



SU01

Independent, Strut

**Uniform
Procedures For
Collision Repair
UPCR**

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v.4.0



1. Description

This procedure describes the diagnosis, repair, and inspection of an independent, strut-type suspension system.



2. Purpose

The purpose of this procedure is to provide industry-accepted requirements for performing high-quality repair of strut-type suspension systems. This procedure is intended for use by professionals who are qualified through training and experience.



3. Referenced Documents

The following documents are considered part of this procedure by reference.

3.1 Procedures

- BR11 Brakes
- BR51 Brakes, Anti-Lock And Traction Control
- HM01 Hazardous Materials
- ME01 Three-Dimensional Measuring
- PS01 Personnel Safety
- SR11 Steering, Rack And Pinion
- SR41 Knuckle And Spindle
- ST11 Structural Straightening
- SU51 Air Springs
- WA01 Wheel Alignment, Front
- WA11 Wheel Alignment, Rear
- WH01S Wheel

3.2 Other Information

- Equipment-specific information
- Recycled parts information
- Vehicle-specific dimension specifications
- Vehicle-specific repair information



4. Equipment And Material Requirements

4.1 Equipment

The use of this equipment is included in this procedure:

- ball-joint removal and pressing tool
- dial indicator
- ball-joint wedge tool
- control-arm bushing replacement tool
- coil spring compressor
- strut compressor
- tie-rod end and ball-joint puller
- tie-rod sleeve-adjusting tools



5. Damage Analysis

5.1 General Damage

Inspect the vehicle and suspension system for these conditions:

- visible damage to the frame rails, crossmember, engine cradle
- visible damage to suspension system parts
- improper previous repairs
- worn, damaged, or leaking struts
- damaged or loose mountings
- worn or damaged bushings
- damaged or improperly seated coil springs
- worn or damaged ball joints
- obvious wheel misalignment

5.2 Strut Suspension Damage Checks

Before inspection, check for correct tire size and pressure.

Check the suspension for these conditions:

- improper ride height
- more than one bounce when the bumper is pushed downward at a corner and released
- internal noise or binding when the strut is compressed or extended
- noise or binding when the front wheels are moved with the tie rod disconnected
- suspension noise when the front wheels are moved through their full steering range
- incorrect ball joint locations
- change in camber during strut-rotation check
- ball joint movement when the wheels are rocked sideways
- out-of-spec bushing movement when pried
- damaged steering knuckle or spindle (see **SR41**)
- damaged or missing jounce bumpers
- wheel misalignment (see **WA01** or **WA11**)
- unusual tire-wear patterns
- modifications to the suspension system

Damaged parts must be replaced. Verify the availability of replacement parts. Replacement of worn parts will be necessary to restore proper suspension system performance. It may be necessary to replace parts on both sides of the vehicle (in axle sets) to restore ride height and proper suspension performance. Follow the vehicle maker's recommendations and procedures for the replacement of suspension parts, which may include the following:

- lower control arms
- strut assemblies
- coil springs

(cont'd)



5. Damage Analysis (cont'd)

- stabilizer bar
- radius rods
- steering knuckles
- bushings
- fasteners
- related steering parts

Further checks may be required to determine the location and extent of damage. Follow the vehicle maker's recommendations. If there are no visible indications of damage, road-test the vehicle to confirm the diagnosis or verify proper operation of the suspension system. See **11.2**.



6. Personnel Safety

6.1 General Safety

General safety information is in **PS01**.

6.2 Safety With Strut Suspension Systems

To prevent injury when working with strut suspension systems:

- Properly lift and support the vehicle.
- Follow the vehicle maker's recommendations for drilling gas-filled strut cylinders before disposal.
- Do not disassemble a strut and spring assembly without first compressing the spring.
- Use the proper tools, and follow the equipment and vehicle maker's recommendations, when compressing struts or springs.

6.3 Anti-Lock Brake System (ABS) High-Pressure Safety

ABS systems use brake fluid under extremely high pressure. To prevent injury from high brake-fluid pressures, follow the vehicle maker's recommendations for depressurizing the system.



7. Environmental Safety

7.1 Strut Disposal

Struts that contain hydraulic fluid must be disposed of following local hazardous waste regulations.

Hazardous material safety information is in **HM01**.



8. Vehicle Protection

8.1 Suspension System

To protect a strut suspension system from damage:

- Do not weld or apply heat to any suspension part, unless recommended by the vehicle maker.
- Do not use excessive force when clamping the strut assembly in a vise.
- Use the proper tools, and follow the equipment and vehicle maker's recommendations.
- Do not use suspension parts for anchoring, clamping, or straightening.
- Disable electronically modulated suspension and traction control systems, if recommended by the vehicle maker.

8.2 ABS Parts

Follow ABS system protection requirements as described in **BR51**.



9. Repair Procedure

Ensure that the vehicle structure is aligned to the vehicle maker's dimension specifications, and all suspension-mounting points are properly located.

9.1 Parts Replacement

To replace strut suspension parts:

- 1. Properly lift and support the vehicle.
- 2. Remove the wheel and tire assembly.
- 3. Remove brake lines and other parts, if required.
- 4. Disconnect ABS and electronic ride control wires, if applicable.
- 5. Remove fasteners and bushings, if required.
- 6. Remove the strut and spring assembly from the vehicle.
- 7. Compress the strut or spring, if required.
- 8. Remove the damaged parts.
- 9. Reassemble and install the replacement parts, duplicating the original mounting methods. Compress the replacement strut or spring. If the tie rods were disconnected from the knuckle, make sure the wheels are pointed straight ahead before reconnecting and tightening tie-rod ends to the knuckles. Replace one-time or damaged fasteners. Use replacement fasteners that are the same grade, size, and type as the original fasteners. Do not reuse cotter pins. Use a thread-locking material if recommended by the vehicle maker.
- 10. Torque all fasteners to the vehicle maker's recommendations.
- 11. Reconnect the brake lines and hoses.
- 12. Bleed the brakes following the vehicle maker's recommendations.
- 13. Reconnect the ABS and electronic ride control wiring.
- 14. Remount the wheel and tire assembly.
- 15. Continue vehicle reassembly.
- 16. Lower the vehicle and verify the ride height to the vehicle maker's specifications.
- 17. Perform a two- or four-wheel alignment, as required.
- 18. Road-test the vehicle. See **11.2**.



10. Use Of Recycled (Salvage) Parts

10.1 Condition Of Salvage Parts

Use extreme care in selecting and using salvage suspension parts. Whenever possible, compare salvage parts to new parts. Inspect salvage parts for bends or cracks. Use dye penetrant if necessary.

Do not install salvage suspension parts with these defects:

- evidence of damage or previous repairs
- evidence of having been heated, welded, or straightened

Do not install salvage brake parts, wheel bearings, bushings, fasteners, ball joints, or tie-rod ends.



11. Inspection And Testing

11.1 Strut Suspension System Inspection

When repairs are completed, inspect the vehicle for these conditions:

- proper installation of all fasteners, brackets, clamps, and retaining clips
- proper tire inflation
- proper ride height
- proper mounting of all parts
- all fasteners torqued to the vehicle maker's recommendations
- proper lubrication of parts
- proper wheel alignment
- steering wheel centered
- no brake fluid leakage
- ability to steer the wheels lock-to-lock with no signs of binding or interference
- noises such as rubbing, squeaking, or popping
- proper clearance between moving parts and fixed parts
- proper operation of all dash warning lamps

Correct any defects.

11.2 Strut Suspension Road-Test

Road-test the vehicle and check for these conditions:

- vehicle wander
- pulling to one side

(cont'd)



11. Inspection And Testing (cont'd)

- abnormal steering effort or handling
- poor steering return
- steering wheel shimmy
- bump steer conditions
- body roll or sway when cornering
- body dive or pull when braking or accelerating
- dogtracking
- unusual noises when accelerating, turning, or braking
- off-center steering wheel
- improper braking action
- proper operation of ABS and electronic ride control systems

Correct any defects.