Require replacement of sleeve
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent	A	Require replacement
Binding	A	Further inspection required
NOTE: If greaseable, grease joint. If problem persists or joint is non-greaseable, require replacement.		
Grease boot cracked	2	Suggest replacement of boot
NOTE: If boot is not available separately, suggest replacement of tie rod end (reason code 2). Cracked grease boot will allow contaminants to enter joint and will accelerate wear.		
Grease boot missing	C	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of tie rod end (reason code 2). Lack of grease boot will allow contaminants to enter joint and will accelerate wear.		
Grease boot torn	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of tie rod end (reason code 2). Torn grease boot will allow contaminants to enter joint and will accelerate wear.		
Grease fitting broken	A	Require replacement of grease fitting
Grease fitting missing	C	Require replacement of grease fitting
Grease fitting won't seal	A	Require replacement of grease fitting
Grease seal missing	C	Require replacement of seal
NOTE: If seal is not available separately, suggest replacement of tie rod end (reason code 2). Lack of grease seal will allow contaminants to enter joint and will accelerate wear.		
Grease seal torn	A	Require replacement of seal

Condition	Code	Procedure
NOTE: If seal is not available separately, suggest replacement of tie rod end (reason code 2), wear. Torn grease seal will allow contaminants to enter joint and will accelerate wear.		
Greaseable tie rod end won't take grease	2	Suggest replacement of grease fitting
NOTE: If greaseable tie rod end will not take grease after replacing the grease fitting, suggest replacement of tie rod end.		
Looseness (perceptible horizontal movement)	1	Suggest replacement
NOTE: If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Looseness exceeds manufacturer's specifications	B	Require replacement
Looseness that is excessive	B	Require replacement
NOTE: Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.		
CAUTION: Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Noisy	2	Further inspection required
NOTE: If greaseable, grease joint. If problem persists or joint is non-greaseable, suggest replacement.		
Nut on stud loose	A	Require repair or replacement
NOTE: Check for bent stud or damaged taper hole.		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: Check for damaged taper hole.		
Stud broken	A	Require replacement
NOTE: Check for damaged taper hole.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: Check for damaged taper hole.		

TIRE PRESSURE MONITORING SYSTEM

NOTE: A Tire Pressure Monitoring System (TPMS) is designed to detect and alert the driver should the air pressure level in one or more of the vehicle's tires, up to all four tires, fall below the manufacturer's recommended inflation pressure or another pre-set level.

NOTE: NHTSA does not consider installation of an aftermarket or replacement tire or rim that is not compatible with the TPMS to be a "make inoperative" situation under 49 U.S.C. 30122, provided that the entity does not disable the TPMS malfunction indicator.

TIRE PRESSURE SENSORS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Inoperative	A	Require repair or replacement
NOTE: Inoperative includes intermittent failure.		
Loose	B	Require repair or replacement
Missing (Non-OE Wheel and/or Tire Applications)	2	Suggest replacement if appropriate sensor is available
Missing (OE Wheel and Tire Applications)	C	Replacement Required
Not Responding	Ä	Further inspection required
NOTE: If sensor does not Wake Up, follow manufacturers recommended diagnostic procedure to determine cause		

TIRES

NOTE: These guidelines do not apply to split rims. Some vehicle manufacturers restrict replacement of tires to specific brands, types, or sizes. High pressure temporary compact spare tires should not be used with any other rims or wheels, nor should standard tires, snow tires, wheel covers, or trim rings be used with high pressure compact spare rims or wheels. Attempting to mount a tire of one diameter on a wheel of a different diameter or flange type may result in serious injury or death. Only specially trained persons should de-mount or mount tires. Explosions of tire and wheel assembly can result from improper mounting, possibly causing serious injury or death. Consult the vehicle owner's manual or vehicle placard for correct size, speed rating, designation, and cold inflation pressure of the original tires. Do not exceed the maximum load or inflation capacity of the tire specified by the Tire and Rim Association. When replacing tires, it is suggested that the replacement tires match or exceed the OEM speed rating designation. If tires of different speed rating designations are mixed on the same vehicle, the tires may vary in handling characteristics. Do not mix different speed rating designations on the same axle. Do not mix radials with non-radial tires on the same axle, as this may affect vehicle handling and stability. If radial tires and bias or bias-belted ply tires are mixed on the same vehicle, the radials must be on the rear. High-pressure temporary compact spare tires are exempt from this rule. Do not mix size or type (Run Flat, all season, performance, mud and snow) of tires on the same axle. If any flammable

emergency tire inflation product has been used on a tire, consult inflation product, manufacturer's product information label for tire deflation procedures to avoid possible serious injury or death. In some vehicles, changing the tire diameter from factory-equipped size can affect drive ability, as well as the performance of ABS and other vehicle systems. Consult the vehicle manufacturer's specifications.

Condition	Code	Procedure
Air pressure incorrect	B	Require repair
Bead broken	A	Require replacement
Bead leaking, caused by tire	A	Require repair or replacement
Bead wire/cord exposed	A	Require replacement
Cord or belt material exposed	A	Require replacement
Cord ply separations	A	Require replacement
Directional/asymmetrical tires mounted incorrectly	B	Require remounting and/or repositioning
Irregular tread wear, affecting performance	2	Suggest replacement
NOTE: Determine and correct cause of irregular tire wear.		
Load ratings less than OEM specifications	B	Require replacement
Mixed tread types (all season, performance, mud and snow) on same axle	A	Require replacement
Number of punctures exceeds manufacturer's limit	B	Require replacement
Out of balance	B	Require rebalance of tire/wheel assembly
Ply separation	A	Require replacement
Pull or lead, caused by tire	A	Require repair or replacement
Radial and bias or bias-belted ply tires on same axle	B	Require repair or replacement
Radials are on the front and not on the rear	B	Require repair or replacement
NOTE: If radials and bias or bias-belted ply tires are on the same vehicle, the radials must be on the rear axle, except for high-pressure temporary spares.		
Run flat damage	A	Require replacement
Shoulder cut	A	Require replacement
Shoulder puncture	A	Require replacement
Shoulder with plug	A	Require replacement
Sidewall bulge	A	Require replacement
Sidewall cut	A	Require replacement
Sidewall indentation	Â	No service required or suggested
Sidewall puncture	A	Require replacement
Sidewall with plug	A	Require replacement
Speed rating designations different on same axle	2	Suggest rotation or replacement
Tire and wheel assembly has excessive run-out	B	Require repair or replacement of appropriate part
NOTE: Excessive is defined as enough to contribute to performance problems. Match mounting may correct run-out. If not, require replacement of appropriate part. Refer to manufacturer's specifications.		
Tires with excessive diameter difference on an all-wheel drive vehicle or four-wheel drive vehicle	B	Require replacement

Condition	Code	Procedure
NOTE: Excessive diameter difference is defined as exceeding manufacturer's specifications or, if no manufacturer's specifications exist, with more than 1/4" diameter difference.		
Tires with excessive diameter difference on the same side of a dual-wheel application	B	Require replacement
NOTE: Excessive diameter difference is defined as exceeding manufacturer's specifications or, if no manufacturer's specifications exist, with more than 1/4" diameter difference.		
Tread area puncture larger in diameter than manufacturer's specifications	B	Require replacement
Tread missing pieces (chunking), exposing cord	A	Require replacement
Tread missing pieces (chunking), not exposing cord	1	Suggest replacement
Tread separations	A	Require replacement
Tube in tubeless tire	3	Suggest removal of tube
NOTE: Most manufacturers do not recommend tubes in tubeless tires. Inspect tire and wheel . Assembly to determine the reason for a tube in tubeless tire. Recommendation for repair or replacement should be based upon condition of tires and! Or wheel listed in these guidelines.		
Weather-checking	Â	No service required or suggested
Worn to tread wear indicators	B	Require replacement

TORQUE SENSOR

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

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

TORSION SPRINGS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Broken	A	Require replacement
Missing	C	Require replacement

TRACK BAR BUSHINGS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Deteriorated, affecting performance	A	Require repair or replacement

NOTE:

If condition is caused by oil-soaking, further inspection is required to determine source of oil.

Distorted, affecting performance	A	Require repair or replacement
Leaking (fluid-filled type)	A	Require replacement
Missing	C	Require replacement
Noisy	2	Further inspection required

NOTE:

If noise isolated to bushing, suggest repair or replacement. Use only approved lubricant on rubber bushings. Petroleum-based lubricants may damage rubber bushings.

Oil-soaked, affecting performance	A	Require replacement
-----------------------------------	---	---------------------

NOTE:

Further inspection required to determine source of oil.

Rubber separating from internal metal sleeve on bonded bushing	A	Require replacement
--	---	---------------------

Condition	Code	Procedure
Seized	A	Require replacement
Shifted (out of position)	B	Require repair or replacement
Split	A	Require replacement
Surface cracking (weather-checked)	A	No service suggested or required

TRACK BARS

Condition	Code	Procedure
Attaching (mating) hole distorted	A	Require repair or replacement of bracket or frame
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Bent, affecting performance	B	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Grease boot cracked	2	Suggest replacement of boot
NOTE: If boot is not available separately, suggest replacement of tie rod end (reason code 2). Cracked grease boot will allow contaminants to enter joint and will accelerate wear .		
Grease boot missing	C	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of track bar (reason code 2). Lack of grease boot will allow contaminants to enter joint and will accelerate wear.		
Grease boot torn	A	Require replacement of boot
NOTE: If boot is not available separately, suggest replacement of track bar (reason code 2). Torn grease boot will allow contaminants to enter joint and will accelerate wear.		
Holes distorted	A	Require replacement
Looseness (perceptible horizontal movement)	1	Suggest replacement
NOTE: If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check. Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Looseness that is excessive	B	Require replacement
NOTE: Excessive looseness is defined as being significant enough to affect vehicle handling or structural integrity. If manufacturer's procedures for inspection exist, use those procedures; otherwise, use an approved inspection method such as the dry park check.		

Condition	Code	Procedure
CAUTION: Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.		
Mating (attaching) hole distorted	A	Require repair or replacement of bracket or frame
Nut on stud loose	A	Require repair or replacement of nut
NOTE: Check for bent stud or damaged mating hole.		
Seized	A	Require replacement
Stud bent	B	Require replacement
NOTE: Check for damaged mating hole.		
Stud broken	A	Require replacement
NOTE: Check for damaged mating hole.		
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement
NOTE: Check for damaged mating hole.		
Wear exceeds manufacturer's specifications	B	Require replacement

TRAILING ARM BUSHINGS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Binding	A	Require repair or replacement
Deteriorated, affecting performance	A	Require repair or replacement
NOTE: If condition is caused by oil-soaking, further inspection is required to determine source of oil.		
Distorted, affecting performance	A	Require repair or replacement
Leaking (fluid-filled type)	A	Require replacement
Missing	C	Require replacement
Noisy	2	Further inspection required
NOTE: If noise isolated to bushing, suggest repair or replacement. Use only approved lubricant on rubber bushings. Petroleum-based lubricants may damage rubber bushings.		

Condition	Code	Procedure
Oil-soaked, affecting performance	A	Require replacement
NOTE: Further inspection required to determine source of oil.		
Rubber separating from internal metal sleeve on bonded bushing	A	Require replacement
Seized	A	Require replacement
Shifted (out of position)	B	Require repair or replacement
Split	A	Require replacement
Surface cracking (weather-checked)	A	No service suggested or required

TRAILING ARMS

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Ball joint hole oversized (loose interference or press fit)	B	Further inspection required
NOTE: If oversized ball joint is available, require replacement of ball joint. If oversized ball joint is not available, require replacement of control arm.		
Bent, affecting performance	B	Require replacement
Bushing hole oversized	B	Require replacement
Corroded, affecting structural integrity	A	Require replacement
Holes distorted	A	Require replacement
Threads damaged	A	Require repair or replacement
Threads stripped (threads missing)	A	Require replacement

VALVE STEMS

NOTE: Most tire manufacturers suggest replacement of non-TPMS valve stems any time a new tire is installed. For TPMS valve stems, the manufacturer may require replacement of the valve stem, o-ring seals, washers, gaskets, valve cores, compression washers and/or locking nut.

Condition	Code	Procedure
Bent	2	Suggest replacement
Broken	A	Require replacement
Cap seized	A	Require repair or replacement
Cut, but not leaking	1	Suggest replacement
Deteriorated (cracking, dry rot)	1	Suggest replacement
Leaking	A	Require repair or replacement
Missing	C	Require replacement
O-Ring leaking	A	Require replacement of O-Ring

Condition	Code	Procedure
Threads damaged	A	Require repair or replacement
Threads stripped	A	Require replacement
Valve cap missing	C	Require replacement of cap

VEHICLE DYNAMICS CONTROL

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

VEHICLE SPEED SENSOR

Condition	Code	Procedure
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware corroded, affecting structural integrity	A	Require replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware
Attaching hardware threads stripped (threads missing)	A	Require replacement of hardware
Connector (Weatherpack type) leaking	A	Require repair or replacement
Connector broken	A	Require repair or replacement
Connector melted	A	Require replacement
Connector missing	C	Require replacement

NOTE:

Determine cause and correct prior to replacement of part.

Dust boot missing	C	Require replacement of boot
Dust boot split	A	Require replacement of boot

NOTE:

If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure

Dust boot torn	A	Require replacement of boot
----------------	---	-----------------------------

NOTE:

If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.

Condition	Code	Procedure
Housing cracked	B	Require replacement
NOTE: If boot is not available separately, suggest replacement of sensor (reason code 2). This condition can lead to damage of the sliding magnet, which, in turn, causes premature sensor failure.		
Lead routing incorrect	B	Require rerouting according to vehicle manufacturer's specifications
Loose	B	Require adjustment to vehicle manufacturer's specifications
Missing	C	Require replacement
Output signal incorrect	B	Require repair or replacement
Terminal burned, affecting performance	A	Require repair or replacement
NOTE: Determine cause and correct prior to repair or replacement of part.		
Terminal burned, not affecting performance	2	Suggest repair or replacement
Terminal corroded, affecting performance	A	Require repair or replacement
Terminal corroded, not affecting performance	2	Suggest repair or replacement
Terminal loose, affecting performance	B	Require repair or replacement
Terminal loose, not affecting performance	1	Suggest repair or replacement
Wire lead burned	A	Require repair or replacement
Wire lead conductors exposed	B	Require repair or replacement
Wire lead open	A	Require repair or replacement
Wire lead shorted	A	Require repair or replacement

VEHICLE STABILITY ASSIST

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

VEHICLE STABILITY/SKID CONTROL

NOTE: An evolution of ABS and Traction Control. It uses the ABS hardware and two additional sensors: a steering-wheel angle sensor, which measures the position and rate of steering wheel input, and a yaw sensor, which measures the rate at which the vehicle is actually turning. By comparing rates, computer determines if the vehicle is oversteering or understeering.

NOTE: On slippery surfaces or during aggressive maneuvers, if the vehicle understeers severely, the computer will actuate the brakes on the inside rear wheel, just hard enough and just long enough to correct the steering

behavior. When the vehicle oversteers severely, the system will brake the outside front wheel instead.

NOTE: When servicing this system, OEM may require steering angle sensor be calibrated to the vehicle thrustline.

WARNING LAMPS

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

WHEEL ALIGNMENT

NOTE: Wheel alignment is defined as the measurement, analysis, and adjustment of steering and suspension angles to conform to manufacturer specifications. These angles usually include, but are not limited to: caster, camber, toe, and thrust angle. Where these angles are not adjustable and not in specification, component replacement or correction kits may be required. Errors in set-back and steering axis inclination (SAI) are often attributable to failed or damaged components and must be corrected prior to performing an alignment. Failure to replace or correct suggested parts or service may prevent a proper alignment. Before performing an alignment check, inspect and verify the following: Tire pressure and size . Vehicle loading . Ride height . Steering and suspension parts only if the inspection reveals that all the above are within published specifications, a wheel alignment check and a proper wheel alignment, if needed, may be performed. Under no circumstances should a technician bend or heat any steering or suspension component, unless specified by the vehicle manufacturer. All measurements and specifications must be noted on the inspection report.

Condition	Code	Procedure
Beyond manufacturer's service interval	3	Suggest alignment check
Dog tracking, shown to be caused by faulty alignment	2	Suggest repair
Drift, shown to be caused by faulty alignment	A	Require alignment
Lead, shown to be caused by faulty alignment	A	Require alignment
Outside manufacturer's specifications	B	Require repair
Part has been changed, affecting alignment	A	Require alignment check
Pull, shown to be caused by faulty alignment	A	Require alignment
Steering wheel off-center	2	Suggest alignment
Tire wear, shown to be caused by faulty alignment	A	Require alignment
Wander, shown to be caused by faulty alignment	A	Require alignment

WHEEL ATTACHMENT HARDWARE

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

Condition	Code	Procedure
Bent	A	Require replacement
Broken	A	Require replacement
NOTE: Some manufacturers require replacement of all studs on that wheel if two or more studs or nuts on the same wheel are broken or missing.		
Locking lug nut locking groove damaged	A	Require replacement
Loose	A	Require repair or replacement of affected component
Lug nut installed backward	B	Require repair or replacement
Lug nut mating surface distorted	A	Require replacement of nut
Lug nut mating type incorrect	B	Require replacement of nut
Lug nut missing	C	Require replacement
Lug nut rounded	A	Require replacement of nut
NOTE: Only required if removing wheel.		
Lug nut seized	A	Require replacement of nut
NOTE: Only required if removing wheel.		
Stud incorrect	B	Require replacement of stud
Stud missing	C	Require replacement
Threads damaged	A	Require repair or replacement of component with damaged threads
Threads stripped	A	Require replacement of component with stripped threads

WHEEL BEARINGS, RACES AND SEALS

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

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

WHEELS (RIMS)

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

Condition	Code	Procedure
Bead leaking, caused by wheel	A	Require repair or replacement
NOTE: Do not attempt to correct a bent rim.		
Bent hub mounting surface	A	Require replacement
Bent rim, causing vibration	2	Suggest replacement
NOTE: Do not attempt to correct a bent rim.		
Broken	A	Require replacement
Cast wheel porous, causing a leak	A	Require repair or replacement
Clip-on balance weight is incorrect type for rim flange	2	Suggest replacement of weight
Corrosion affecting structural integrity	A	Require replacement
Corrosion build-up on wheel mounting surface	A	Require repair
Cracked	B	Require replacement
Directional/asymmetrical wheels mounted incorrectly	B	Require remounting and/or repositioning
Load capacity less than OEM specifications	B	Require replacement
Mating surface distorted	A	Require replacement
Offset mismatched on same axle	B	Require replacement
Rivets leaking	A	Require replacement
Run-out beyond OEM specs	B	Require replacement
NOTE: Some wire-spoke wheels may be repaired.		
Stud holes elongated	A	Require replacement
NOTE: Inspect wheel attaching hardware for damage.		
Welded or brazed repair	2	Suggest replacement
Welds leaking	A	Require replacement
Wheel centering (pilot) hole incorrect	B	Require replacement

WIRING HARNESSES AND CONNECTORS

Condition	Code	Procedure
Application incorrect	B	Require repair or replacement
Attaching hardware broken	A	Require repair or replacement of hardware
Attaching hardware missing	C	Require replacement of hardware
Attaching hardware not functioning	A	Require repair or replacement of hardware
Attaching hardware threads damaged	A	Require repair or replacement of hardware

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

REASON CODE EXPLANATION

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

AUTOMOTIVE TERMINOLOGY & DEFINITIONS

ACTIVE SUSPENSION SYSTEM

active suspension systems move each wheel up and down to control body motion in response to road abnormalities. The system responds to inputs from the road and the driver. With an active suspension, a vehicle can simultaneously provide the smooth ride of a soft suspension along with the superior handling associated with a firm suspension.

ACTIVE TILT CONTROL

active tilt control winds up the stabilizer bars in the front and rear suspension to resist body lean while cornering. Because active control is used only as needed, vehicle spring rates and stabilizer bar stiffness can be reduced, improving normal ride characteristics. In addition, this system has potential to increase low-speed, off-road traction on 4WD vehicles.

ACTIVE VARIABLE RATIO STEERING

electronically provides variable steering ratios. A computer is linked with the vehicle stability control system to aid in directional stability of the vehicle. As the vehicle travels down the highway, road surfaces and wind gusts can affect the vehicle directional stability. The car may wander a little or dart to one side, as many who have met a tractor-trailer unit on a windy day have experienced. Sensors on the car detect this sudden unintentional movement and the computer will stabilize the car by moving the Active Steering electric motor and steering gear. The driver doesn't turn the steering wheel at all.

AIR SPRING

a suspension device made up of a flexible bladder containing compressed air. The air spring takes the place of a conventional coil or leaf spring. Air is supplied by an on-board compressor, usually with auxiliary equipment to sense vehicle weight and modify the pressure in the air spring as needed.

AIR SUSPENSION

instead of steel coil or leaf springs, some vehicles have a bellows-like unit at each corner that contains pressurized air. As a rule, air suspensions can produce a softer ride.

ALIGNMENT

an adjustment to bring parts or components into a line or proper coordination.

ALL-WHEEL DRIVE

the method of providing traction to any of the wheels of a vehicle, as conditions require. Depending on the system, it may be full-time or part-time.

ANTI-ROLL BAR

see 'stabilizer bar'.

ASPECT RATIO

the relationship between the height of a tire from bead to tread, and the tread width, usually expressed as a percentage of the tread width.

AUTOMATIC RIDE CONTROL

automatic ride control adjusts vehicle shock absorber resistance (damping) in response to driver inputs such as steering and braking and for changes in road surface. During maneuvers such as hard braking or quick lane changes, the system increases suspension damping to improve dynamic stability. Damping is automatically decreased during steady driving, so that bumps and potholes are absorbed rather than being transmitted to the occupants. Some systems also allow the driver to select suspension settings: soft, normal or firm (sport).

AXIAL LOAD

a type of load placed on a bearing that is parallel to the axis of the rotating shaft.

AXIAL PLAY

movement of a component parallel to the axis of rotation.

AXIAL

round, on or along an axis; having the same direction or being parallel to the axis of rotation.

AXIS

a real or imaginary straight line on which or around which an object rotates.

BALANCE

a condition of equal weight distribution within a component or among components; the act of equalizing the weight distribution, such as balancing a tire or an engine's reciprocating assembly.

BALL JOINT

a suspension component that provides a pivot point, allowing the steering knuckle to move up and down as well as turn. In response to steering input. The ball fits into a socket housing that is attached to the control arm and the stud on the other end of the ball is attached to the steering knuckle. A dust cover is installed over the ball and socket assembly to keep dirt out and lubricant in.

BEAD

the steel reinforced inner edge of a tire, which fits inside and seals against the wheel rim.

BOOT

protective rubber cover with accordion pleats used to contain lubricants and exclude contaminating dirt, water and grime, located at each end of the rack-and- pinion assembly and FWD CV-joints.

BUMP STEER

a steering problem in which a vehicle tends to the left or the right after a bump, without steering wheel input from the driver. This is usually caused by some steering misalignment or damage that permits change of toe when the suspension works up and down.

BUSHING

a liner, usually removable, for a bearing; an anti-friction liner used in place of a bearing; a type of bearing that is used to support rotating shafts.

CAMBER

the attitude of a wheel/tire assembly in which, when viewed from the front, the distance between the tops and bottoms of the tires are different. If the distance between the tops is greater than between the bottoms, positive camber is present. If the distance between the tops is less than between the bottoms, negative camber is present.

CASTER

angle formed between the kingpin axis and a vertical axis as viewed from the side of the vehicle. Caster is considered positive when the top of the kingpin axis is behind the vertical axis, that is, tilted toward the rear of the vehicle.

CENTER LINK

a steering linkage component which attaches the Pitman arm to the idler arm, tie-rod or crosslink.

COIL SPRING

spring steel rod wound into a coil that supports the vehicle's weight while allowing suspension movement.

COLLAPSIBLE STEERING COLUMN

a steering column that is designed to collapse, to prevent the column from heavily impacting the driver during an accident.

CONSTANT VELOCITY (CV) JOINT

a flexible coupling between two shafts that allows each shaft to maintain the same speed regardless of operating angle.

CONTROL ARM

a suspension component that connects the vehicle frame to the steering knuckle or axle housing and allows the up and down movement of the wheels.

COTTER PIN.

a safety component made from soft steel, used to keep a nut from loosening on a bolt or stud. The cotter pin is inserted through a hole in the bolt or stud and through slots in the nut (see 'castellated nut'), then the ends of the cotter pin are spread to lock it in position.

CROSSMEMBER

part of the vehicle frame structure, arranged transversely and attached to the frame rails at each side of the vehicle. Can be removable or welded in place.

DAMPEN

to slow or reduce oscillations or movement.

DEAD AXLE

a load-supporting axle that does not transmit power; an axle that does not rotate, but merely forms a base on which to attach the wheels.

DIRECTIONAL STABILITY

the ability of a car to travel in a straight line on a flat surface with a minimum of driver control.

DIRECTIONAL TIRE

tire with a tread pattern that is designed to give maximum traction by removing water from under the tread in such a way as to minimize the risk of aquaplaning. Directional tires must be installed to turn in a specific direction.

DOWNFORCE

negative aerodynamic lift.

DRAG COEFFICIENT

drag divided by the product of dynamic pressure and projected area. A factor representing the drag acting on a body (as an automobile or airfoil).

DRAG LINK

a steering linkage component that connects the pitman arm and the steering arm.

DRAG

horizontal aerodynamic retarding force on a vehicle parallel to the relative wind direction.

DYNAMIC BALANCING

balancing a part while it is in motion.

ELECTRICALLY POWERED STEERING

electrically powered steering uses an electric motor to drive either the power steering hydraulic pump or the steering linkage directly. The power steering function is therefore independent of engine speed, resulting in significant energy savings.

ELECTRONIC AIR SUSPENSION

electronic air suspension provides the comfort of riding on air with adjustable spring rates and capability to change ride height and load-carrying ability. Under normal driving conditions, an electronic air suspension vehicle rides at the same height as a traditionally sprung vehicle. With a heavy load, ride height is increased automatically. On current vehicles, the suspension lowers the ride height by 20 mm at highway speeds for improved aerodynamics, with about 2 percent better fuel economy. Lower ride height also can improve on-center feel of steering due to the change in suspension geometry and increased caster angle.

ELECTRONIC LEVEL CONTROL.

a suspension system that uses air springs to maintain vehicle ride height. Height sensors are used to signal a control unit when the vehicle is riding low or high. In response to this signal, compressed air is either sent to or vented from the air springs.

HALF SHAFT

transfers power from the transaxle to the front wheels on a front-wheel drive vehicle. Also used on some vehicles with rear-wheel drive and independent rear suspension to transfer power from the differential to the rear wheels. Consists of a stub shaft that is splined into the differential side gear, another stub shaft that is splined into the wheel hub, an interconnecting shaft, and two CV-joints, which connect the interconnecting shaft to the stub shafts.

HARMONIC VIBRATION

periodic motion or vibration along a straight line. The severity depends on the frequency or amplitude.

HEIGHT SENSOR

a component used in an air suspension system to signal a control unit when the vehicle is riding low or high. In response to this signal, compressed air is either sent to or vented from the air springs.

HUB

mounting point for the wheel on an axle or spindle; the part of the synchronizer assembly that is splined to the transmission shaft; the center part of a wheel, gear, etc., that rides on a shaft.

IDLER ARM

a conventional steering system component consisting of an arm that swivels in a bushing on a shaft, which is attached to the frame. The idler arm is mounted on the right side of the vehicle and is the same length and set at the same angle as the Pitman arm. Its function is to hold the right end of the center link level with the left end, which is moved by the pitman arm, and transfer the steering motion to the right side tie-rod.

INCLUDED ANGLE

the sum of the angle of camber and steering axis inclination; the sum of two intersecting angles.

INDEPENDENT SUSPENSION

a suspension in which each wheel can travel up and down without directly affecting the position of the opposite wheel.

INTEGRAL POWER STEERING

a power steering system in which the power cylinder and control valve are contained in one housing.

INTELLIGENT VEHICLE HIGHWAY SYSTEM (IVHS)

the Intelligent Vehicle Highway System (IVHS) provides a variety of information to the vehicle and driver through cooperation of automotive electronics, communications, controls and systems engineering technologies. IVHS has two areas of interest to car and truck makers: (1)telematics and (2)active safety warning and control systems. Several features are: Telematics: Navigation systems Traffic messaging Emergency messaging and security tracking (e.g. RESCU - Remote Emergency Satellite Cellular Unit) Short range communications/ automatic toll collection Active Safety Warning and Control Systems Collision warning/avoidance - Backup and parking aids - Side vision aid - Vision enhancement - (all weather/night vision) - Adaptive cruise control - Lane departure control

INTERACTIVE VEHICLE DYNAMICS (IVD)

interactive Vehicle Dynamics is designed to minimize loss of vehicle control due to loss of traction. The IVD system could be activated when a vehicle is taking a turn too quickly or when encountering an icy patch.

JAM NUT

a locknut.

KINGPIN

the pivot shaft for the steering knuckle on most early axles and some modern heavy-duty axles.

KNUCKLE

the suspension component that connects the upper and lower control arms or the strut and lower control arm. On rear wheel drive vehicles, it usually incorporates the front wheel spindle and on front wheel drive vehicles it has an opening where the halfshaft passes through. A steering arm is attached to the knuckle, where the tie-rod end is connected. Also called a steering knuckle.

LANE-DEPARTURE WARNING SYSTEM

Issues a warning when the vehicle edges off course and reaches the highway lane markers. Introduced on the 2005 Infiniti FX and available on the 2006 Infiniti M45, the system developed by Iteris can detect lane dividers even in rainy weather. It delivers a noticeable sound when the vehicle starts to move into an adjacent lane, whether due to inattention, drowsiness or distraction.

LATERAL RUNOUT

side-to-side movement or wobble in a wheel or tire.

LEAF SPRING

a suspension spring consisting of a single flat plate made of steel or composite material or several steel plates bundled together.

LOW TIRE PRESSURE WARNING

a low tire pressure warning system alerts the driver if the air pressure in a tire becomes too low. Typically, a light on the instrument panel will be illuminated to warn of the low-pressure condition.

MACPHERSON STRUT

the principal device in the suspension of the same name, in which the spring, shock absorber and sometimes the steering knuckle are combined in a single unit.

MEMORY STEER

a steering condition where the steering wheel and wheels want to return to a position other than center. This can be caused by tightening rubber bonded socket tie-rod ends when the steering wheel is not centered, binding in the upper strut mounts, or binding in a steering component or ball joint.

ON-CAR BALANCING

the practice of spinning a wheel on the car to balance the wheel and all other rotational components together.

PARALLELOGRAM STEERING LINKAGE

a type of conventional steering linkage consisting of a pitman arm, center link, idler arm and tierod assemblies to connect to the steering knuckles. The pitman arm, center link and idler arm form three sides of a parallelogram.

PITMAN ARM

a steering system component mounted on the steering box shaft and transfers the gearbox motion to the steering linkage.

PLUNGER JOINT

the inboard CV-joint on a halfshaft, so called because the joint moves in and out in response to the suspension's up and down movement, which causes the distance between the transaxle and the wheel to change. The movement takes place within the joint, with the tripod rollers or double offset ball bearings moving in and out on elongated grooves in the yoke or outer race.

PRESS FIT

when a part is slightly larger than a hole it must be forced together with a press.

PULL

a steering condition where the vehicle driver has to maintain constant pressure on the steering wheel to keep the vehicle moving straight.

RACK-AND-PINION STEERING

a type of steering mechanism that replaces the pitman arm, center link and idler arm on gearbox steering. The steering column ends in a pinion gear that moves the driven rack to the left and right. The rack ends contain ball studs connected to the outer tie-rod ends and steering knuckles.

RADIAL LOAD

load applied at 90 degrees to an axis of rotation.

RADIAL RUNOUT

the out-of-roundness of a wheel or tire.

RADIAL

branching out in all directions from a common center; perpendicular to the shaft or bearing bore.

RADIUS ARM

a suspension component that is connected to a twin I-beam or solid axle at one end and to the vehicle frame through bushings at the other. The radius arm braces the I-beam or axle and keeps it at a right angle to the vehicle frame.

REAR WHEEL STEERING

a system used on some vehicles to change the toe of the rear wheels to either steepen a sharp turn or enhance cornering on a shallower, faster one.

RIDE HEIGHT

the dimension between a fixed point on the vehicle and the pavement. The fixed point varies according to vehicle and manufacturer. Also called vehicle height.

ROLLING RESISTANCE

retarding force, parallel to the direction of travel, caused by tire resistance along the ground.

RUNOUT

wobble or deflection beyond a rotating part's normal plane of movement.

SAI

see 'steering axis inclination',

SCRUB RADIUS

the distance between the point at which the tire's vertical centerpoint intersects the road, and the steering axis inclination (SAI) intersects the road.

SHACKLE

the attachment to the frame for one end of a leaf spring. The shackle allows the spring to change in length as the vehicle encounters uneven road surfaces.

SHIM

thin sheets of material, usually metal, used as spacers to control the distance between parts.

SHOCK ABSORBER

a device used to dampen the oscillation of the suspension caused by irregularities in the road surface.

SHORT AND LONG ARM SUSPENSION

a suspension system in which the upper control arm is shorter than the lower control arm, allowing the wheel to deflect in a vertical direction with minimal change in camber.

SPINDLE

a shaft used to attach the wheel assembly on non-drive axles.

SPRING

a suspension system component that supports the vehicle and absorbs shock caused by uneven road surfaces; a device that returns to its original form after being forced out of shape.

SPROCKET

a toothed wheel used to engage a chain or ribbed belt.

SPRUNG WEIGHT

the weight of all the vehicle components that are supported by the springs; see 'unsprung weight'.

STABILIZER BAR

a torsion-bar spring connecting the suspension on either side of the vehicle. When a vehicle rolls to the side in a turn, the suspension at the outside wheel compresses and the suspension at the inside wheel extends. The stabilizer bar that connects them twists to apply a counteracting force to hold the vehicle closer to level. Also called an anti-roll bar or sway bar.

STATIC BALANCE

balance at rest; still balance; the equal distribution of weight of the wheel and tire around the axis of rotation such that the wheel assembly has no tendency to rotate by itself regardless of its position.

STEERING ARM

the steering system component that links the steering knuckle to the tie-rod assembly.

STEERING AXIS INCLINATION

the angle between true vertical and an imaginary line running through the rotational center of the ball joint(s).

STEERING COLUMN

the housing, steering shaft, bearings and related components between the steering wheel and the steering gear.

STEERING GEAR

the assembly located at the end of the steering column, which contains the gears and other components that multiply the driver turning force.

STEERING KNUCKLE

the suspension component that connects the upper and lower control arms or the strut and lower control arm. On rear wheel drive vehicles, it usually incorporates the front wheel spindle and on front wheel drive vehicles it has an opening where the halfshaft passes through. A steering arm is attached to the steering knuckle, where the tie-rod end is connected.

STEERING LINKAGE

all of the components that connect the steering gear to the front wheels.

STRUT ROD

on vehicles where the lower control arm is attached to the frame at one pivot point, a strut rod is used to brace the control arm against the vehicle frame.

STUD

a fastener that has screw threads at both ends.

SWAY BAR

see 'stabilizer bar',

THRUST ANGLE

the difference between the thrust line and the geometric centerline of the vehicle.

THRUST LINE ALIGNMENT

aligning the front wheels to the thrust line during a wheel alignment, when rear wheel toe cannot be adjusted to specification.

THRUST LINE

an imaginary line that divides the total toe angle of the rear wheels.

THRUST LOAD

load placed on a part that is parallel to the center of the axis.

TIE-ROD END

a ball and socket joint that connects the tie-rod to the steering knuckle arm and to the center link or steering rack.

TIE-ROD

steering linkage member which connects the steering knuckle arm with the centerlink or the steering rack.

TIRE ROTATION

the practice of moving a set of tires to different positions on the vehicle to equalize wear and extend the life of the tires.

TIRE SLIP

see 'wheel slip'.

TOE

the direction in which a wheel tends to roll, a major factor in tire wear.

TOE-IN

a condition that exists if the tire's line of forward direction intersects the extended centerline of the vehicle.

TOE-OUT ON TURNS

the designed angle of the steering arm on the steering knuckle, which causes the inside front wheel to turn at a sharper angle than the outside front wheel during a turn. The specification is checked using the turntables on wheel alignment machine. Toe-out on turns is not an adjustable angle, and if it is incorrect it is most likely due to a bent steering arm.

TOE-OUT

a condition that exists if the tire's line of forward direction and the vehicle centerline are angled apart.

TRACK

the distance between the centers of the treads of parallel wheels.

TRACKING

travel of the rear wheels in a parallel path with the front wheels.

TWIN I-BEAM SUSPENSION

a type of independent front suspension and used on light trucks and vans. It consists of two I-beams supported by coil springs, and the steering knuckles/spindles, which are connected by king pins or ball joints. The inner end of the axle connects to the vehicle frame through a rubber

bushing. A radius arm also connects to the frame through rubber bushings to control wheelbase and caster.

UNSPRUNG WEIGHT

the components of a vehicle that rest directly on the road surface without being supported by the suspension springs.

VARIABLE ASSIST POWER STEERING

a power steering system that uses valves and speed sensors to vary the amount of steering assist according to engine or road speed. At slow speeds more steering assist is delivered and steering the wheels is easier; necessary for parking, etc.. At higher speeds, steering assist is reduced and more steering effort is required to steer the car, giving the driver greater feel of the road. Also known as Speed-sensitive power steering.

VEHICLE HEIGHT

see 'ride height'.

WHEEL ALIGNMENT

the adjustment of suspension and steering components to optimize steering control and minimize tire wear.

WHEEL BALANCE

the condition in which a wheel/tire assembly has equal weight around its center, preventing vibration at high speeds. Wheel balance can be static, such as on a bubble balancer, or dynamic, such as with a spin balancer.

WHEEL OFFSET

the dimensional difference between a wheel's centerline and the plane of the axle flange mounting surface.

WHEEL SLIP

a measurement (in percentage) of the friction between the tire and road surface; at zero slip the tire rotates freely, while at 100% slip the tire is locked up and is pushed along the road surface by the moving vehicle. Also called tire slip.

WHEEL SPEED SENSOR

a permanent magnetic sensor that sends information to the computer in an ABS system regarding wheel speed.

WHEEL WEIGHTS

small weights, usually made of lead, attached either mechanically or by adhesive to a wheel/tire assembly to correct its balance.

WORM GEAR

a gear into which teeth are cut, resembling the threads of a screw.