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## 1. DESCRIPTION

The vehicle is provided with an air suspension system. The system consists of air springs, height control valves, radius rods, sway bars, tripod and shock absorbers (Figure 1 to Figure 6). The system operation is fully automatic and maintains a constant vehicle height regardless of load, or load distribution.

The vehicle is also equipped with a front kneeling system.

## 2. FRONT I-BEAM AXLE SUSPENSION

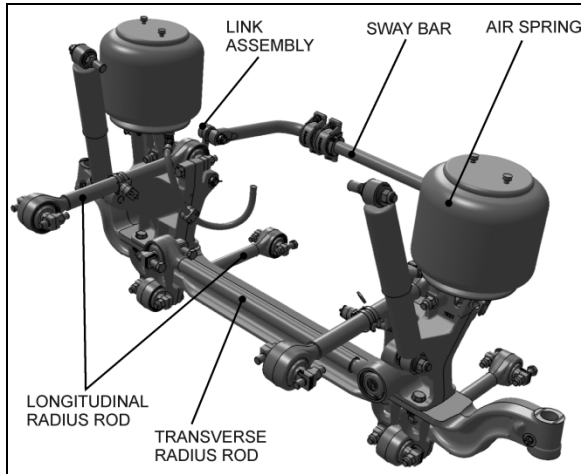


FIGURE 1: FRONT I-BEAM AXLE SUSPENSION 16105

### 2.1 AIR SPRINGS

The air springs are made from a special compound rubber molded to the proper contour and dimensions. The entire vertical load of the vehicle is supported by these springs. Each of the three axles is provided with air springs that are attached to the subframe and to the axles.

#### 2.1.1 Inspection

1. Check operation of bellows.
2. Visually inspect bellows for evidence of cracks, punctures, deterioration, or chafing. Replace the bellows if any damage is evident.
3. With the primary air system at normal operating pressure (95 - 125 psi (655 - 860 kPa)), coat all suspension air line connections and bellows mounting areas with a water and soap solution. Bubbles will indicate an air leak, and none is permissible. Repair or replace defective parts.

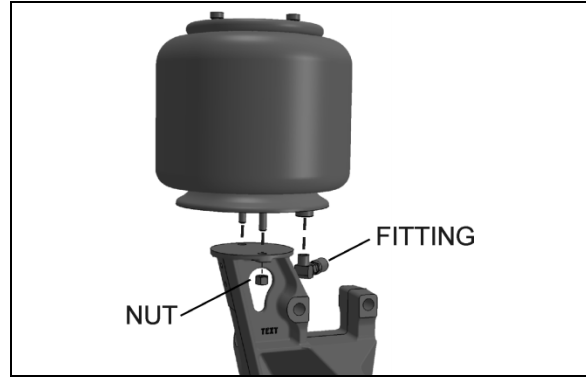


FIGURE 2: AIR SPRING

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#### NOTE

If air spring is removed from vehicle, bellows can be lightly inflated and submerged in water to detect any leakage. If any leakage is detected, replace bellows.



#### WARNING

To prevent personal injury, do not apply more than 10 psi (69 kPa) of air pressure to the uninstalled air spring.

#### 2.1.2 Removal

#### NOTE

Front suspension air springs can be removed without removing the entire axle assembly.

1. Safely support vehicle at the recommended body jacking points. To gain access to a given air spring, the corresponding wheel can be removed as follows:
  - a) Jack vehicle until the tire clears the ground, and place safety supports underneath body.



#### CAUTION

Only the recommended jacking points must be used as outlined in Section 18, "Body".

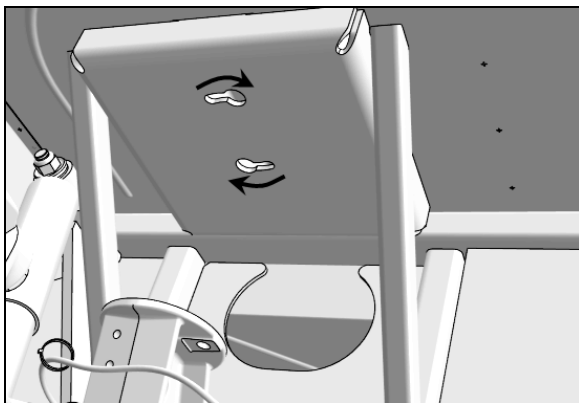
- b) Support the axle with a suitable hydraulic floor jack at the recommended jacking points. Make sure that the measurement between the air spring mounting plates is greater than the normal clearance (normal ride height).
- c) Remove wheel.

2. Exhaust compressed air from accessory air tank by opening drain cock under reservoir.
3. Disconnect the height control valve link and pull down the overtravel lever to ensure all air is exhausted from air springs.

**NOTE**

*While performing this step, do not change the height control valve overtravel lever adjustment.*

4. Disconnect air line from air spring and cover both the line end and fitting to prevent the entry of foreign matter.
5. Unscrew the two air spring lower mounting nuts.
6. Rotate the air spring counterclockwise to free the upper attachments from the mounting plate.
7. Remove the air springs.



**FIGURE 3: AIR SPRING UPPER MOUNTING PLATE**

### 2.1.3 Installation

1. Compress air spring as necessary and position air spring between both the lower and upper mounting plates.
2. Align the upper attachments with holes in the mounting plate. Rotate air spring clockwise.
3. Thread the lower nuts a few turns.

**NOTE**

*To facilitate air spring installation, compress it manually then put a piece of tape over the air line threaded fitting. This prevents air from getting back into the air spring and keeps it compressed, thus enabling to place the air spring in between the mounting plates and greatly easing installation.*

4. Tighten and torque the lower stud nuts according to Torque Table under heading Torque Specifications.
5. Install fitting (if applicable), then connect air line.
6. Connect the height control valve link.
7. Build up air pressure in system.

**NOTE**

*To accelerate this operation, air reservoirs can be filled from an exterior air supply connected to the accessory tank fill valve or to the emergency fill valve.*

7. Check operation of bellows and with the primary air system at normal operating pressure (95 – 125 psi (655 – 860 kPa)), coat the air line connections and air spring mounting areas with a water and soap solution. Bubbles will indicate an air leak, and none is permissible. Repair or replace defective parts.
8. Reinstall wheel.
9. Remove the hydraulic floor jack from under the axle, then lower vehicle to ground.

## 2.2 SHOCK ABSORBERS

Double-action, telescoping-type shock absorbers ensure a smooth ride and enhance vehicle stability on the road. All shock absorbers are eye-type mountings. The front and tag axles are each provided with two shock absorbers while the drive axle is provided with four of them.

Shock absorbers are non-adjustable and non-repairable. Maintenance requirements involve replacement of the rubber mounting bushings, and tightening of all shock absorber pins according to Torque Table under heading Torque Specifications when shock absorber replacement occurs. If a shock absorber becomes inoperative, complete unit must be replaced.

**CAUTION**

When a shock absorber is found defective, always replace with a new set on affected axle, except if there has been a recent replacement of one unit. The following method will help in determining if both shock absorbers on the same axle have to be replaced.

### 2.2.1 Inspection

Loosen lower mounting of both shocks, and then carefully attempt to raise and lower the bottom portion of each shock. Note the rate of effort for distance of travel. Replace both shocks if a definite differential rate is found.

The shock must be bench checked in an upright, vertical position. If checked in any other position, air will enter the cylinder tube and make the shock absorber appear defective.

Proceed as follows to check shock absorbers:

1. With the shock absorber in a vertical position (top end up), clamp the bottom mount in a vise.



### CAUTION

Do not clamp the reservoir tube or the dust tube.

2. Rotate the dust tube. Notice any binding condition (may be compared with new unit). Binding condition indicates a scored rod. Units with scored rods should be replaced.
3. Fully extend shocks and check for leaks in the seal cover area. Shock fluid is a very thin hydraulic fluid that has a characteristic odor and dark brown tint. A slight trace of shock fluid around the seal cover area is not a cause for replacement (Refer to the SACHS document "Guideline to Evaluate Warranty Claims" before replacing a shock). The shock seal is designed to permit a very slight seepage to lubricate the rod. Units that leak should be replaced.
4. Visually check shock for dents that could cause the shock to bind. Also, check for a bent rod.
5. Extend and collapse shock several times to determine that it has control (resistance) in both rebound and compression.
6. Visually inspect the shock mountings and vehicle mounting for:
  - a. Broken mounts;
  - b. Extreme bushing wear;
  - c. Shifted bushing or sleeve;
  - d. Deep cracks in bushing material (shallow surface cracks are normal);
  - e. Loose shock absorber pins;
  - f. Presence of convex washers, and their position relative to the rubber bushing.

### 2.2.2 Removal

1. Remove nuts and washers from shock absorbers on upper and lower mounting pins, taking care to identify the inner and outer washers to ease reinstallation. Refer to Figure 4 for details.
2. Remove the shock absorber assembly from pins.
3. Remove the two inner bushings from the shock absorber and discard them.

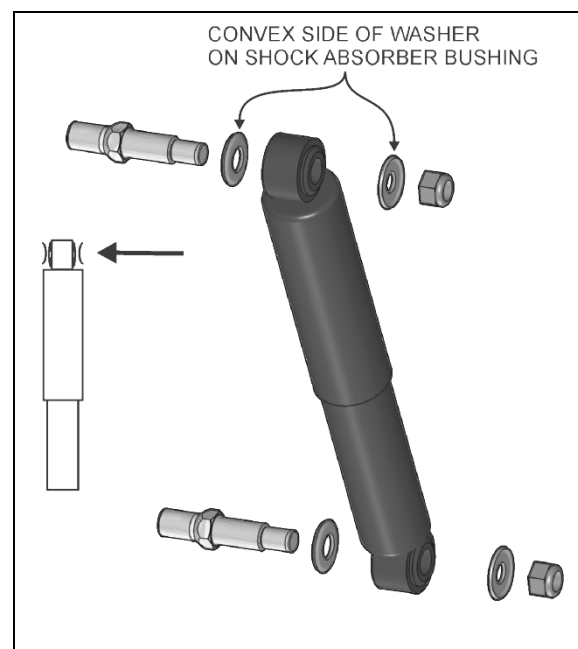


FIGURE 4: SHOCK ABSORBER

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### 2.2.3 Installation

1. Ensure that the shock absorber mounting pins are tight and that the threads are not stripped.
2. Install new rubber mounting bushings on shock absorbers (upper and lower).
3. Place the inner washers (with washer convex side facing the shock absorber rubber bushing) on each shock absorber pin.
4. Install the shock absorber eyes over the mounting pins, then the outer washers (with washer convex side facing the shock absorber rubber bushing) on each shock extremity.

**NOTE**

*If shock absorber pins are removed, they must be reinstalled using “Loctite” (see “Parts Specifications” in this section).*

- Place the lower and upper mounting pin stud nuts and torque according to paragraph 13 Torque Specifications.

### 2.3 RADIUS RODS

Radius rods are used to secure the axles in the proper transversal and longitudinal positions. Five radius rods are provided on the front I-beam axle suspension (four longitudinal and one transversal). Refer to Figure 1 and Figure 5 for details. These rods transmit both braking and driving forces from the axles to the vehicle body.

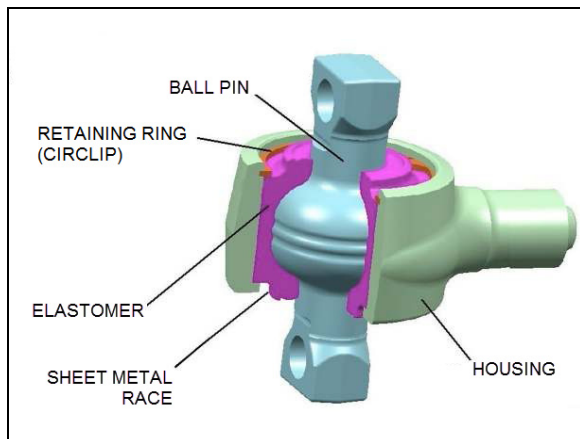


FIGURE 5: BALL PIN JOINT CONSTRUCTION 16186

#### 2.3.1 Inspection

- Clean all parts thoroughly.
- Inspect radius rods for distortion and cracks. We recommend the “Magnaflux” process to detect cracks in the radius rod. Any damaged part should be replaced with a new one.

#### **NOTE**

*New bushings should be used when rods are replaced.*

- The radius rod bushings should be checked periodically for signs of shearing, deterioration, or damage. Any defective part should be replaced with a new one.

Take off the load from the ball joint by lifting the vehicle. Apply a load on the joint in all of the

degrees of freedom in an axial, radial, etc. sense with a suitable lever tool. After the load is taken off, the joint has to spring back into its starting position. Free play is not acceptable.

Separation of rubber from ball pin or sheet metal race is permissible up to a third of the circumference.

When the following characteristics are noted, the joint is to be changed:

- Free play between ball pin and housing;
- Radial cracking of the external sheet-metal race (Figure 6)
- Any crack or fracture of a metal part
- Plastic deformation of the sheet metal race
- Loosened bolt
- Broken bolt
- Loss of bolt
- Circlip (retaining ring) detached from groove
- Broken Circlip
- Loss of Circlip
- Incipient crack

If damage to the inner housing contour or the Circlip groove is found during replacement of the molecular bearing, the entire radius rod must be replaced.

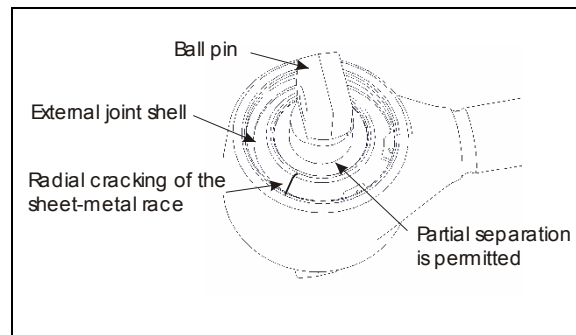


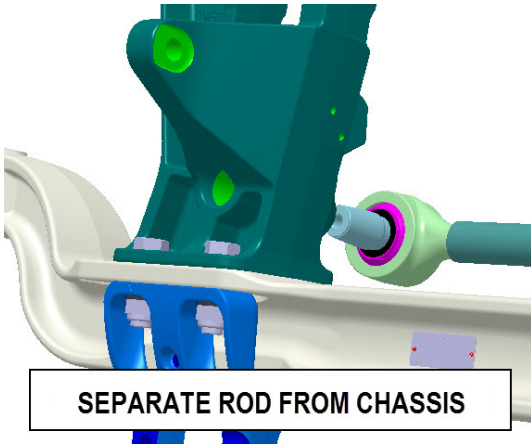
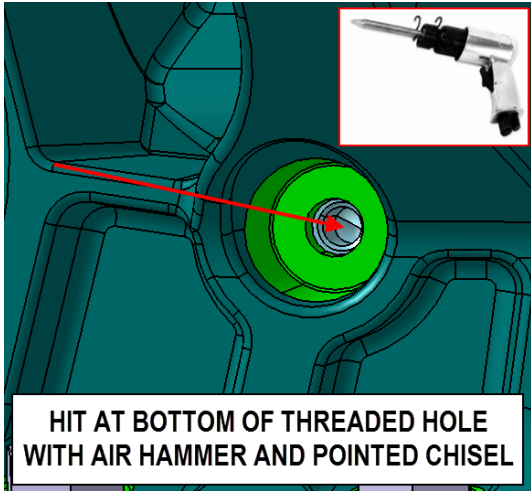
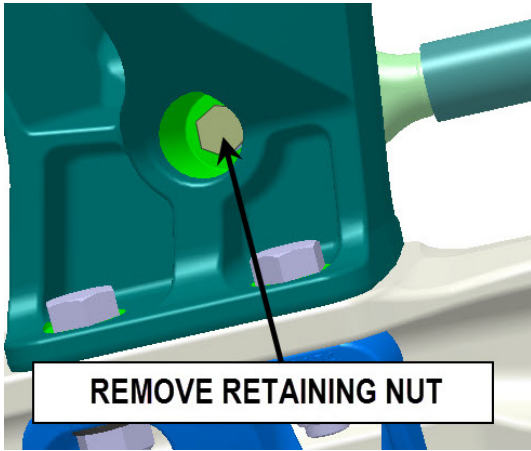
FIGURE 6: BALL PIN BUSHING

#### 2.3.2 Radius Rod Removal

- Unscrew the nuts (or bolts) at each extremity of the radius rod.
- Remove the radius rod.

**NOTE**

One end of the transversal radius rod is fitted with a conical (tapper) pin that will require the use of an air hammer and a pointed 13mm (1/2inch) diameter chisel to remove it from the chassis (after the retaining nut is removed from the rod end). **Care must be taken not to damage the rod pin threads.**



**CAUTION**

Do not hit the cast parts of the chassis to disengage taper radius rods; this could lead to cracking and/or deformations of the cast parts.



**2.3.3 Stripping Down**

Strip down the defective joint by removing the Circlip, and ball pin/bushing assembly. Clean out housing bore and Circlip groove.

**2.3.4 Radius Rod Assembly**

The assembly work may be done only by a recognized specialized workshop. Ensure that old and new parts do not get mixed up with each other. It is for this reason that all the old parts are to be scrapped immediately after a joint has been stripped down.

A complete repair set must be used for each joint repaired, i.e. use of only part of a repair set is not permissible.

Execute assembly of the new joint parts in the following sequence:

1. Complete moistening of the contact surface between housing bore and ball pin elastomer through application of grease.

**NOTE**

*Apply the supplied grease, only if you are using a repair kit.*

2. Insert ball pin/bushing, assembly. Ensure that the bolt bores are in the correct position in relation to the axis of the tube.
3. Place joint in receiving fixture and mount annular assembly tool on the housing. Then locate Circlip in the housing using axial load with the aid of assembly stamp.

- Opening of the Circlip is located at 45° to the housing shaft axis. Make sure that the Circlip is perfectly engaged in the housing.

### 2.3.5 Radius Rod Installation

- Snug up the nuts (or bolts) and repeat at the other end.
- Refer to heading "Suspension Height Adjustment" later in this section, and set the vehicle to normal ride height.
- With the vehicle at normal ride height, tighten all radius rod anchor pin nuts or bolts as prescribed.



## CAUTION

It is extremely important upon reconnection of the rods that the proper clearance height between the axle and body be maintained. Otherwise, the rubber bushings in radius rod ends will become preloaded, thus reducing their life span.

## 2.4 SWAY BAR

A sway bar is provided on the front axle to increase vehicle stability. It controls lateral motion (swaying movement) of vehicle (Figure 7).

### 2.4.1 Removal

- Disconnect the two links from sway bar.
- Safely support the sway bar. Unbolt the four bushing brackets from subframe.
- Remove sway bar.

### 2.5 TORQUE SPECIFICATIONS - FRONT I-BEAM AXLE SUSPENSION AND STEERING

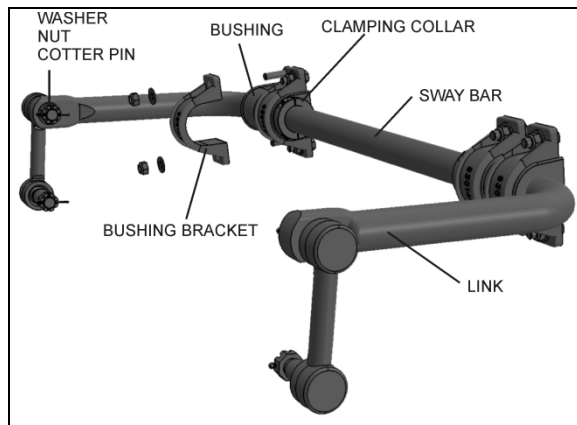


FIGURE 7: SWAY BAR

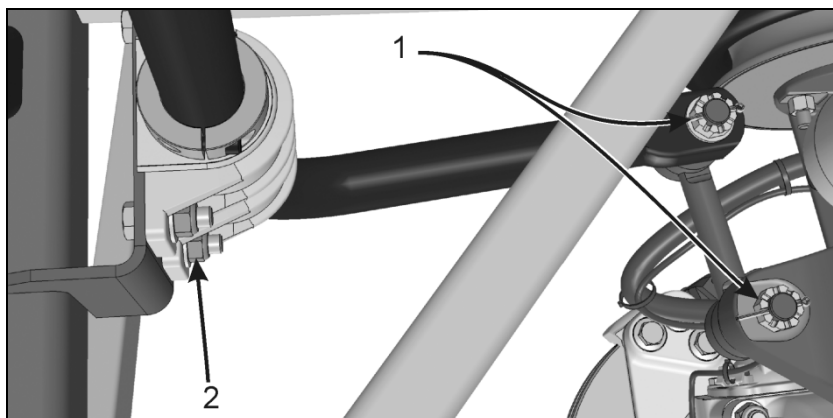
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### NOTE

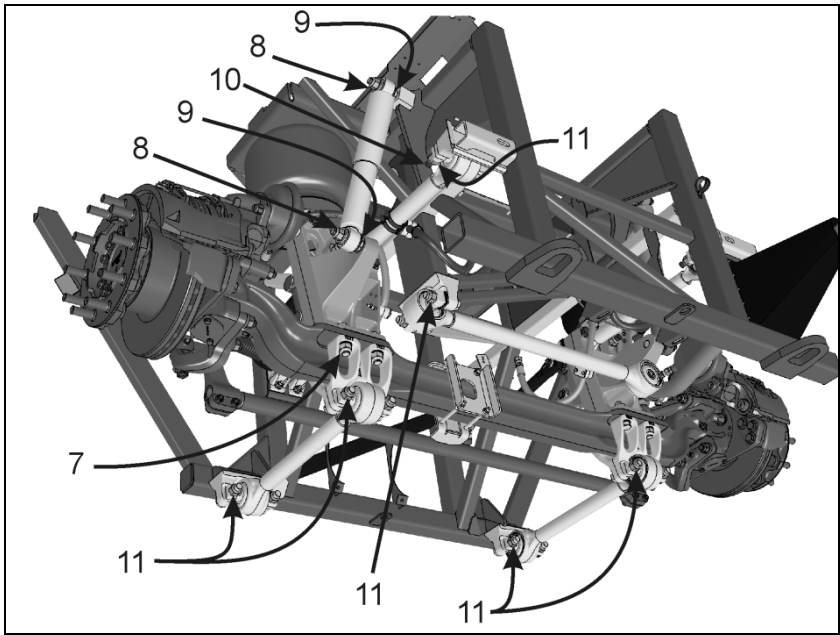
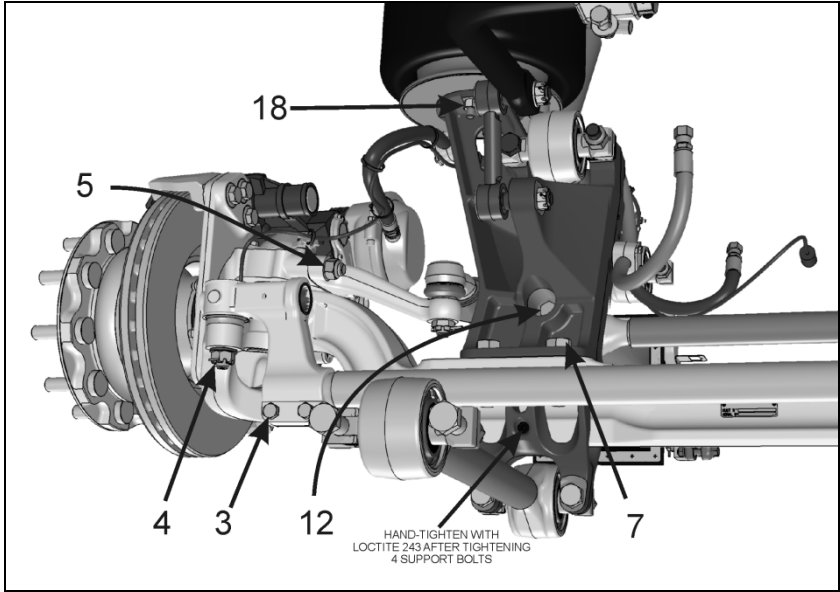
Sway bar bushings are slit to ease their removal.

### 2.4.2 Installation

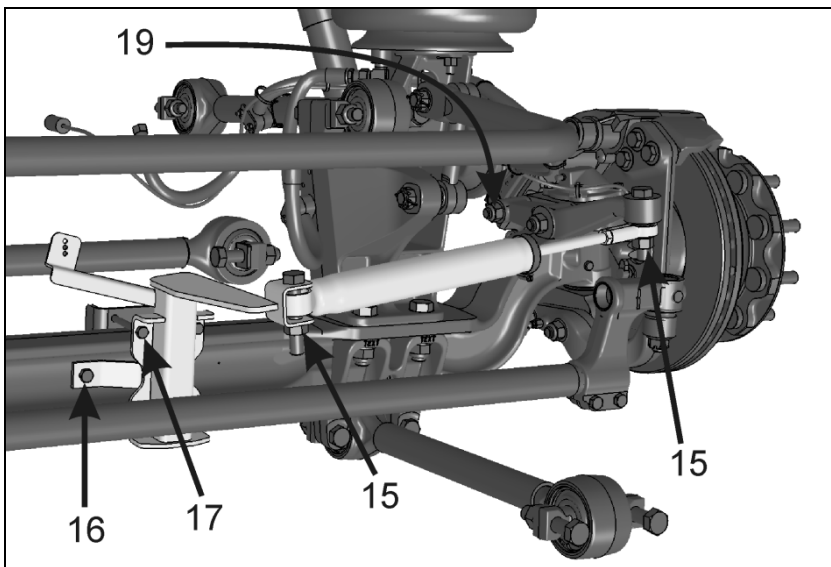
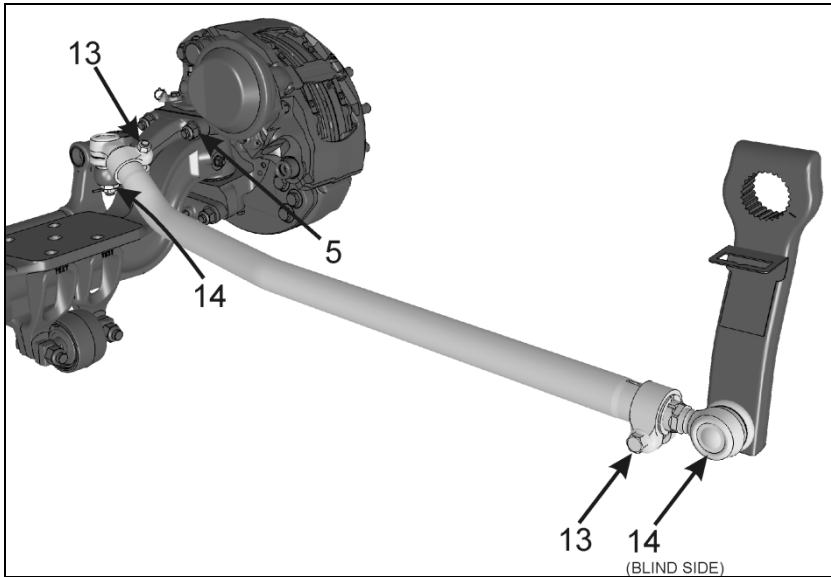
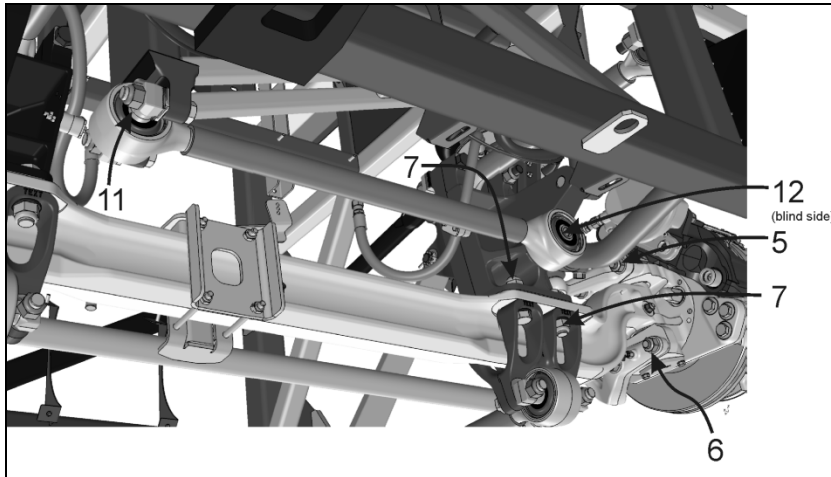
- Loosely install the sway bar.
- Tighten the eight bushing brackets nuts according to Torque Table 1 under heading Torque Specifications.
- Tighten sway bar link upper nuts and lower nuts according to Torque Table 1 under heading Torque Specifications.







SECTION 16: SUSPENSION



The following table lists the tightening torques that require a specific torque value. When no torque specifications are indicated, use the Standard Torque Specifications table found in Section 00: General Information of the Maintenance Manual.

| <b>SPECIFIC TORQUE TABLE 1 – FRONT I-BEAM AXLE SUSPENSION &amp; STEERING</b> |  |            |  |         |
|--|--|------------|--|---------|
| <b>REFERENCE</b>   | <b>DESCRIPTION</b>                         | <b>QTY</b> | <b>TORQUE DRY (lbf-ft / Nm)</b><br><i>threads must be free of oil or other lubricant</i> |         |
| 1  | SWAY BAR LINK, UPPER AND LOWER NUTS        | 4          | 165-200  | 224-271 |
| 2  | SWAY BAR BUSHING BRACKET                   | 8          | 80-100   | 108-136 |
| 3  | TIE ROD END CLAMP BOLTS                    | 4          | 65-75  | 88-102  |
| 4  | TIE ROD END BALL PIN NUTS                  | 2          | 150-200  | 203-271 |
| 5  | STEERING ARM STUD NUTS                     | 2          | 285-315  | 386-427 |
| 6  | TIE ROD ARM STUD NUTS                      | 4          | 285-315  | 386-427 |
| 7  | I-BEAM AXLE MOUNT NUTS                     | 8          | 230-280  | 311-378 |
| 8  | SHOCK ABSORBER UPPER & LOWER MOUNTING NUTS | 2          | 99-121   | 134-164 |
| 9  | SHOCK ABSORBER PINS, UPPER & LOWER         | 2          | 350-400  | 475-545 |
| 10   | RADIUS ROD RETAINING STUDS                 | 4          | 90-100   | 122-136 |
| 11   | RADIUS ROD RETAINING NUTS                  | 18         | 225-255  | 305-346 |
| 12   | TRANSVERSE RADIUS ROD TAPER PIN NUT        | 1          | 207-253  | 281-343 |
| 13   | DRAG LINK CLAMP BOLTS                      | 2          | 118-133  | 160-180 |
| 14   | DRAG LINK BALL JOINT STUD NUT              | 2          | 150-200  | 203-271 |
| 15   | STEERING DAMPER NUTS                       | 2          | 100-120  | 135-160 |
| 16   | STEERING DAMPER BRACKET BOLT               | 1          | 39-45  | 53-61   |
| 17   | STEERING DAMPER BRACKET NUTS               | 4          | 29-34  | 39-46   |
| 18   | AIR SPRING NUT                             | 4          | 31-38  | 42-52   |
| 19   | STEERING DAMPER ARM NUTS                   | 2          | 285-315  | 386-427 |

For more torque specifications, see 'Dana Spicer Maintenance Manual NDS Axles and Maintenance Manual Model NDS'.

### 3. REAR SUSPENSION

For a description of all these systems, refer to the appropriate heading in this section.

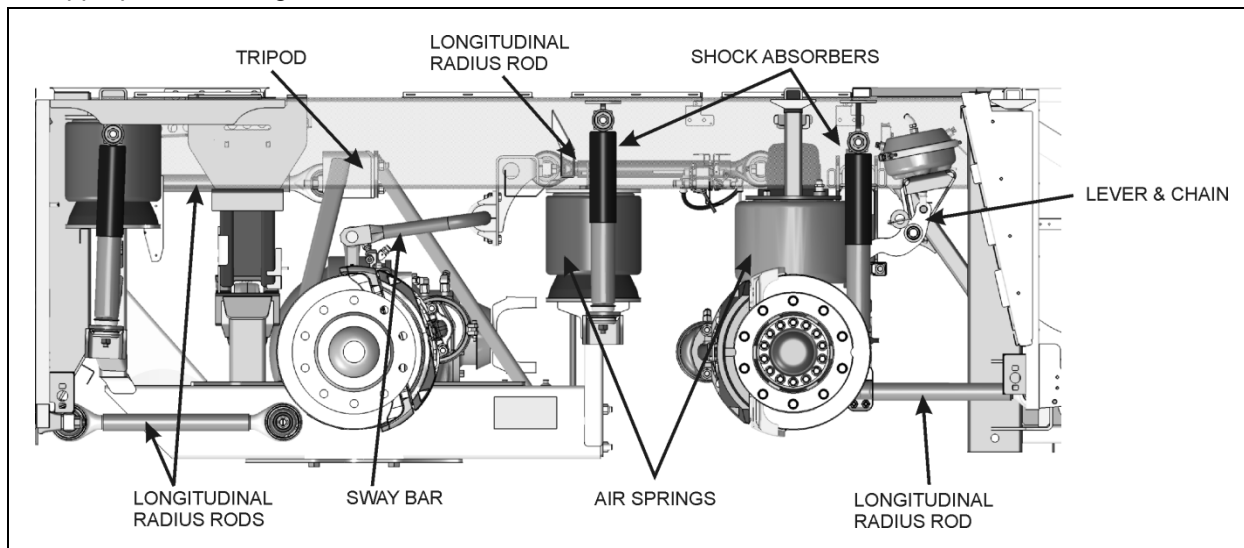


FIGURE 8: REAR SUSPENSION COMPONENTS

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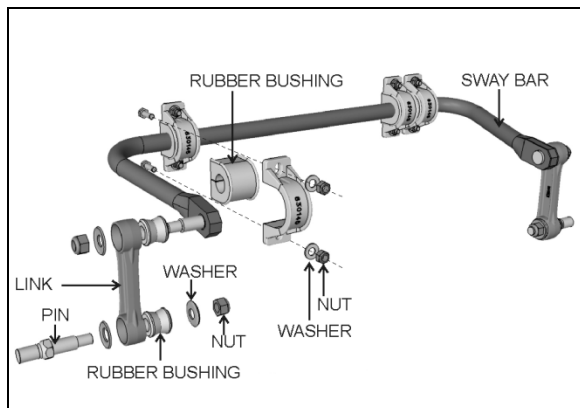


FIGURE 9: SWAY BAR (REAR SUSPENSION)

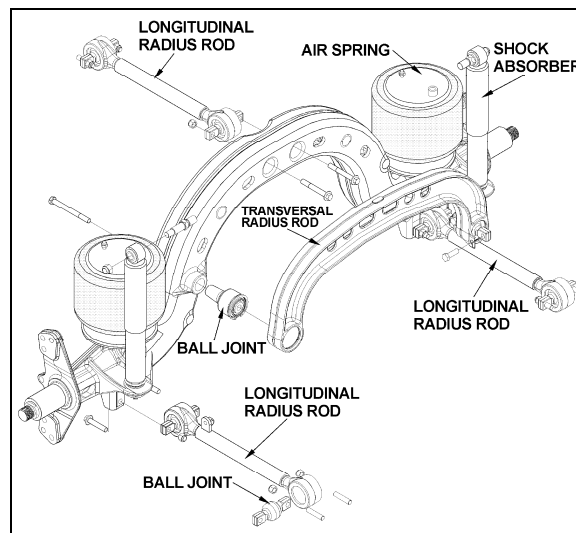
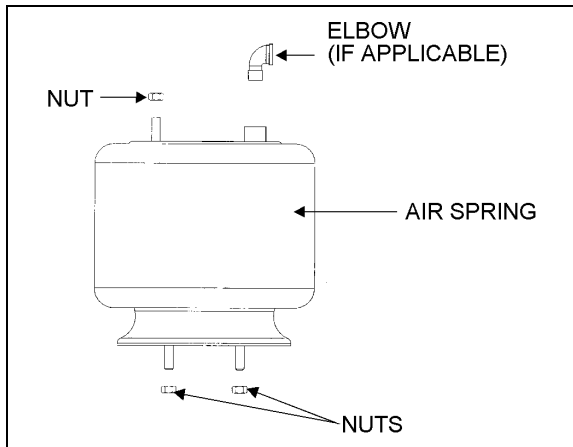


Figure 10: TAG AXLE SUSPENSION

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### 3.1 AIR SPRINGS



**FIGURE 11: AIR SPRING** 16052

The air springs are made from a special compound rubber molded to the proper contour and dimensions. The entire vertical load of the vehicle is supported by these springs. Each of the two axles is provided with air springs that are attached to the subframe and to the axles.

#### 3.1.1 Inspection

1. Check operation of bellows.
2. Visually inspect bellows for evidence of cracks, punctures, deterioration, or chafing. Replace the bellows if any damage is evident.

### MAINTENANCE

Inspect air bellows every 6,000 miles.

3. With the primary air system at normal operating pressure (95 - 125 psi (655 - 860 kPa)), coat all suspension air line connections and bellows mounting areas with a water and soap solution. Bubbles will indicate an air leak, and none is permissible. Repair or replace defective parts.

**NOTE**

*If air spring is removed from vehicle, bellows can be lightly inflated and submerged in water to detect any leakage. If any leakage is detected, replace bellows.*

**WARNING**

To prevent personal injury, do not apply more than 10 psi (69 kPa) of air pressure to the uninstalled air spring.

#### 3.1.2 Removal

**NOTE**

*Suspension air springs (drive and tag axles) can be removed without removing the entire axle assembly.*

1. Safely support vehicle at the recommended body jacking points. To gain access to a given air spring, the corresponding wheel can be removed as follows.
  - a) Jack vehicle until the tire clears the ground, and place safety supports underneath body.

**CAUTION**

Only the recommended jacking points must be used as outlined in Section 18, "Body".

- b) Support the axle with a suitable hydraulic floor jack at the recommended jacking point.
  - c) Remove wheel.
2. Exhaust compressed air from accessory air tank by opening drain cock under reservoir.
3. Disconnect the height control valve link and pull down the overtravel lever to ensure all air is exhausted from air springs.

**NOTE**

*While performing this step, do not change the height control valve overtravel lever adjustment.*

4. Disconnect air line from air spring, remove elbow (if applicable), and cover both the line end and fitting to prevent the entry of foreign matter.
5. Remove the air spring upper nut, and then the two lower nuts. Remove air spring.

#### 3.1.3 Installation

1. Compress air spring as necessary, then aligning studs with their holes, position air spring between both the lower and upper

supports. Thread the lower nuts and the small upper nut a few turns.

**NOTE**

*To facilitate air spring installation, compress it manually then put a piece of tape over the air line threaded fitting. This prevents air from getting back into the bag and keeps it compressed, thus enabling to place the bag in between the mounting plates and greatly easing installation.*

2. Tighten and torque the lower stud nuts, and then the upper one according to Torque Table under heading Torque Specifications.
3. Screw on the remaining upper nut (large nut) and tighten according to Torque Table under heading Torque Specifications.
4. Install elbow (if applicable), then connect air line.
5. Connect the height control valve link.
6. Build up air pressure in system.

**NOTE**

*To accelerate this operation, air reservoirs can be filled from an exterior air supply connected to the accessory tank fill valve or to the emergency fill valve.*

7. Check operation of bellows, with the primary air system at normal operating pressure (95 – 125 psi (655 – 860 kPa)), coat the air line connections and air spring mounting areas with water and soap solution. Bubbles will indicate an air leak, and none is permissible. Repair or replace defective parts.
8. Reinstall wheel.
9. Remove the hydraulic floor jack from under the axle, then lower vehicle to ground.

### 3.2 SHOCK ABSORBERS

Double-action, telescoping-type shock absorbers ensure a smooth ride and enhance vehicle stability on the road. All shock absorbers are eye-type mountings. The tag axle is provided with two shock absorbers while the drive axle is provided with four of them (Figure 12 & Figure 13).

Shock absorbers are non-adjustable and non-repairable. Maintenance requirements involve replacement of the rubber mounting bushings, and tightening of all shock absorber pins at the proper torque of 500 - 550 lbf-ft (680 - 750 Nm)

when shock absorber replacement occurs. If a shock absorber becomes inoperative, complete unit must be replaced.

**CAUTION**

When a shock absorber is found defective, always replace with a new set on affected axle, except if there has been a recent replacement of one unit. The following method will help in determining if both shock absorbers on the same axle have to be replaced.

#### 3.2.1 Inspection

Loosen lower mounting of both shocks, and then carefully attempt to raise and lower the bottom portion of each shock. Note the rate of effort for distance of travel. Replace both shocks if a definite differential rate is found.

The shock must be bench checked in an upright, vertical position. If checked in any other position, air will enter the cylinder tube and make the shock absorber appear defective.

Proceed as follows to check shock absorbers:

1. With the shock absorber in a vertical position (top end up), clamp the bottom mount in a vise.

**CAUTION**

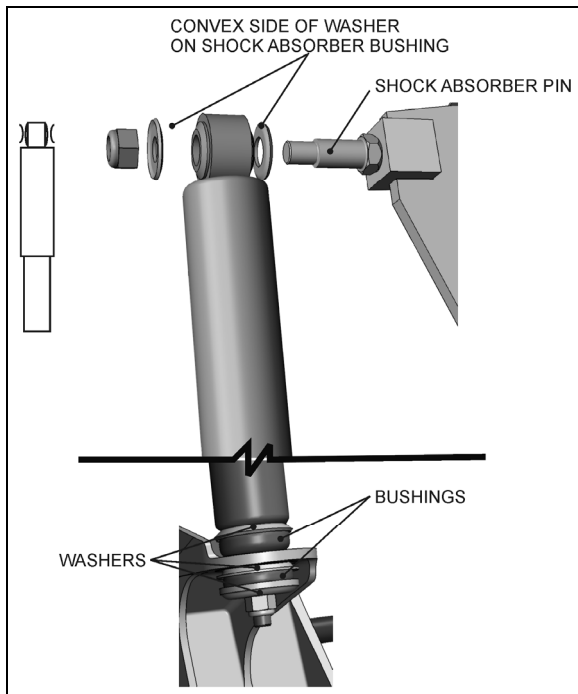
Do not clamp the reservoir tube or the dust tube.

2. Rotate the dust tube. Notice any binding condition (may be compared with new unit). Binding condition indicates a scored rod. Units with scored rods should be replaced.
3. Fully extend shocks and check for leaks in the seal cover area. Shock fluid is a very thin hydraulic fluid that has a characteristic odor and dark brown tint. A slight trace of shock fluid around the seal cover area is not a cause for replacement. The shock seal is designed to permit a very slight seepage to lubricate the rod. Units that leak should be replaced.
4. Visually check shock for dents that could cause the shock to bind. Also, check for a bent rod.

5. Extend and collapse shock several times to determine that it has control (resistance) in both rebound and compression.
6. Visually inspect the shock mountings and vehicle mounting for:
  - a) Broken mounts;
  - b) Extreme bushing wear;
  - c) Shifted bushing or sleeve;
  - d) Deep cracks in bushing material (shallow surface cracks are normal);
  - e) Loose shock absorber pins;
  - f) Presence of convex washers, and their position relative to the rubber bushing.

**3.2.2 Removal**

1. Remove nuts and washers from shock absorbers on upper and lower mounting pins, taking care to identify the inner and outer washers to ease reinstallation. Refer to Figure 12 for details.
2. Remove the shock absorber assembly from pins.



**FIGURE 12: TYPICAL SHOCK ABSORBER SETUP** 16009

**3.2.3 Installation**

1. Ensure that the shock absorber mounting pin is tight and that the threads are not stripped.
2. Install new rubber mounting bushings on shock absorbers (upper and lower).
3. At the upper mounting pin, place the inner washer with washer convex side facing the shock absorber rubber bushing.
4. Install the shock absorber eyes over the mounting pin, then the outer washers (with washer convex side facing the shock absorber rubber bushing).

**NOTE**  
*If shock absorber pins are removed, they must be reinstalled using "Loctite" (see "Parts Specifications" in this section).*

5. Place the lower and upper mounting pin stud nuts and torque as prescribed in Torque Table 3.

**3.3 RADIUS RODS**

Radius rods are used to secure the axles in the proper transversal and longitudinal positions. Four radius rods are provided on the drive axle suspension (three longitudinal and one transversal) and also four on the tag axle with a layout similar to the drive axle. These rods transmit both braking and driving forces from the axles to the vehicle body.

Refer to section 2.3 for additional details.

4. REAR SUSPENSION TORQUE SPECIFICATIONS

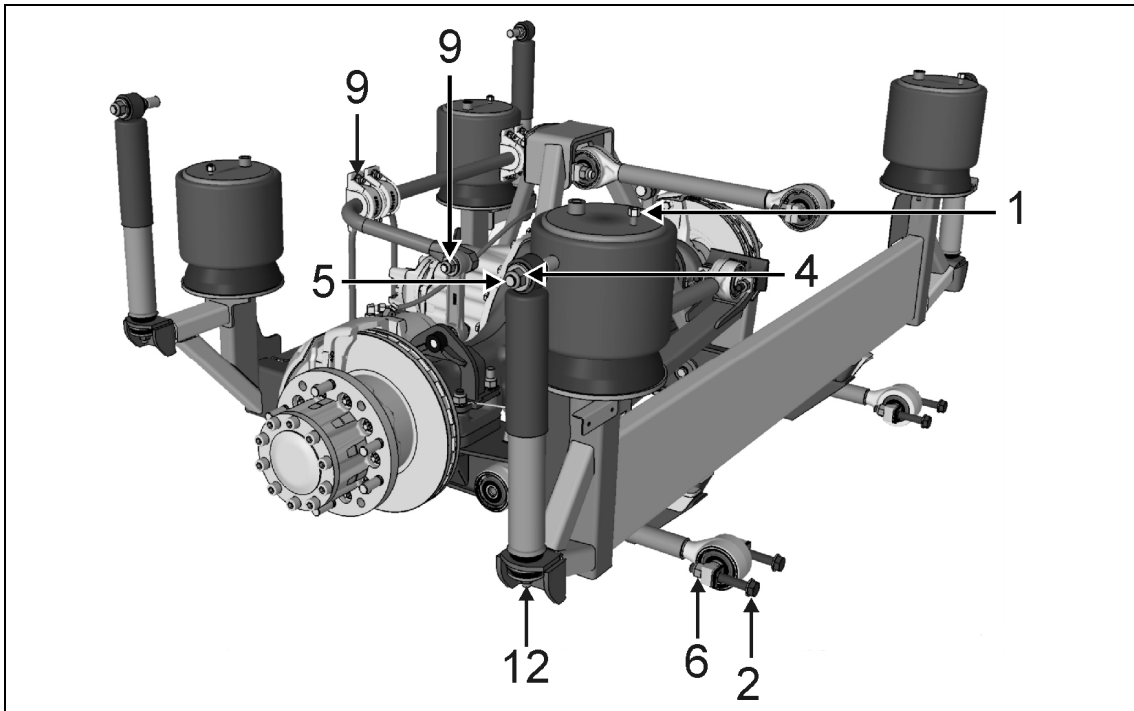


FIGURE 13: TORQUE SPECIFICATIONS – DRIVE AXLE

16158\_A

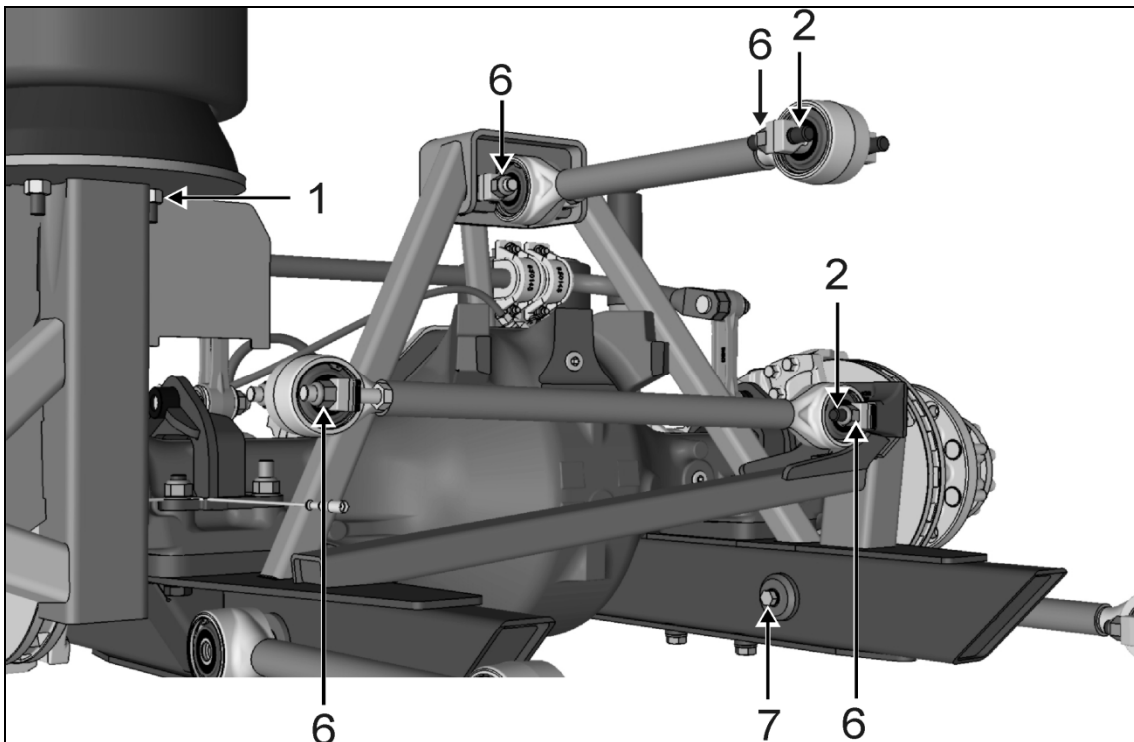


FIGURE 14: TORQUE SPECIFICATIONS – DRIVE AXLE

16159



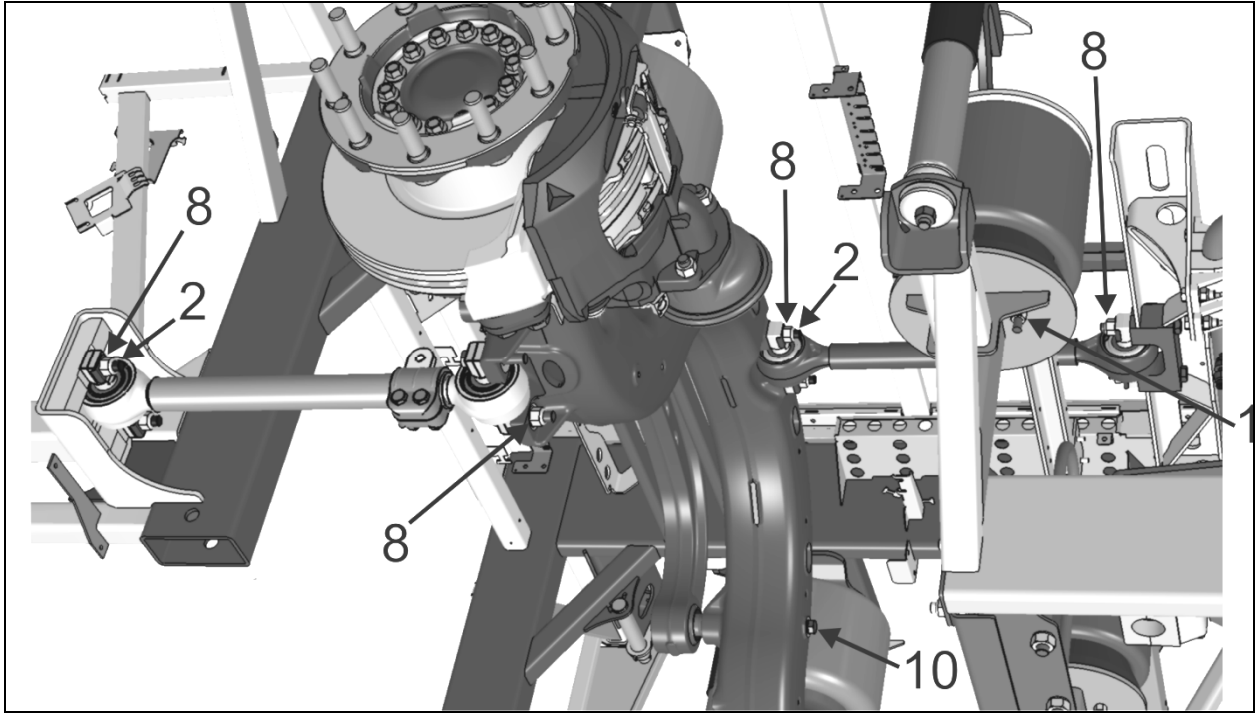


FIGURE 15: TORQUE SPECIFICATIONS – TAG AXLE

16160

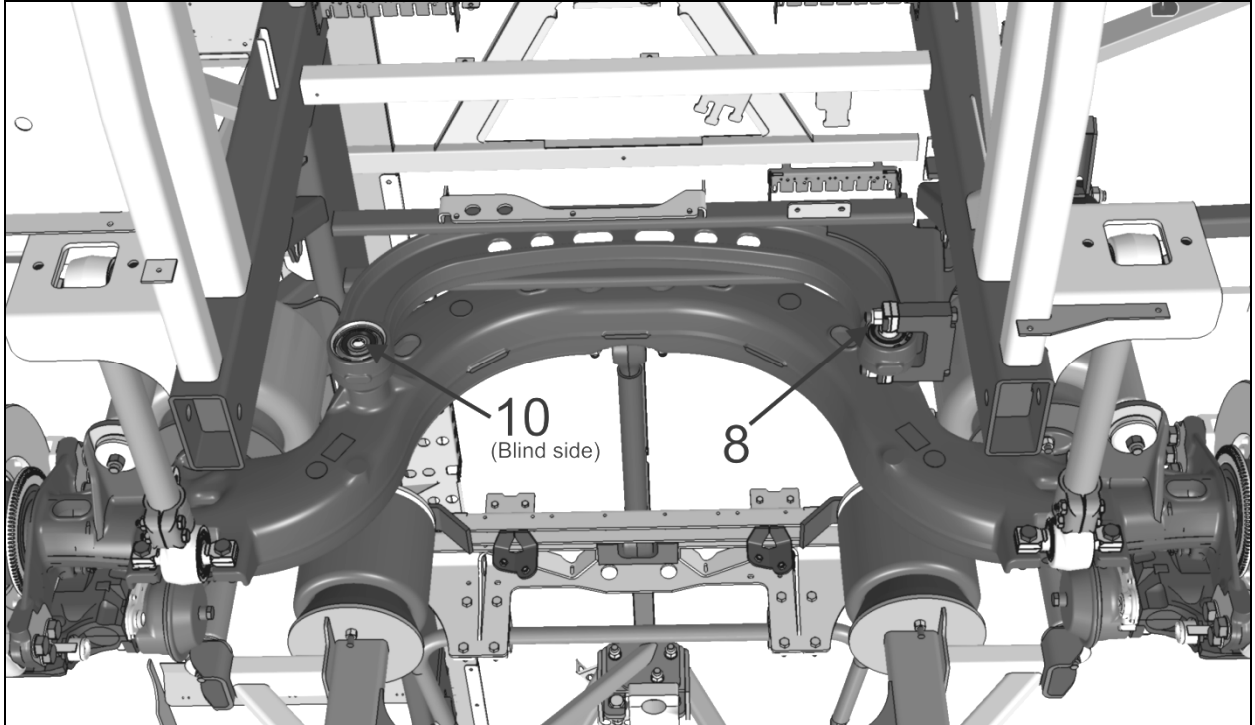


FIGURE 16: TORQUE SPECIFICATIONS – TAG AXLE

16161

The following table lists the tightening torques of bolts and nuts requiring a specific torque value. When no torque specifications are indicated, use the Standard Torque Specifications table found in Section 00: General Information of the Maintenance Manual.

**SPECIFIC TORQUE TABLE 3 – REAR SUSPENSION**

| REFERENCE | DESCRIPTION  | TORQUE DRY (lb-ft / Nm) |         |
|-----------|--|-------------------------|---------|
| 1         | Air Spring Upper & Lower Stud Nut (6 air springs)                  | 31-38                   | 42-52   |
| 2         | Drive & Tag Axle Radius Rod threaded stud (12 supports)            | 90-110                  | 122-149 |
| 3         | Sway Bar Link Upper & Lower Nut                                    | 99-121                  | 134-164 |
| 4         | Shock Absorber Pin Nut (6 shock absorbers)                         | 99-121                  | 134-164 |
| 5         | Shock Absorber Pin (6 shock absorbers)                             | 350-400                 | 475-545 |
| 6         | Drive axle Radius Rod Nut/bolt (6 supports)                        | 225-255                 | 305-346 |
| 7         | Drive Axle Radius Rod Retaining Bolts (2 longitudinal radius rods) | 171-209                 | 231-283 |
| 8         | Tag Axle Radius Rods Nut (6 supports)                              | 228-252                 | 309-341 |
| 9         | Sway Bar Bushing Collar Bolt                                       | 80-100                  | 108-136 |
| 10        | Tag Axle Transversal Radius Rod (Casting) Retaining Bolt           | 171-209                 | 231-283 |
| 11        | Sway Bar Link Pin Stud   | 350-400                 | 475-545 |
| 12        | Shock Absorber Lower Nut (6 shock absorbers)                       | 60-75                   | 81-101  |

**NOTE**

Apply corrosion-protective compound on exposed threads.

**5. SUSPENSION AIR SYSTEM**

The suspension air system has its own air reservoir (accessory tank) which is located in the reclining bumper compartment. Pressurized air from the main tank (wet tank) flows through a pressure protection valve (PR-4), to the accessory air tank and through an air filter which is located in front service compartment.

The pressure protection valve (PR-4) is mounted to the supply port of the tank. This valve controls the pressure at which compressed air is delivered to the accessory air tank. The valve remains closed until a preset pressure is reached (approximately 70 psi (485 kPa)). It then opens and passes air out the delivery port.

The main use for this valve is to protect the main air system by ensuring at all times a sufficient air pressure in the main system (i.e. air delivered to the accessories will be shut off in case of a decrease in pressure). Maintenance and repair information on the pressure protection valve is supplied in the applicable booklet, under reference number SD-03-2010.

**WARNING**

Depressurize parts prior to removal.

**5.1 INSPECTION**

The following inspection should be performed at established service inspection periods. Performing these procedures will allow substandard performance to be discovered before the condition becomes bad enough to cause operator complaints and failure on a run.

1. Visually inspect the suspension air lines for evidence of chafing on metal parts or other damage.
2. Visually inspect the air springs for cracks, abrasion or other damage.
3. Replace any parts found to be damaged.

**5.2 AIR LINE TEST**

With the main air system at normal operating pressure, coat all suspension air line connections and air spring mountings with a solution of soap and water. Air leakage will produce soap bubbles. Any leak found must be corrected as no air leakage is permissible.

**6. SUSPENSION HEIGHT ADJUSTMENT**

The flow of pressurized air from the accessory air tank to the air springs is controlled by three

height control valves. The two rear valves are mounted to the subframe and connected to the rear axles through an arm and link connection. The front valve is mounted to the subframe and connected to the front air tank support. These connections allow the valves to apportion air pressure in the springs to the vehicle load, maintaining normal ride height.

Immediate response height control valves increase or decrease the air pressure in the suspension system as required. One height control valve is located **at center of front sway bar**, and regulates air to front suspension air springs in order to maintain the vehicle at the required height. Two are located at the drive axle, one on each inner side of rear wheelhousing.

The appropriate vehicle body height is obtained by measuring the clearance of all the air springs installed on the vehicle. Refer to Figure 17, Figure 18, Figure 19, to identify the correct area to take measurement and proper value. At this point, it should not be necessary to make an adjustment under normal service conditions. However, if an adjustment is required, change the position of the overtravel lever in relation to the overtravel control body. The lever should be moved up to raise vehicle height, and down to lower it. Check that main air pressure is at normal operating pressure and raise the vehicle to the specified height.

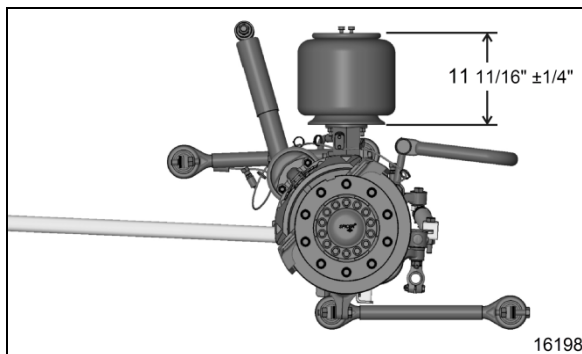


FIGURE 17: FRONT I-BEAM AXLE AIR SPRING CLEARANCE

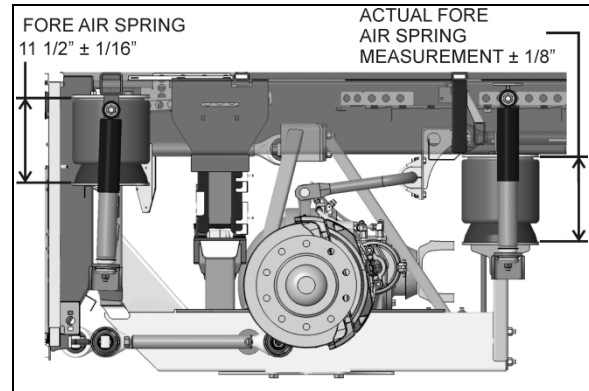


FIGURE 18: DRIVE AXLE AIR SPRING CLEARANCE 16195

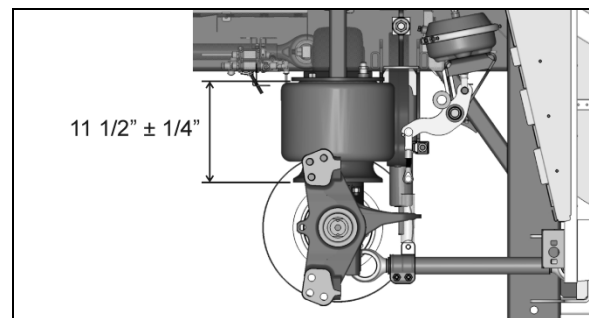


FIGURE 19: TAG AXLE AIR SPRING CLEARANCE 16195



**CAUTION**

Always adjust on "fill cycle". If it is necessary to lower vehicle height, release sufficient air to be well below height, and adjust to height or fill cycle.

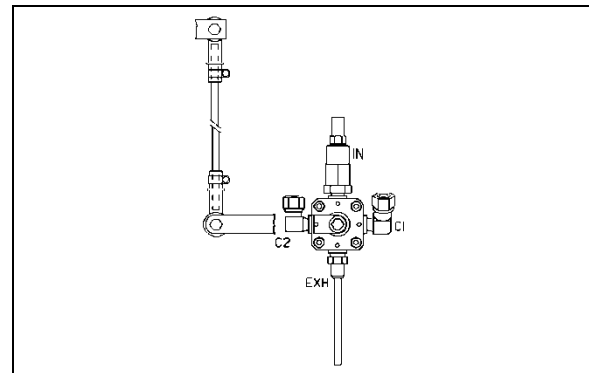


FIGURE 20: FRONT HEIGHT CONTROL VALVE 16100

The normal ride height is obtained by adjusting air spring clearance of both front and rear suspension as follows:

**Front I-beam axle air spring clearance**

1. With the vehicle at normal operating air pressure [100 - 125 psi (689 - 860 kPa)], measure air spring clearance. This

clearance should be  $11\ 11/16'' \pm 1/4''$  ( $297 \pm 6$  mm).

**NOTE**

The measurement should be taken from underneath the upper air spring support on subframe to top of the lower air spring support on axle (refer to Figure 17 for more details). If adjustment is required, begin with the drive axle.

- Loosen the clamp on the height control valve rubber coupling and bring it up or down (Figure 21).

**NOTE**

Allow suspension to stabilize before taking reading.

When the desired height is obtained, tighten clamp.

**Rear air spring clearance**

- With the vehicle at normal operating air pressure [122 - 140 psi], measure air spring clearance. This clearance should be as per Figure 18 and Figure 19.

**NOTE**

The measurement should be taken from underneath the upper air spring support on subframe to top of the lower air spring support on axle.

- Loosen the clamp on the height control valve rubber coupling and bring it up or down (Figure 21).

**NOTE**

Allow suspension to stabilize before taking reading.

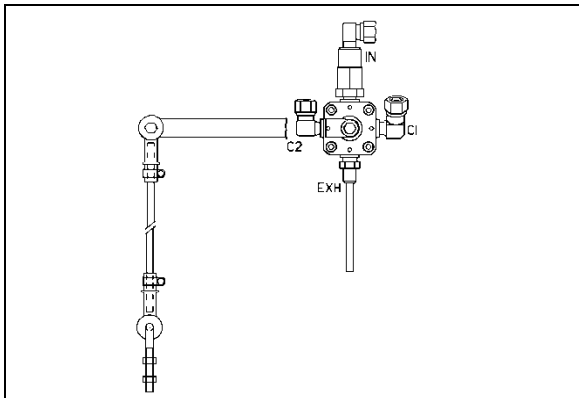


FIGURE 21: REAR HEIGHT CONTROL VALVE 16093

When the desired height is obtained, tighten clamp.

**7. HEIGHT CONTROL VALVE**

The height control valves automatically add air to, or release air from air springs to maintain constant suspension height regardless of load, or load distribution. Each valve adjusts independently according to the following conditions:

**Loading Position**

As the load increases and lowers the vehicle body, the overtravel lever commands the height control valve to add air to air springs.

**Neutral Position**

When vehicle body reaches the normal ride height, the height control valve overtravel lever reaches the "neutral" position and keeps both the supply and exhaust ports closed to ensure normal ride height is maintained. This condition remains static until the vehicle load is altered.

**Unloading Position**

As the load decreases and raises the vehicle body, the overtravel lever commands the height control valve to release air from air springs.

**7.1 MAINTENANCE**

The height control valve requires no periodic maintenance. Height control valve linkage operates on rubber bushings and no lubrication should be attempted at this location. Inspect the valve for loose joints, air leaks and worn bushings.

**7.2 REMOVAL AND INSTALLATION**

Before disconnecting a height control valve air line, securely support the vehicle by its jacking points on the body, and place safety supports underneath body. Refer to paragraph "16. Vehicle Jacking Points" in Section 18, "Body".

- Exhaust air from air system by opening all air tank drain cocks. Remove height control valves.
- Disconnect overtravel lever from link and pull down lever to exhaust remaining air from air springs.
- Disconnect air supply and delivery lines from the height control valve. Cover line ends with tape to prevent entry of foreign matter.
- Remove the nuts retaining the height control valve to the mounting bracket, then remove valve assembly.

Reverse removal procedure to replace height control valve. After installation, check for leakage using a soap and water solution.

### 8. AIR SYSTEM

The basic air system consists of an air compressor, tanks, valves, filters and interconnecting lines and hoses (refer to Maintenance Manual, Section 12, "Brake and Air System" for complete information). It provides a means for braking, operating controls and accessories, and suspension. An air system schematic diagram is provided for a better understanding of the system.

The air coming from the air dryer is first directed to the wet air tank, then to the primary (for the primary brake system), secondary (for the secondary brake system), and accessory (for the pneumatic accessories) air tanks (Figure 22).

#### 8.1 AIR TANK MAINTENANCE

Ensure that the accessories air tank is purged during pre-starting inspection. A good practice is to purge this tank at the end of every driving day by the remote air tank drain valve located in the front service compartment (Figure 24).

Moreover, purge all tanks by their bottom drain valves at specified intervals.

##### 8.1.1 Wet Air Tank

This tank is installed above the drive axle on the L.H. side, and is provided with a bottom drain valve. It is recommended to **purge** the wet air tank by its bottom drain valve every 12,000 miles.

A remote valve located in engine compartment and accessible through engine R.H. side door is used to **drain** the air dryer (Figure 23).

##### 8.1.2 Primary Air Tank

The primary air tank is located above the drive axle on the R.H. side (Figure 22).

This tank is provided with a bottom drain valve. It is recommended to purge the primary air tank by its bottom drain valve every 12,000 mile.

##### 8.1.3 Secondary Air Tank

This tank is located in front wheelhousing, between air springs. The tank is provided with a bottom drain valve (Figure 22).

It is recommended to purge the tank by its bottom drain valve, every 12,000 miles.

##### 8.1.4 Accessory Air Tank

The accessory air tank is installed next to the secondary air tank. The tank is provided with a bottom drain valve (Figure 22).

It is recommended to purge the tank by its bottom drain valve, every 12,000 miles.

A remote drain valve is located in front service compartment (Figure 23) underneath the accessory air filter. Refer to Section 12, paragraph "4. Accessory Air Filter" of the maintenance manual for daily purge procedure.

##### 8.1.5 Kneeling Air Tank

The kneeling air tank is located in the front wheelhousing (Figure 22), and is provided with a bottom drain valve.

##### 8.1.6 Parking Brakes Override Air Tank

The parking brakes override air tank is installed at the ceiling of the rear baggage compartment, on the L.H. side and is provided with a bottom drain valve.

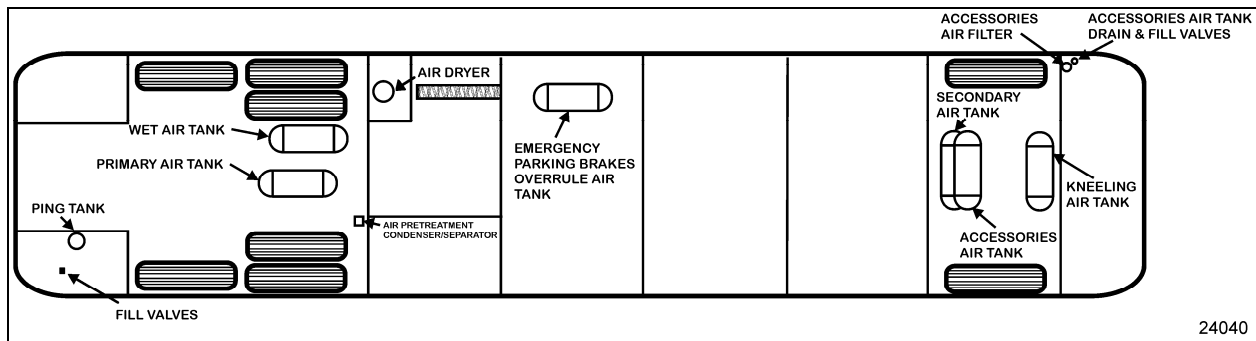


FIGURE 22: I-BEAM FRONT SUSPENSION AIR TANKS LOCATION

## 8.2 EMERGENCY FILL VALVES

The vehicle is equipped with two air system fill valves to supplement the air system when air pressure is low and engine cannot be operated.

The **rear valve** is located in engine compartment and accessible from engine R.H. side door (Figure 23).

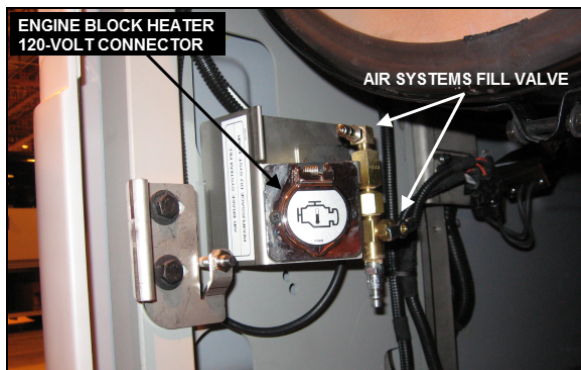


FIGURE 23: REAR VALVE LOCATION

12211\_1



### CAUTION

No other point should be used to supply air system. The maximum allowable air pressure is 125 psi (860 kPa).

The front valve is located in the front service compartment close to accessory air filter (Figure 24).

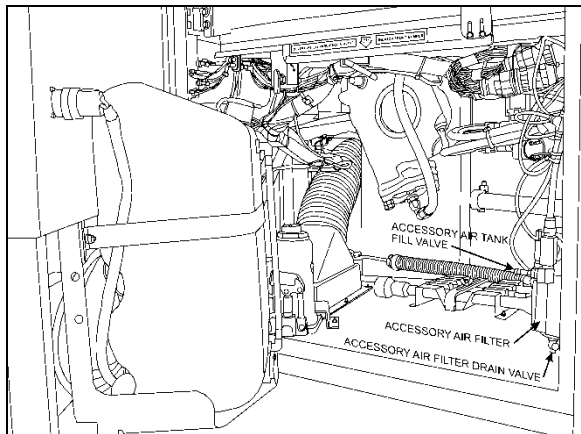


FIGURE 24: FRONT SERVICE COMPARTMENT

These two air valves are fitted with the same valve stems as standard tires, and can be filled by any standard external air supply line.

The rear valve will supply air for all systems (brakes, suspension and accessories) while the front valve will supply air for accessories only.



### CAUTION

Air filled through these two points will pass through the standard air filtering system provided by Prevost. Do not fill air through any other points.

## 9. FRONT KNEELING SYSTEM

The kneeling system is used to lower the front of vehicle. This allows passengers to board the vehicle with greater ease. The kneeling action is achieved by exhausting air from the front air springs (bellows). This system bypasses the height control valve to provide a fast up and down movement of the front suspension. Only four seconds are required to lower vehicle from normal level to the lowered position, and approximately the same time to raise the vehicle back to normal level. The quick response is achieved by an auxiliary air tank installed beside the secondary air reservoir (for exact position, refer to Section 12, "Brake and Air System"). This tank provides sufficient air supply to the kneeling system for some successive operations.

The system is provided with two safety features; first, a speed switch will enable the kneeling system to work only at less than 5 mph (8 km/h). Secondly, the parking brake is automatically applied, and a limit switch will keep it applied as long as the vehicle has not returned to a certain height where the driver will be able to manually remove the parking brake.

### 9.1 PRINCIPLE OF OPERATION

Refer to the air system schematic diagram.

#### DOWN (FRONT KNEELING):

Both the bellows control and bellows exhaust solenoid valves are energized, so the air control valves release air from front air springs. The height control valve is bypassed to ensure no air is forwarded to air springs while lowering the front suspension.

### 9.2 MAINTENANCE

Since the kneeling action is issued from both the air system and electrical system, refer to Section: 12, "Brake and Air System" and Section 06, "Electrical System".


For diagnosis and understanding of the system, refer to wiring diagrams, and to the appropriate air system schematic.

9.3 BELLOWS CONTROL SOLENOID VALVES

9.3.1 Removal and installation

1. On the rear side of steering compartment, locate both the bellows control and bellows exhaust solenoid valves.
2. Identify hoses and wires to ease reinstallation. Disconnect solenoid wires and the three flexible black hoses from solenoid valves.
3. Unscrew and remove the control solenoid valve and exhaust solenoid valve assembly. Place on a clean working place.

Reverse removal procedure to reinstall.

|  |
|--|
|  <b>CAUTION</b> |
| Any cable tie that has been cut during removal procedure should be replaced with a new one.      |

10. TROUBLESHOOTING

| Condition   | Cause  | Correction  |
|---|--|---|
| Bellows deflate over time                                     | <ol style="list-style-type: none"> <li>1. Defective check valve assembly.</li> <li>2. Defective exhaust valve assembly.</li> <li>3. Leak in air line and/or bellows.</li> <li>4. Defective valve cover, rubber O-rings or gasket.</li> </ol> | <ol style="list-style-type: none"> <li>1. Replace check valve assembly.</li> <li>2. Replace exhaust valve assembly.</li> <li>3. Replace air line or bellows.</li> <li>4. Replace valve cover, O-rings or gasket.</li> </ol> |
| Bellows raise to full height and fail to exhaust air pressure | <ol style="list-style-type: none"> <li>1. A clogged exhaust screen in height control valve assembly.</li> <li>2. A combination clogged exhaust screen and defective air inlet valve assembly.</li> </ol>                                     | <ol style="list-style-type: none"> <li>1. Remove and clean screen.</li> <li>2. Clean exhaust screen and replace air inlet valve assembly.</li> </ol>  |
| Erratic valve action  | <ol style="list-style-type: none"> <li>1. Dirt or foreign matter in the air valve lever chamber.</li> <li>2. Defectives valves.</li> </ol>   | <ol style="list-style-type: none"> <li>1. Remove valve cover and blow out dirt. Install cover using new gasket.</li> <li>2. Overhaul height control valve assembly</li> </ol>   |
| Vehicle body fails to level to satisfactory ride height       | <ol style="list-style-type: none"> <li>1. Improper height control valve overtravel lever adjustment</li> </ol>   | Adjust lever as directed.   |

**11. SECTION CHANGE LOG**

| <b>DESCRIPTION</b> |   | <b>DATE</b> |
|--------------------|---|-------------|
| 1                  | page 11, reference 12 was 171-209 lbf-ft, changed for 207-253 lbf-ft<br>page 18, reference 7 was 228-252 lbf-ft, changed for 171-209 lbf-ft | Apr.04,2016 |
| 2                  | page 14, air spring nut wrong torque value 20-25 lbf-ft removed   | Apr.16,2019 |
| 3                  |   |             |
| 4                  |   |             |
| 5                  |   |             |
| 6                  |   |             |