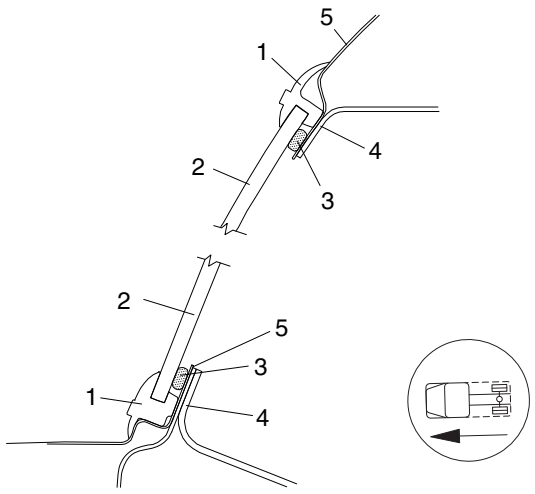
Group Index, Alphabetical

Contents

General Information

The one-piece windshield is available in two different styles: roped-in and encapsulated. The roped-in style is installed with a separate retainer that is not part of the windshield glass. The encapsulated style comes from the manufacturer with an injection-molded polyurethane seal and flange attached all the way around the edges of the windshield glass. There is no need for a separate retainer or moldings.

The encapsulated windshield is held in place on the windshield mask by a bead of urethane adhesive/sealant. The installation is similar to automobile windshields, where the urethane sealant holds the windshield in place and seals out moisture; see **Fig. 1**.



12/11/2001 f820390

1. Injection-Molded Polyurethane Seal and Flange
2. Windshield Glass
3. Urethane Adhesive/Sealant
4. Interior Trim
5. Windshield Mask

Fig. 1, Encapsulated Windshield Installation (cross-sectional view)

The information and procedure in this section applies only to the encapsulated style of windshield. This is the standard windshield installation for Business Class M2 vehicles.

See **Specifications 400** for special tools and materials needed to replace a windshield.

Replacement

NOTE: Freightliner recommends Sika Ultrafast, Dow U-400HV, or Bostik® 70-08A adhesive for windshield replacement.

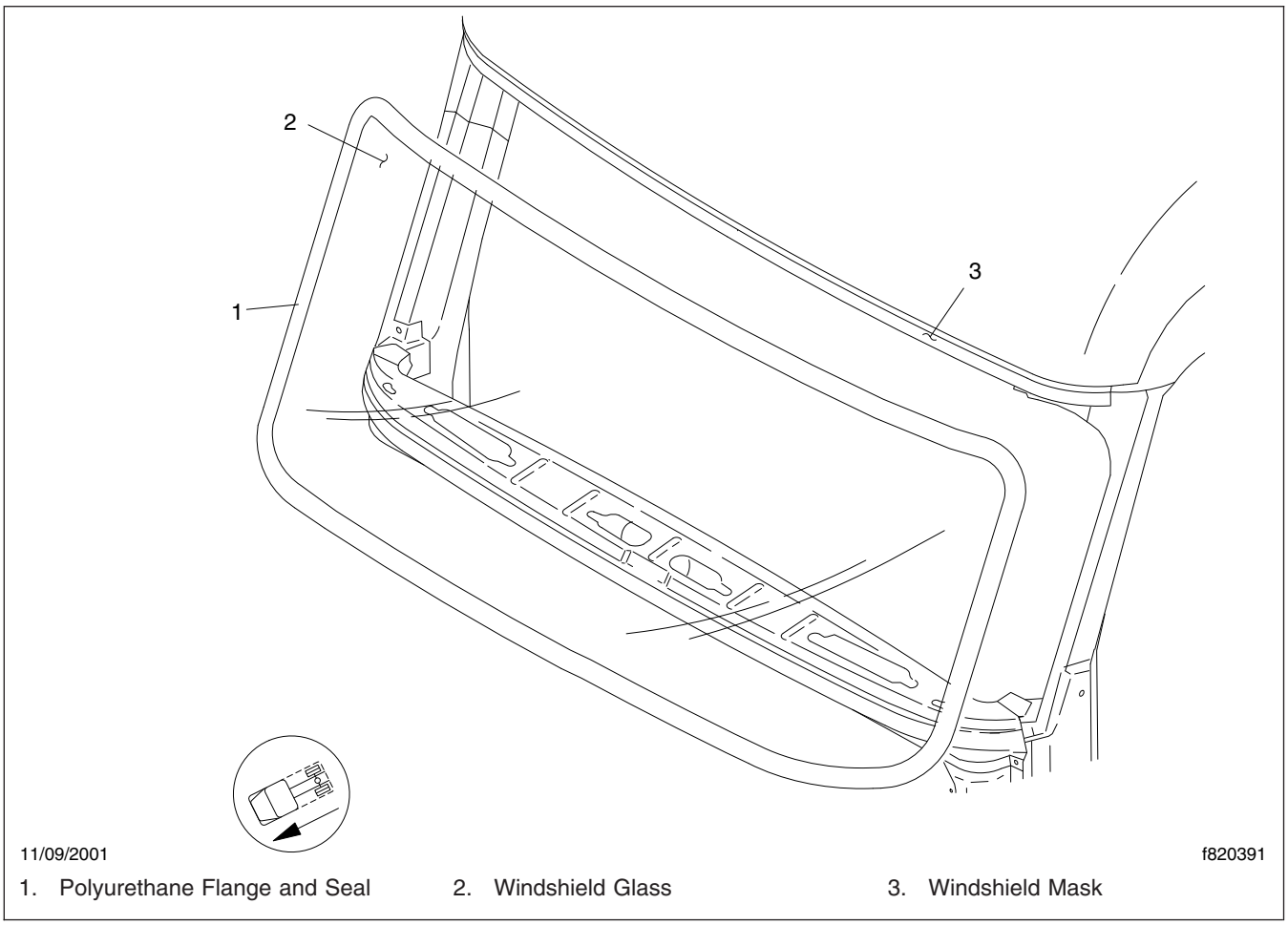
The procedure below specifies Dow adhesives and primers, though other manufacturers' systems can be used. Regardless of the system used, adhere to the adhesive manufacturer's instructions, and use that manufacturer's recommended primers and glass prep solutions for the entire procedure.

NOTE: The following procedure pertains to encapsulated windshields only; see **Fig. 1**.

If the windshield is cracked, carefully inspect the glass, urethane sealant, and the windshield mask to determine the cause. Correct the problem before installing a new windshield. If the underlying cause for the crack is not corrected, the replacement windshield may crack when exposed to high winds, pressure, temperature extremes, or vehicle motion.

NOTE: At least two people are needed to replace a windshield.

1. Apply the parking brakes and chock the tires.
2. Open the windows. Shutting the doors with the windows closed could pressurize the cab and create gaps in the uncured adhesive.
3. Open the hood.



1. Polyurethane Flange and Seal
2. Windshield Glass
3. Windshield Mask

Fig. 1, Windshield Installation (encapsulated windshield)

Windshield Replacement

4. Remove the windshield wiper arms; see **Group 82**.
5. Protect the paint finish and instrument panel by taping paper around the inside and outside of the windshield opening.
6. Lower the door windows, to prevent pressure build-up when closing the doors, which could damage the uncured adhesive seal.
7. Using a suitable knife, make a 90-degree cut into the polyurethane flange surrounding the windshield. Cut off the flange all the way around the windshield.
8. Using a pneumatic cutting tool (**Fig. 2**), a piano wire (**Fig. 3**), or a pull knife (**Fig. 4**), cut through the urethane sealant all around the edges of the windshield glass. See **Fig. 5** for a cross-sectional view.

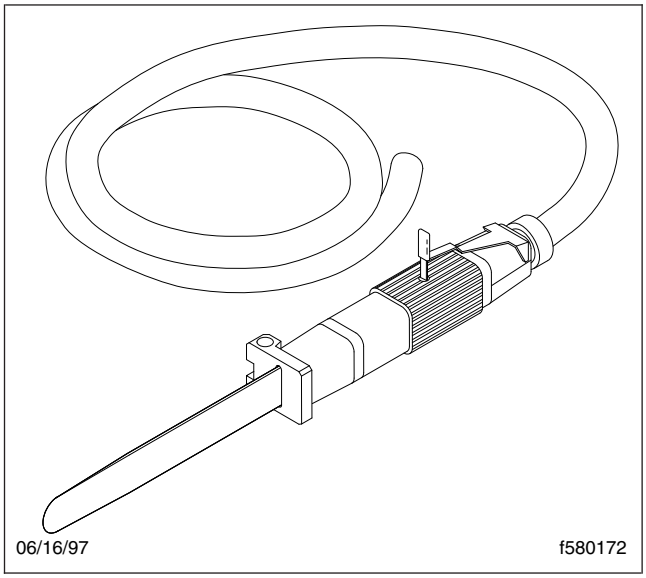
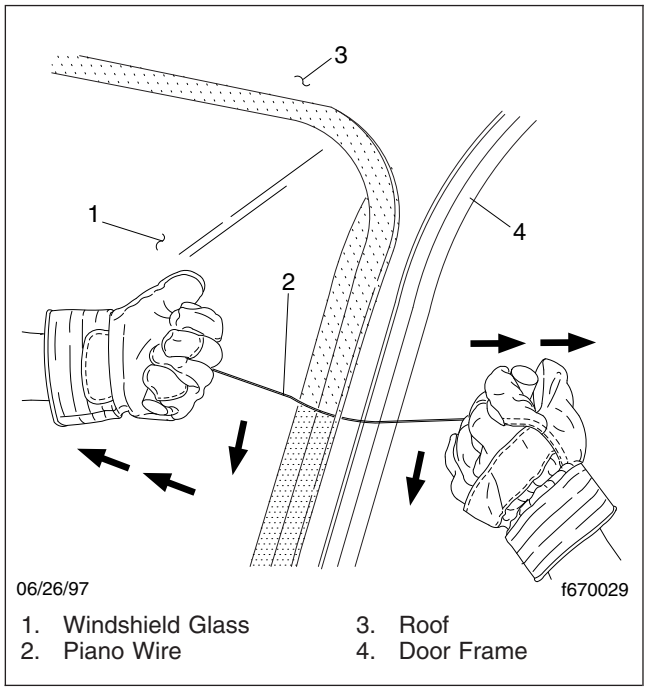


Fig. 2, BTB Pneumatic Cutting Tool

NOTE: To order a BTB pneumatic cutting tool, see **Specifications 400**.

⚠ WARNING

Wear protective gloves and safety glasses when replacing windshield glass. Gloves will protect your hands from sharp edges, and allow a better grip. Failure to wear gloves and safety glasses when handling glass could result in injury to hands or eyes.



1. Windshield Glass
2. Piano Wire
3. Roof
4. Door Frame

Fig. 3, Windshield Glass Removal with Piano Wire

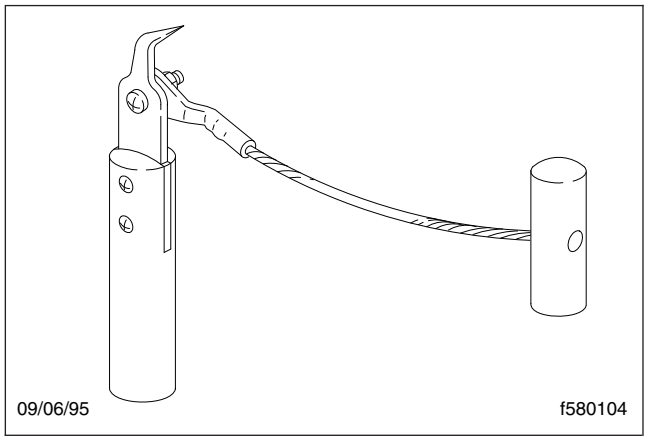
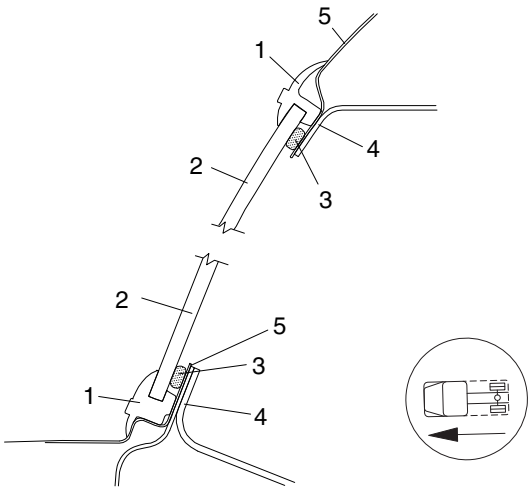


Fig. 4, Typical Pull Knife

9. Carefully remove the damaged windshield glass.
10. Using a BTB pneumatic cutting tool or a sharp knife, trim down the old urethane adhesive/sealant, leaving no more than 1/16 inch (1 to 2 mm) on the windshield mask. Make sure any remaining adhesive has a smooth and even surface.
11. Brush the remaining adhesive and debris from the windshield mask.



1. Injection-Molded Polyurethane Seal and Flange
2. Windshield Glass
3. Urethane Adhesive/Sealant
4. Interior Trim
5. Windshield Mask

Fig. 5, Encapsulated Windshield Installation (cross-sectional view)

12. Check the windshield mask. Apply Betaprime® 5404A Pinchweld and Encapsulation Primer to any bare metal. Allow to dry for a minimum of 6 minutes.

NOTE: Exposed bare metal areas larger than 1/2 inch x 1/2 inch (13 mm x 13 mm) require the use of Betaprime 5201TF Bare Metal Etch Primer.

13. Put the new encapsulated windshield glass on a suitable stand or fixture, with the inside surface of the glass facing up.
14. Clean the bonding surface of the glass with Betaclean GC-800.
15. Apply Betaprime 5500 1-Step Glass/Frit Primer all the way around the edge of the glass to a width of about 1 inch (25 mm). *Do not get any of the primer on the clear glass outside the black band.* Allow a minimum of six minutes for the primer to dry.
16. Holding the sealant applicator at a 90-degree angle to the windshield mask on the cab, apply a uniform and continuous bead of Betaseal U-400HV Adhesive all the way around the edges of the windshield mask. The bead should be a minimum of 3/8 inch (10 mm) thick.

    Keep the spiked edge of the applicator tip against the edge of the mask, and overlap the bead slightly.

IMPORTANT: Do not apply the urethane adhesive/sealant to the windshield glass. Aligning a windshield with adhesive on the glass is very difficult to do without getting the adhesive/sealant on the painted cab surface outside the windshield mask.

17. Attach a suction device to the outside of the windshield. Lift and install the windshield. Align the center of the windshield with the indexing point at the center of the windshield mask. Gently set the windshield in place, then adjust it side-to-side for the best fit. Make sure the lip of the polyurethane flange fits over the sheet metal of the A-pillars.
18. Gently press down on the glass all the way around the bead line to firmly seat the windshield.
19. With a spatula or a paddle, smooth the adhesive flat along the edge of the windshield and remove any excess.
20. Install the wiper arms; see **Group 82**.
21. Clean both sides of the new windshield glass.
22. Remove the protective coverings from the inside and outside of the windshield opening.
23. Close the hood.
24. See the adhesive manufacturer's documentation for cure and drive-away times.

Specifications

See **Table 1** for the materials needed for windshield installation using Dow U-400HV urethane adhesive. The items in **Table 1** are available from your local Dow/Essex dealer.

If using another adhesive, refer to the adhesive manufacturer's instructions for applicable cleaners and primers.

Materials and Tools Needed for Windshield Installation	
Material or Tool	**Part Number**
Betapclean® Glass Cleaner	GC-800
Betaprime® Glass Primer	5500
Betaprime Body Primer	5404A
Betaseal® Adhesive	U-400HV
Betaseal Primerless Auto Glass Adhesive	U-418

Table 1, Materials and Tools Needed for Windshield Installation

See **Fig. 1** and **Fig. 2** for the special tools needed for windshield removal.

To obtain the BTB pneumatic cutting tool (J–43029) contact:

SPX Kent-Moore
28635 Mound Road
Warren, Michigan 48092-3499
1-800-328-6657

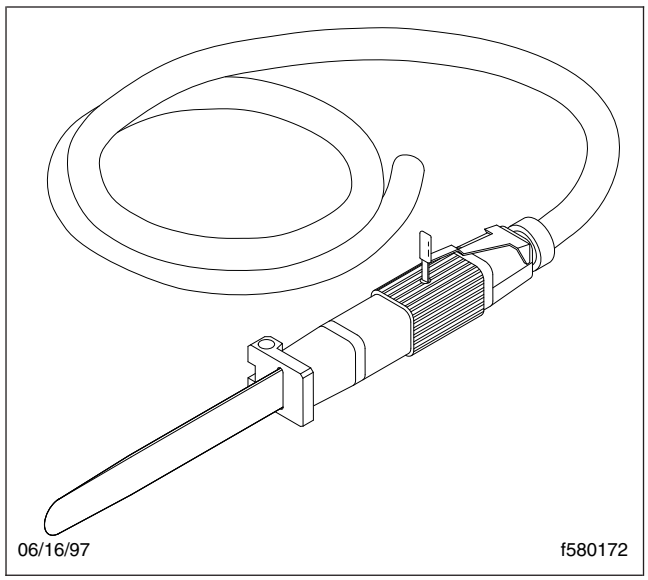


Fig. 1, BTB Pneumatic Cutting Tool (J-43029)

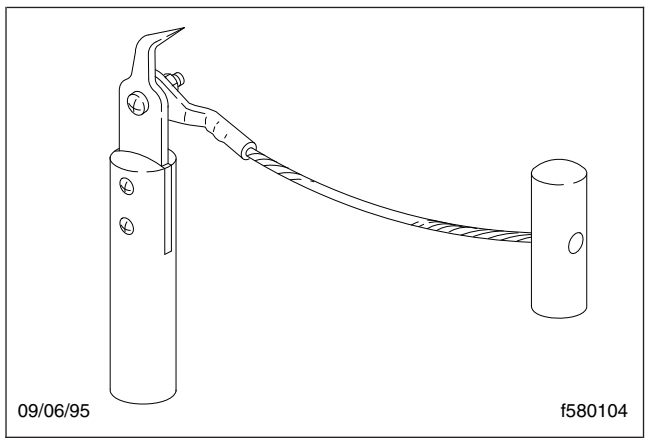


Fig. 2, Typical Pull Knife

Contents

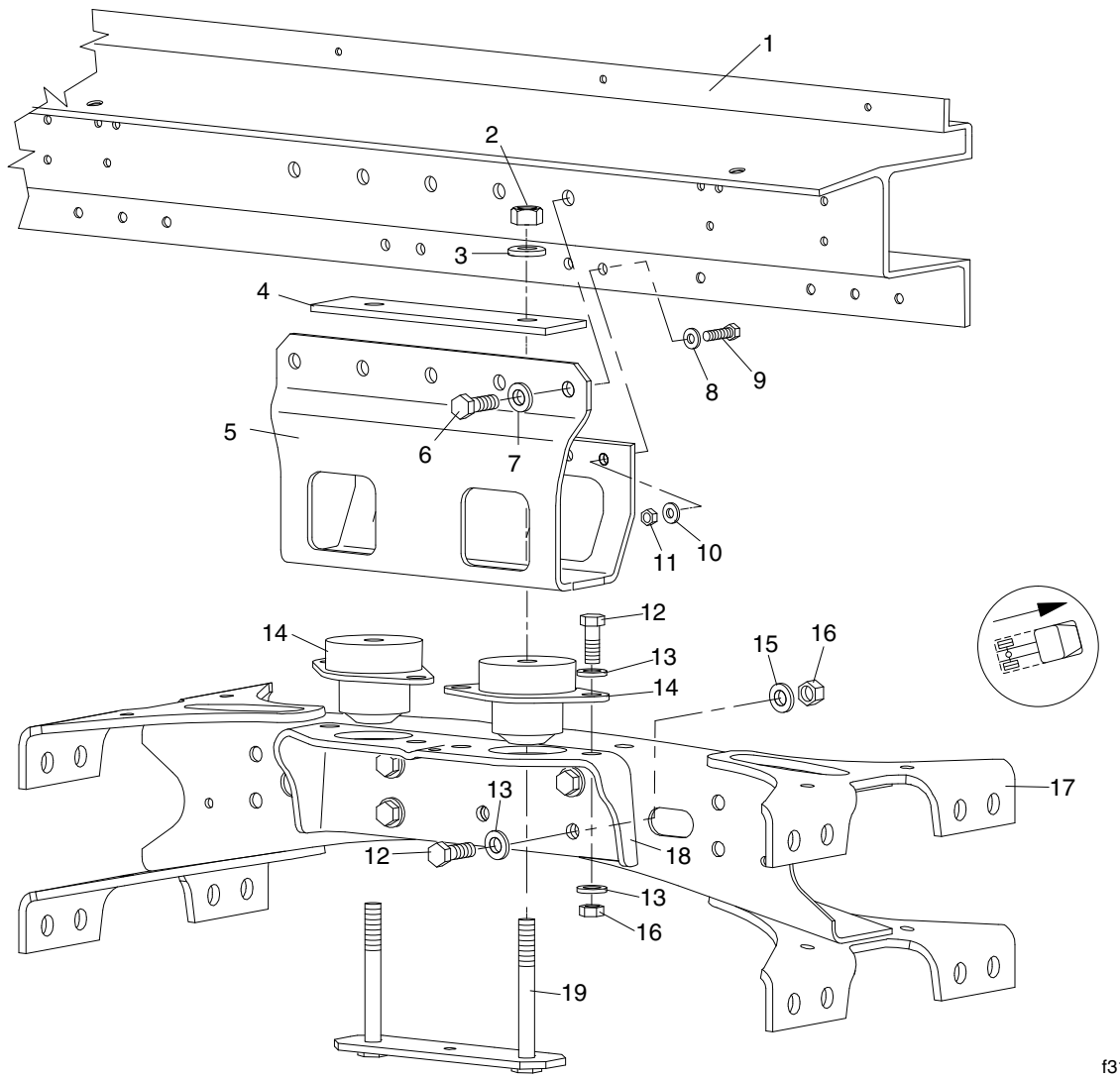
General Information

The solid rubber cab suspension consists of a pair of rubber isolators positioned between two mounting brackets. See **Fig. 1**.

The upper mounting bracket is attached to the cab rear sill, and the lower mounting bracket is attached to the frame rail crossmember.

The isolators are made of rubber with a steel mounting flange integral to each assembly. The isolators are not serviceable. Each is replaced as a complete assembly.

General Information



1. Cab Rear Sill
2. Hexnut, 5/8–11
3. Flatwasher
4. Upper Backing Plate
5. Upper Mounting Bracket
6. Hexbolt, M12 (5 qty.)
7. Flatwasher, M12 (5 qty.)
8. Flatwasher, M8
9. Hexbolt, M8
10. Flatwasher, M8
11. Hexnut, M8
12. Hexbolt, 1/2–13
13. Flatwasher
14. Isolator Assembly
15. Flatwasher
16. Hexnut, 1/2–13
17. Frame Rail Crossmember
18. Lower Mounting Bracket
19. Lower Backing Plate Assembly

Fig. 1, Cab Solid Rubber Suspension

Replacement

1. Park the vehicle on a level surface, shut down the engine, set the parking brake, and chock the tires.
2. Using a suitable jack, raise the cab enough to take the weight off the cab suspension.
3. Support the cab with safety stands, blocks of wood, or other suitable means.

⚠ WARNING

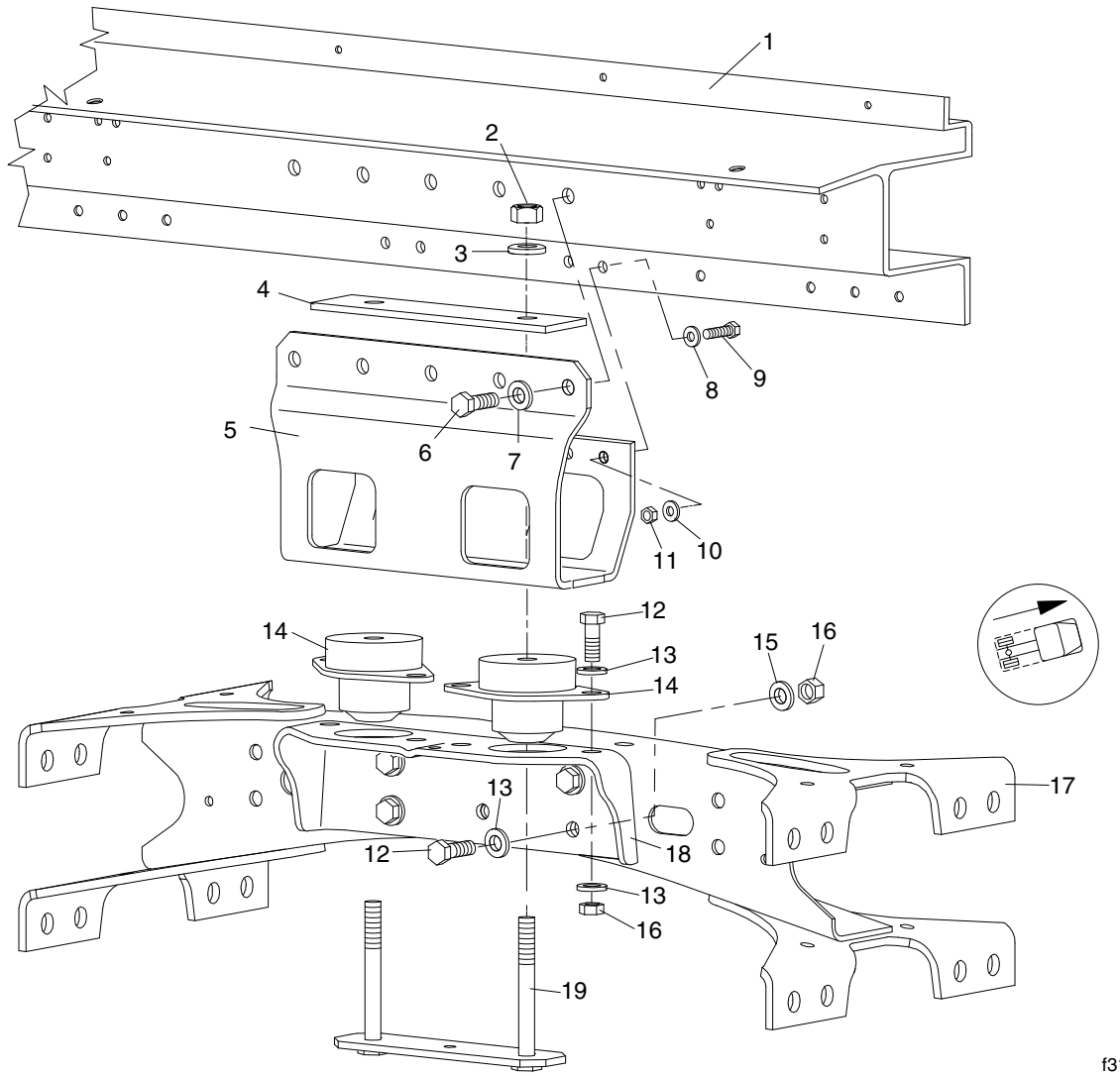
Do not work under the cab when it is supported only by a jack. Use safety stands or other suitable means to firmly support the cab. Jacks can slip, causing the cab to fall, which could result in serious injury or death.

4. Remove the hexnuts and washers from the lower backing plate studs. See **Fig. 1**.
5. If necessary, remove any fuel line, air line, or wiring standoff brackets from the frame rail crossmember. Move the lines/wiring out of the way.
6. Remove the fasteners holding the lower mounting bracket to the frame rail crossmember.
7. Remove the lower mounting bracket and the isolators from the vehicle and put them on a workbench.
8. Remove the fasteners that attach each isolator to the lower mounting bracket.

NOTE: The isolators are not serviceable. If they are damaged, replace the entire assembly.

9. If replacing the upper mounting bracket, remove the five fasteners holding it to the outside of the cab rear sill, then the four fasteners holding it to the inside of the cab rear sill.
10. Remove the upper mounting bracket from the vehicle.
11. If it was removed, install the upper mounting bracket onto the cab rear sill. See **Fig. 1**.
    - 11.1 Position the upper mounting bracket in place on the rear sill and install the four M8 hexbolts, flatwashers, and hexnuts from the inside surface of the rear sill. Install the hexbolts with their heads inboard. See **Fig. 1**. Tighten 12 lbf·ft (19 N·m).
    - 11.2 On the outside surface of the rear sill, install the M12 hexbolts and washers. Tighten 60 lbf·ft (81 N·m).
12. Install the isolators onto the lower mounting bracket. Tighten the 1/2–13 fasteners 68 lbf·ft (92 N·m).
13. Install the studs of the lower backing plate through the isolators.
14. Install the lower bracket and the isolators onto the frame rail crossmember. Tighten the 1/2–13 fasteners 68 lbf·ft (92 N·m).
15. Raise the cab, remove the blocks or stands, and lower the cab.
16. Install the 5/8–11 hexnuts and washers onto the isolator center-bolts. Tighten 136 lbf·ft (184 N·m).
17. As applicable, attach any fuel line, air line or wiring standoff brackets that were removed earlier. Route the lines/wiring.
18. Remove the chocks from the tires.

Cab Suspension Components Replacement



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1. Cab Rear Sill
2. Hexnut, 5/8–11
3. Flatwasher
4. Upper Backing Plate
5. Upper Mounting Bracket
6. Hexbolt, M12 (5 qty.)
7. Flatwasher, M12 (5 qty.)
8. Flatwasher, M8
9. Hexbolt, M8
10. Flatwasher, M8
11. Hexnut, M8
12. Hexbolt, 1/2–13
13. Flatwasher
14. Isolator Assembly
15. Flatwasher
16. Hexnut, 1/2–13
17. Frame Rail Crossmember
18. Lower Mounting Bracket
19. Lower Backing Plate Assembly

Fig. 1, Cab Solid Rubber Suspension

Specifications

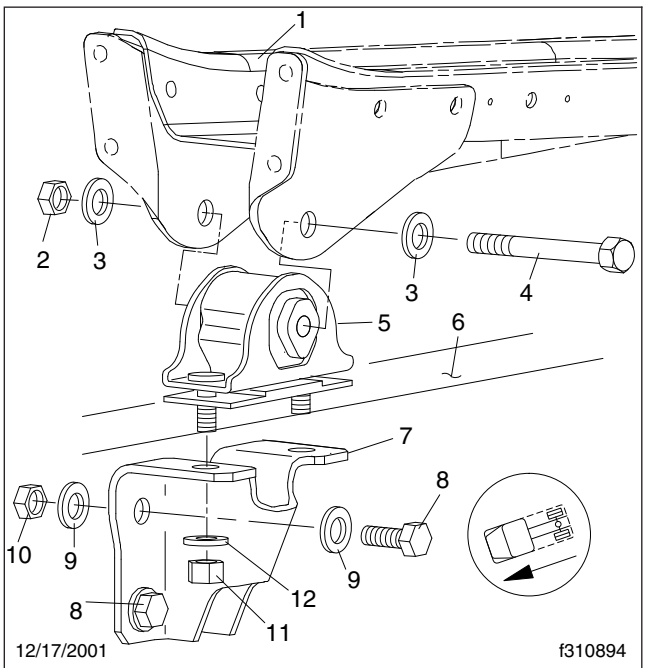
Cab Suspension Fastener Torque Values		
Description	**Size**	**Torque: lbf·ft (N·m)**
Upper Mounting Bracket Rear Fasteners	M12	60 (81)
Upper Mounting Bracket Forward Fasteners	M8	12 (19)
Isolator Assembly Fasteners	1/2–13	68 (92)
Lower Mounting Bracket Assembly Fasteners	1/2–13	68 (92)
Lower Backing Plate Hexnuts	5/8–11	136 (184)

Table 1, Cab Suspension Fastener Torque Values

Contents

General Information

The forward part of the cab is attached to the frame rails with two cab mount assemblies. See **Fig. 1**. Each forward cab mount assembly consists of a hard rubber isolator surrounded by a steel bracket. The assembly is attached to a frame rail bracket and the cab underbody.



1. Cab Underbody Bracket
2. Hexnut, 5/8–11
3. Flatwasher
4. Isolator Hexbolt
5. Cab Mount Assembly
6. Left Frame Rail
7. Frame Rail Bracket
8. Hexbolt, 5/8–11
9. Flatwasher
10. Hexnut, 5/8–11
11. Hexnut, 5/8–11
12. Flatwasher

Fig. 1, Left Forward Cab Mount Installation

Forward Cab Mount Replacement

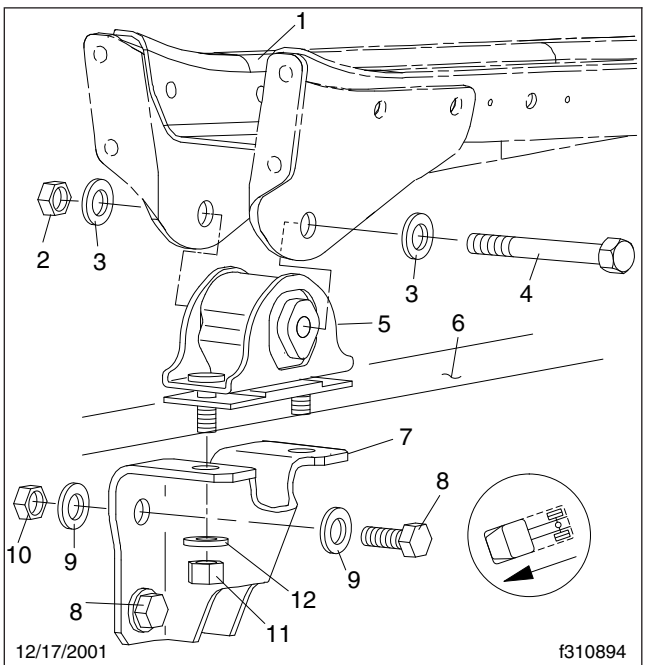
Replacement

1. Park the vehicle, apply the parking brakes, then chock the tires.
2. Jack up the front of the cab to take the weight off of the forward cab mount. Support the cab with jackstands.

⚠ WARNING

Do not work under the cab when it is supported only by a jack. Use safety stands or other suitable means to firmly support the cab. Jacks can slip, causing the cab to fall, which could result in serious injury or death.

3. Remove the 5/8–11 fasteners holding the cab mount assembly to the frame rail brackets. See **Fig. 1.**



1. Cab Underbody Bracket
2. Hexnut, 5/8–11
3. Flatwasher
4. Isolator Hexbolt
5. Cab Mount Assembly
6. Left Frame Rail
7. Frame Rail Bracket
8. Hexbolt, 5/8–11
9. Flatwasher
10. Hexnut, 5/8–11
11. Hexnut, 5/8–11
12. Flatwasher

Fig. 1, Left Forward Cab Mount Installation

4. Remove the 5/8–11 fasteners that hold the cab mount assembly to the cab underbody bracket.
5. If needed, raise the cab so the studs on the bottom of the cab mount assembly clear the holes on the frame rail bracket; then remove the cab mount assembly.
6. Install a new cab mount assembly.
   - 6.1 Place the cab mount assembly between the ears of the cab underbody bracket; then install the 5/8–11 isolator hexbolt, flatwashers and nut. Make sure the bolt head is facing outboard.
   - 6.2 Hand tighten the nut.
   - 6.3 Carefully lower the cab, making sure the studs at the bottom of the cab mount assembly line up with the holes in the frame rail bracket.

     Make sure the cab mount assembly is centered on the frame rail mounting bracket. Compare it with the cab mount assembly on the opposite side of the vehicle.
   - 6.4 Install the 5/8–11 nuts and washers onto the cab mount assembly studs. Tighten the nuts 136 lbf·ft (184 N·m).
   - 6.5 Tighten the nut on the isolator hexbolt 136 lbf·ft (184 N·m).
7. Raise the cab and remover the safety stands.
8. Lower the cab.
9. Remove the chocks from the tires.

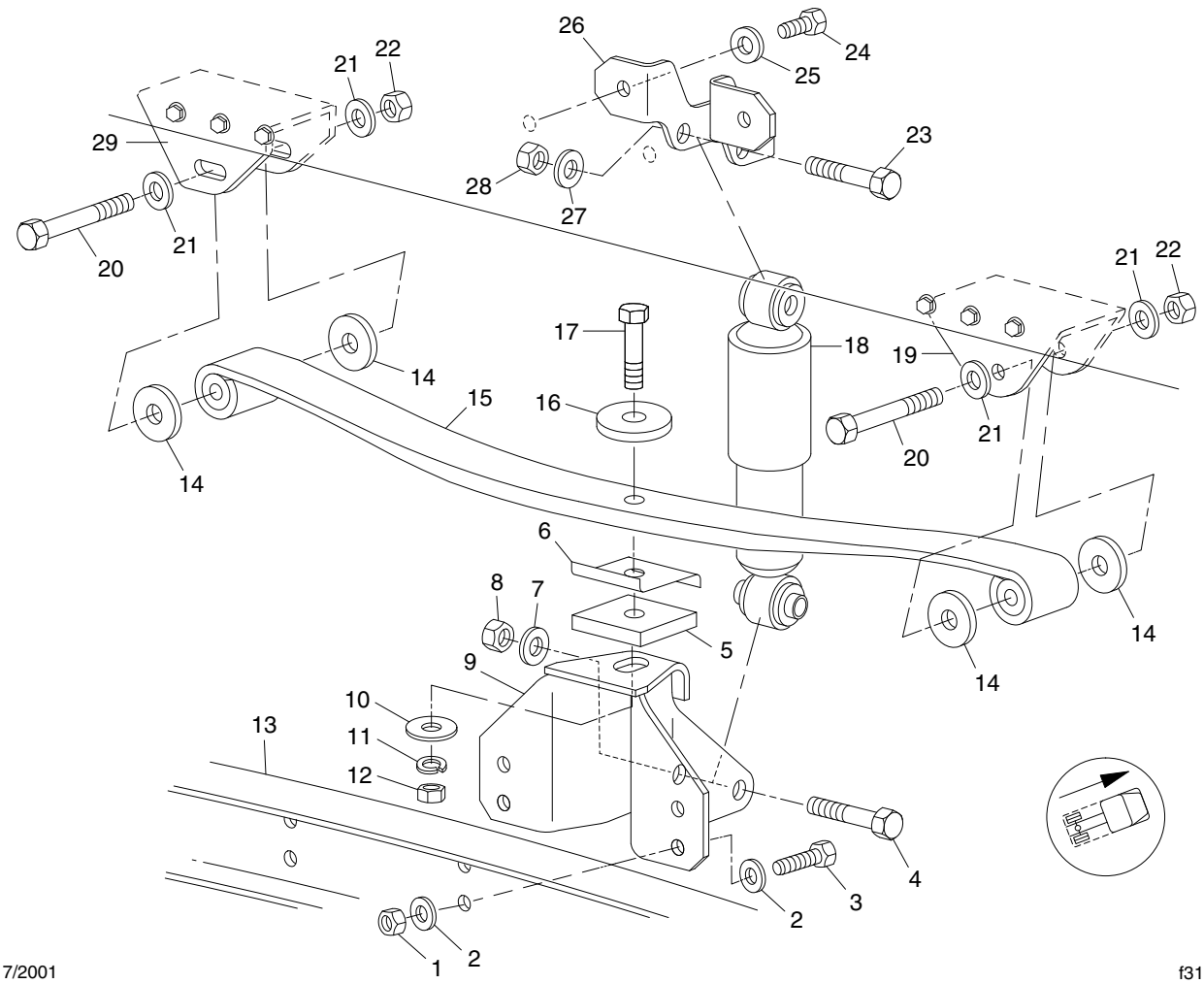
Contents

General Information

The leaf spring cab suspension consists of a single leaf spring and a shock absorber mounted between the underside of the cab and the frame rail cross-member. See **Fig. 1**.

The leaf spring absorbs road shocks and vibration, and the shock absorber dampens the rebound of the leaf spring.

General Information



NOTE: The vertical fasteners for the spring-eye mounting brackets not shown.

1. Hexnut, 1/2–13 (4 qty.)
2. Flatwasher
3. Hexbolt, 1/2–13
4. Hexbolt, 1/2–13
5. Spacer Block
6. Shim
7. Flatwasher
8. Hexnut, 1/2–13
9. Lower Mounting Bracket Assembly
10. Flatwasher
11. Lockwasher
12. Hexnut, M12
13. Frame Rail Crossmember
14. Flatwasher
15. Leaf Spring
16. Flatwasher
17. Center-Bolt, M12 X 70
18. Shock Absorber
19. Spring-Eye Mounting Bracket (right-side)
20. Hexbolt, 1/2–13
21. Flatwasher
22. Hexnut, 1/2–13
23. Hexbolt, 1/2–13
24. Hexbolt, M12 X 45 (2 qty.)
25. Flatwasher (2 qty.)
26. Shock Absorber Upper Mounting Bracket
27. Flatwasher
28. Hexnut, 1/2–13
29. Spring-Eye Mounting Bracket (left-side)

Fig. 1, Cab Leaf Spring Suspension

Replacement

1. Park the vehicle on a level surface, shut down the engine, set the parking brake, and chock the tires.
2. Remove upper and lower shock absorber fasteners, then remove the shock absorber. See **Fig. 1**.
3. Using a suitable jack, raise the cab enough to take the weight off the leaf spring.
4. Support the cab with safety stands, blocks of wood, or other suitable means.

⚠ WARNING

Do not work under the cab when it is supported only by a jack. Use safety stands or other suitable means to firmly support the cab. Jacks can slip, causing the cab to fall, which could result in serious injury or death.

5. Remove the leaf spring. See **Fig. 1**.
   - 5.1 Remove the M12 X 70 leaf spring centerbolt, hexnut and flatwashers.
   - 5.2 If needed, raise the cab slightly to remove the spacer and shim from the lower mounting bracket assembly.
   - 5.3 Remove the 1/2–13 spring eye fasteners.
   - 5.4 Remove the leaf spring from the vehicle.
6. If replacing them, remove the spring-eye mounting brackets from the underside of the cab.
   - 6.1 On one side of the cab, remove the M8 horizontal fasteners holding the spring-eye bracket to the cab backwall.

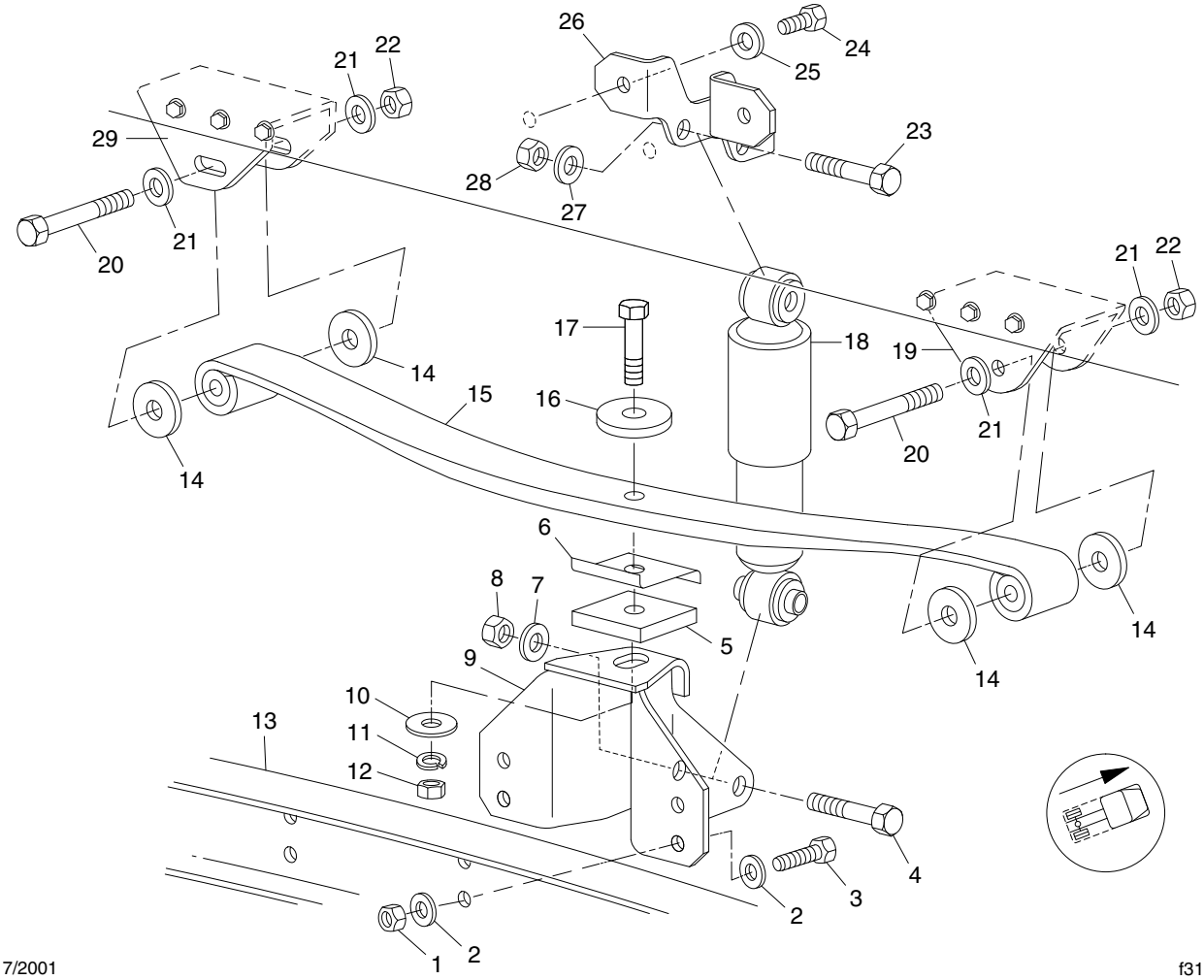
     IMPORTANT: Support the spring-eye bracket while removing the final vertical fastener from it.
   - 6.2 Remove the three M12 vertical fasteners that support the spring-eye bracket to the underside of the cab.
   - 6.3 Remove the spring-eye bracket.
   - 6.4 Repeat the procedure on the other side of the cab.
7. If replacing it, remove the lower mounting bracket assembly from the frame rail crossmember.
   - 7.1 Remove the four 1/2–13 fasteners holding the bracket to the crossmember.
   - 7.2 Remove lower mounting bracket assembly from the vehicle.
8. If replacing it, remove the upper shock absorber mounting bracket from the cab backwall.
   - 8.1 Remove the two M12 X 45 hexbolts and flatwashers.
   - 8.2 Remove the shock absorber upper mounting bracket.
9. If they were removed, install the right and left spring-eye brackets.

   IMPORTANT: The left-side spring-eye mounting bracket has an oblong mounting hole in it to allow for spring compression when the full weight of the cab is placed on the spring. See **Fig. 1**. Do not switch the right- and left-side brackets.
   - 9.1 On one side of the cab, place the applicable spring-eye bracket in position underneath the cab.
   - 9.2 Install the three vertical M12 X 45 hexbolts and flatwashers. Tighten *finger-tight*.
   - 9.3 Install the three M8 X 35 horizontal fasteners with the bolt heads outboard. Tighten finger-tight.
   - 9.4 Tighten the M12 vertical hexbolts 60 lbf·ft (81 N·m).

     Tighten the M8 horizontal fasteners 12 lbf·ft (16 N·m).
10. If it was removed, install the shock absorber upper mounting bracket. Tighten the fasteners 60 lbf·ft (81 N·m).
11. If it was removed, attach the lower mounting bracket assembly to the frame rail crossmember. See **Fig. 1**.

    Tighten the four 1/2–13 fasteners 68 lbf·ft (92 N·m).
12. Install the leaf spring. See **Fig. 1**.
    - 12.1 Position the right spring eye into the right spring-eye bracket and install the 1/2–13 fasteners. Use the outboard mounting

Suspension Components Replacement



NOTE: The vertical fasteners for the spring-eye mounting brackets not shown.

1. Hexnut, 1/2–13 (4 qty.)
2. Flatwasher
3. Hexbolt, 1/2–13
4. Hexbolt, 1/2–13
5. Spacer Block
6. Shim
7. Flatwasher
8. Hexnut, 1/2–13
9. Lower Mounting Bracket Assembly
10. Flatwasher
11. Lockwasher
12. Hexnut, M12
13. Frame Rail Crossmember
14. Flatwasher
15. Leaf Spring
16. Flatwasher
17. Center-Bolt, M12 X 70
18. Shock Absorber
19. Spring-Eye Mounting Bracket (right-side)
20. Hexbolt, 1/2–13
21. Flatwasher
22. Hexnut, 1/2–13
23. Hexbolt, 1/2–13
24. Hexbolt, M12 X 45 (2 qty.)
25. Flatwasher (2 qty.)
26. Shock Absorber Upper Mounting Bracket
27. Flatwasher
28. Hexnut, 1/2–13
29. Spring-Eye Mounting Bracket (left-side)

Fig. 1, Cab Leaf Spring Suspension

holes in the spring-eye bracket. Tighten the fasteners just enough to hold them in place.

12.2 Position the left spring eye into the left spring-eye bracket and install the 1/2–13

fasteners through the oblong hole in the spring-eye bracket.

12.3 If needed, raise the cab enough for clearance to install the spring shim and spacer block.

12.4 Install the shim and spacer block onto the top of the lower mounting bracket assembly.

12.5 Install the M12 X 70 center-bolt, flatwashers and hexnut. Tighten 60 lbf·ft (81 N·m).

13. Raise the cab, remove the blocks or safety stands, then lower the cab.
14. With the full weight of the cab on the leaf spring, tighten the left and right spring-eye fasteners 60 lbf·ft (81 N·m).
15. If it was removed, install the shock absorber.

    Tighten the upper and lower fasteners 45 lbf·ft (61 N·m).

IMPORTANT: Do not overtighten the shock absorber fasteners.

16. Remove the chocks from the tires.

Specifications

Cab Suspension Fastener Torque Values		
Description	**Size**	**Torque: lbf·ft (N·m)**
Leaf Spring Center-Bolt	M12 X 70	60 (81)
Spring-Eye Fasteners	1/2–13	60 (81)
Shock Absorber Upper and Lower Mounting Locknut	1/2–13	45 (61)
Lower Mounting Bracket Assembly Fasteners	1/2–13	68 (92)
Spring-Eye Bracket Horizontal Fasteners	M8 X 35	12 (16)
Spring-Eye Bracket Vertical Fasteners	M12 X 45	60 (81)
Shock Absorber Upper Mounting Bracket Hexbolts	M12 X 45	60 (81)

Table 1, Cab Suspension Fastener Torque Values

Contents

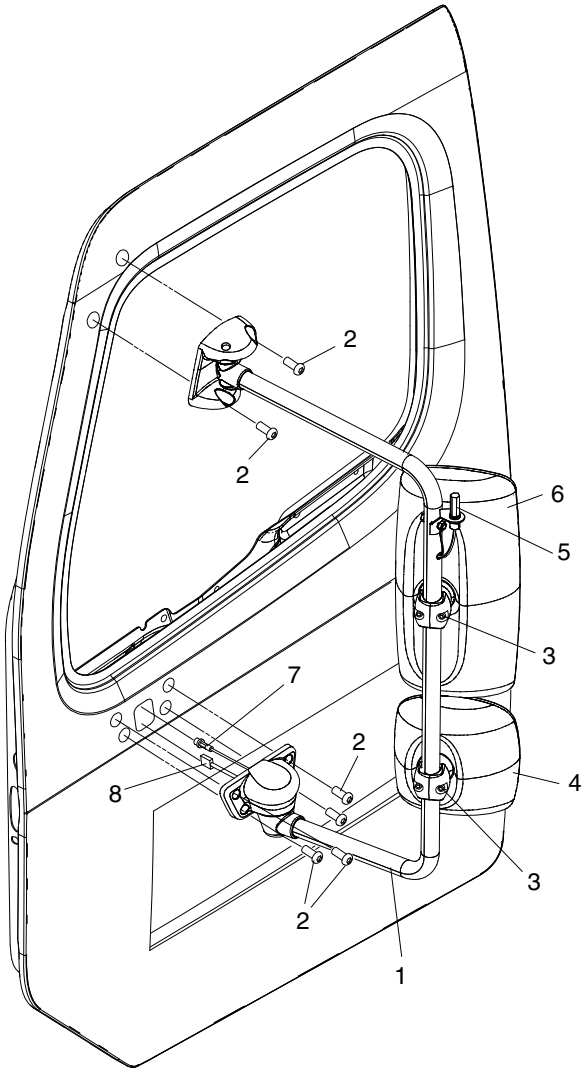
General Information

The Business Class M2 exterior mirror unit consists of a rectangular (flat) mirror mounted on a fold-away tubular support loop. An optional lower square (convex) mirror is mounted on the same support loop, below the main mirror. See **Fig. 1**.

Both mirrors are mounted in separate housings, and the housings are attached to the support loop, which is mounted to the door by brackets and Torx®-head screws.

Additional options include electrically powered and heated mirrors. In such cases, the wiring is hidden within the support loop and the mirror housings.

General Information



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1. Fold-Away Tubular Support Loop
2. Torx-Head Screws, M8
3. Torx-Head Screws, Self-Tapping
4. Square, Convex Mirror Housing (optional)
5. CB Radio Antenna Lead (optional)
6. Rectangular, Flat Mirror Housing
7. CB Radio Antenna Cable (optional)
8. Electrical Wiring

Fig. 1, Exterior Mirror (manual, left side)

Mirror Assembly

Removal

1. Apply the parking brake and chock the tires.
2. Remove the two screws that attach the support loop upper bracket to the door; see **Fig. 1**.
3. While holding the support loop assembly, remove the four screws that attach the lower bracket to the door.
4. Disconnect any wiring or antenna cables, if present.

Installation

1. Connect any wiring and antenna cables, as applicable.
2. Holding the support loop in position, install the mounting screws finger-tight (two screws on the upper bracket, and four on the lower bracket). See **Fig. 1**.
3. Test the mirror function for movement and heating. If there are problems, check the wiring.
4. Tighten the mounting screws 10 lbf·ft (14 N·m) on both the upper and lower brackets.

Mirror Housing

NOTE: The procedure for removing and installing the convex and flat mirrors are identical.

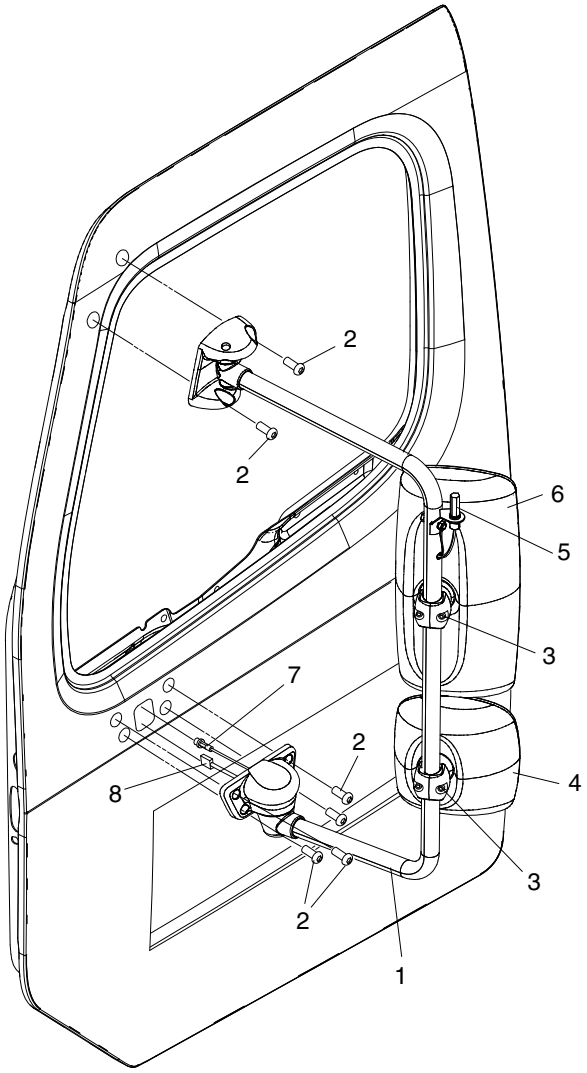
Removal

1. Apply the parking brake and chock the tires.
2. Mark the location of the mirror housing on the support loop; see **Fig. 1**.
3. If equipped with a heated/power mirror, remove the mirror bezel and glass, then disconnect the wiring.
4. Remove the two screws that attach the housing to the support loop. Disconnect any wiring, if present, and remove the housing assembly.

Installation

1. If equipped with a heated/powered mirror, connect the wiring to the mirror, then install the mirror glass and bezel into the mirror housing.
2. As previously marked, position the mirror housing onto the support loop. Install the self-tapping screws finger-tight; see **Fig. 1**.
3. Test the mirror function for movement and heating. If there are problems, check the wiring.
4. Tighten the self-tapping screws 96 lbf·in (1085 N·cm).

Exterior Mirror Removal and Installation



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NOTE: LH shown.

1. Fold-Away Tubular Support Loop
2. Screws, M8
3. Screws, Self-Tapping
4. Square, Convex Mirror Housing
5. CB Radio Antenna Lead (optional)
6. Rectangular, Flat Mirror Housing
7. CB Radio Antenna Cable (optional)
8. Electrical Wiring

Fig. 1, Exterior Mirror Assembly

Specifications

Unless listed in **Table 1**, tighten all fasteners using the torque specifications found in **Section 00.04**.

Torque Specifications				
Fastener Description	**lbf·ft**	**N·m**	**lbf·in**	**N·cm**
Mirror Loop Assembly Mounting Screws, M8	10	14	—	—
Mirror Housing Mounting Screws	—	—	96	1085

Table 1, Torque Specifications

Contents

General Information

The aluminum cab is a semi-monocoque design, which means that the outer skin panels are load bearing as is the internal framework. This type of construction requires less framework than standard cab construction, and results in a very strong, yet lightweight cab. See **Fig. 1**.

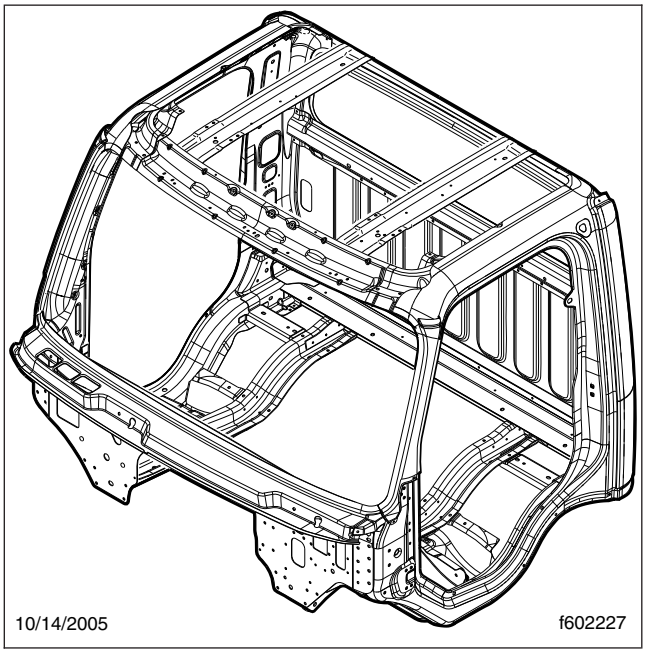


Fig. 1, Cab Structure (Day Cab Shown)

The three basic configurations of day cab, extended cab, and crew cab come in the following lengths:

- 106-inch flat-roof day cab
- 126-inch high-roof extended cab
- 132-inch high-roof extended cab
- 138-inch high-roof extended cab
- 148-inch high-roof crew cab
- 154-inch high-roof crew cab
- 160-inch high-roof crew cab

The major cab parts are the front-wall assembly, right and left door-frame (side-wall) assemblies, back-wall assembly, roof assembly, and the cab deck assembly. See **Fig. 2**.

The cab deck consists of a framework of longitudinal sills and transverse crossmembers, with a deck plate fastened to them. The cab deck is not available as an assembly; components must be ordered separately.

The door-frame assemblies consist of several panels that are riveted and glued together. In order to maintain structural integrity, the door-frame assemblies are available as complete units only.

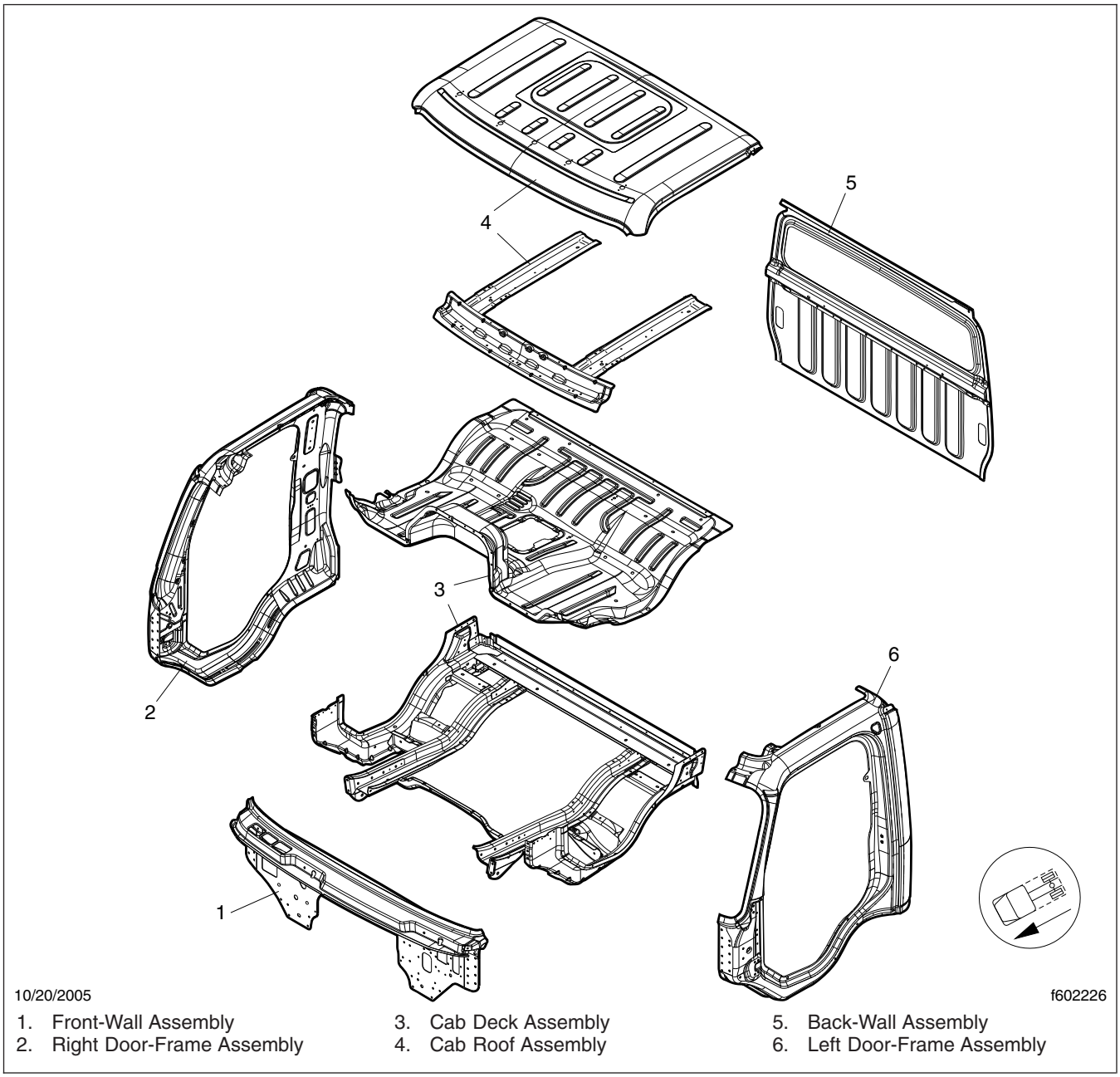
The cab back wall and cab roof components are available as individual pieces.

The cab front-wall assembly is a complete unit attached to the front of the door-frame assemblies, and must be replaced as an entire unit.

The cab parts are held together with a variety of fasteners, including Huck® bolts, blind rivets, and steel Henrob rivets. Structural foam or adhesive is used between the roof cap and roof bows to prevent flutter of the roof.

When any repairs are done to the cab, it is necessary to check the frame rails for correct alignment and squaring. The cab must be leveled and squared. If the cab is repaired without straightening the frame rails, undue stress could be put on the cab, which could weaken it. Also, it may be impossible then to square the cab.

General Information



1. Front-Wall Assembly
2. Right Door-Frame Assembly
3. Cab Deck Assembly
4. Cab Roof Assembly
5. Back-Wall Assembly
6. Left Door-Frame Assembly

Fig. 2, Major Cab Parts (Day Cab Shown)

Cab Water-Leak Detection

Use the following procedure to locate areas where water may intrude into the cab.

1. Park the vehicle, apply the parking brakes, and chock the front and rear tires.
2. Prepare a wash solution of at least one-quarter cup of soap to one gallon of water in a spray bottle.
3. Place tape over the cab exhausters.
4. Close all doors, windows, and vents.
5. With the HVAC system in "Fresh Air" mode, turn the fan blower motor on high.

NOTE: Perform the leak detection test with the HVAC system in the "Fresh Air" mode only. Do not set the system in the "Recirculation" mode.

6. Spray the cab with the wash solution and look for bubbles. See **Fig. 1**. Inspect all applicable areas listed below:
    - windshield perimeter
    - visor brackets (if so equipped)
    - air horns and marker lights (if so equipped)
    - roof deflector mounts (if so equipped)

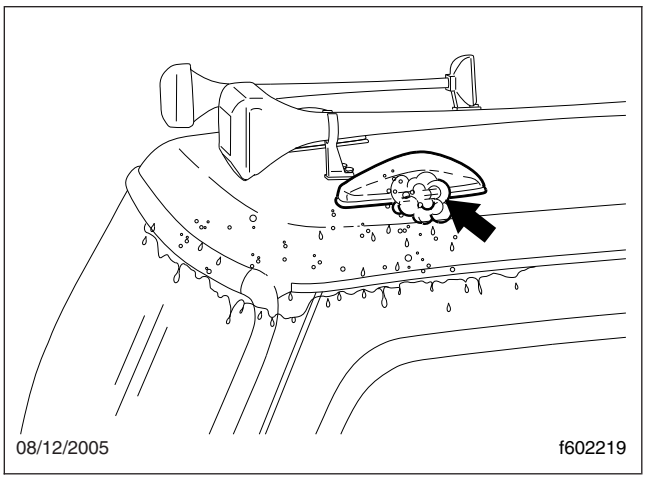


Fig. 1, Cab Water-Leak Detection with Wash Solution

7. Mark areas of suspected leaks.

NOTE: This method of leak detection may also identify areas that will not leak water, even though those areas produce bubbles. Bubbles around door seals and along the vehicle side walls will likely not cause water intrusion issues.

If small bubbles are found in an area that is not suspected to leak, a repair may not be necessary.

8. Rinse the wash solution off the vehicle with water.
9. Turn off the fan blower motor.
10. Remove the tape from the cab exhausters.
11. Remove the chocks from the tires.

Cab Water-Leak Repair

If a leak is found, the repair method will depend on the area and type of leak. It may be necessary to remove some components, though most leaks should be repairable by sealing the area of the leak with silicone sealant.

Repair leaks in the windshield using the approved method. See **Section 60.00, Subject 100**.

Contents

NOTE: Interior components are varied and optional. The following generalized information is intended for broad use and should not be considered as a guide for a specific vehicle.

Headliner Replacement

Removal

1. Park the vehicle on a level surface, shut down the engine, set the parking brake, and chock the tires.
2. Drain the air tanks.
3. Disconnect the batteries at the negative terminals.
4. If applicable, remove all items from the overhead storage bins.
5. If so equipped, remove the front overhead storage bins by prying up around the edges of each bin.
6. Remove the sun visors.
   - 6.1 Remove the fasteners from the sun visor outboard brackets.
   - 6.2 Remove the sun visors.
7. Remove the inboard bracket for the sun visors.
8. Remove the dome light by prying it out from the upholstery panel, then disconnecting the wiring.
9. If so equipped, remove the center seat belt anchor.
10. Remove the small-head, Christmas-tree type fasteners attaching the headliner to the roof bows. See **Fig. 1**.
11. Remove the A-pillar covers and the passenger-side grab handle.
    - 11.1 Remove the Torx®-head screws holding the grab handle in place.
    - 11.2 Remove the Torx-head screws holding the A-pillar covers in place.
    - 11.3 Remove the driver's side A-pillar cover, then the passenger-side cover along with the grab handle.
12. If so equipped, disconnect the air horn lanyard from its anchor point on the roof structure, and pull it up and through the headliner.
13. Remove the remaining Christmas-tree type fasteners attaching the headliner to the rear wall upholstery panel.
14. Remove the headliner from the cab.

Installation

1. Put the headliner into the cab, using a helper to hold it in place.
2. Using new Christmas-tree type fasteners, attach the rear of the headliner to the rear wall upholstery panel and the cab structure.
3. Install the sun visors.
   - 3.1 Install the outboard brackets.
   - 3.2 Install the center bracket.
   - 3.3 Install the sun visors.
4. If so equipped, put the air horn lanyard through the opening in the headliner, then attach the lanyard to its anchor point on the cab roof structure.
5. If applicable, install the right- and left-side storage bins and the center bin.
6. Install the right- and left-side A-pillar covers.
7. Install the passenger-side grab handle.
8. Using new Christmas-tree type fasteners, attach the headliner to the roof bows.
9. Connect the wiring to the dome light, then install it into the headliner.
10. If so equipped, install the center seat belt anchor.
11. Connect the batteries.
12. Remove the chocks from the tires.

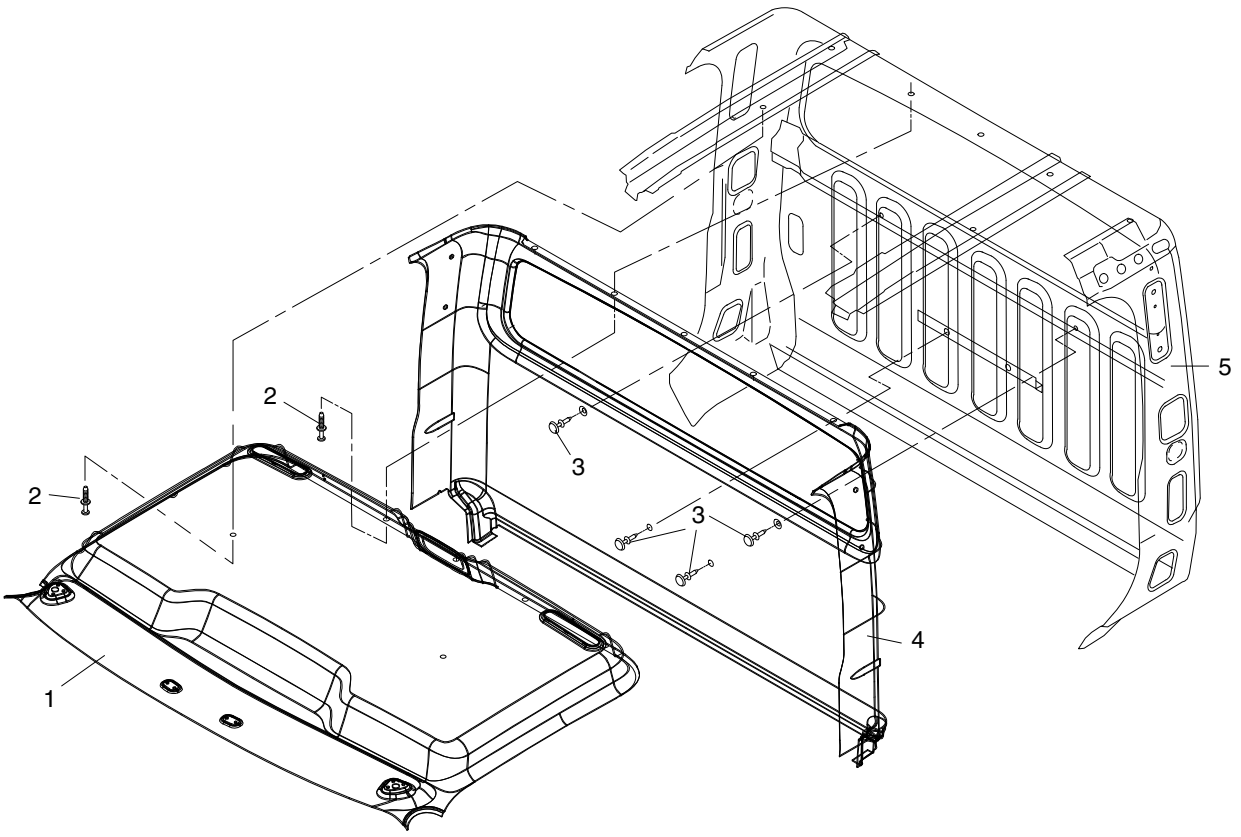
Rear Wall Upholstery Panel Replacement

Removal

NOTE: See **Fig. 1** for this procedure.

1. If not already done, park the vehicle on a level surface, shut down the engine, set the parking brake, and chock the tires.
2. If not already done, drain the air tanks.
3. If not already done, disconnect the batteries at the negative terminals.

Upholstery Panels Replacement



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1. Headliner
2. Christmas-Tree Type Fastener, small head (7 qty.)
3. Christmas-Tree Type Fastener, large head (4 qty.)
4. Rear Wall Upholstery Panel
5. Cab Structure

Fig. 1, Headliner and Rear Wall Upholstery Panels

4. Remove the seat(s). For instructions on removing a bench seat, see **Group 91** in this manual.
5. Remove the interior grab handles.
6. Remove the tread plates from the doorways.
7. Remove the upper anchors for the seat belts.
   - 7.1 On one side of the vehicle, pry off the plastic cover.
   - 7.2 Remove the hexnut, rubber washer, and bushing
   - 7.3 Remove the seat belt anchor.
   - 7.4 Repeat the procedure on the other side of the vehicle.
8. If so equipped, remove the driver's and passenger's seat-belt height adjusters.
9. Remove the lower outboard seat belt anchors.
10. Remove the seals from the rear edge of each door opening.
11. Remove the headliner. For instructions, see "Headliner Replacement" in this subject.
12. Remove the four Christmas-tree type fasteners holding the upholstery panel to the cab structure.
13. Pull up the bottom edge of the rear wall upholstery panel from behind the lip at the rear of the floor mat.

14. Remove the rear wall upholstery panel from the cab.

Installation

1. Put the rear wall upholstery panel in place in the cab.
2. Push the bottom rear edge of the panel down behind the lip on the floor mat.
3. Using new Christmas-tree type fasteners, attach the upholstery panel to the cab structure.
4. Install the headliner. For instructions, see "Headliner Replacement."
5. Install the door seals.
6. Connect the wiring and install the dome light.
7. Install the tread plates in the doorways.
8. Install the interior grab handles.
9. Install the upper center seat belt anchors.
10. If applicable, install the driver's and passenger's seat-belt height adjusters.
11. Remove the chocks from the tires.

Floor Mat Replacement

Removal

1. If not already done, park the vehicle on a level surface, shut down the engine, set the parking brakes, and chock the tires.
2. If not already done, disconnect the batteries at the negative terminals.
3. Remove the seat(s) and seat belts. For instructions on removing a bench seat, see **Group 91** in this manual.
4. Remove the kick panels forward of the doors.
5. Remove the tread plates from the doorways.
6. If equipped with a manual transmission, remove the shift lever boot, rubber mat, and metal cover plate.

   If equipped with an automatic transmission, remove the rubber mat and metal transmission cover plate. See **Fig. 2**.

NOTE: The transmission ECU is attached to the underside of the metal transmission cover plate. Disconnect the wiring from the ECU before removing the cover plate.

7. Push the bottom of the rear wall upholstery panel in, and lift the rear edge of the floor mat off the top of the metal lip at the rear of the cab deck. See **Fig. 2**. There is a plastic U-channel between the mat and the metal lip.

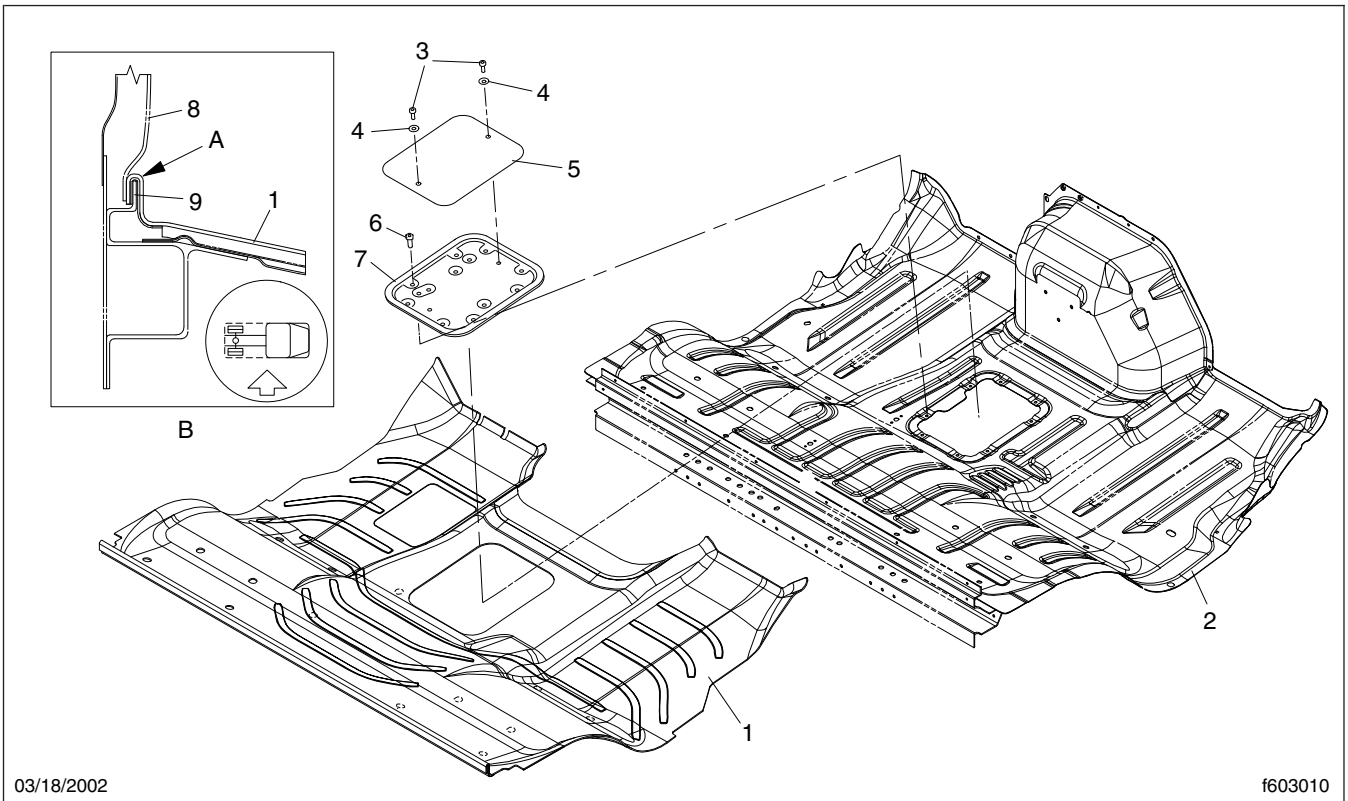
   Work your way across the width of the cab to remove both the U-channel and the floor mat.
8. Remove the floor mat and the attached insulation from the cab.

Installation

1. Put the floor mat and the attached insulation in place in the cab, then install it and the U-channel over the metal lip along the back wall.
2. If equipped with an automatic transmission, connect the wiring to the transmission ECU, then install the transmission cover plate and rubber mat. Tighten the fasteners firmly.

   If equipped with a standard transmission, install the metal cover plate, the rubber mat, and then the shift lever boot.
3. Install the kick panels forward of the doors.
4. Install the treadplates in the doorways.
5. Install the seat(s) and the seat belts. For instructions on installing a bench seat, see **Group 91** in this manual.
6. Connect the batteries.
7. Remove the chocks from the tires.

Upholstery Panels Replacement



A. Floor fits over this lip.

B. Cross-Sectional View (rear of cab)

1. Floor Mat
2. Cab Deck Structure
3. Torx-head Screw, 1/4–20
4. Washer
5. Rubber Mat
6. Torx-head Screw, M6 (8 qty.)
7. Cover Plate
8. Rear Wall Upholstery Panel
9. Steel Lip (plastic U-channel not shown)

Fig. 2, Floor Mat Installation (equipped with automatic transmission)

Contents

Dash Panels Removal and Installation

Removal

See **Fig. 1** for the removal and installation procedures.

1. Park the vehicle on a level surface, shut down the engine, set the parking brake, and chock the tires.
2. Disconnect the batteries at the negative terminal.
3. Remove the HVAC lower cover by removing the three Torx-head screws holding it in place.
4. Remove the HVAC control head assembly by removing the Torx-head screws holding it in place.
5. Remove the trim plate panel.
6. Remove the right-hand dash panel assembly.
   - 6.1 Remove the Torx-head screws holding the panel in place.
   - 6.2 Disconnect the wiring for the dome light switch.

   NOTE: The dome light switch is on the side of the panel assembly and is activated by the door.

   - 6.3 Pry up the upper edge of the dash panel to release the clips from the slots.
   - 6.4 Remove the right-hand dash panel assembly.
7. Remove the top cover by removing the Torx-head screws holding it in place.
8. Remove the cup holder assembly.
   - 8.1 Remove the screws holding the assembly in place.
   - 8.2 Lift the assembly out and disconnect the wiring from the back of the HVAC controls.
   - 8.3 Remove the cup holder assembly.

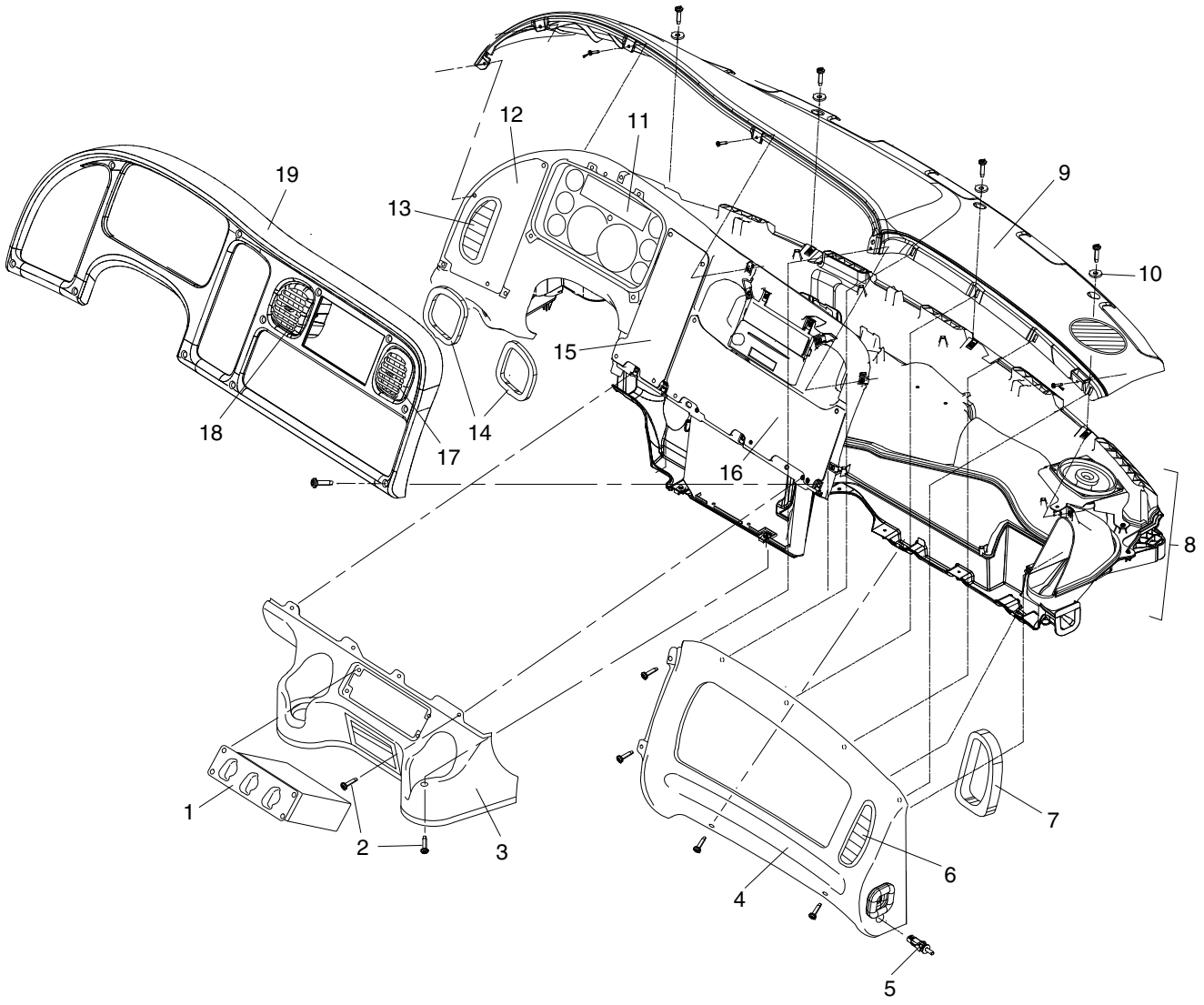
Installation

1. Install the cup holder assembly.
   - 1.1 Put the cup holder assembly in place and connect the wiring to the back of the HVAC controls.
   - 1.2 Install the Torx-head screws.
2. Install the top cover. Tighten the Torx-head screws firmly.
3. Install the right-hand dash panel assembly.
   - 3.1 Put the panel in place.
   - 3.2 Connect the wiring for the dome light switch on the side of the panel assembly.
   - 3.3 At the upper edge of the right-hand dash panel, push the clips into their slots.
   - 3.4 Install the Torx-head screws. Tighten firmly.

NOTE: The right-hand dash panel must be installed before you can install the trim plate panel.

4. Install the trim plate panel. Tighten the Torx-head screws firmly.
5. Install the lower HVAC panel. Tighten the Torx-head screws firmly.

Dash Panels Removal and Installation



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NOTE: HVAC lower cover not shown.

1. HVAC Control Head Assembly
2. Torx®-Head Screw
3. Cup Holder Assembly
4. Right-Hand Dash Panel Assembly
5. Dome Light Switch
6. Right-Hand Window Outlet Louver
7. Duct Seal
8. Tray Assembly with HVAC Ducting
9. Top Cover
10. Washer
11. Instrument Cluster, ICU 3
12. Gauge Panel
13. Left-Hand Window Outlet Louver
14. Duct Seal
15. Gauge Panel
16. Gauge Panel
17. Right-Hand Dash Outlet Louver
18. Left-Hand Dash Outlet Louver
19. Trim Plate Panel

Fig. 1, Dash Panels

Tray Assembly Removal and Installation

Removal

The tray assembly functions as a dash support, wiring harness carrier, and as the ducting assembly for the heater/air conditioning system. It is attached to the cab frontwall.

1. Park the vehicle on a level surface, shut off the engine, set the parking brakes, and chock the tires.
2. Remove all the dash panels. See **Subject 100** for instructions.
3. As applicable, remove or disconnect the dash gauges, instruments, and controls.
4. Remove the upper dash panel assembly framework.
   - 4.1 Disconnect the ignition wiring.
   - 4.2 Disconnect and remove the dome light switch.
5. Tilt the hood.
6. Partially drain the radiator to below the level of the surge tank.
7. Remove the surge tank. See **Group 20** for instructions.
8. Separate the bulkhead electrical connector in the engine compartment by loosening the centerbolt. Push the cab end of the wiring harness through the frontwall and into the cab.
9. From inside the cab, mark, then disconnect all the wiring and air lines on the dash. Cut and remove any tie-straps holding the wiring or air lines in place.
10. Remove the left-hand kick panel and the tread plate, then mark and disconnect the ground wires to the left of, and below the steering column.
11. Remove the upper and lower steering column covers.
12. Disconnect the steering column by removing the four fasteners holding it to the mounting bracket. Do not disconnect the U-joint. Let the steering wheel and the column rest on the driver's seat.
13. Remove the two fasteners holding the tray assembly to the steering column mounting bracket.
14. Remove the one fastener attaching the tray assembly to the top of the HVAC unit.
15. Remove the Christmas tree-type fasteners holding the tray assembly to the wiring harness bracket.
16. Remove the two fasteners holding the tray assembly to the center bracket where the cup holder assembly was attached.
17. From the engine compartment, remove the four fasteners attaching the tray assembly to the frontwall.
    - 17.1 Remove the fasteners attaching the air cleaner to the mounting bracket and the rain tray. Remove the air cleaner.
    - 17.2 Remove the remaining fasteners attaching the tray assembly to the frontwall.
18. Remove the tray assembly from the cab.

Installation

1. Position the tray assembly in place in the cab, making sure the holes in the tray assembly line up with those in the frontwall.
2. Install the four fasteners attaching the assembly to the frontwall. Don't tighten them fully until they are all installed, then tighten them firmly.
3. Install the fasteners inside the cab (do not tighten fully until all are installed):
   - two at the steering column bracket
   - two at the edge of where the cup holder assembly was removed
   - one on top of the HVAC unit.
4. Install the bulkhead connector harness in the frontwall opening.

   As previously marked, connect the main harness plugs.
5. Attach the steering column to its bracket. Tighten the fasteners 25 lbf·ft (34 N·m).
6. Connect the ground wires to the stud below and to the left of the steering column.
7. Secure all the wiring with tie-straps.
8. Install the upper dash panel frame assembly.
   - 8.1 Connect the ignition wiring.

Tray Assembly Removal and Installation

8.2 Install and connect the switch for the dome light.

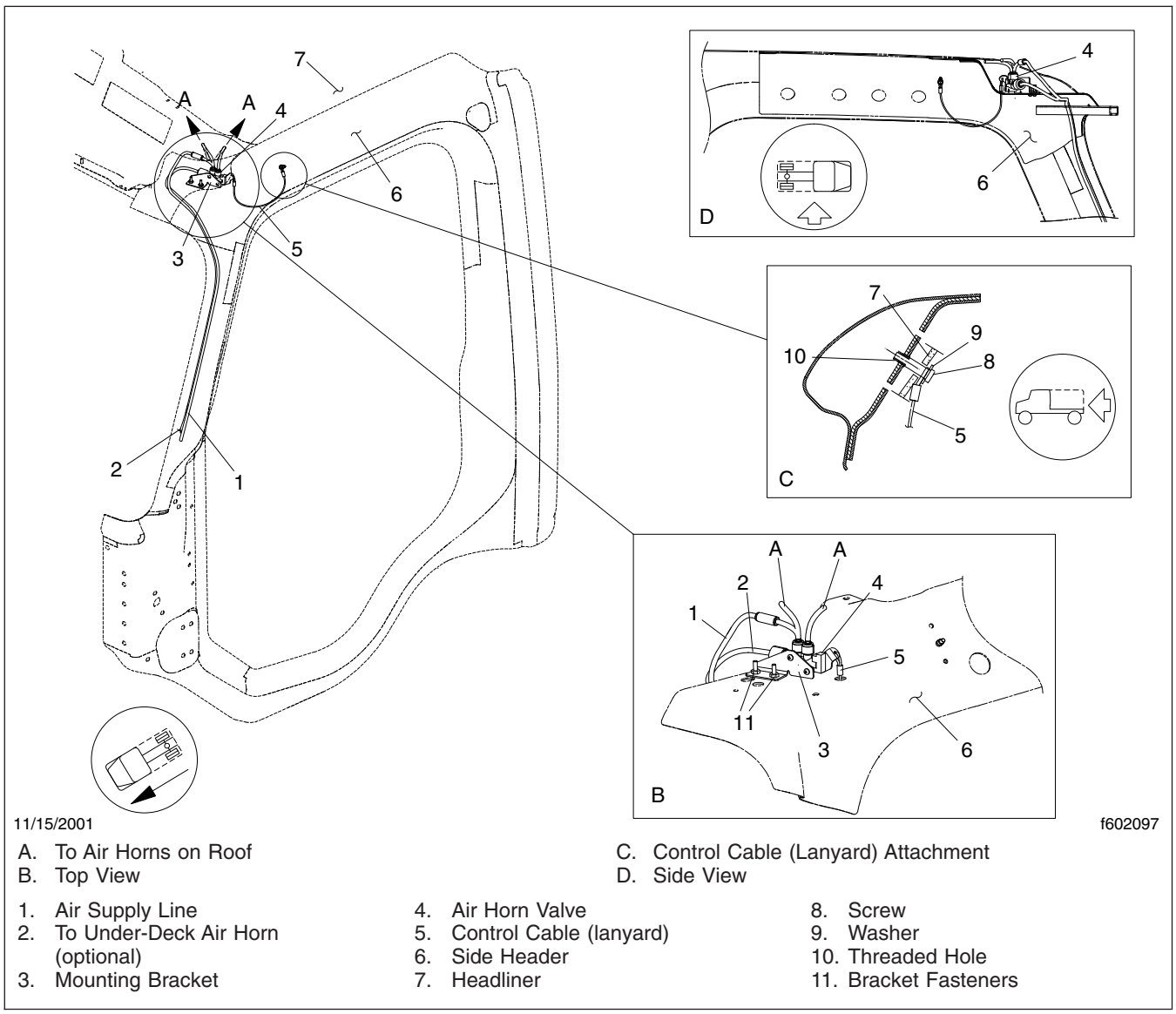
9. As applicable, put all air lines and wiring through the openings in the dash panel frame assembly.
10. Install and connect the dash gauges, instruments, and controls.
11. Install the dash panels. See **Subject 100** for instructions.
12. Install the left-hand kick panel and tread plate.
13. Install the upper and lower steering column covers.
14. Install the cup holder assembly.
15. From outside the vehicle, install the air cleaner. See **Section 09.01**, Subject 110, for instructions.
16. Install the surge tank. See **Group 20** for instructions.
17. Fill the radiator through the surge tank.
18. Lower the hood.
19. Connect the batteries.
20. Remove the chocks from the tires.

Contents

Air Horn Valve Removal and Installation

Replacement

1. Apply the parking brake and chock the tires.
2. Drain the air supply, and disconnect the batteries.
3. Remove the screw and washer that hold the end of the control cable (lanyard) in place. See **Fig. 1**.
4. Remove the headliner.
5. Mark the air lines for later reference, then disconnect them from the air horn valve.
6. Remove the fasteners that attach the air horn valve to the mounting bracket. Remove the valve.
7. If necessary, disconnect the control cable (lanyard) from the air horn valve.
8. If applicable, connect the control cable (lanyard) to the new air horn valve.



A. To Air Horns on Roof
B. Top View
C. Control Cable (Lanyard) Attachment
D. Side View

1. Air Supply Line
2. To Under-Deck Air Horn (optional)
3. Mounting Bracket
4. Air Horn Valve
5. Control Cable (lanyard)
6. Side Header
7. Headliner
8. Screw
9. Washer
10. Threaded Hole
11. Bracket Fasteners

Fig. 1, Air Horn Valve Installation

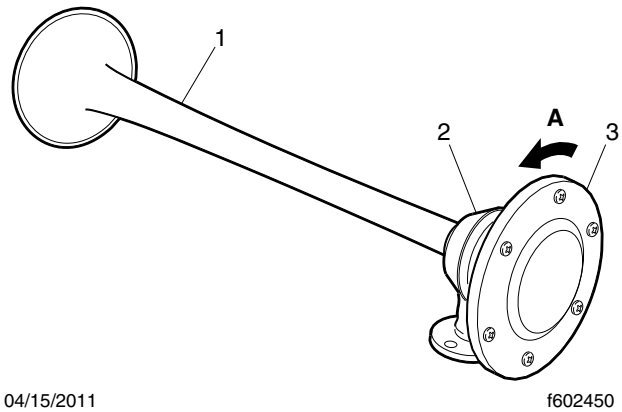
Air Horn Valve Removal and Installation

9. Attach the air horn valve to the mounting bracket.
10. As previously marked, connect the air lines to the air horn valve.
11. Install the headliner.
12. Using the screw and washer previously removed, attach the end of the control cable (lanyard) to the side header. Make sure the screw threads into the hole in the steel panel behind the headliner.
13. Connect the batteries.
14. Start the engine, and refill the air supply.
15. Test the horn.

Air Horn Adjustment, Grover Stuttertone

Adjustment

1. Apply the parking brake and chock the tires.
2. Run the engine to build vehicle air pressure to at least 100 psi (690 kPa), then shut off the engine, apply the parking brakes, and chock the tires.
3. Rotate the sound unit counterclockwise (as viewed from the back of the horn) to loosen the horn; see **Fig. 1**.



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A. Rotate the sound unit counterclockwise to loosen the horn.

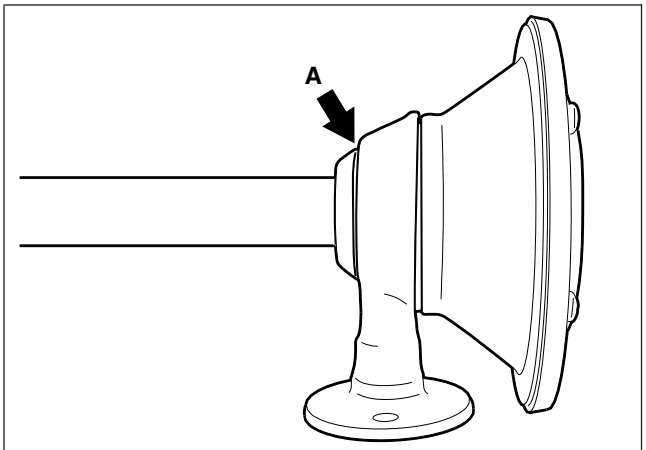
1. Bell
2. Mounting Ring
3. Sound Unit

Fig. 1, Loosening the Horn

4. Rotate the bell/bushing assembly until there is approximately one thread visible at the top front of the mounting ring. The bell/bushing assembly may need to be rotated in either direction. See **Fig. 2**.
5. Test the horn.

   If the horn sounds sounds "breathy" with a lot of air sound, the back of the bell is too far from the diaphragm. Loosen the sound unit, then rotate the bell 1/8 turn clockwise to make more of the bell stick out the back of the mounting ring. Tighten the sound unit and test the horn.

   If the horn sounds "pinched" or "squeaky," the bell is too close to the diaphragm. Loosen the sound unit, then rotate the bell 1/8 turn counterclockwise to move it away from the diaphragm. Tighten the sound unit and test the horn.



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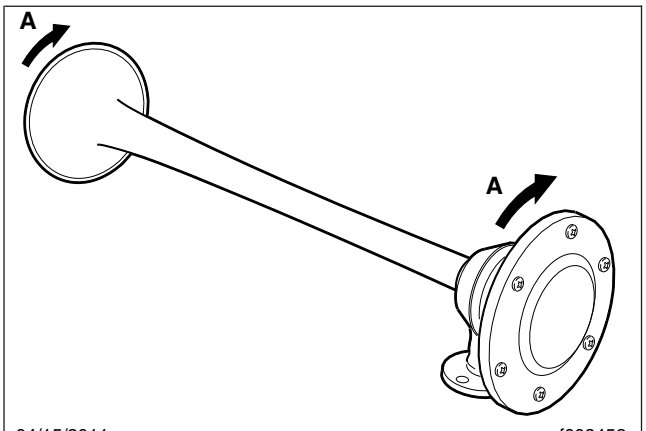
A. Rotate the bell/bushing assembly until there is approximately one thread visible at the top front of the mounting ring.

Fig. 2, Adjusting the Horn

NOTE: It may be necessary to loosen and adjust the horn several times to get desired results.

6. After the horn is adjusted to your satisfaction, tighten the horn by rotating the bell and the sound unit simultaneously in a clockwise direction (as viewed from the back of the horn); see **Fig. 3**.



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A. Rotate the bell and sound unit simultaneously in a clockwise direction, while the mounting ring is stationary.

Fig. 3, Tightening the Horn

Air Horn Adjustment, Grover Stuttertone

IMPORTANT: To preserve the desired gap between the bell and the diaphragm, the bell and the sound unit must be rotated together when tightening the air horn.

Contents

Safety Precautions

1. Park the vehicle on a level surface. Shut down the engine. Set the parking brake, and chock the front and rear tires.
2. Tilt the hood.
3. Disconnect the batteries. Attach the welding ground strap as close to the work being done as safely possible.

⚠ CAUTION

Before performing any electric welding on a vehicle, disconnect the battery power and ground cable, and disconnect all connectors from any electronic control units or similar devices installed on the vehicle. Electric currents produced during electric welding can damage various electrical components on the vehicle, which could result in malfunction of the components.

4. Disconnect all electronic control units and similar devices.

Contents

General Information

The cab rear air-suspension system absorbs road shocks better than a solid-mount system, and thus provides a smoother ride for cab occupants and cab-mounted equipment.

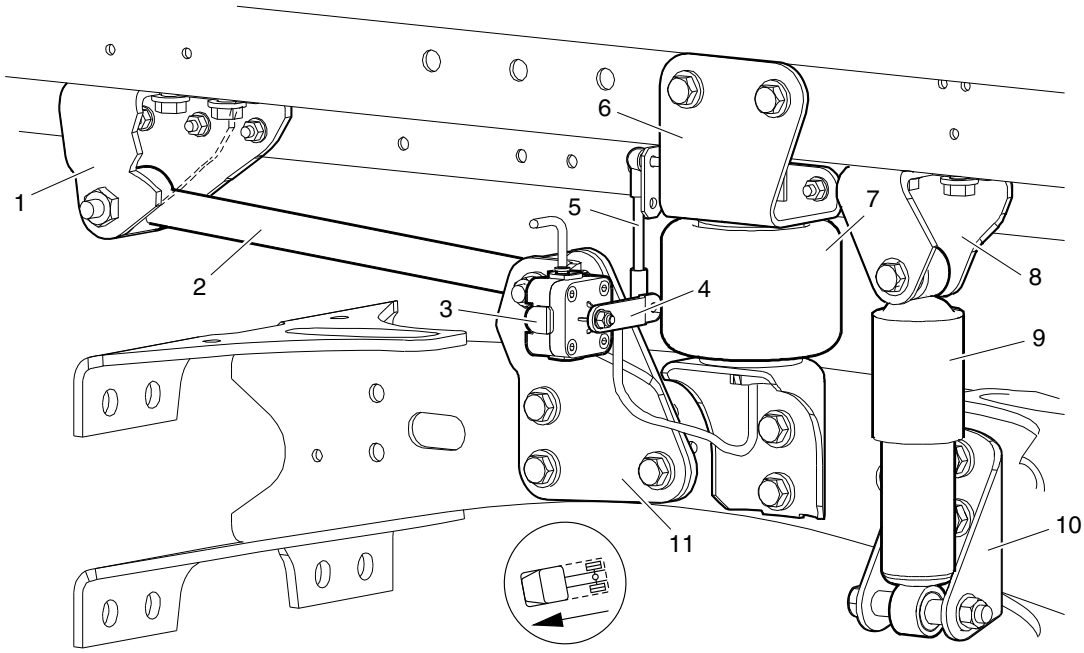
Several different cab air suspension installations are used on the M2, depending on the size of the cab. All installations consist of an air spring, a height-control valve, a lateral control rod, a shock absorber, and a vertical linkage; see **Fig. 1**.

Height-Control Valve

NOTE: If a leak occurs in the cab air-suspension system, a pressure protection valve (located at the secondary air tank, which supplies the air to the height-control valve) will maintain a minimum pressure of about 65 psi (450 kPa) in the vehicle secondary air system.

All of the air in the cab air-suspension system is admitted through or exhausted from the height-control valve. It mounts on the control rod bracket, which is attached to the frame rail crossmember. The height-control valve has a horizontal control lever, the outboard end of which is connected to the vertical linkage. The upper end of the vertical linkage is attached to a bracket on the cab underbody.

When the load on the cab increases, the dimension between the cab and the crossmember decreases, causing the vertical linkage to push downward on the end of the control lever. This turns the height-control



1. Control Rod Cab Bracket
2. Lateral Control Rod
3. Height-Control Valve
4. Horizontal Control Lever
5. Vertical Linkage
6. Air Spring Upper Bracket
7. Air Spring
8. Shock Absorber Upper Bracket
9. Shock Absorber
10. Shock Absorber Lower Bracket
11. Control Rod Chassis Bracket

Fig. 1, Cab Rear Air Suspension Installation

Air Springs

The top of the air spring is mounted to a bracket on the cab underbody, and the bottom is mounted to a bracket on a frame rail crossmember. Together with the height-control valve, the air spring compensates for changes in cab load by maintaining the correct cab height at the rear of the cab.

valve shaft, which activates the height-control valve. Air flows through the valve and into the air springs until the pressure in the springs raises the cab to the correct height. At this height, the control lever and the control shaft are returned to their neutral positions, closing the intake air supply.

When the load on the cab decreases, the rear of the cab rises, causing the vertical linkage to pull up on the end of the horizontal linkage. Turning the height-control valve control shaft in this direction activates an exhaust port in the valve. This allows air pressure in the air springs to decrease until the cab is lowered to the correct height. Again, the control lever and control shaft are returned to their neutral positions, and air flow is stopped.

When the vehicle is in motion, small and abrupt movements of the cab will occur, resulting in small or abrupt movements of the control lever. These movements of the control lever do not activate the height-control valve because of a built-in free-travel range: a gap between the height-control valve control shaft and both of the valve cores (intake and exhaust).

Changes in load that result in larger movements of the control lever will activate the height-control valve. Such changes in load occur when occupants or heavy items are added to or removed from the cab. Also, when the vehicle is moving forward at high speed or in a high headwind, a major change in load occurs from the downforce applied to an optional air shield or air fairing. When these changes in load occur, the cab air-suspension system will adjust the height at the rear of the cab.

Lateral Control Rod

The lateral control rod limits the side-to-side motion of the rear of the cab. The inboard end of the control rod is mounted on the crossmember bracket.

Shock Absorbers

The shock absorbers control the air spring and cab suspension movement, and reduce the amount of oscillation in the cab suspension system.

Fitting Leakage Repair

1. With the vehicle parked on a level surface, apply the parking brakes and chock the tires.

⚠ WARNING

Do not disconnect any air lines in the cab suspension system without first blocking the cab securely. If the cab isn't securely blocked, disconnecting an air line could cause the cab to fall abruptly, possibly resulting in serious injury.

2. Place blocks between the frame and the bottom of the cab to keep the cab in position when the air spring is deflated.
3. Drain all air from the air tanks.

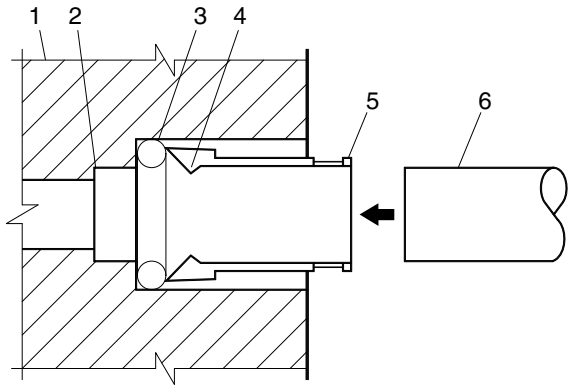
⚠ WARNING

Air lines under pressure can whip dangerously if disconnected. Drain all air from the air tanks before disconnecting air lines. Disconnecting pressurized air lines can cause personal injury and/or property damage.

4. Remove the nut and washer that attach the vertical linkage to the horizontal control lever. Disconnect the vertical linkage from the control lever.
5. Rotate and hold the control lever up until all air is exhausted from the air spring.
6. Push the collar of the quick-connect fitting into the fitting body with a 1/4-inch (7-mm) open-end wrench; see **Fig. 1**. With the collar pushed into the fitting, pull the tubing from the fitting. The fitting should easily release the tubing.

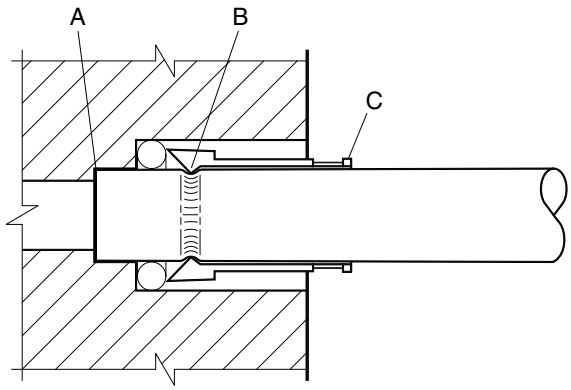
NOTE: Find the mark on the tubing, about 1/4 inch (7 mm) from the end, where the collar clamped the tubing; see **Fig. 2**. If this mark is less than 1/4 inch (7 mm) from the end of the tubing, the fitting was not assembled correctly and could have caused an air leak.

7. Inspect the end of the tubing for paint or debris that could prevent full insertion of the tubing into the fitting. Remove any dirt from the tubing and fitting.
8. Check that the end of the tubing is cut square. If the tubing is cut at an angle, the fitting will not seal correctly; cut the end of the tubing at an angle of 90 degrees.
9. Insert the squared-end of the tubing into the fitting. An initial resistance is felt when the tubing touches the clamping ring section of the collar. Push the tubing past this resistance another 1/4 inch (7 mm) or so until the tubing is fully against the shoulder.



1. Fitting Body
2. Shoulder
3. Release Ring
4. Clamping Ring
5. Collar
6. Nylon Tube

Fig. 1, Parts of the Quick-Connect Fitting



A. Square end of the tube against the shoulder.
B. The collar clamps the tube here.
C. Push the collar to release the tube.

Fig. 2, Correctly Installed Quick-Connect Fitting

Quick-Connect Fittings

10. Tug on the air tubing to ensure the tubing is clamped in the collar.
11. Align the vertical linkage with the control lever, and install the washer and nut.
12. Run the engine to build vehicle air pressure to at least 100 psi (690 kPa). Check for air leaks.
13. Remove the blocks that were installed to support the cab.
14. Remove the chocks.

Height-Control Valve Checking

It is normal to hear air leaking from the height-control valve for as much as five minutes after getting out of the vehicle. This air leakage, due to a decreased load on the cab suspension, is just the height-control valve exhausting air from the air spring to reach the neutral position.

The height-control valves used on the M2 are Barksdale valves. Two methods are available to check the operation of the Barksdale height-control valves. A leak in the valve may be discovered without using a test kit, but a test kit is necessary to determine if the valve has an unacceptable rate of leakage.

Some Barksdale height-control valves have been returned for warranty because the four bolts in the valve housing were overtightened, often, enough to crack the valve housing. These bolts should not be loose, and should not normally require tightening, as there are no serviceable parts in the valve.

IMPORTANT: To prevent voiding the warranty on Barksdale height-control valves, note the following:

- Do not overtighten the bolts in the Barksdale height-control valve housing if you detect leaks in the housing. The bolts should not be loose, and should not require tightening. Only if necessary, tighten the valve housing bolts 45 lbf·in (500 N·cm). Any damage to the valve housing will void the warranty.
- If it is necessary to remove a Barksdale height-control valve from a mounting bracket, always hold the valve-side mounting studs in place with an Allen wrench while loosening or tightening the nuts that attach the valve to the bracket. Because the mounting studs are threaded into the valve body, loosening the nuts without holding the studs can tighten the studs, crushing the valve body and damaging the valve. Conversely, tightening the nuts without holding the studs can back the studs out, causing a separation of the two halves of the valve body, and possibly a leak.
- Do not attempt to disassemble the Barksdale valve body or the control lever. There are no serviceable parts in the valve, and any disassembly will void the warranty.

Checking the Height-Control Valve Without Using a Test Kit

⚠ WARNING

Keep your hands and all objects away from the area under and around the cab when removing the pressure from the air system. Parts will move as the air is released and can cause personal injury or damage to any objects that are between the moving parts.

1. With the vehicle parked on a level surface, run the engine to build vehicle air pressure to at least 100 psi (690 kPa), then shut off the engine, apply the parking brakes, and chock the tires.
2. After shutting off the engine, wait 5 to 10 minutes for the air suspension system to equalize.

NOTE: Normal operation of the height-control valve requires a maximum of 10 minutes to settle. Any air leakage during this time is considered normal, and does not indicate a defective valve.

3. Disconnect the vertical linkage from the horizontal control lever.
4. Pull the control lever up about 45 degrees for 6 to 8 seconds. If air passes through the valve, that section of the valve is okay.
5. Return the control lever to the neutral position.
6. Push the control lever down about 45 degrees for 6 to 8 seconds. If the air spring inflates, that section of the valve is okay.
7. Return the control lever to the neutral position. If the air stops again in the neutral position, the valve is working correctly.
8. If the valve works as stated in all of the above steps, no further checking is needed. Connect the vertical linkage to the control lever, then tighten the linkage nut.

NOTE: If a leak is detected, go to "Checking the Height-Control Valve Using a Test Kit." Barksdale valves have an acceptable leakage rate of 3 cubic inches (50 cc) per minute. You can de-

termine if a leak is acceptable only by using the Barksdale test kit.

9. Remove the chocks.

Checking the Height-Control Valve Using a Test Kit

⚠ WARNING

Keep your hands and all objects away from the area under and around the cab when removing the pressure from the air system. Parts will move as the air is released and can cause personal injury or damage to any objects that are between the moving parts.

NOTE: The Barksdale field test kit is designed to be used with the height-control valve installed on the vehicle.

NOTE: Refer to **Specifications 400** for information on ordering this Barksdale height-control valve test kit.

1. If not already done, park the vehicle on a level surface, apply the parking brakes, and chock the tires.
2. Run the engine to build vehicle air pressure to at least 100 psi (690 kPa).
3. Shut off the engine and wait 5 to 10 minutes for the air suspension system to equalize.

NOTE: Normal operation of the height-control valve requires a maximum of 10 minutes to settle. Any air leakage during this time is considered normal, and does not indicate a defective valve.

4. Check the rubber exhaust flapper at the back of the valve housing for leaks. Use a soapy solution.
5. Disconnect the vertical linkage from the control lever.
6. Rotate and hold the control lever up at about 45 degrees to exhaust air from the air springs.
7. Disconnect the air lines from the air spring ports on the height-control valve. Leave the elbow fittings (if equipped) in place. Install a Parker plug into each air spring port (or elbow fitting); see **Fig. 1**.
8. If a flapper is present on the exhaust port of the height-control valve, remove it using needlenose pliers.
9. Clean the surface around the exhaust port, then install the test fitting into the exhaust port. The centering pin on the fitting must align with the slot on the exhaust port. Rotate the test fitting 45 degrees clockwise to lock it in place; see **Fig. 1**.
10. Connect one end of the air hose from the kit to the test connector on the exhaust port, and the other end to the test gauge.
11. Check the height-control valve in the fill mode, as follows.
    - 11.1 Rotate the valve control lever down 45 degrees from the horizontal to the fill position.
    - 11.2 Press the reset button on the test gauge.
    - 11.3 Observe the test gauge for 30 seconds. Refer to **Fig. 2** for the maximum allowable exhaust pressure change versus inlet pressure.

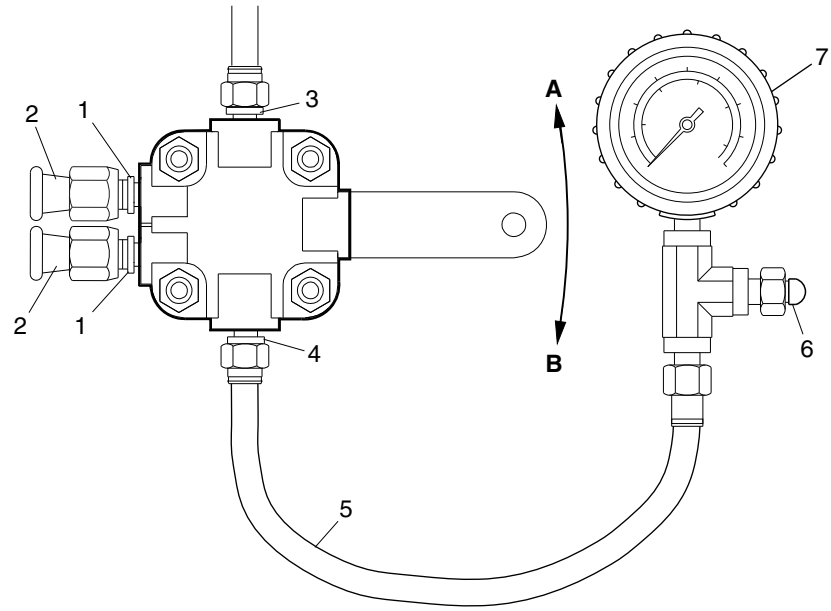
      The valve is not working correctly if the gauge pressure reading exceeds the maximum allowable within 30 seconds.

      If the gauge reads less than the maximum allowable pressure change in 30 seconds, the valve is okay.

NOTE: The test gauge will register the exhausting air. *This does not indicate a defective valve.*

12. Check the height-control valve in the exhaust mode, as follows.
    - 12.1 Rotate the valve control lever up 45 degrees from the horizontal to the exhaust position.
    - 12.2 Press the reset button on the test gauge.
    - 12.3 Observe the test gauge for 30 seconds. Refer to **Fig. 2** for the maximum allowable exhaust pressure change versus inlet pressure.

      The valve is not working correctly if the gauge pressure reading exceeds the maximum allowable within 30 seconds.



A. Exhaust
B. Fill

1. Air Spring Port
2. Parker Plug
3. Air Intake Port
4. Exhaust Port Test Fitting
5. Air Line
6. Reset Button
7. Test Gauge Assembly

Fig. 1, Test Connections

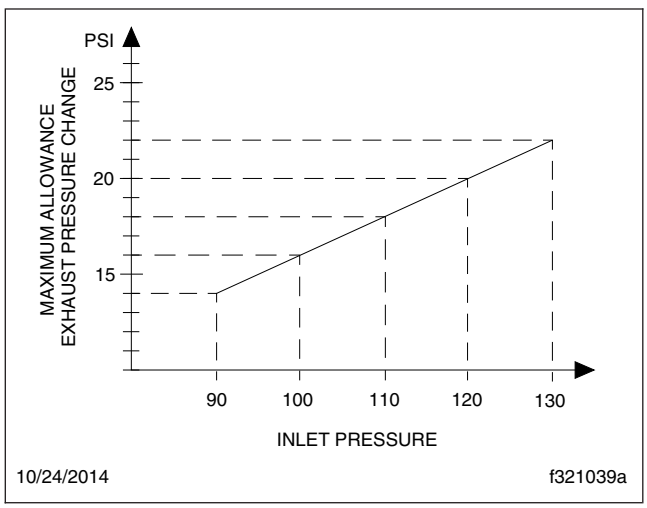


Fig. 2, Inlet Pressure vs. Exhaust Pressure Change in 30 Seconds

If the gauge reads less than the maximum allowable pressure change in 30 seconds, the valve is okay.

NOTE: The test gauge will register the exhausting air. *This does not indicate a defective valve.*

13. Disconnect the test gauge and connector from the valve exhaust port.
14. If the height-control valve is defective, replace it; see **Subject 120**.
15. Install the flapper on the exhaust port by pressing it into place.
16. Remove the two Parker plugs from the air spring ports, and connect the air lines to the air spring ports (or elbow fittings). Connect the vertical linkage to the height-control valve control lever. The ride height will automatically return to the correct position.
17. Remove the chocks.

Replacement

IMPORTANT: Before replacing the height-control valve, perform the steps in **Subject 110** to see if the height-control valve is actually damaged or just out of adjustment.

1. With the vehicle parked on a level surface, apply the parking brakes and chock the tires.

⚠ WARNING

Do not disconnect any air lines in the cab suspension system without first blocking the cab securely. If the cab isn't securely blocked, disconnecting an air line could cause the cab to fall abruptly, possibly resulting in serious injury.

2. Place blocks between the frame and the bottom of the cab, or use jack stands to keep the cab in position when the air spring is deflated.
3. Drain all air from the air tanks.

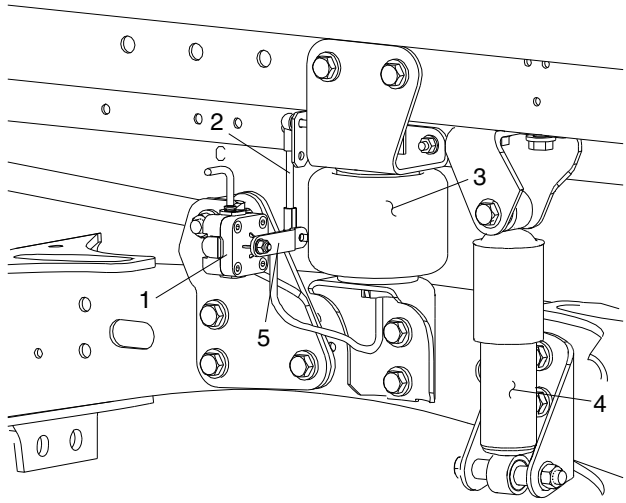
⚠ WARNING

Air lines under pressure can whip dangerously if disconnected. Drain all air from the air tanks before disconnecting air lines. Disconnecting pressurized air lines can cause personal injury and/or property damage.

4. Remove the nut and washer that attach the vertical linkage to the horizontal control lever. Disconnect the vertical linkage from the horizontal control lever; see **Fig. 1**.
5. Rotate and hold the horizontal-control lever up until all air is exhausted from the air spring.
6. Mark the air tubing to the height-control valve for later reference, then disconnect the tubing.

⚠ CAUTION

When removing or loosening a Barksdale height-control valve from a mounting bracket, always hold the valve-side mounting studs in place with an Allen wrench while loosening or tightening the nuts that attach the valve to the bracket. Because the mounting studs are threaded into the valve body, loosening the nuts without holding the studs can tighten the studs, which can crush the valve body and damage the valve. Conversely, tightening the nuts without holding the studs can back the studs out, causing a separation of the two halves of the valve body, and possibly a leak.



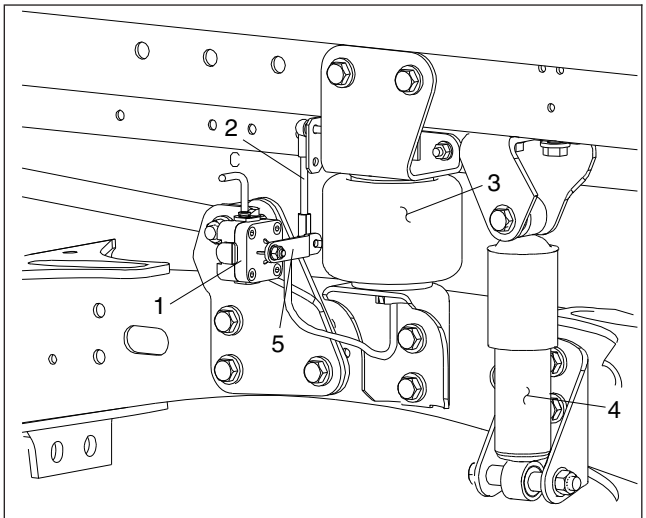
1. Height-Control Valve
2. Vertical Linkage
3. Air Spring
4. Shock Absorber
5. Horizontal Control Lever

Fig. 1, Cab Height-Control Valve

7. While holding the height-control valve mounting studs in place with an Allen wrench, remove the nuts and washers that attach the valve to the mounting bracket. Remove the height-control valve.
8. Position the new height-control valve on the height-control bracket. While holding the height-control valve mounting studs in place with an Allen wrench, install the nuts and washers, and tighten 45 lbf·in (500 N·cm). Do not overtighten.
9. Connect the air tubing to the height-control valve.
10. Align the vertical linkage with the horizontal control lever and install the washer and nut.
11. Start the engine and run it until air pressure builds to at least 100 psi (690 kPa).
12. Check all air tubing and fittings for leaks.
13. Remove the cab supports.
14. Remove the chocks.

Shock Absorber Replacement

1. Park the vehicle on a level surface and set the parking brake. Chock the tires.
2. Make sure the cab suspension is fully aired up and at normal ride height. Shut down the engine.
3. Remove the nut, washers, and bolt that attach the shock absorber to the mounting bracket on the cab. See **Fig. 1**.



1. Height-Control Valve
2. Vertical Linkage
3. Air Spring
4. Shock Absorber
5. Control Lever

Fig. 1, Cab Height-Control Valve

4. Remove the nut, washers, and bolt that attach the shock to the mounting bracket on the cross-member, then remove the shock.
5. Install the shock in the lower mounting bracket and install the bolt, washers, and nut.
6. Position the upper end of the shock in the mounting bracket and install the bolt, washers, and nut.
7. Tighten the upper and lower nuts 45 lbf·ft (61 N·m).

Replacement

1. With the vehicle parked on a level surface, apply the parking brakes and chock the tires.

⚠ WARNING

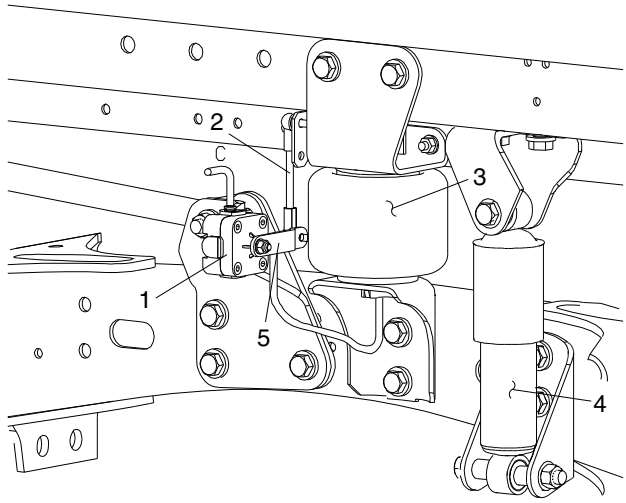
Do not disconnect any air lines in the cab suspension system without first blocking the cab securely. If the cab isn't securely blocked, disconnecting an air line could cause the cab to fall abruptly, possibly resulting in serious injury.

2. Place blocks between the frame and the bottom of the cab, or use jack stands to keep the cab in position when the air spring is deflated.
3. Drain all air from the air tanks.

⚠ WARNING

Air lines under pressure can whip dangerously if disconnected. Drain all air from the air tanks before disconnecting air lines. Disconnecting pressurized air lines can cause personal injury and/or property damage.

4. Remove the nut and washer that attach the vertical linkage to the horizontal control lever. Disconnect the vertical linkage from the control lever; see **Fig. 1**.
5. Rotate and hold the horizontal control lever up until all air is exhausted from the air spring.
6. Disconnect the supply air tubing from the bottom of the air spring. Push in the brass ring at the connection, then pull the air line straight out. If the new air spring will not be installed immediately, cover the open end of the air tubing to prevent dirt or other foreign material from entering.
7. Insert a screwdriver between the upper bracket and the air spring, and pry the air spring away from the bracket to pop the air spring tangs out of the bracket. Repeat the procedure for the bottom of the air spring, then pull the air spring out enough to access the supply air tubing.
8. Install the new air spring by snapping it into the bottom bracket first, then the top bracket.
9. Remove the cover from the air line, then connect it by pushing it into the fitting on the bottom of the air spring. Push the air line all the way in. If it is not pushed all the way in, the connection will leak air. Tug on the air line to seat it completely.
10. Align the vertical linkage with the control lever and install the washer and nut.
11. Start the engine, and run it until air pressure builds to at least 100 psi (690 kPa). Check for air leaks at the air spring.
12. Remove the cab supports.
13. Remove the chocks.

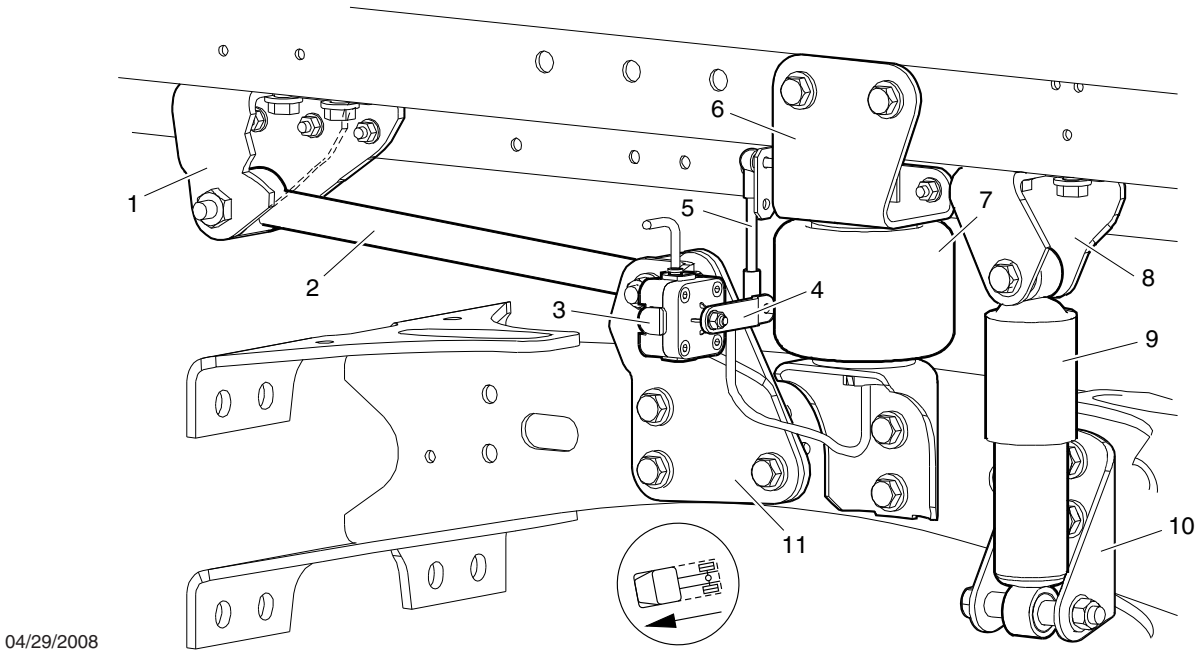


1. Height-Control Valve
2. Vertical Linkage
3. Air Spring
4. Shock Absorber
5. Horizontal Control Lever

Fig. 1, Cab Height-Control Valve

Replacement

1. With the vehicle parked on a level surface, apply the parking brakes and chock the tires.
2. Place blocks between the frame and the bottom of the cab, or use jack stands to keep the cab in position when the lateral control rod is removed.
3. Remove the nut, washers, and bolt that attach the lateral control rod to the control rod cab bracket; see **Fig. 1**.



1. Control Rod Cab Bracket
2. Lateral Control Rod
3. Height-Control Valve
4. Horizontal Control Lever
5. Vertical Linkage
6. Air Spring Upper Bracket
7. Air Spring
8. Shock Absorber Upper Bracket
9. Shock Absorber
10. Shock Absorber Lower Bracket
11. Control Rod Chassis Bracket

Fig. 1, Cab Rear Air Suspension Installation

4. Remove the nut, washers, and bolt that attach the lateral control rod to the control rod chassis bracket, then remove the lateral control rod.
5. Attach the inboard end of the new lateral control rod in the chassis bracket, using the bolt, washers, and nut.
6. Position the outboard end of the lateral control rod in the cab bracket and install the bolt, washers, and nut.
7. Tighten the inboard and outboard nuts 45 lbf·ft (61 N·m).
8. Remove the cab supports.
9. Remove the chocks.

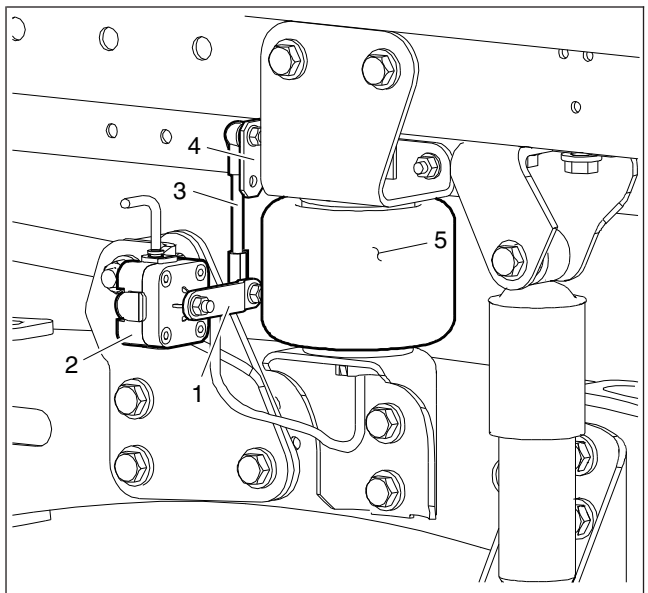
Replacement

1. With the vehicle parked on a level surface, apply the parking brakes and chock the tires.
2. Run the engine to build vehicle air pressure to at least 100 psi (690 kPa), then shut off the engine.

⚠ WARNING

Do not disconnect the vertical linkage in the cab suspension system without first blocking the cab securely and inserting a pin in the neutral-position hole of the height-control valve and the horizontal control lever. If the cab is not securely blocked, dislodging the pin and moving the control lever could cause the cab to fall or rise abruptly, possibly resulting in serious injury.

3. Place blocks between the frame and the bottom of the cab or use jack stands to keep the cab in position when the air spring is deflated.
4. Insert a 5/32-inch (4-mm) drill bit into the neutral position hole of the height-control valve and horizontal control lever.
5. Disconnect the upper end of the vertical linkage. Depending on the vehicle configuration, it is attached to the cab underbody, or to a vertical linkage bracket on the cab underbody; see **Fig. 1**.
6. Remove the nut and washer that attach the vertical linkage to the horizontal control lever. Disconnect the vertical linkage from the control lever.
7. Align the new vertical linkage between the control lever and the bracket on the cab underbody. Attach the lower end of the linkage to the control lever, using the nut and washer.
8. Attach the upper end of the vertical linkage to the cab underbody, or to the vertical linkage bracket on the cab underbody.
9. Remove the drill bit or pin from the height-control valve.
10. Remove the cab supports.
11. Remove the chocks.



1. Horizontal Control Lever
2. Height-Control Valve
3. Vertical Linkage
4. Vertical Linkage Bracket
5. Air Spring

Fig. 1, Cab Height-Control Valve

Checking the Cab Height-Control System for Air Leaks

⚠ WARNING

Keep your hands and all objects away from the area under and around the cab when removing the pressure from the air system. Parts will move as the air is released and can cause personal injury or damage to any objects that are between the moving parts.

IMPORTANT: To prevent voiding the warranty on Barksdale height-control valves, note the following:

- Do not overtighten the bolts in the Barksdale height-control valve housing if you detect leaks in the housing. The bolts should not be loose, and should not require tightening. Only if necessary, tighten the valve housing bolts 45 lbf·in (500 N·cm). Any damage to the valve housing will void the warranty.
- If it is necessary to remove a Barksdale height-control valve from a mounting bracket, always hold the valve-side mounting studs in place with an Allen wrench while loosening or tightening the nuts that attach the valve to the bracket. Because the mounting studs are threaded into the valve body, loosening the nuts without holding the studs can tighten the studs, crushing the valve body and damaging the valve. Conversely, tightening the nuts without holding the studs can back the studs out, causing a separation of the two halves of the valve body, and possibly a leak.
- Do not attempt to disassemble the Barksdale valve body or the control lever. There are no serviceable parts in the valve, and any disassembly will void the warranty.

1. Park the vehicle on a level surface, apply the parking brakes, and chock the tires.
2. Run the engine to build vehicle air pressure to at least 100 psi (690 kPa). Turn off the engine and wait 5 to 10 minutes for the system to equalize.

NOTE: Normal operation of the height-control valve requires a maximum of 10 minutes to settle. Any air leakage during this time is considered normal and does not indicate a damaged valve.

3. Apply a soap-and-water solution to the outside of the air fittings on the height-control valve and on the suspension air springs. Look for bubbles indicating an air leak.
4. If bubbles are seen, check that the air tubing is installed correctly into the fitting; see **Subject 100**.

   If no bubbles are seen, check the height-control valve for air leaks; see **Subject 110**.

Diagnostics and Testing

Air Spring

Inspect the exterior surfaces of the air spring, looking for wear. With the air spring fully inflated, check to see if there is sufficient clearance around the air spring to prevent lines or objects from rubbing against the air spring. Air tubing or cab components that rub against the air spring will cause damage to the air spring. If the air spring is not capable of lifting the cab to its proper ride height, check to see if the shock absorber is damaged. A binding shock absorber will limit the air spring's ability to extend. To clean the air spring, use soap and water.

NOTE: Do not use organic solvents, abrasives, or pressurized steam cleaners to clean the air spring.

Shock Absorber

Inspect the shock body for damage such as bends or dents in the piston. Bends or dents in the shock body will negatively affect the operation of the shock. Inspect the shock body for signs of leaking fluid. Normal operation of the shock will result in some misting of the hydraulic fluid onto the exterior shock body. Large streams of fluid indicate a leak and the shock should be replaced; see **Fig. 1**.

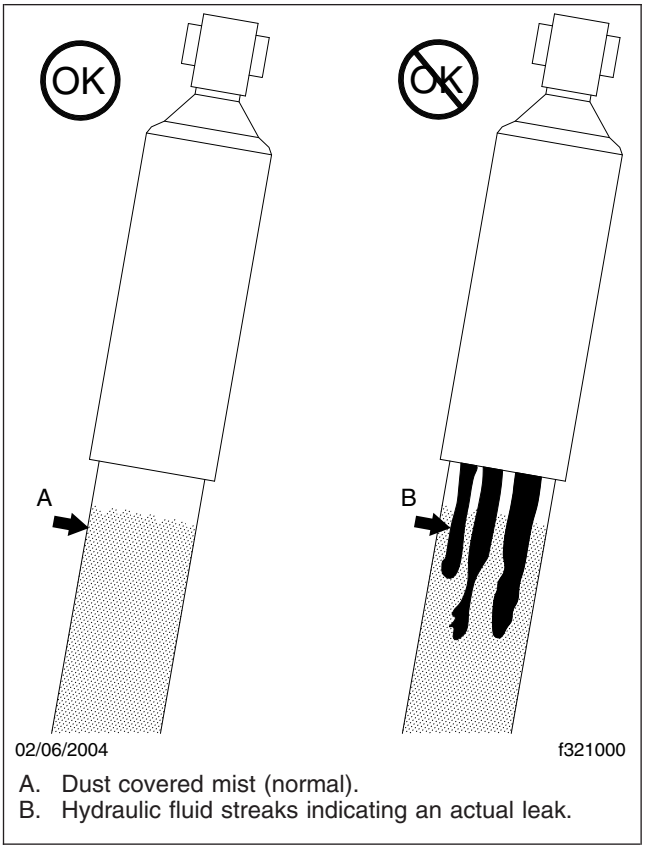
To test the operation of a shock absorber, hold the shock in an upright position and cycle the piston at least five times by pushing the piston up and down. The piston should move evenly throughout each section of the cycle. If the shock does not move evenly

Troubleshooting

when pushed down or pulled up, the shock should be replaced.

Noises such as squeaks, which may be intermittent, may be caused by the valves used to regulate the internal hydraulic fluid. This problem is not repairable and the shock will need to be replaced. Noises from the shock, such as knocking or rattling, may be due to movement between the bushings and mounting brackets. Inspect the bushings or mounting brackets for wear. Repair worn components as necessary. Check the torque of the shock absorber mounting nuts and tighten if necessary.

NOTE: The shock absorber bushings do not require any type of lubrication. Do not attempt to stop bushing noise by lubricating them; grease and mineral-oil-base lubricants will deteriorate the bushing rubber.



A. Dust covered mist (normal).
B. Hydraulic fluid streaks indicating an actual leak.

Fig. 1, Differences Between Misting and Leaking

Torque Specifications

Unless listed in **Table 1**, tighten all fasteners using the torque specifications found in **Section 00.04**.

Torque Specifications				
Fastener Description	**lbf·ft**	**N·m**	**lbf·in**	**N·cm**
Lateral Control Rod Upper and Lower Nut	45	61	—	—
Shock Absorber Upper and Lower Nut	45	61	—	—
Height-Control Valve Mounting Nut	—	—	45	500

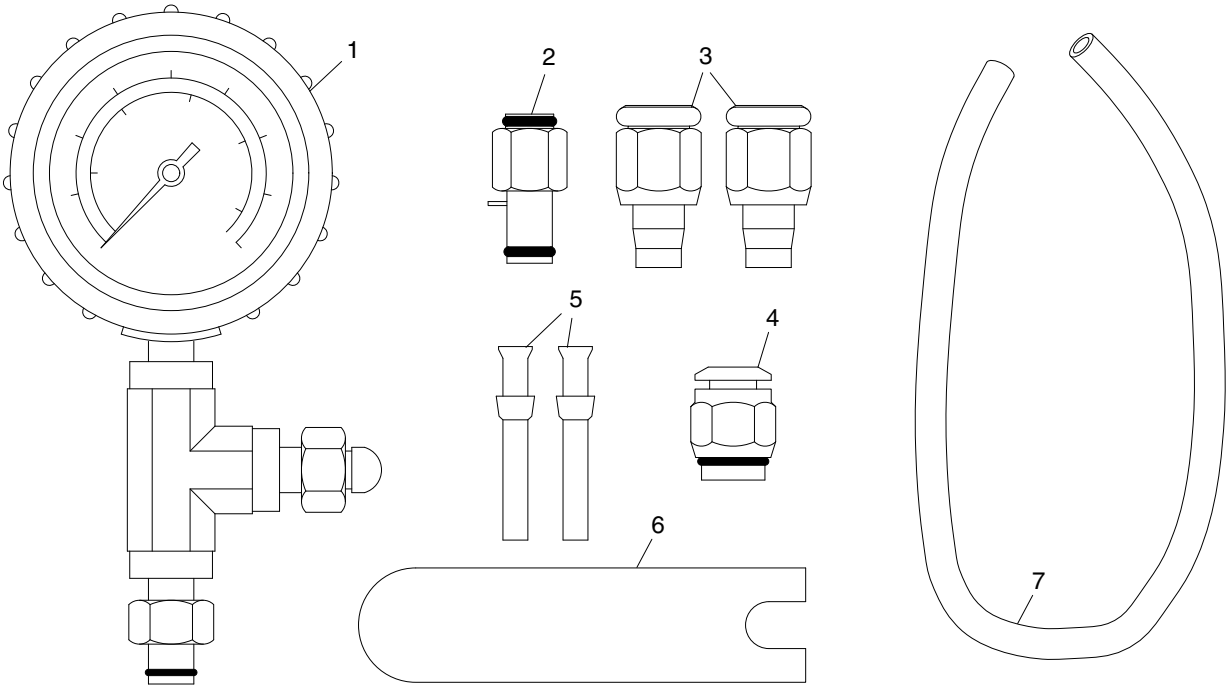
Table 1, Torque Specifications

Special Tools

Use the kit shown in **Fig. 1** to test a Barksdale height-control valve. Test kit BKS KD2264 is available via the Direct Ship program in paragon, or directly from Barksdale, at **www.barksdale.com**, or:

Barksdale, Inc.
3211 Fruitland Avenue
Los Angeles, California 90058
Telephone: 866-832-6278

Specifications



1. Test Gauge Assembly with Reset Button
2. Exhaust Port Test Connector for Cab Suspension Valve
3. Parker Plugs
4. Exhaust Port Test Connector for Chassis Suspension Valve
5. Test Plugs for Cab Suspension Valve
6. Special Tools for Disconnecting Air Line
7. Air Line

Fig. 1, Barksdale Height-Control Valve Test Kit BKS KD2264