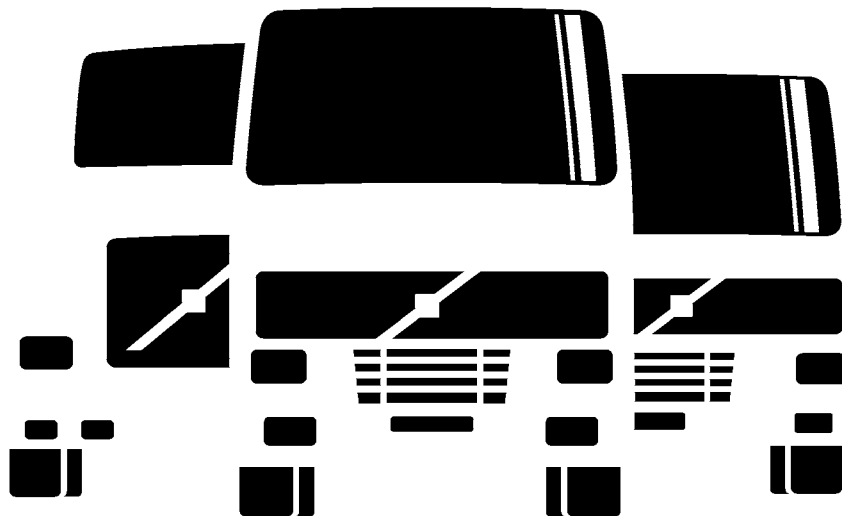


# Service Manual Trucks

Group **720–510**

Volvo Optimized Air Suspension

VN  
From build date 1.2002





# Foreword

The descriptions and service procedures contained in this manual are based on designs and methods studies carried out up to January 2002.

The products are under continuous development. Vehicles and components produced after the above date may therefore have different specifications and repair methods. When this is believed to have a significant bearing on this manual, supplementary service bulletins will be issued to cover the changes.

The new edition of this manual will update the changes.

In service procedures where the title incorporates an operation number, this is a reference to an V.S.T. (Volvo Standard Times).

Service procedures which do not include an operation number in the title are for general information and no reference is made to an V.S.T.

The following levels of observations, cautions and warnings are used in this Service Documentation:

**Note:** Indicates a procedure, practice, or condition that must be followed in order to have the vehicle or component function in the manner intended.

**Caution:** Indicates an unsafe practice where damage to the product could occur.

**Warning:** Indicates an unsafe practice where personal injury or severe damage to the product could occur.

**Danger:** Indicates an unsafe practice where serious personal injury or death could occur.

**Volvo Trucks North America, Inc.**  
Greensboro, NC USA

**Order number: PV776-TSP178199**

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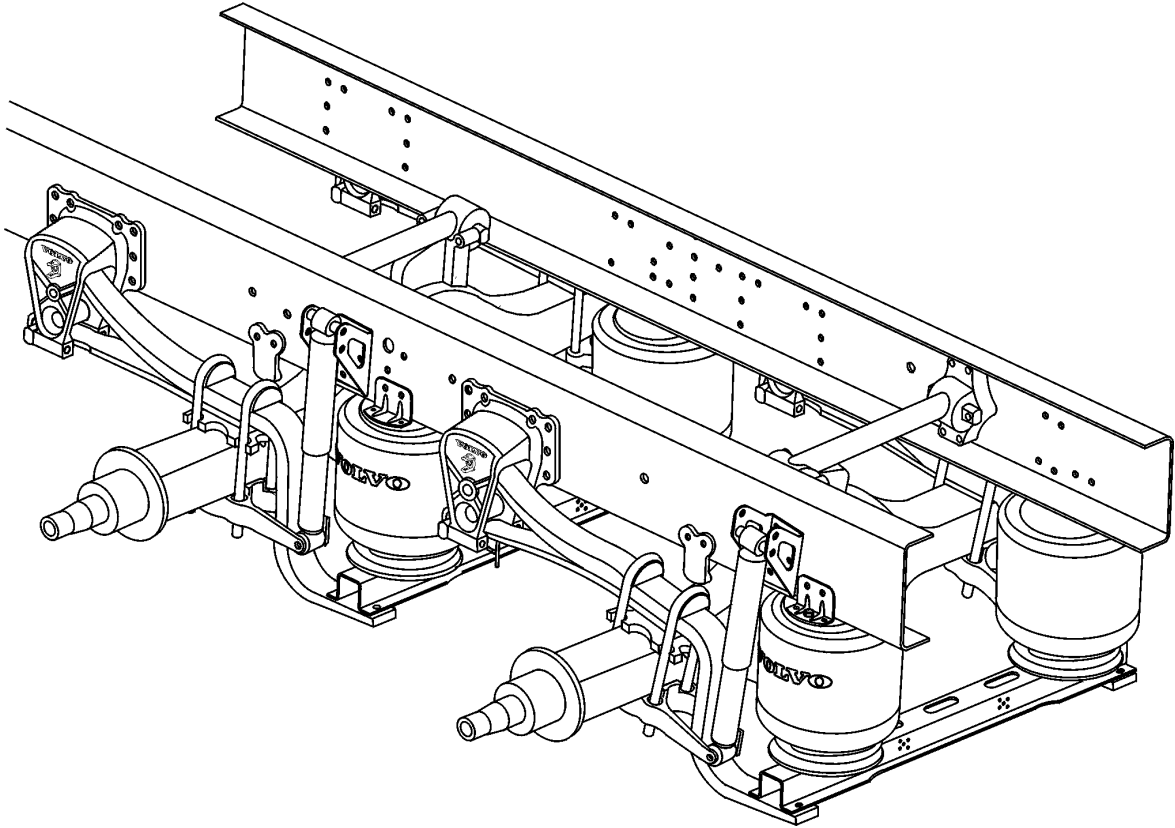
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# General

## Basic Description



W7001036

This information covers specifications, service procedures, ride height adjustments, calculations, and pinion angles for the Volvo Optimized Air Suspension produced since January 2002. Information in this manual is essential to maintain proper serviceability and proper ride height set by the manufacturer for the Volvo Optimized Air Suspension.



### CAUTION

The Volvo Optimized Air Suspension ride height is set at the factory. Changing the ride height will affect the driveshaft angles and may cause driveline vibration and/or shorten component life.

**Ride height adjustments must be performed in accordance with all documented service procedures.**





# Specifications

## Tightening Torques

6X4 VOAS				
Frame Height mm (in.)		Ride Height mm (in.)	Pinion Angle (°) (first drive axle)	Pinion Angle (°) (second drive axle)
<b>Meritor RT40-145</b>				
266 (10.47)	axle space 1320	225 ± 5 (8.86 ± 0.2)	2.5 ± 1°	13.2 ± 1°
RRH200	axle space 1520	217 ± 5 (8.54 ± 0.2)	1.7 ± 1°	12.0 ± 1°
300 (11.81)	axle space 1320	208 ± 5 (8.19 ± 0.2)	2.5 ± 1°	13.2 ± 1°
RRH180	axle space 1520	200 ± 5 (7.87 ± 0.2)	1.7 ± 1°	12.0 ± 1°
266 (10.47)	axle space 1320	181 ± 5 (7.13 ± 0.2)	2.5 ± 1°	13.2 ± 1°
RRH160	axle space 1520	173 ± 5 (6.81 ± 0.2)	1.7 ± 1°	12.0 ± 1°
<b>Dana 404</b>				
266 (10.47)	axle space 1320	208 ± 5 (8.19 ± 0.2)	1.8 ± 1°	12.2 ± 1°
RRH200	axle space 1520	206 ± 5 (8.11 ± 0.2)	1.6 ± 1°	10.8 ± 1°
300 (11.81)	axle space 1320	191 ± 5 (7.52 ± 0.2)	1.8 ± 1°	12.2 ± 1°
RRH180	axle space 1520	189 ± 5 (7.44 ± 0.2)	1.6 ± 1°	10.8 ± 1°
266 (10.47)	axle space 1320	164 ± 5 (6.46 ± 0.2)	1.8 ± 1°	12.2 ± 1°
RRH160	axle space 1520	157 ± 5 (6.18 ± 0.2)	1.6 ± 1°	10.8 ± 1°
<b>4X2 VOAS with any Axle</b>				
266 (10.47)		225 ± 5 (8.86 ± 0.2)	3.5 ± 1°	
RRH200				
300 (11.81)		208 ± 5 (8.19 ± 0.2)	3.5 ± 1°	
RRH200				

## Ride Height and Pinion Angle Specifications

6X4 VOAS				
Frame Height mm (in.)		Ride Height mm (in.)	Pinion Angle (°) (first drive axle)	Pinion Angle (°) (second drive axle)
<b>Meritor RT40-145</b>				
266 (10.47) RRH200	axle space 1320	225 ± 5 (8.86 ± 0.2)	2.5 ± 1°	13.2 ± 1°
	axle space 1520	217 ± 5 (8.54 ± 0.2)	1.7 ± 1°	12.0 ± 1°
300 (11.81) RRH200	axle space 1320	208 ± 5 (8.19 ± 0.2)	2.5 ± 1°	13.2 ± 1°
	axle space 1520	200 ± 5 (7.87 ± 0.2)	1.7 ± 1°	12.0 ± 1°
266 (10.47) RRH160	axle space 1320	181 ± 5 (7.13 ± 0.2)	2.5 ± 1°	13.2 ± 1°
	axle space 1520	173 ± 5 (6.81 ± 0.2)	1.7 ± 1°	12.0 ± 1°
<b>Dana 404</b>				
266 (10.47) RRH200	axle space 1320	208 ± 5 (8.19 ± 0.2)	1.8 ± 1°	12.2 ± 1°
	axle space 1520	206 ± 5 (8.11 ± 0.2)	1.6 ± 1°	10.8 ± 1°
300 (11.81) RRH200	axle space 1320	191 ± 5 (7.52 ± 0.2)	1.8 ± 1°	12.2 ± 1°
	axle space 1520	189 ± 5 (7.44 ± 0.2)	1.6 ± 1°	10.8 ± 1°
266 (10.47) RRH160	axle space 1320	164 ± 5 (6.46 ± 0.2)	1.8 ± 1°	12.2 ± 1°
	axle space 1520	157 ± 5 (6.18 ± 0.2)	1.6 ± 1°	10.8 ± 1°
<b>4X2 VOAS with any Axle</b>				
266 (10.47) RRH200		225 ± 5 (8.86 ± 0.2)	3.5 ± 1°	
300 (11.81) RRH200		208 ± 5 (8.19 ± 0.2)	3.5 ± 1°	

Table 1. Ride Height and Corresponding Pinion Angle

As measured from the axle center to the frame rail bottom. \*In the event that both the ride height and pinion angles can not be adjusted at the same time for 6X4s, the ride height should be adjusted to the minimum cancellation error angle for the intermediate prop shaft, then lowered by 10 mm.

**Note:** Working angles are measured at the forward axle joint or rear axle joint; See "Calculation Form" page 29.

## Suspension Applications

**Note:** There are two vehicle suspension ride height versions. The RRH-180 and RRH-200 have a stamped sheet metal torque rod bracket (on the axle) and a different torque rod. The vehicles with this version are equipped with a Meritor axle. The other version is the

RRH-160, this suspension has a cast iron torque rod bracket and is available on all Dana/Eaton axles as well as Meritor. The difference between the two versions is that the bumpstop has changed and this has impacted the total suspension travel that is available.

Suspension Configuration	Maximum GAWR Metric Ton (lb)	Maximum GCW Metric Ton (lb)	Axle Spacing mm (in.)	Required Number of Parking Chambers	Available Axles	
					Models	Metric Ton (lb)
4x2	9 (20,000)	50 (110,000) <b>(1)</b>	N/A	TWO	Eaton Meritor	10 (23,000)
6x4	17 (38,000)		1320 (52)	TWO (1st Axle)	Eaton Meritor	18 (40,000)
	18 (40,000)		1320 (52)	FOUR		
	18 (40,000)		1524 (60)	FOUR		

(1) GCW (Gross Combination Weight) rating can be reduced by vehicle operating applications, engine horsepower/torque, axle type/model, axle ratio, and/or vehicle tire size.

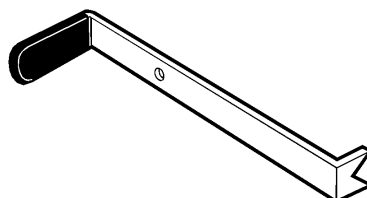


# Tools

## Special Tools

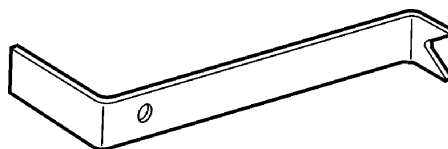
For special tool ordering instructions, see service information in group 08.

J42189  
air line release tool



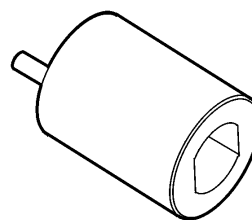
W0001198

J44773  
air line release tool



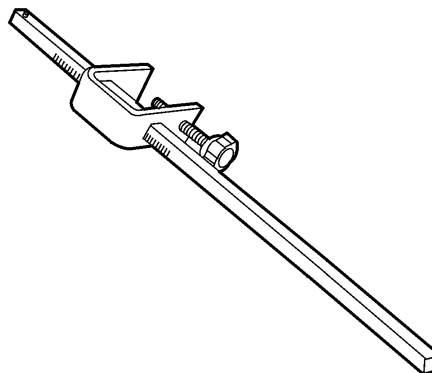
W0001874

J44544  
adjustment socket



W0001815

J44684  
ride height gauge

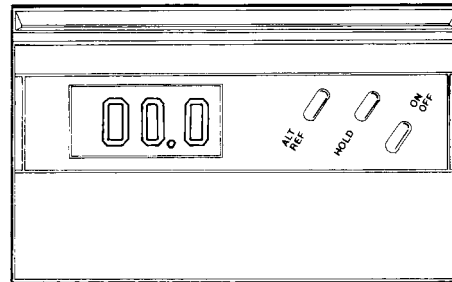


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## Special Equipment

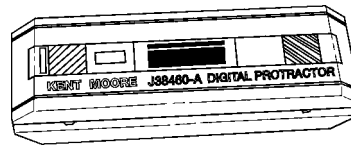
For special tool ordering instructions, see service information in group 08.

Anglemaster  
Digital inclinometer



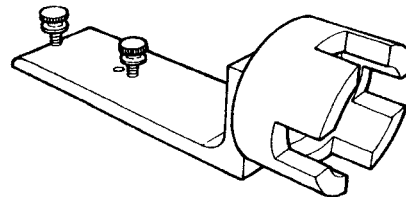
W7000250

J38460-A  
Digital protractor



W7000708

J38460-25  
Bracket

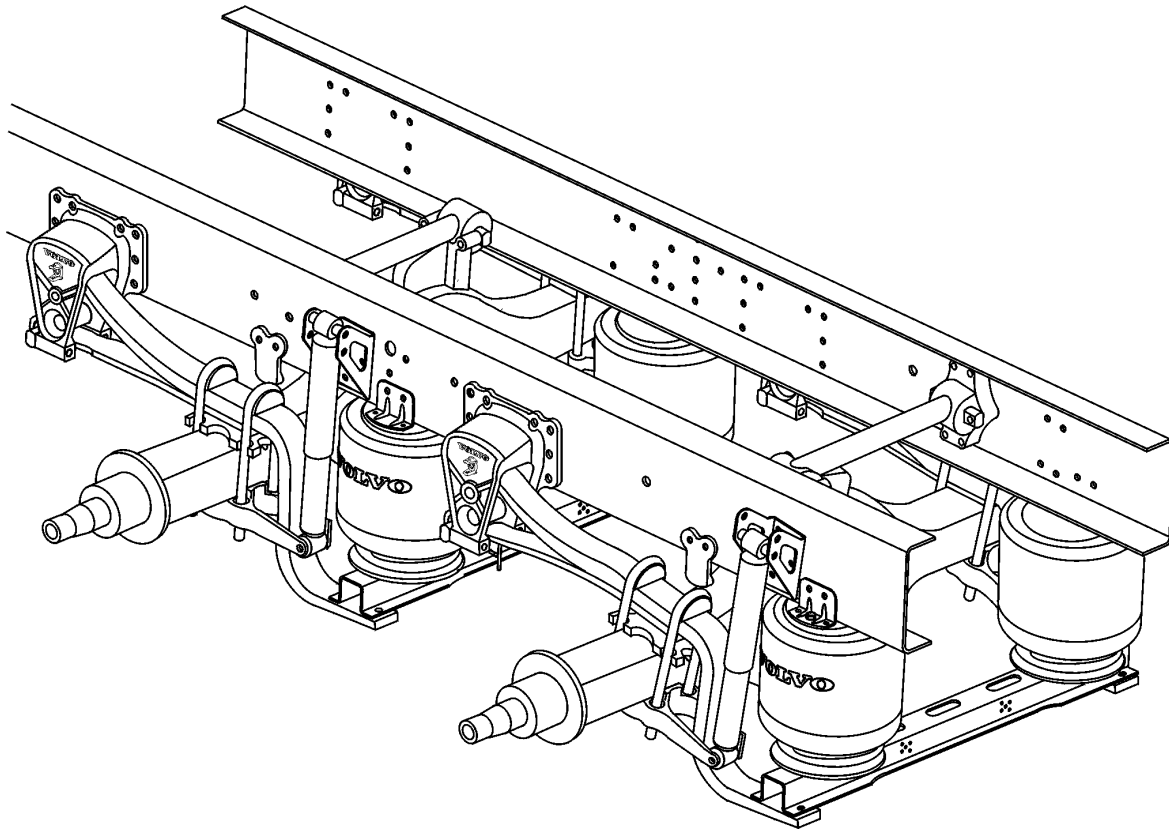


W7000726

# Design and Function

## Rear Air Suspension

### Volvo Air Suspension



W7001036

The design of the Air-Ride Suspension has been refined by Volvo Trucks North America. The result of this refinement process is the Volvo Optimized Air Suspension. This new Suspension is a rear air suspension with improved ride characteristics and increased durability.



#### CAUTION

The Volvo Optimized Air Suspension is set at the factory. Changing the ride height will affect the driveshaft angles and may cause driveline vibration and/or shorten component life.

**Ride height adjustments must be performed in accordance with all documented service procedures.**

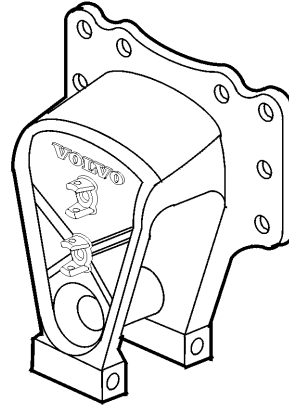
## Air Suspension, Adjustment (Ride Height and Driveline Calculation)

Ride height has a direct relationship with driveline pinion angles. It is critical to maintain all ride height specifications as recommended by Volvo Trucks North America, Inc. (VTNA).

Interaxle cancellation (equal forward and rear interaxle U-joint angles) is the key to reduced driveline vibrations and increased component life. "Air Suspension, Adjustment (Ride Height and Driveline Calculation)" page 23, describes how to achieve interaxle cancellation by maintaining the proper ride height and pinion angles.

## Spring Hanger

The Spring Hanger is a ductile iron casting and includes an internal alignment guide to help center the Z-spring within the bracket during initial assembly.

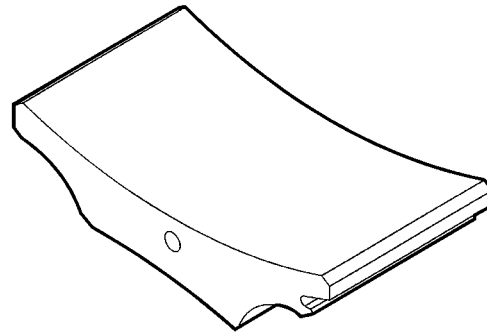


W7001044

## Wear Plate

The wear plate (pad) is constructed of the same Ultra-High Molecular Weight Polyethylene as earlier wear plates. This material provides an extremely smooth surface for the spring to contact and virtually eliminates the noise associated with the metal-to-metal contact of other suspension designs. The Volvo Optimized Air Suspension wear plate mounts with a single fastener into a pocket between the vertical legs of the spring hanger.

**Note:** Wear plates (pads) must be replaced in pairs (left and right) to avoid excessive stress on the suspension.

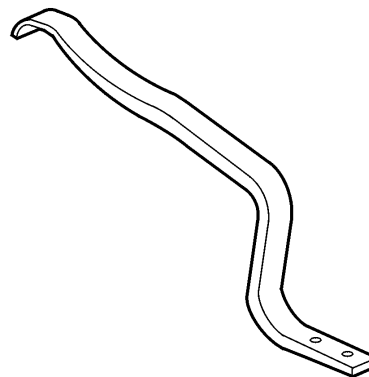


W7000739

## Z-Spring

The Z-spring has been improved to provide a larger clamping surface, an improved alignment with mating components, and increased clearance to the lower shock mounting bracket.

**Note:** The Z-Spring on the second drive axle on the 6 x 4 may be longer than the first drive axle.



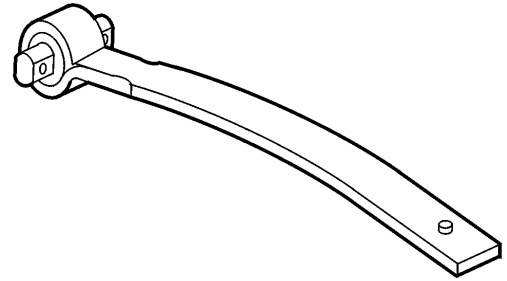
W7001045



## Radius Leaf Spring

The radius leaf spring is crucial to the vehicle's alignment. The radius leaf spring has an improved bushing for increased component durability. The Volvo Optimized Air Suspension spring uses a locating pin that precisely locates the radius leaf spring for an improved fit with the mating Z-spring and axle seat. Precisely locating the radius leaf spring helps to improve the vehicles overall axle alignment.

**Note:** The first and second drive axles on the 6 x 4 have different radius leaf springs.



W7001046

## Crossbeam

The crossbeam (pedestal plate) has been redesigned to improve strength while reducing weight. The Volvo Optimized Air Suspension crossbeam uses only four mounting bolts (two on each end) for easy installation of the Z-spring.



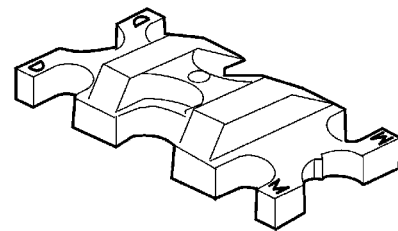
W7000704

Crossbeam

## Axle Seat

The axle seat defines the axle pinion inclination. It has been refined to eliminate the extra spacers necessary in earlier designs. By eliminating the spacers, the Volvo Optimized Air Suspension axle seat forms a strong and secure joint between the radius leaf spring and the axle.

**Note:** For proper positioning of axle seat, see "Axle Seat, Replacement" page 53.



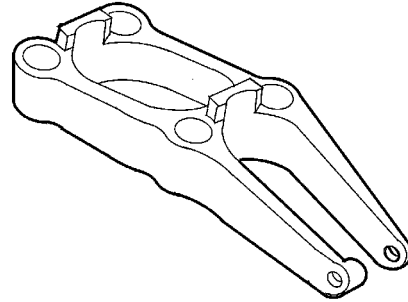
W7001200

Axle seat

## Bottom Plate/Rear Shock Absorber Bracket, Lower

The bottom axle plate/lower shock absorber bracket is found underneath the axle housing, and is held in place by the U-bolts. It helps maintain axle alignment with the springs in the suspension and prevents movement of the axle. It can also be helpful in keeping U-bolts properly aligned and secured.

**Note:** There is a left-and right-hand bracket.

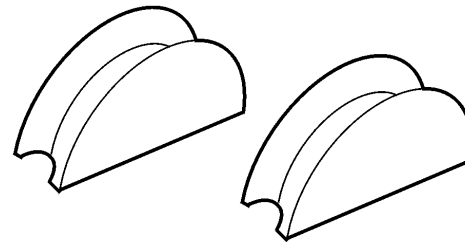


W7001049

Bottom plate/rear shock absorber bracket (Right hand bracket shown above)

## Top Plate

The top plate (upper clip) is located at the top of the Z-spring and is clamped down by the U-bolts. It helps maintain alignment of the U-bolts to secure and align the Z-spring, radius leaf spring, and axle seats. The top plate also helps maintain a secure surface for U-bolts when the nuts are tightened.



W7001050

Top plate

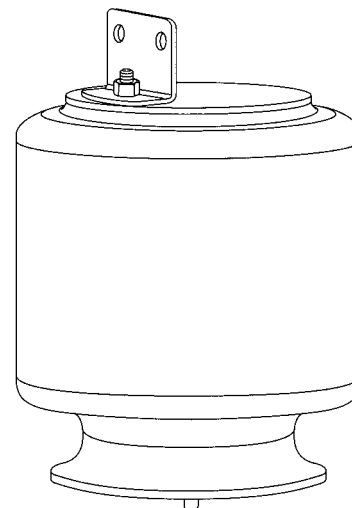
## Air Spring

The air spring in the Volvo Optimized Air Suspension system is a rolling-lobe, sleeve type with a composite piston. The air spring uses a single stud to attach to the crossbeam.



### CAUTION

Do not mix the air springs of the Volvo Optimized Air Suspension with air springs of earlier suspensions. System failure may result.



W7000225

## Leveling Rod

The Volvo Optimized Air Suspension uses a leveling rod that is factory adjusted and set to accurately control the dimensions of the air springs, prevent inappropriate adjustments, and avoid unnecessary servicing.



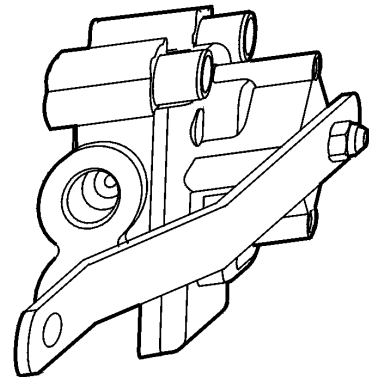
W7001195

## Load Leveling Valve

The load leveling valve was designed to simplify the chassis air suspension system. The quick-dump valve is now combined into the height control valve. This eliminates one valve and the related plumbing.

The valve is located on the left side of the frame rail, adjacent to the fifth wheel.

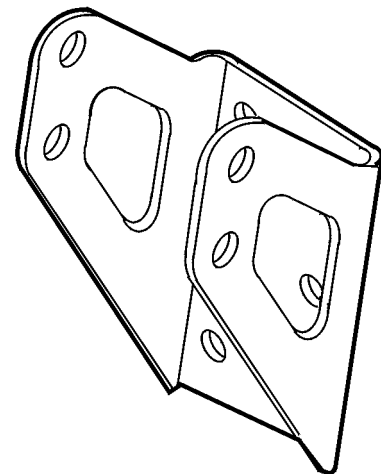
The Volvo Optimized Air Suspension height valve incorporates an integrated dump feature that eliminates the need for a separate valve and allows the rear to be lowered when driving out from under an uncoupled trailer.



W7001051

## Shock Absorber Bracket, Upper

The upper shock absorber bracket has been redesigned to eliminate the need for left-hand and right-hand versions.



W7001053

## Torque Rod

The torque rod is located on top of the axle housing. It is positioned between the frame rail mounted bracket and the axle housing mounted bracket. It helps maintain lateral alignment of the rear axle or axles for the suspension.

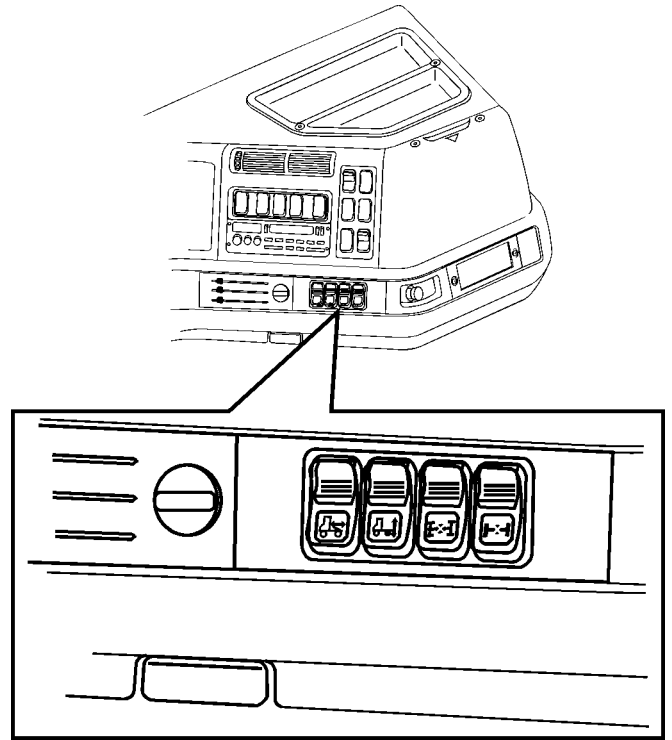
**Note:** Different models of torque rods should not be interchanged.



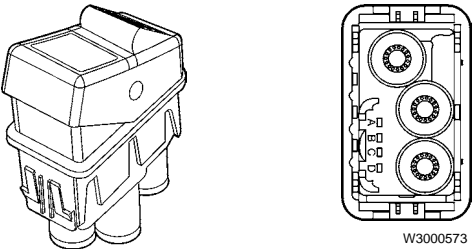
W7000722

# Pneumatic Switch Panel

The air suspension level switch is used to lower the truck when uncoupling the trailers. It then enables you to return to the raised position (“ride”) for a better ride.



W7000714

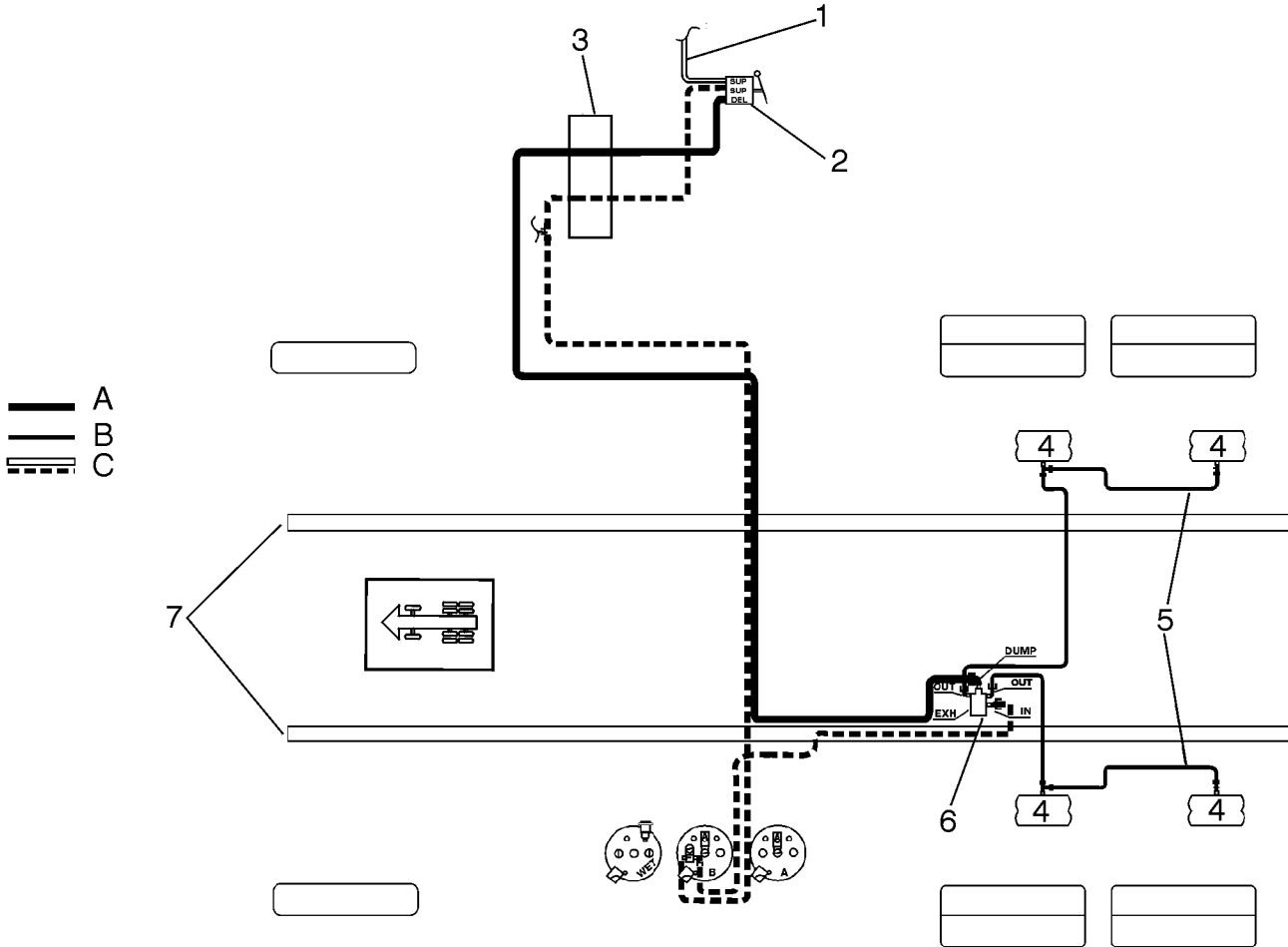
Switch	Switch Function	Terminal			
		A	B	C	D
 <p>W3000574</p> <p>W3000573</p>	Interaxle DLO	To Cluster Telltale Lamp	+12V Supply	Ground	+12V Illumination Control
	Fifth Wheel Slide	To Cluster Telltale Lamp	Not Used	Ground	+12V Illumination Control
	<b>Suspension Dump</b>	To Cluster Telltale Lamp	Not Used	Ground	+12V Illumination Control
	Interwheel DLO	N/A	Not Used	Ground	+12V Illumination Control

## Dump Switch Operation

To “dump” air from the system (to lower the suspension), push the switch to the position labeled “uncouple.”

**Note:** Lower the suspension when disconnecting and connecting the trailer.

To fill the system (to return to the normal ride height), push the switch to the position labeled “ride.”



W7001198

### Volvo Optimized Air Suspension

- A Dump System
- B Air Suspension System
- C Air Supply
- 1 Supply for Dash Systems
- 2 Air Suspension Dump
- 3 BulkHead pass through
- 4 Air Spring
- 5 6 X 4 only
- 6 Air Suspension Leveling Valve
- 7 Frame Rail

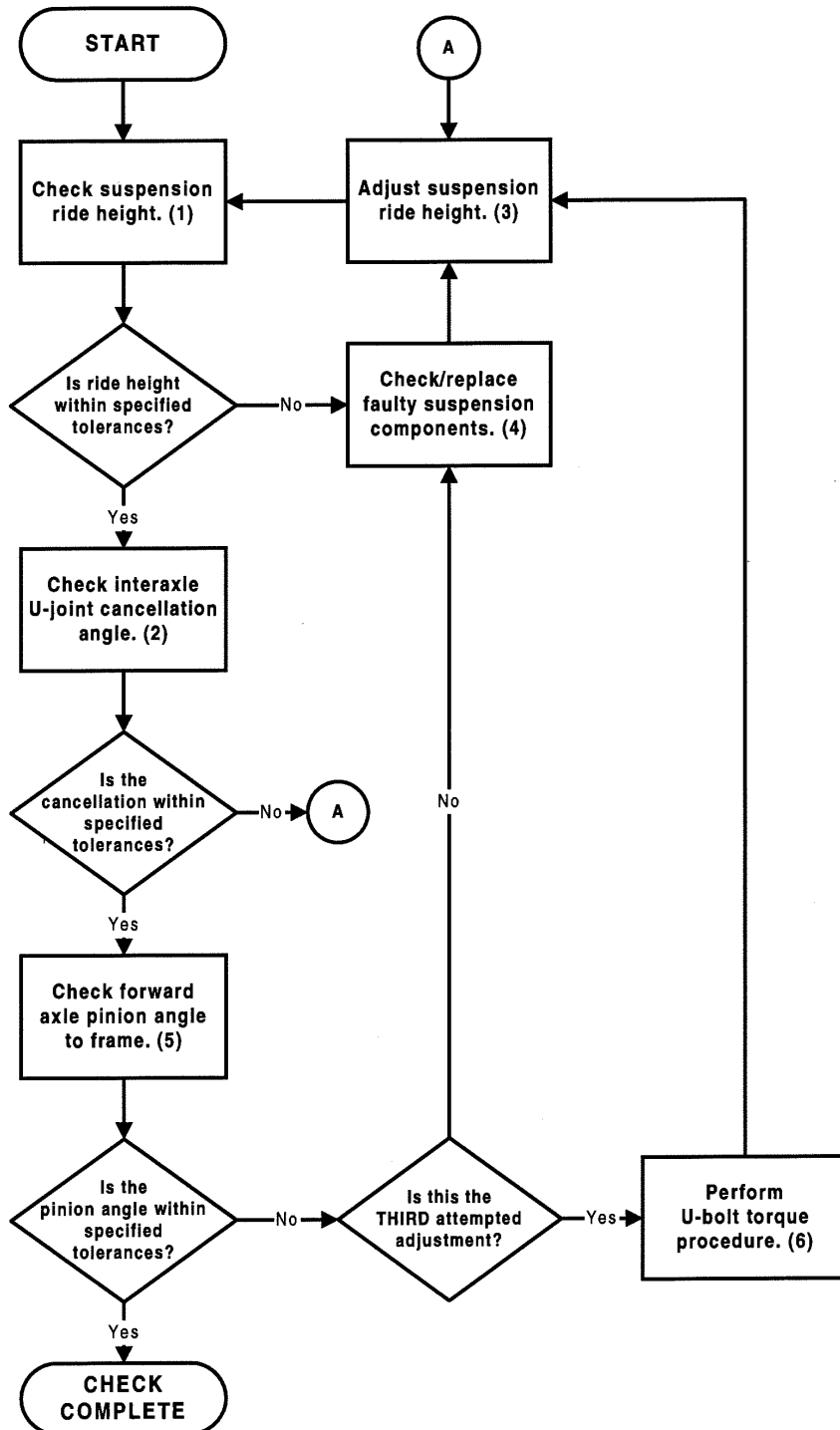
# Troubleshooting

## Rear Suspension Troubleshooting

### Volvo Optimized Air Suspension

Problem	Cause
<b>Vibration</b>	U-joint angle incorrect
	Improper phasing of drivelines
	Axle inclination incorrect
	Worn wear plate
	Worn radius arm bushing
	Improper ride height
	Broken or defective spring
	Thrust alignment incorrect
	Improper wheel run-out or balance
	Broken or loose U-bolts
	Excessive wheel bearing end play
	Mismatched wheels and tires
	Improper axle seat installation
<b>Bottoming Out</b>	Broken or defective shock absorber
	Defective leveling valve
	Overloaded vehicle
	Pressure regulator set too low
	Wrong air spring
	Improper ride height
	Broken or defective spring
	Low air pressure
<b>Tracking</b>	Thrust alignment incorrect
	Worn or defective torque rod bushing
	Worn radius arm bushing
	Broken or loose U-bolts
	Broken or defective spring
	Total wheel alignment of axles incorrect
	Lateral alignment of axles incorrect
	Improper axle seat installation
<b>Ride Height Incorrect</b>	Defective leveling valve
	Ride height not set properly
	Axle inclination incorrect
	Overloaded vehicle
	Defective air spring
<b>Low Air Pressure</b>	Defective manifold
	Defective leveling valve
	Air leak or loose line
	Defective pressure regulator
	Defective dump switch

# Volvo Optimized Air Suspension Ride Height and Driveline Angle Check Flow Diagram



W7000749

- 1 See "Air Suspension, Adjustment (Ride Height and Driveline Calculation)" page 23
- 2 See "Interaxle U-joint Angle Cancellation Check (Calculation)" page 25
- 3 See "Load Leveling Valve, Adjustment" page 33
- 4 See "Forward Axle Pinion Angle to Frame Check" page 27
- 5 See "U-bolt Torque, Adjustment" page 30



## Visual Inspection of Air Spring Damage

Type of Air Spring Damage	Cause
<b>Misalignment</b>	Holes rubbed in sidewall — Worn bushings
	Loose internal bumper — Suspension out of alignment
<b>Loose girdle hoop</b>	Girdle hoop torn loose — Improperly set or inoperative leveling valve/pressure regulator
<b>Bottom-out/abrasion</b>	Top plate concave — Broken or wrong shock
	Loose internal bumper — Leveling valve or pressure regulator
	Hole in girdle hoop area — Pressure set too low
	Hole in top plate junction area — Overloaded vehicle
	Holes rubbed in sidewall — Wrong air spring (too tall)
<b>Circumferential cuts</b>	Bellows cut in circle at top plate junction — Inoperative leveling valve and or pressure regulator
	Bellows cut in circle at piston juncture — Inoperative leveling valve and or pressure regulator
<b>Over Extension</b>	Top plate convex — Broken or worn shock
	Bellows separated from top plate — Broken shocks or leveling valve set too high
	Air leak at top plate fitting — Improperly set or inoperative leveling valve/pressure regulator
	Leaking at end closure (reversible style) — Defective upper stop/wrong air spring (too short)



## Service Procedures

### 7281-05-02-01 Air Suspension, Adjustment (Ride Height and Driveline Calculation)

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.



#### CAUTION

The Volvo Air Suspension is set at the factory. Changing the ride height will affect the driveshaft angles and may cause driveline vibration and/or shorten component life. **Ride height adjustments must be performed in accordance with all documented service procedures.**

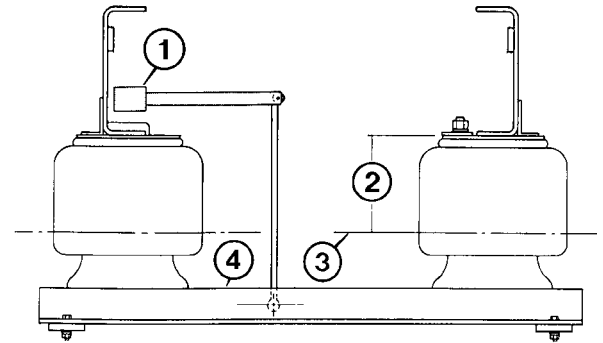
**Note:** After work has been performed on the air suspension, wheel realignment may be required.

For proper specifications for checking the wheel alignment, refer to service information in group 601 Regarding "Wheel Alignment, Steer and Drive Axles"

*Other special equipment: J-38460-A, J-38460-25*

### Air Suspension Ride Height Check

1



W7000765

- 1 Load leveling valve
- 2 Ride height
- 3 Axle center line
- 4 Crossbeam

Before you can accurately calculate the ride height, prepare the vehicle using these steps:

- Measurements must be performed on an unloaded vehicle.
- Park the vehicle on a level surface.
- The steer and rear drive axle tires must be at normal operating pressure.
- Free and center all suspension joints by slowly moving the vehicle back and forth twice without using the brake. When coming to a complete stop, make sure the brakes (parking and service) are released.
- Front wheels must be pointed straight ahead.

**2**

Chock the front wheels on the vehicle.

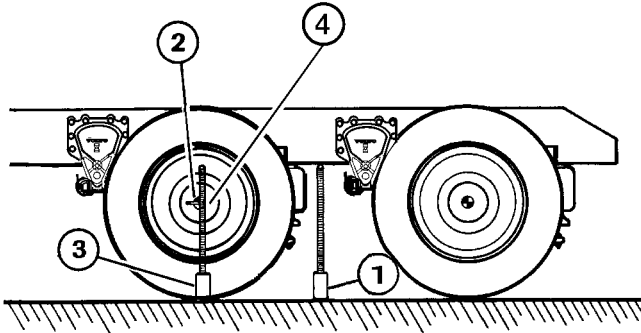
**3**

Dump (release) the suspension air (see "Dump Switch Operation" page 18).

**DANGER**

Stay clear when suspension air is released. Chassis may drop quickly, which can cause serious injury or death to anyone under the vehicle.

Start the engine and fill the suspension with air. Turn off the engine.

**4**

W7001054

The ride height is the distance from the axle centerline to the bottom of the frame rail. The ride height must be within specifications. See "Ride Height and Pinion Angle Specifications" page 6.

To accurately measure ride height:

- a. Measure from the ground to the bottom of the frame rail (1).
- b. Locate the axle centerline (the center hole on the end of the hub works best) using a steel rule or an appropriate tool (2). Measure from the ground to the axle centerline (3).
- c. Calculate the difference between (1) and (3). The difference is the ride height (4).
- d. Ride height should fall within specifications (see above).

**5**

Record the measurement for calculation (refer to "Calculation Form" page 29). If the measurement is not within the specified range, it must be corrected before proceeding. If the ride height is not adjusted to specification, check for the following:

- Excessively worn wear plates (pads).

**Note:** Wear plates (pads) must be replaced in pairs (left and right on same axle); see "Wear Plate (Pad), Replacement" page 46.

- Damaged spring hanger.
- Damaged air spring, Z-spring, and/or radius leaf spring.
- Damaged leveling rod.
- Faulty load leveling valve.

Replace the components as necessary, then adjust the suspension ride height (see "Load Leveling Valve, Adjustment" page 33).

**6**

Re-measure the ride height following instructions shown in step 4. Repeat as necessary until the measurement is within specifications.

**7**

Proceed to "Interaxle U-joint Angle Cancellation Check (Calculation)" page 25.

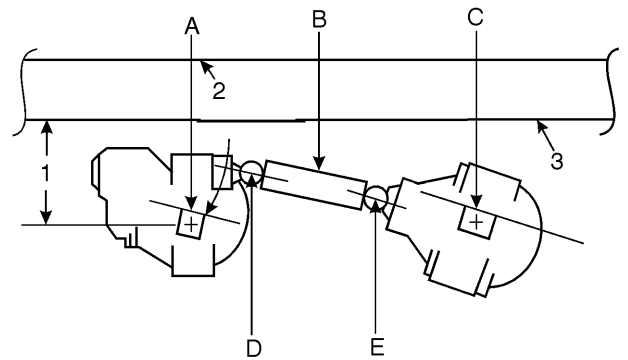
## Interaxle U-joint Angle Cancellation Check (Calculation)

### 1

The steps from "Air Suspension Ride Height Check" page 23 must be performed before continuing with this procedure.

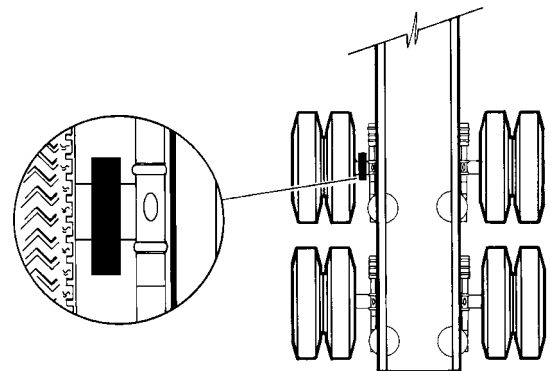
**Note:** All angle measurements are relative to level ground.

### 2



W7001194

- A** Angle A FWD Axle pinion
- B** Angle B Interaxle shaft Angle
- C** Angle C Rear Axle pinion
- D** Angle D FWD Axle Joint Working Angle
- E** Angle E Rear Axle Joint Working Angle
- 1** Ride Height
- 2** Angle P Relative to frame
- 3** Frame Rail



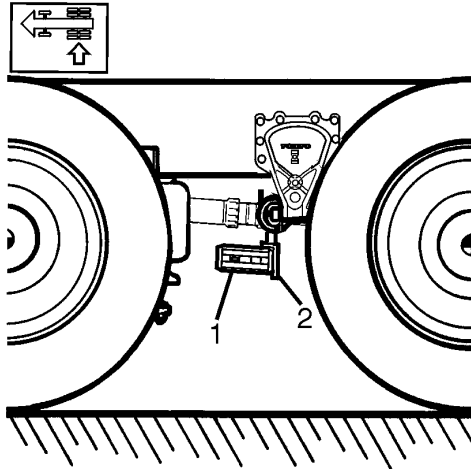
W7000252

J-38460-A

Measure the **forward** axle angle (**A**) using a protractor or recommended tool. Record the measurement for calculation (refer to "Calculation Form" page 29).

**Note:** Wipe surface clean of dirt and debris before taking measurement.

3



W7001202

- 1 Digital Protractor J-38460
- 2 Bracket J-38460-25

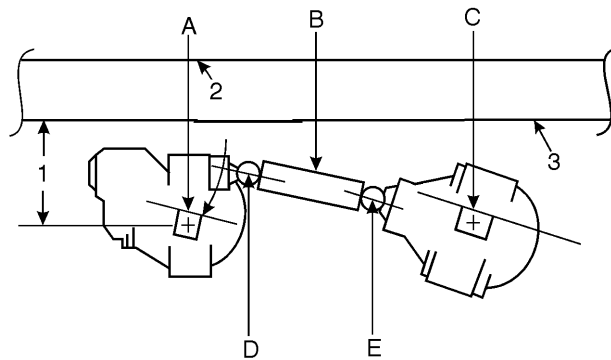
Measure the interaxle shaft angle (**B**) using the recommended tools. Record the measurement for calculation (refer to "Calculation Form" page 29).

**Note:** Wipe surface clean of dirt and debris before taking measurement.

4

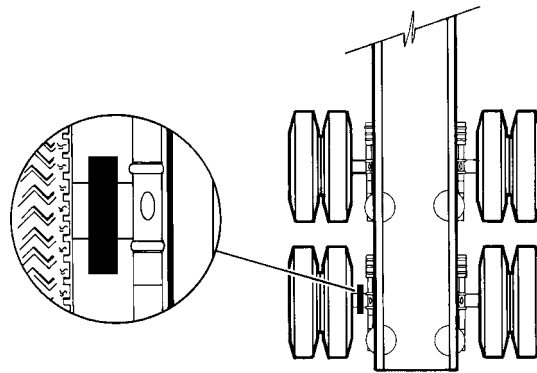
Calculate :  $B - A = D$   
 The interaxle angle minus the forward axle angle will give the value (**D**) (refer to "Calculation Form" page 29).

5



W7001194

- A Angle A FWD Axle pinion
- B Angle B Interaxle shaft Angle
- C Angle C Rear Axle pinion
- D Angle D FWD Axle Joint Working Angle
- E Angle E Rear Axle Joint Working Angle
- 1 Ride Height
- 2 Angle P Relative to frame
- 3 Frame Rail



W7000253

Measure the **rear** axle angle (**C**) using the recommended tools. Record the measurement for calculation (refer to "Calculation Form" page 29).

**Note:** Wipe surface clean of dirt and debris before taking measurement.

6

Calculate:  $C - B = E$   
 The rear axle angle minus the interaxle angle will give the value (**E**). Record the measurement for calculation (refer to "Calculation Form" page 29).

**7**Calculate:  $D - E = F$ 

Record the measurement for calculation (refer to "Calculation Form" page 29).

Compare the value of angle (**F**) with the following guidelines:If (**F**) is less than -4, lower the ride height.If (**F**) is between -4 and -1, no adjustment is necessary.If (**F**) is greater than -1, raise the ride height.

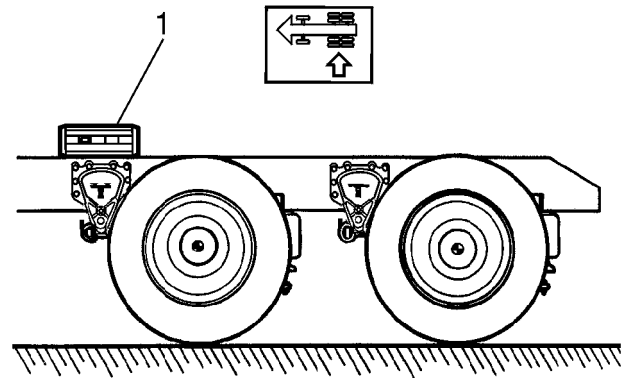
For procedures on lowering or raising ride height, refer to "Load Leveling Valve, Adjustment" page 33.

**8**

Proceed to "Forward Axle Pinion Angle to Frame Check" page 27.

## Forward Axle Pinion Angle to Frame Check

1



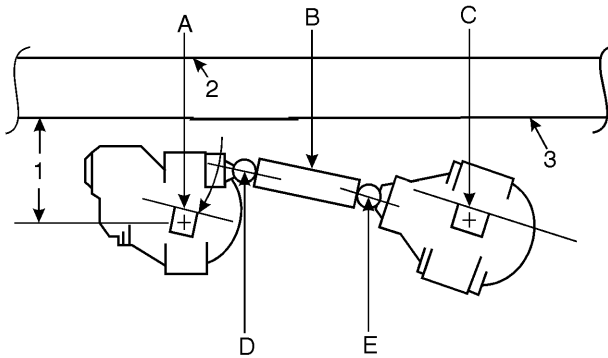
W7001201

1 Digital protractor

Place a protractor or recommended tool on top of the frame. "Zero-out" protractor or recommended tool.

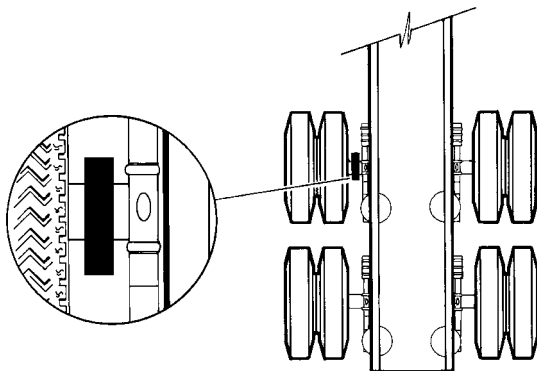
J-38460-A

2



W7001194

- A Angle A FWD Axle pinion
- B Angle B Interaxle shaft Angle
- C Angle C Rear Axle pinion
- D Angle D FWD Axle Joint Working Angle
- E Angle E Rear Axle Joint Working Angle
- 1 Ride Height
- 2 Angle P Relative to frame
- 3 Frame Rail



W7000252

Measure the **forward** axle angle (**P**), using the “zeroed out” protractor or recommended tool.

3

The angle (P) measurement must be within the specified range. See “Ride Height and Pinion Angle Specifications” page 6. If angle (P) is outside the specifications, it must be corrected. Check for the following:

- Excessively worn wear plates (pads).
  - Note:** Wear plates (pads) must be replaced in pairs (left and right on same axle); see “Wear Plate (Pad), Replacement” page 46.
- Damaged spring hanger.
- Damaged air spring, Z-spring, and/or radius leaf spring.
- Damaged leveling rod.
- Broken/loose U-bolts.
- Faulty load leveling valve.

Replace the components as necessary, then adjust the suspension ride height (see “Load Leveling Valve, Adjustment” page 33).

4

Repeat all steps in “Air Suspension Ride Height Check” page 23, “Interaxle U-joint Angle Cancellation Check (Calculation)” page 25, and “Forward Axle Pinion Angle to Frame Check” page 27.

**Note:** If, after the second attempt, the axle pinion angles are still not within specification, perform the “U-bolt Torque, Adjustment” page 30, as a last attempt to correct the axle pinion angles.



## Calculation Form

Use this form to record the measurements for calculating ride height and checking pinion angles (all angle measures are in degrees).

	ANGLE	MEASUREMENTS	
		INITIAL	FINAL
<b>1) MEASURE THE RIDE HEIGHT:</b>  Ride Height must be within specification. See "Ride Height Pinion Angle Specifications" page 6. If ride height is not within specification, it must be corrected before continuing.			
<b>2) MEASURE FORWARD AXLE ANGLE</b>  (Relative to the ground)	A		
<b>3) MEASURE THE INTERAXLE SHAFT</b>  (Relative to the ground)	B		
<b>4) CALCULATE: B - A =</b>  The difference between B and A is value "D"	D		
<b>5) MEASURE THE REAR AXLE ANGLE</b>  (Relative to the ground)	C		
<b>6) CALCULATE: C - B =</b>  The difference between C and B is value "E"	E		
<b>7) CALCULATE: D - E =</b>	± F		

ACTION:	LOWER RIDE HEIGHT	No Adjustment	RAISE RIDE HEIGHT
IF ANGLE "F" IS:	less than -1.5	between -1.5 and 1.5	greater than 1.5

**Note: The Air Suspension ride height cannot fall outside the specified tolerance.** If the adjustment for angle (F) requires that the air suspension ride height be adjusted outside the specified range, see "Volvo Optimized Air Suspension Troubleshooting" page 23.

For the forward axle angle P (relative to frame) measurement specifications see "Ride Height and Pinion Angle Specifications" page 6.

**Note:** If angle (P) is not within tolerance, see "Volvo Optimized Air Suspension Troubleshooting" page 23.

## 7214-05-02-01

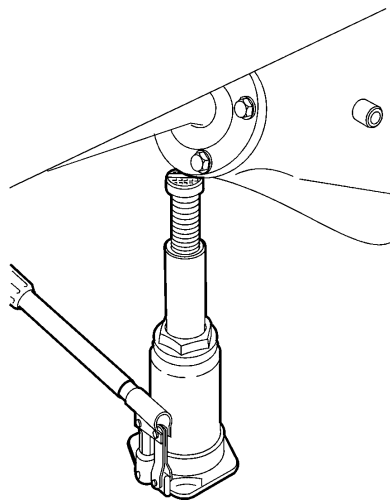
### U-bolt Torque, Adjustment

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

Loosening and re-tightening the suspension U-bolts in a particular sequence can influence the axle pinion angle. U-bolts on both the left and right side of the same axle must be loosened and re-tightened before performing this procedure.

#### Method 1 (Preferred)

1



W7000752



#### DANGER

Failure to properly support the nose of the axle may result in the axle rolling forward, causing serious injury or death.

Support the nose of the axle with an adequate jack.

**Note:** Always replace both U-bolts at a particular axle position. The longer of the two U-bolts is positioned to the rear side of the axle housing.

2

Loosen the U-bolts enough to allow the bottom plate/rear shock absorber bracket to be slightly free from the axle housing. Lower the jack slightly, approximately 10 – 15 mm (0.38 – 0.50 in.).

**Note:** Any time you work on the suspension, make sure you loosen both sides of the suspension on an axle at the same time. It is difficult to realign all parts with opposite side of the axle restricting motion.

3

Check for dirt or debris in the U-bolt threads. Clean the threads if necessary and coat with a light wax-based lubricant.

**Note:** Lubricating the threads with motor oil is not recommended because of the detergent additives.

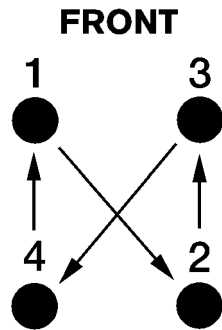
4

Tighten the U-bolt nuts so that there is no movement in the bottom plate/rear shock absorber bracket.

**Note:** Whenever the U-bolts are loosened and/or the suspension components attached to the axle are being worked on, make sure that the locating features on each component are properly engaged so that the components are positioned together properly.

**Note:** Make sure that the pin in the radius leaf spring has not been pushed out of position. If the pin is correctly set, make sure that the pin is placed in its proper position relative to the axle seat and Z-spring before clamping it with the U-bolts.

5



W7000750

Tighten U-bolts using a cross pattern shown above. Tighten using a five step process as follows:

1

1 M20: 40 Nm (29 ft-lb)

2 M22: 47 Nm (35 ft-lb)

2

3 M20: 135 Nm (100 ft-lb)

4 M22: 156 Nm (115 ft-lb)

3

5 M20: 250 Nm (184 ft-lb)

6 M22: 250 Nm (184 ft-lb)

4

7 M20: Rotate 90 degrees

8 M22: Rotate 90 degrees

5

9 M20:  $500 \pm 75$  Nm ( $370 \pm 55$  ft-lb)10 M22:  $575 \pm 50$  Nm ( $425 \pm 37$  ft-lb)

**Note:** The applied torque should be  $500 \pm 75$  Nm ( $370 \pm 55$  ft-lb) for M20 and  $575 \pm 50$  Nm ( $440 \pm 55$  ft-lb) for M22 U-bolts while keeping the U-bolt perpendicular to the axle. Inspection torque should be a minimum of 330 Nm (243 ft-lb) and 380 Nm (280 ft-lb) 10 hours after assembly.

6

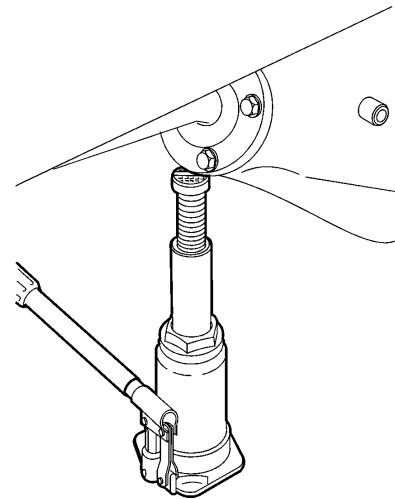
Road-test the vehicle to seat components, then re-tighten the U-bolt nuts.

7

Re-perform the procedure: "Air Suspension, Adjustment (Ride Height and Driveline Calculation)" page 23. If axle pinion angles are still outside the specifications, proceed with Method 2.

## Method 2

1



W7000752



### DANGER

Failure to properly support the nose of the axle may result in the axle rolling forward, causing serious injury or death.

Support the nose of the axle with an adequate jack.

**Note:** Always replace both U-bolts at a particular axle position. The longer of the two U-bolts is positioned to the rear side of the axle housing.

2

Loosen the U-bolts enough to allow the bottom plate/rear shock absorber bracket to be slightly free from the axle housing. Lower the jack slightly, approximately 10 –15 mm (0.38 – 0.50 in.).

**Note:** Any time you work on the suspension, make sure you loosen both sides of the suspension on an axle at the same time. It is difficult to realign all parts with opposite side of the axle restricting motion.

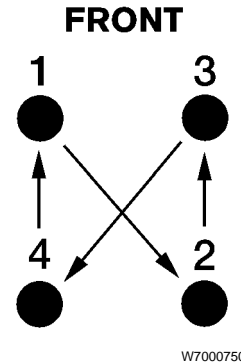
**3**

Check for dirt or debris in the U-bolt threads. Clean the threads if necessary and coat with a light wax-based lubricant.

**Note:** Lubricating the threads with motor oil is not recommended because of the detergent additives.

**4**

Tighten the U-bolt nuts so that there is no movement in the bottom plate/lower shock absorber bracket.

**5**

Tighten U-bolts using a cross pattern shown above. Tighten using a five step process as follows:

1

1 M20: 40 Nm (29 ft-lb)

2 M22: 47 Nm (35 ft-lb)

2

3 M20: 135 Nm (100 ft-lb)

4 M22: 156 Nm (115 ft-lb)

3

5 M20: 250 Nm (184 ft-lb)

6 M22: 250 Nm (184 ft-lb)

4

7 M20: Rotate 90 degrees

8 M22: Rotate 90 degrees

5

9 M20: 500 ± 75 Nm (370 ± 55 ft-lb)

10 M22: 575 ± 50 Nm (425 ± 37 ft-lb)

**Note:** The applied torque should be 500 ± 75 Nm (370 ± 55 ft-lb) for M20 and 575 ± 50 Nm (425 ± 37 ft-lb) for M22 U-bolts while keeping the U-bolt perpendicular to the axle. Inspection torque should be a minimum of 330 Nm (243 ft-lb) and 380 Nm (280 ft-lb) 10 hours after assembly.

**6**

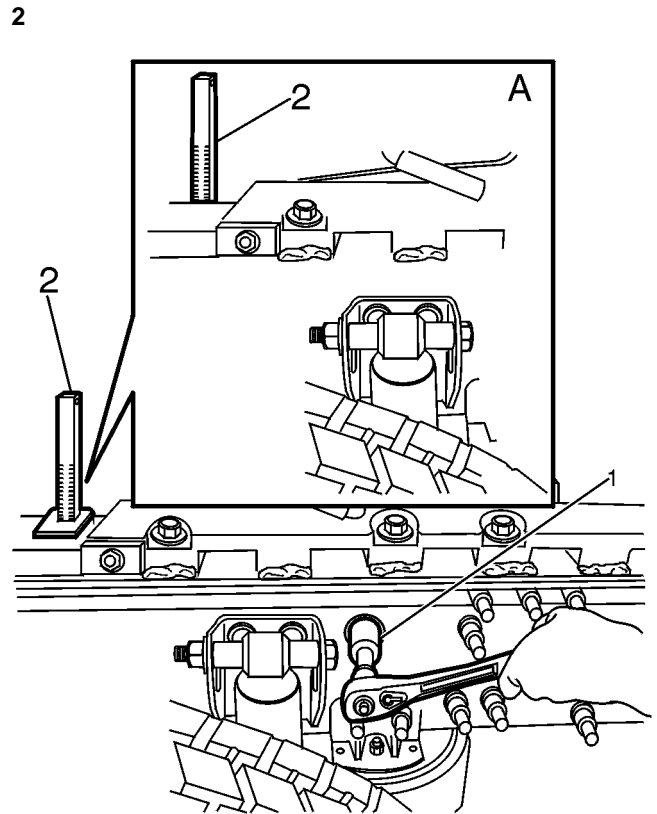
Repeat the procedure: "Air Suspension, Adjustment (Ride Height and Driveline Calculation)" page 23.

M20:  
500 ± 75 Nm  
(370 ± 55 ft-lb)  
M22:  
575 ± 50 Nm  
(425 ± 37 ft-lb)

## 7641-05-02-01 Load Leveling Valve, Adjust- ment

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

- 1**  
Park the vehicle on a level surface, place the transmission in neutral and chock the front wheels.



W7001203

- A** Alternate tool position for checking Ride Height.
- 1** Adjustment Socket J-44544
- 2** Ride Height Gauge J-44684

### DANGER

Use caution when moving the load leveling valve arm down. This will release the suspension air and the chassis may drop quickly, possibly causing serious injury or death to anyone under the vehicle.

To raise or lower the suspension ride height, use a ratchet and extension, along with Kent Moore tool number J-44544. Place tool inside the hole in the frame rail. The hole is located on the left side, behind the 1st drive axle.

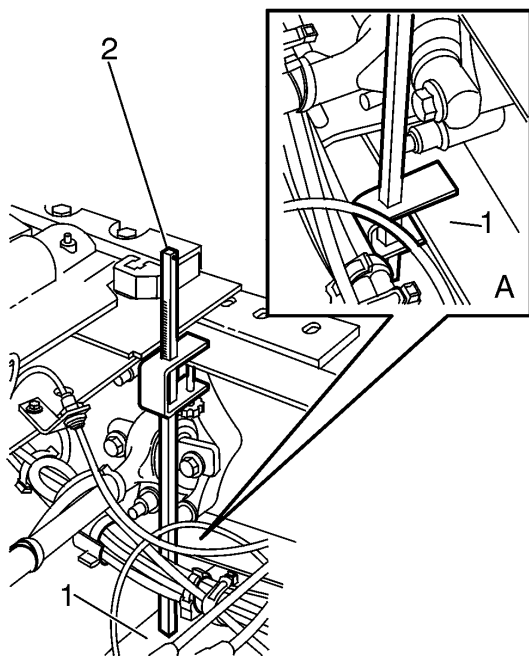
3

**! DANGER**

Use caution when moving the load leveling valve arm down. This will release the suspension air and the chassis may drop quickly, possibly causing serious injury or death to anyone under the vehicle.

Position the ride height gauge such that it is clamped, either to the top or bottom flange of the frame rail. Make sure the rod for the ride height gauge rests on top of the axle housing.

4

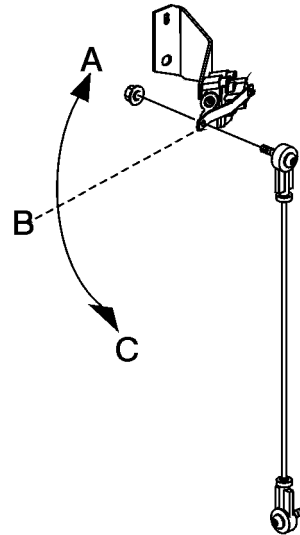


W7001204

- A Alternate tool location for checking Ride Height.
- 1 Axle Housing
- 2 Ride Height Gauge

The scale on the ride height gauge is used to read the ride height from the top flange on the frame rail. J-44684

5



W7001056

- A Raise
- B Neutral
- C Lower

The suspension ride height is changed by turning the load leveling valve clockwise (to raise) or counter clockwise (to lower).

**! DANGER**

Stay clear when suspension air is released. Chassis may drop quickly, possibly causing serious injury to anyone under the vehicle.

6

Dump (release) the suspension air (see "Dump Switch Operation" page 18).

7

Start the engine to build up air pressure to check the ride height (see "Air Suspension Ride Height Check" page 23). The ride height must be within specifications. See "Ride Height and Pinion Angle Specifications" page 6.

8

Perform the "Interaxle U-joint Angle Cancellation Check (Calculation)" page 25, and the "Forward Axle Pinion Angle to Frame Check" page 27.

## 7641-03-02-01 Load Leveling Valve, Replacement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.



### CAUTION

Do not try to alter the load leveling valve. Do not take it apart. Do not lengthen or shorten the handle on the valve. Altering the load leveling valve may result in system failure.

### Removal

1

Chock the front wheels on vehicle and release the parking brakes.

2



### DANGER

Stay clear when suspension air is released. Chassis may drop quickly and can cause serious injury or death to anyone under the vehicle.

Dump (release) the suspension air (see "Dump Switch Operation" page 18).

3

Remove rod from the load leveling valve handle.

4

Remove the bolt that mounts the leveling valve bracket to the frame.

5

Note the air line positions and orientation to the fittings in the valve. Disconnect the air lines, and remove the valve.

6

Swap fittings (or position new fittings) to the replacement valve.

7

Transfer the bracket from the faulty valve to the replacement valve. Tighten the screws as follows:

M8:  
30 ± 5 Nm  
(30 ± 5 ft-lb)

M8: 30 ± 5 Nm (22 ± 4 ft-lb).

## Installation

### 8

Lay the valve in the frame and install the air lines.

### 9

Install the bolt through the valve bracket and the frame. Tighten the mounting bolt as follows:

M14:  
200 ± 33 Nm  
(148 ± 24 ft-lb)

M14: 200 ± 33 Nm (148 ± 24 ft-lb).

### 10

Connect the leveling rod to the arm. Tighten the rod nut as follows:

M6:  
10 ± 1.5 Nm  
(7 ± 1 ft-lb)

M6: 10 ± 1.5 Nm (7 ± 1 ft-lb).

### 11

When completed, start the engine to build up air pressure, then check the ride height (see "Air Suspension Ride Height Check" page 23).

The ride height must be within the following specifications: See "Ride Height and Pinion Angle Specifications" page 6.

## 7647-03-02-01 Leveling Rod, Replacement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

### Removal

#### 1



Stay clear when suspension air is released. Chassis may drop quickly and can cause serious injury or death to anyone under the vehicle.

Dump (release) the suspension air (see "Dump Switch Operation" page 18).

#### 2

Unbolt leveling rod from load leveling valve arm and crossbeam (pedestal). Remove from vehicle.

### Installation

#### 3

Install leveling rod. Note position of washer. Tighten both nuts as follows:

M6: 10 ± 1.5 Nm (7 ± 1 ft-lb).

M6:  
10 ± 1.5 Nm  
(7 ± 1 ft-lb)

**Note:** Mount in same hole in the crossbeam (pedestal) as the original leveling rod. Do not crimp or tighten clamp at lower end of the leveling rod at this time.

#### 4

When completed, start the engine to build up air pressure to check the ride height (see "Air Suspension Ride Height Check" page 23).

The ride height must be within the following specifications: See "Ride Height and Pinion Angle Specifications" page 6.



## 7262-03-02-03 Crossbeam (Pedestal), Re- placement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

### Removal

1



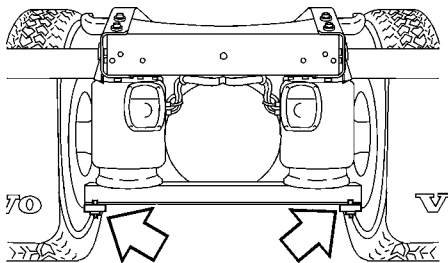
Stay clear when suspension air is released. Chassis may drop quickly and can cause serious injury or death to anyone under the vehicle.

Raise the rear suspension and support the frame with jack stands, maintaining the approximate ride height. Dump (release) the suspension air to relieve air pressure from the air springs.

2

Remove the nuts that hold the air bags to the crossbeam (pedestal plate). Push the air springs out of the crossbeam and forward.

3



W7000707

Remove the nuts and bolts that hold the crossbeam to the Z-springs and remove the crossbeam.

### Installation

4

Install the crossbeam to the Z-spring with the nuts and bolts. Tighten the bolts as follows:

M12:  
105 ± 20 Nm  
(77 ± 15 ft-lb)

M12: 105 ± 20 Nm (77 ± 15 ft-lb).

5



**CAUTION**

M12

50 ± 10 Nm

Over-tightening will damage the air spring (37 ± 7.5 ft-lb)

Install the air springs back onto the crossbeam and tighten the nuts as follows:

M12: 50 ± 10 Nm (37 ± 7.5 ft-lb).

6

When completed, jack up the rear of the truck, remove the jack stands and lower the vehicle. Start the engine to build air pressure to raise the air suspension.

## 7224-03-02-03 Z-Spring, Replacement

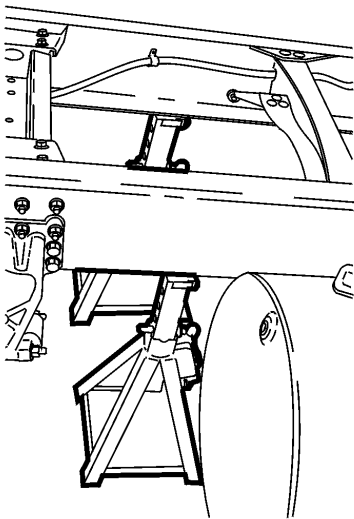
You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

### Removal

1

**Note:** Always replace both U-bolts at a particular axle position. The longer of the two U-bolts is positioned to the rear side of the axle housing. Park the vehicle on a level surface with the transmission in neutral and, chock the front wheels.

2



W7001139

Jack up the axle being worked on, and support it with jack-stands of adequate rating.

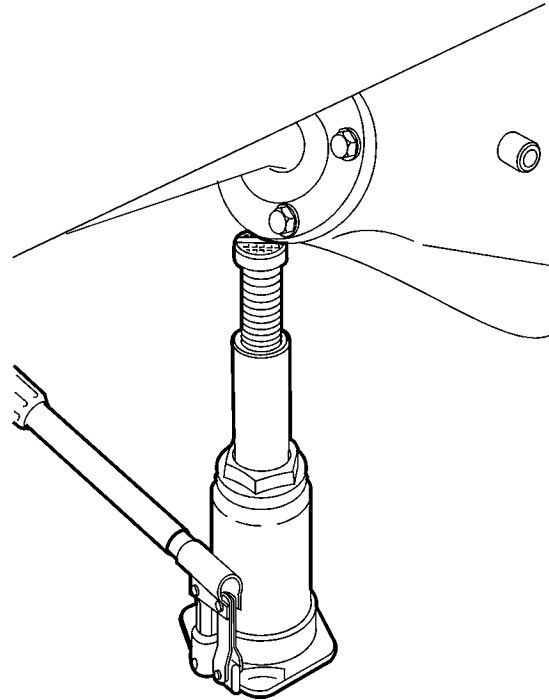
**Note:** Never install jack directly under the crossbeam. The crossbeam is not designed to support vehicle weight.

**Note:** The nose of the axle should also be supported to prevent the axle from rolling forward during service.

3

Remove wheels and tires on axle being worked on.

4



W7000752

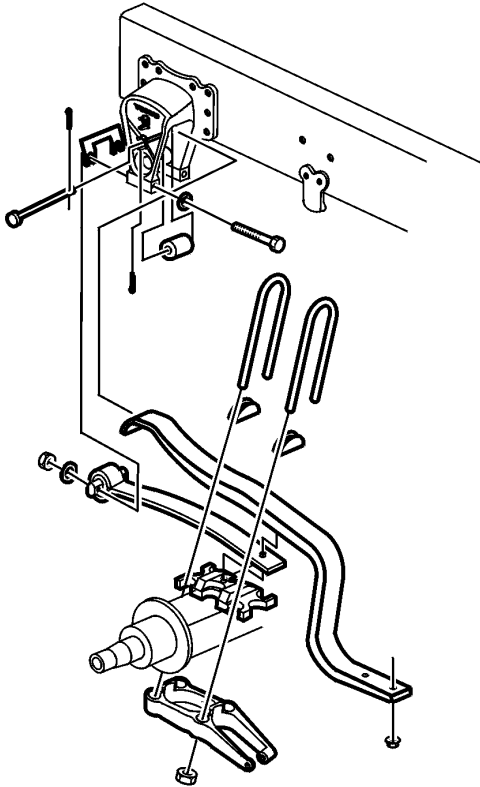
Support the nose of the axle with a jack of adequate rating.

### DANGER

Failure to properly support the nose of the axle may result in the axle rolling forward causing personal injury or death.

Jack up vehicle and place jack stands under axle(s) being worked on. While lowering vehicle onto jack stands, support the nose of the axle with a bottle jack.

5



Remove the U-bolt nuts, then remove the bottom plate rear shock absorber bracket, U-bolts, and top clip plates.

6

Remove the roller and pin from the spring hanger.

7

Remove the bolts and nuts from the air spring crossbeam.

8

Remove Z-spring.

**Note:** You may need to raise or lower the axle slightly to remove tension from the Z-spring before removal.

## Installation

9

Install Z-spring into position and install the roller and pin into the spring hanger.

10

Check for dirt or debris in the U-bolt threads. Clean the threads if necessary and coat with a light wax-based lubricant.

**Note:** Lubricating the threads with motor oil is not recommended because of the detergent additives.

11

Install the top (clip) plates, U-bolts, and bottom plate rear shock absorber bracket. Tighten the U-bolt nuts, but do not torque at this time.

**Note:** To align the Z-spring with the radius leaf spring it may be necessary to slightly raise or lower the axle. It may also be necessary to loosen the U-bolts on the opposite side of the axle for alignment.

12

Install the bolts and nuts to the air spring crossbeam. Tighten as follows:

M14: 105 ± 20 Nm (75 ± 15 ft-lb)

M14:  
105 ± 20 Nm  
(75 ± 15 ft-lb)

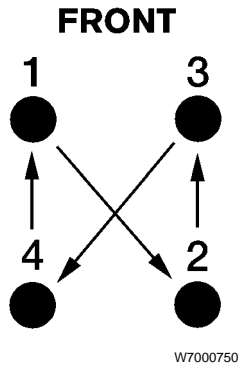
13

Install the shock absorber. Tighten as follows:

M16: 220 ± 35 Nm (162 ± 26 ft-lb)

M16:  
220 ± 35 Nm  
(162 ± 26 ft-lb)

14



Tighten U-bolts using a cross pattern shown above. Tighten as follows:

M20:  $500 \pm 75$  Nm ( $370 \pm 55$  ft-lb).

M22:  $575 \pm 50$  Nm or ( $425 \pm 37$  ft-lb).

M20:  
 $500 \pm 75$  Nm  
( $370 \pm 55$  ft-lb)  
M22:  
 $575 \pm 50$  Nm  
( $425 \pm 37$  ft-lb)

**Note:** Make sure the pin in the radius leaf spring has not been pushed out of position. If the pin is correctly set, make sure the pin is placed in its proper position, relative to the axle seat and Z-spring, before clamping it with the U-bolts.

**Note:** Before tightening the U-bolt nuts, position the suspension at approximately the normal ride height and make sure the bolts holding the cross-beam (pedestal plate) to the Z-spring are loosened. This will help provide proper alignment for the Z-springs.

**Note:** To ensure proper tightening, refer to "U-bolt Torque, Adjustment" page 30.

15

Install the wheels and tires.

16

Remove any jack stands and check wheel alignment.

For proper specifications for checking the wheel alignment, refer to service information in group 601 on "Wheel Alignment, Steer and Drive Axles"

## 7224-03-02-02 Radius Leaf Spring, Replacement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

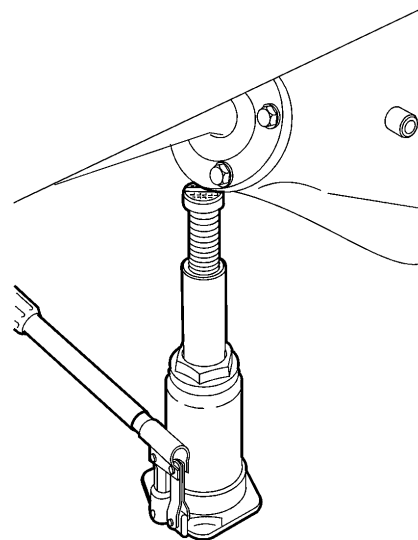
**Note:** Always replace both U-bolts at a particular axle position.

### Removal

**1**  
Park the vehicle on a level surface with the transmission in neutral and chock the front wheels.

**2**  
Jack up the axle being worked on, and support it with jack-stands of adequate rating.

3



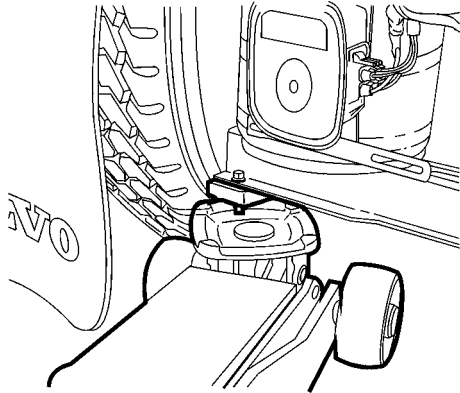
### DANGER

Failure to properly support the nose of the axle may result in the axle rolling forward, causing serious injury or death.

The nose of the axle should be supported to prevent the axle from rolling forward during service.

**4**  
Remove the U-bolt nuts, then remove the bottom plate rear shock absorber bracket.

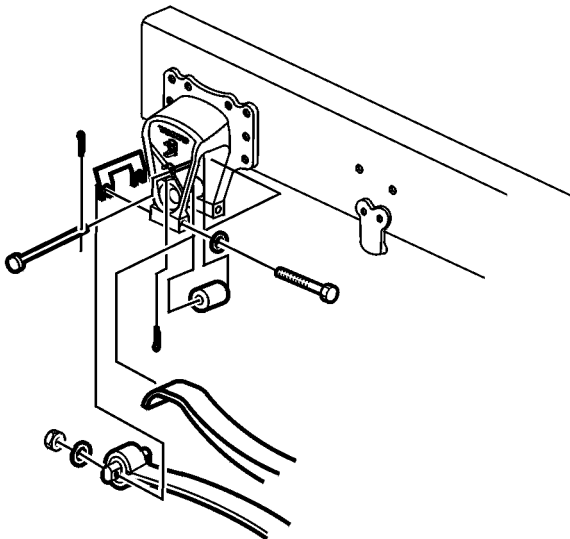
**5**



W7000725

Use a floor jack under the Z-spring to raise it enough to separate the Z-spring from the radius leaf spring.

**6**



W7001062

Remove the bolts from the radius leaf spring, then remove the radius leaf spring.

## Installation

**7**  
Install radius leaf spring into place and tighten the bolts as follows:

M14: 217 ± 20 Nm (160 ± 15 ft-lb)

M14:  
217 ± 20 Nm  
(160 ± 15 ft-lb)

**Note:** Whenever the U-bolts are loosened and/or the suspension components attached to the axle are being worked on, make sure that the locating features on each component is properly engaged so that the components are positioned together properly.

**8**

Lower vehicle, be certain that Z-spring and radius leaf spring are properly aligned while lowering.

**9**

Install top (clip) plates, U-bolts, and bottom plate rear shock absorber bracket. "Snug up" the U-bolt nuts, but do not tighten at this time.

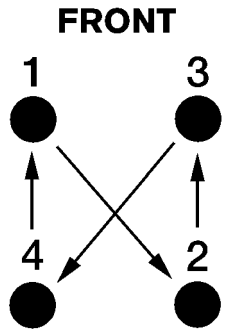
**Note:** To align the Z-spring with the radius leaf spring it may be necessary to slightly raise or lower the axle. It may also be necessary to loosen the U-bolts on the opposite side of the axle for alignment.

**10**

Check for dirt or debris in the U-bolt threads. Clean the threads if necessary and coat with a light wax-based lubricant.

**Note:** Lubricating the threads with motor oil is not recommended because of the detergent additives.

11



W7000750

Tighten U-bolts using a cross pattern shown above. Tighten as follows:

M20:  $500 \pm 75$  Nm ( $370 \pm 55$  ft-lb).

M22:  $575 \pm 50$  Nm or ( $425 \pm 37$  ft-lb).

**Note:** Make sure the pin in the radius leaf spring has not been pushed out of position. If the pin is correctly set, make sure the pin is placed in its proper position, relative to the axle seat and Z-spring, before clamping it with the U-bolts.

**Note:** To ensure proper tightening, refer to "U-bolt Torque, Adjustment" page 30.

**12**

Remove any jack stands and check wheel alignment.

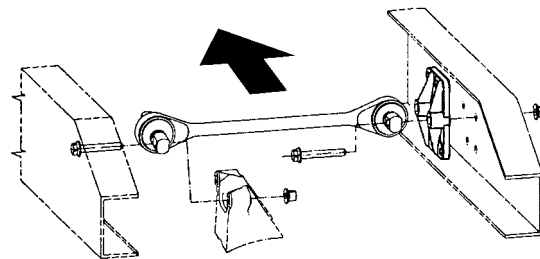
M20:  
 $500 \pm 75$  Nm  
 ( $370 \pm 55$  ft-lb)  
 M22:  
 $575 \pm 50$  Nm  
 ( $425 \pm 37$  ft-lb)

## 6521-03-02-04 Torque Rod, Replacement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

**Removal****1**

Remove any wires or air line clippings from the torque rod.

**2**

W7000716

Remove the two (2) bolts holding the torque rod to the frame rail side bracket.

**3**

Remove the two (2) bolts holding the torque rod to the axle housing bracket and remove the torque rod.

**Note:** These may be Huck-style fasteners, which require additional effort for removal. See "Permanent Fastener, Removal" page 56.

## Installation

4

**Note:** Use only approved fasteners.  
Install two (2) bolts through the torque rod at the axle housing bracket.

5

Install two (2) bolts holding the torque rod to the frame rail side bracket.

6

Tighten bolts to the torque rod.  
Tighten rod bracket as follows:

M16: 271 ± 27 Nm (200 ± 20 ft-lb).

7

Reattach any wires or air line clippings to the torque rod.

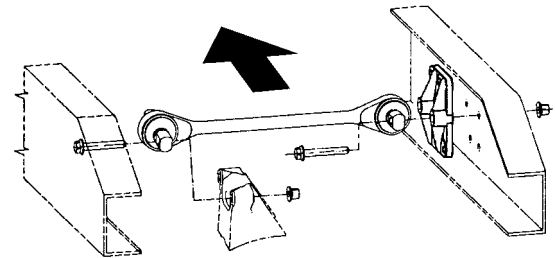
M16:  
271 ± 27 Nm  
(200 ± 20 ft-lb)

## 6529-03-02-02 Torque Rod Frame Rail Bracket, Replacement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

### Removal

1



W7000716

Remove the bolts through the torque rod at the frame rail side bracket.

2

Remove the fasteners to the torque rod frame rail bracket at the frame rail, and remove the bracket.

**Note:** These may be Huck-style fasteners, which require additional effort for removal.

### Installation

3

Install bolts to the torque rod frame rail bracket at frame rail.

**Note:** Use only approved fasteners.

4

Install bolts through the torque rod at the frame rail side bracket.

5

Tighten the bolts to tighten rod.  
Tighten rod bracket as follows:

M16: 271 ± 27 Nm (200 ± 20 ft-lb).

M16:  
271 ± 27 Nm  
(200 ± 20 ft-lb)

6

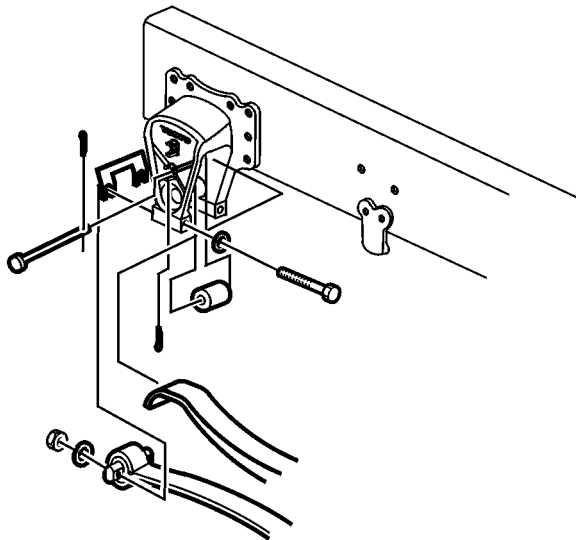
Re-attach any wires or air line clippings to the torque rod frame rail bracket.

## 7114-03-02-04 Spring Hanger, Drive Axle, Re- placement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

### Removal

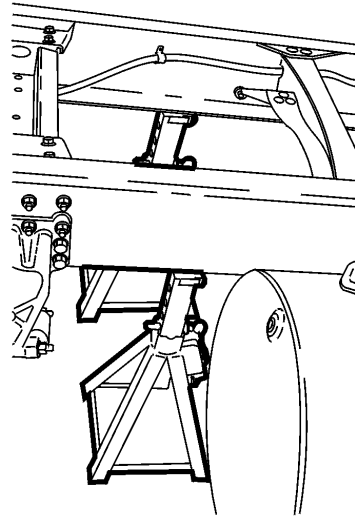
1



W7001062

Park the vehicle on a level surface with the transmission in neutral and chock the front wheels.

2



W7001139

Jack up the vehicle, and support it with jack stands of adequate rating.

**Note:** These may be Huck® style fasteners, which require additional effort for removal. See "Permanent Fastener, Removal" page 56.

**Note:** The ABS modulator valve may need to be removed in some applications.

3

Remove the spring hanger.

**Note:** The Z-spring may need to be raised or lowered to relieve tension from the spring hanger for removal.

4

Remove the wear plate (pad) from the spring hanger and place it in the new spring hanger.

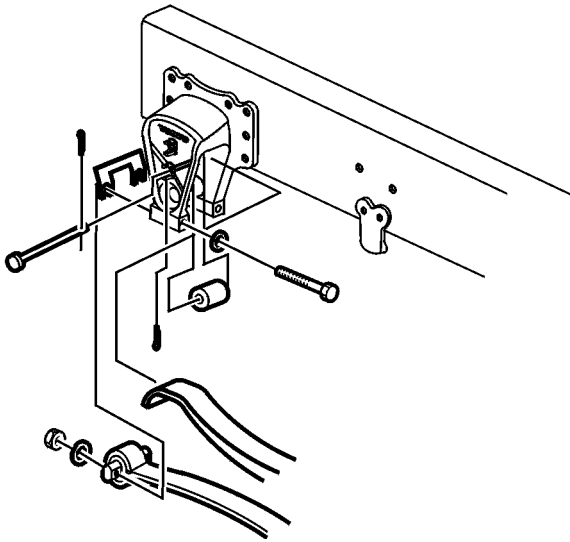
**Note:** If either wear plate needs replacement, they should be replaced in pairs.

5

Raise the rear of the truck to relieve pressure off the spring hanger bolts.



6



W7001062

Remove spring hanger bolts in front and behind the bracket.

7

Remove hanger.

8

Remove the split pin and retaining pin holding the wear plate (pad) into the spring hanger (frame) bracket. Remove the wear plate.

**Note:** We recommend replacing wear plates (pads). They should be replaced in pairs (left and right) on the same axle. See "Wear Plate (Pad), Replacement" page 46.

## Installation

9

Install the spring hanger and the bolts. Tighten the bolts as follows:

M16:  $320 \pm 50$  Nm ( $236 \pm 37$  ft-lb).

M16:  
 $320 \pm 50$  Nm  
( $236 \pm 37$  ft-lb)

10

Install radius leaf spring bolts and tighten as follows:

M14:  $217 \pm 20$  Nm ( $160 \pm 15$  ft-lb)

M14:  
 $217 \pm 20$  Nm  
( $160 \pm 15$  ft-lb)

**Note:** Whenever the U-bolts are loosened and/or the suspension components attached to the axle are being worked on, make sure that the locating features on each component is properly engaged so that the components are positioned together properly.

11

Install the roller and pin.

12

Raise the vehicle and remove the jack stands.

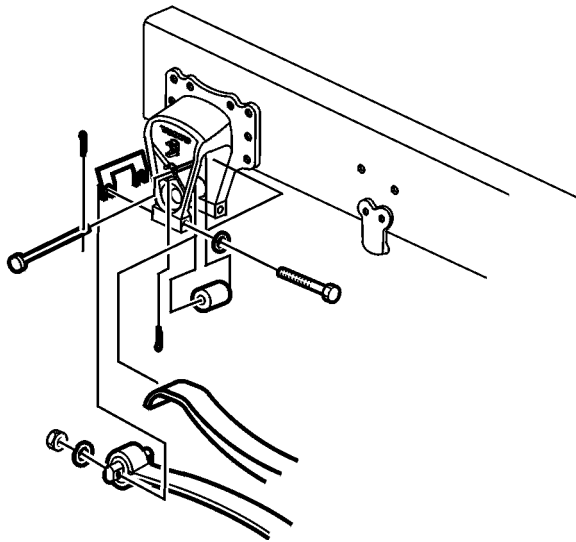
**Note:** Ride height adjustment may be required after service.

## 7269-03-02-06 Wear Plate (Pad), Replacement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

### Removal

1



W7001062

Remove the retaining pin and isolator (spring roller) from spring hanger (frame) bracket (located under "hook end" of Z-spring).

**Note:** It is strongly recommended that the wear plates (pads) be replaced in pairs (left and right side) on the same axle.

2

Chock front wheels on vehicle.

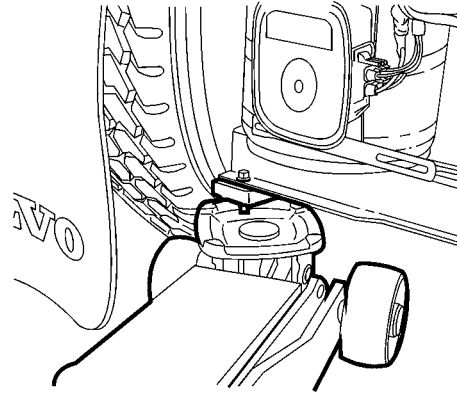
3



Stay clear when suspension air is released. Chassis may drop quickly and can cause serious injury or death to anyone under the vehicle.

Dump (release) the suspension air (see "Dump Switch Operation" page 18).

4



W7000725

Jack the vehicle from under the rear of the Z-spring at the crossbeam (pedestal plate) mounting until there is sufficient gap between the wear plate and Z-spring to remove the wear plate.

**Note:** Jacking both the left and right sides simultaneously will help obtain a sufficient gap. Also, lifting (and properly supporting) the rear of the chassis may increase the size of the gap.

5

Remove the split pin and the retaining pin holding the wear plate into the spring hanger (frame) bracket.

6

Pry out the old wear plate.

### Installation

7

Install the replacement wear plate into the spring hanger (frame) bracket.

**Note:** The thick end of the wear plate is always positioned to the rear of the vehicle.

8

Jack from the rear of the Z-spring.

9

Install the retaining pin and a replacement split pin into the spring hanger (frame) bracket to hold the installed wear plate.

10

Start engine to build air pressure to raise the air suspension.

**11**

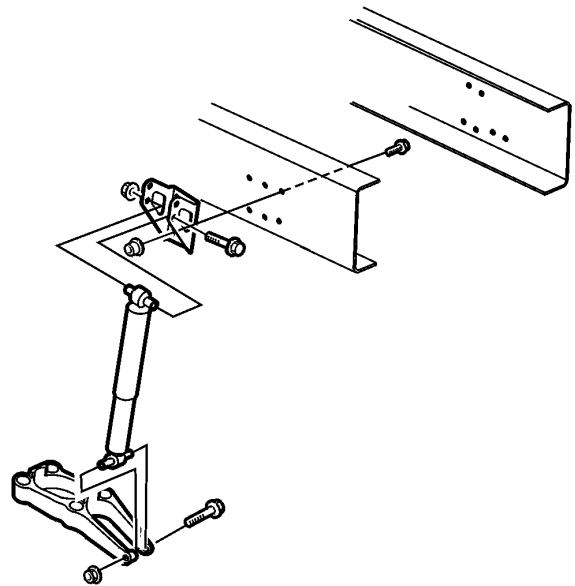
Install the isolator (spring roller), retaining pin, and a replacement split pin in the spring hanger (frame) bracket, under the Z-spring.

**12**

Ride height and axle pinion angle may require adjustment. See "Air Suspension, Adjustment (Ride Height and Driveline Calculation)" page 23.

**7614-03-02-06****Rear Suspension Shock Absorber Bracket, Replacement**

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

**Removal****1**

Mark the mounting bracket bolt hole and remove the upper shock mounting bolt. Move shock and position out of the work area.

W7001064

**2**

Remove frame fasteners holding shock bracket to frame. Remove bracket.

**Note:** These may be Huck®-style fasteners, requiring additional effort for removal. See "Permanent Fastener, Removal" page 56.

**3**

Remove upper shock bracket.

## Installation

4

Install the shock bracket. Tighten fasteners as follows:

271 ± 27 Nm  
(200 ± 20 ft-lb)

271 ± 27 Nm (200 ± 20 ft-lb).

**Note:** Use only approved fasteners.

5

**Note:** The shock mounting location in the upper bracket may vary depending on the axle and frame configuration. On the 6x4 chassis with a frame rail height of 300 mm the shock is mounted to the upper holes on the first drive axle, and to the lower holes on the second drive axle. The first drive axle on a chassis with a 266 mm frame rail height has a special bracket with one set of holes only. On the second axle the shocks are mounted in the upper holes.

On the 4x2 axles the shocks are mounted in the upper holes. Install shock, bushings, and upper shock mounting bolt. Tighten bolt as follows:

M16:220 ± 35 Nm  
(162 ± 26 ft-lb)

M16: 220 ± 35 Nm (162 ± 26 ft-lb)

**Note:** When replacing shocks, use only Volvo-approved components (shocks and bushings).

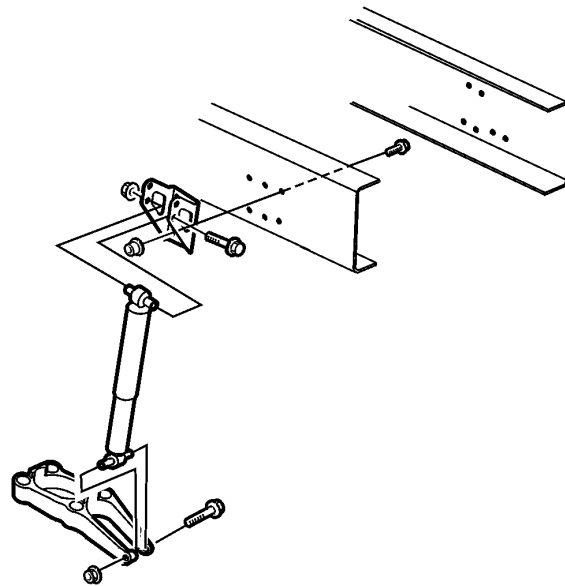
## 7612-03-02-01

### Rear Suspension Shock Absorber, Replacement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

#### Removal

1



Remove lower shock mounting bolt.

W7001064

2

Mark the mounting bracket bolt hole and remove the upper shock mounting bolt. Remove the shock.

## Installation

3

**Note:** The shock mounting location in the upper bracket may vary depending on the axle and frame configuration. On the 6x4 standard chassis (frame rail height 300 mm) the shock is mounted to the upper holes on the first drive axle, and to the lower holes on the second drive axle. The first drive axle on the low chassis (frame rail height 266 mm) has a special bracket with one set of holes only. On the second axle the shocks are mounted in the upper holes. On the 4x2 axles the shocks are mounted in the upper holes. Install shock and bushings. Position the mounting bolt in the correct bracket hole and tighten as follows:

M16: 220 ± 35 Nm (162 ± 26 ft-lb)

**Note:** When replacing shocks, use only Volvo-approved components (shocks and bushings).

M16: 220 ± 35 Nm  
(162 ± 26 ft-lb)

## 7222-03-02-06 Top Plate, Replacement

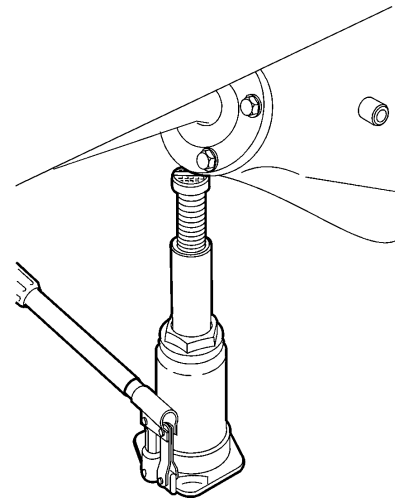
You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

### Removal

1

Chock front wheels on vehicle.

2



W7000752

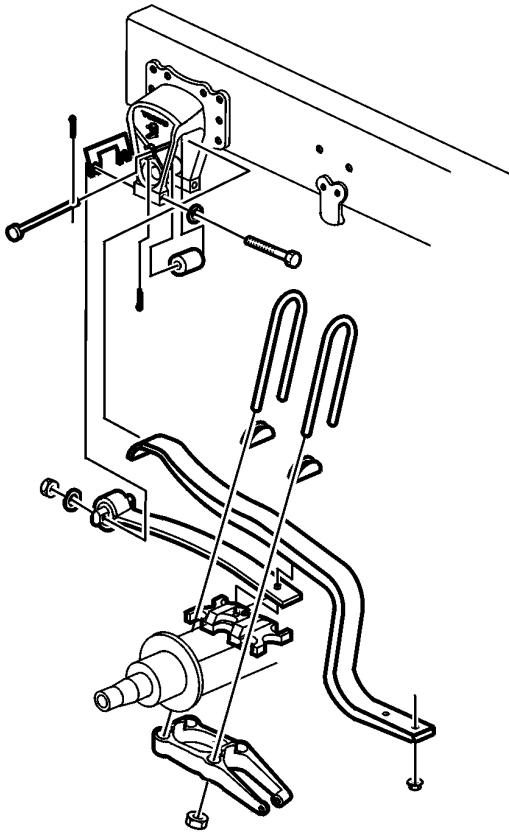
Support the nose of the axle with an adequate jack.

**Note:** Failure to properly support the nose of the axle may result in the axle rolling forward, which can cause serious injury or death to anyone under the vehicle.

3

Remove nuts from the U-bolts, then remove the U-bolts. Leave lower shock bracket attached to shock absorber, but position bracket clear of the work area.

4



Remove the top plate.

**Installation**

5

Install the top plate.

**Note:** Make sure the alignment pin on the top plate is engaged into the pocket on the top surface of the Z-spring.

6

Check for dirt or debris in the U-bolt threads. Clean the threads if necessary and coat with a light wax-based lubricant.

**Note:** Lubricating the threads with motor oil is not recommended because of the detergent additives.

7

Install the U-bolts.

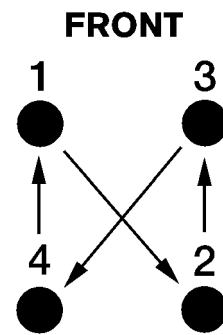
**Note:** Whenever the U-bolts are loosened and/or the suspension components attached to the axle are being worked on, make sure that the locating features on each component are properly engaged so that the components are positioned together properly.

8

Check for dirt or debris in the U-bolt threads. Clean the threads if necessary and coat with a light wax-based lubricant.

**Note:** Motor oil, because of detergent additives, is not recommended.

9



W7000750

Tighten U-bolts using a cross pattern shown above. Tighten as follows:

M20: 500 ± 75 Nm (370 ± 55 ft-lb).

M22: 575 ± 50 Nm or (425 ± 37 ft-lb).

M20:  
500 ± 75 Nm  
(370 ± 55 ft-lb)  
M22:  
575 ± 50 Nm  
(425 ± 37 ft-lb)

**Note:** Before tightening the U-bolt nuts, position the suspension at approximately the normal ride height and make sure the bolts holding the cross-beam (pedestal plate) to the Z-spring are loosened. This will help provide proper alignment for the Z-springs.

**Note:** To ensure proper tightening, refer to “U-bolt Torque, Adjustment” page 30.

10

**Note:** Ride height and pinion angle may require adjustment. See “Air Suspension, Adjustment (Ride Height and Driveline Calculation)” page 23.

**11**

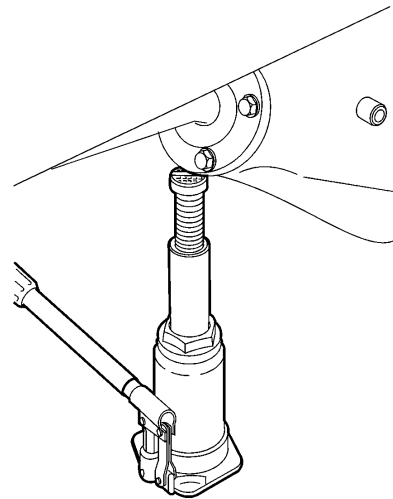
Check the wheel alignment.  
For alignment specifications, refer to service information in group 601 on "Wheel Alignment, Steer and Drive Axles"

**7222-03-02-08****Bottom Plate, Replacement**

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

**Removal****1**

Chock front wheels on vehicle.

**2**

W7000752

Support the nose of the axle with an adequate jack.

**Note:** Failure to properly support the nose of the axle may result in the axle rolling forward, which can cause serious injury or death to anyone under the vehicle.

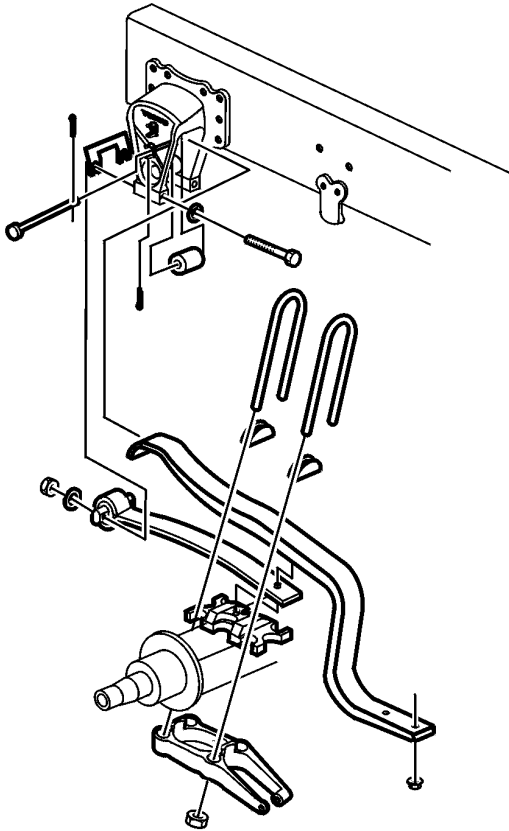
**3**

Disconnect the shock from the bottom plate/lower shock absorber bracket.

**4**

Remove nuts from the U-bolts, then remove the bottom plate/lower shock absorber bracket.

5



W7001061

### Installation

6

Install the bottom plate/lower shock absorber bracket and reconnect the lower shock absorber and U-bolt nuts.

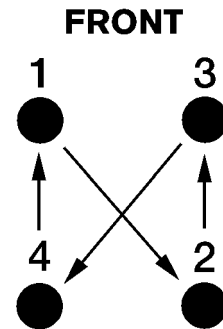
**Note:** Whenever the U-bolts are loosened and/or the suspension components attached to the axle are being worked on, make sure that the locating features on each component are properly engaged so that the components are positioned together properly.

7

Check for dirt or debris in the U-bolt threads. Clean the threads if necessary and coat with a light wax-based lubricant.

**Note:** Lubricating the threads with motor oil is not recommended because of the detergent additives.

8



W7000750

Tighten U-bolts using a cross pattern shown above. Tighten as follows:

M20: 500 ± 75 Nm (370 ± 55 ft-lb).

M22: 575 ± 50 Nm or (425 ± 37 ft-lb).

M20:  
500 ± 75 Nm  
(370 ± 55 ft-lb)  
M22:  
575 ± 50 Nm  
(425 ± 37 ft-lb)

**Note:** Before tightening the U-bolt nuts, position the suspension at approximately the normal ride height and make sure the bolts holding the cross-beam (pedestal plate) to the Z-spring are loosened. This will help provide proper alignment for the Z-springs.

**Note:** To ensure proper tightening, refer to "U-bolt Torque, Adjustment" page 30.



## 7222-03-02-05

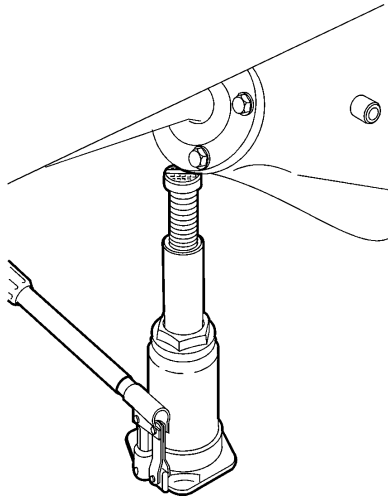
### Axle Seat, Replacement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

#### Removal

**1**  
Chock front wheels on vehicle.

**2**



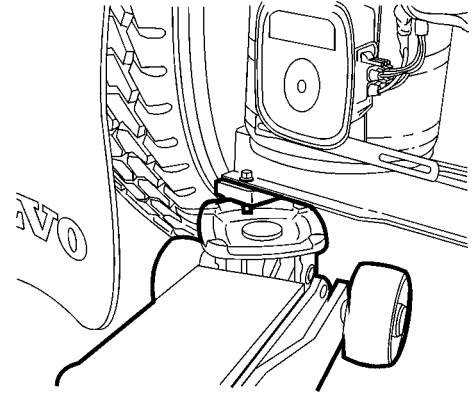
W7000752

Support the nose of the axle with an adequate jack.

**Note:** Failure to properly support the nose of the axle may result in the axle rolling forward, which can cause serious injury or death to anyone under the vehicle.

**3**  
Remove nuts from the U-bolts, then remove the U-bolts. Leave lower shock bracket attached to shock absorber, but position bracket clear of the work area.

**4**

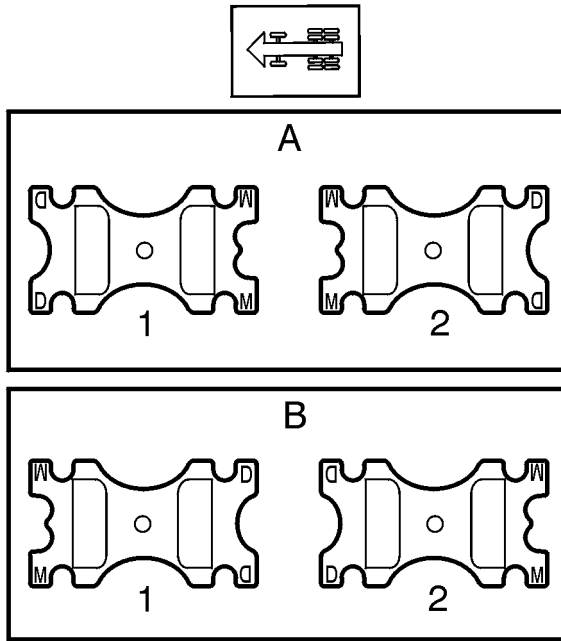


W7000725

Using a lift, raise the Z-spring from the axle seat, then remove axle seat.

**Installation**

5



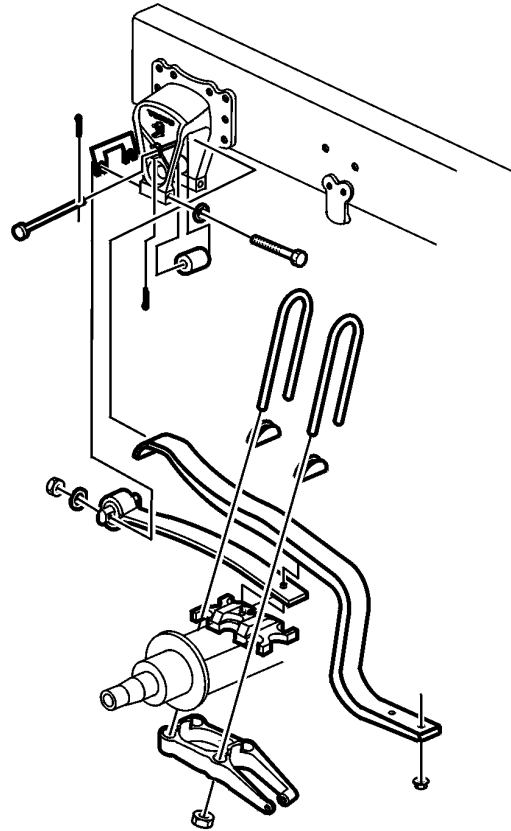
W7001199

- A Meritor
- B Eaton/Dana
- 1 1st drive axle
- 2 2nd drive axle

When installing the new axle seat, If it is a Meritor axle, make sure the "M" markings at the tip of each axle seat are facing each other. For the Eaton/Dana axle seat, the "D" markings should be turned toward each other.

**Note:** Whenever the U-bolts are loosened and/or the suspension components attached to the axle are being worked on, make sure that the locating features on each component are properly engaged so that the components are positioned together properly.

6



W7001061

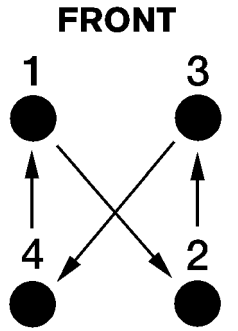
Install the axle seat.

7

Check for dirt or debris in the U-bolt threads. Clean the threads if necessary and coat with a light wax-based lubricant.

**Note:** Lubricating the threads with motor oil is not recommended because of the detergent additives.

8



W7000750

Tighten U-bolts using a cross pattern shown above. Tighten as follows:

M20:  $500 \pm 75$  Nm ( $370 \pm 55$  ft-lb).

M22:  $575 \pm 50$  Nm or ( $425 \pm 37$  ft-lb).

**Note:** Before tightening the U-bolt nuts, position the suspension at approximately the normal ride height and make sure the bolts holding the cross-beam (pedestal plate) to the Z-spring are loosened. This will help provide proper alignment for the Z-springs.

**Note:** To ensure proper tightening, refer to "U-bolt Torque, Adjustment" page 30.

**Note:** Ride height and pinion angle may require adjustment. See "Air Suspension, Adjustment (Ride Height and Driveline Calculation)" page 23.

M20:  $500 \pm 75$  Nm ( $370 \pm 55$  ft-lb)  
M22:  $575 \pm 50$  Nm ( $425 \pm 37$  ft-lb)

## 7261-03-02-03 Rear Suspension Air Spring, Replacement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

### Removal

**1**  
Support the frame (maintaining the approximate normal ride height.) Deflate air springs.

**2**

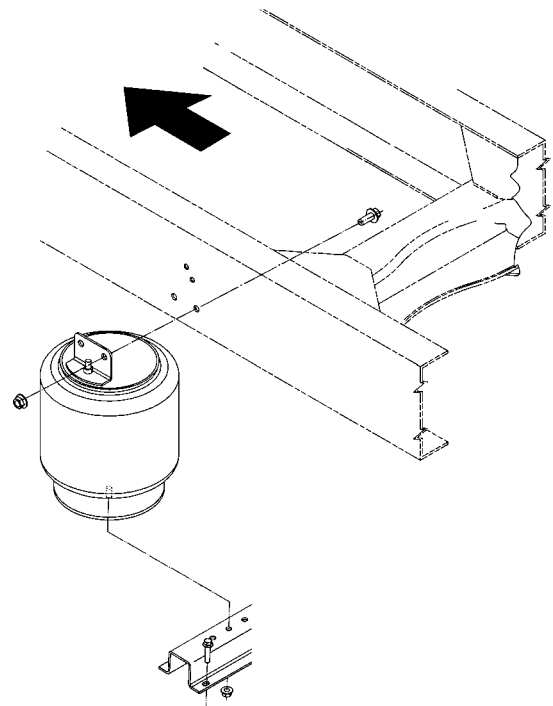


**DANGER**

Pneumatic components store compressed air and can separate violently during disassembly or removal. Before servicing any part of the pneumatic (air) system, completely release the air pressure. Failure to do so can result in serious personal injury or death.

Remove air lines from air springs

**3**



W7000719

**Note:** Remove the upper mounting nut and bottom nut.

**4**  
Remove the air spring from chassis.

**5**  
Remove the fitting from air spring.

### Installation


**6**  
Install fitting in the air spring

**7**  
Install air spring back onto the frame and crossbeam (pedestal plate).

**8**  
Tighten upper mounting nut as follows:

M14: 200 ± 33 Nm (148 ± 24 ft-lb).	M14: 200 ± 33 Nm (148 ± 24 ft-lb)
------------------------------------	---

**9**

 <b>CAUTION</b>
Over-tightening will damage air spring.

Tighten lower nut as follows:

M12: 50 ± 10 Nm (37 ± 7.5 ft-lb).

**10**  
Install air lines into the air springs.

**11**  
Start engine to build pressure to inflate the air suspension. Remove supports from frame

**12**  
Check ride height (see "Air Suspension, Adjustment (Ride Height and Driveline Calculation)" page 23).

## Suspension Dump Switch, Replacement

You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

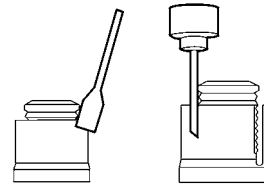
For the suspension dump switch replacement procedure refer to the "Electrical General Manual".

### 7113-01-02-01

## Permanent Fastener, Removal


You must read and understand the precautions and guidelines in Service Information, group 70, "General Safety Practices" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

The fasteners used on the VOAS 1.5 suspension are designed to be permanent, helping to maintain a consistent tight clamp. An installed fastener has a collar that is cold-worked or "swagged" over the grooved pin. No amount of twisting or hammering will dislodge the pin from the collar. The collar must be cut longitudinally to the extent of the swagged section. This may best be accomplished with a small wheel grinder. Other options may be to use a drill or chisel to create openings on the collar wall.

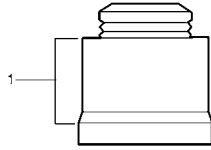


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Fig. 1: Optional collar removal procedures

 <b>CAUTION</b>
HUCKBOLT® Permanent Fasteners are clamped at a very high torque and they may release suddenly. Wear proper eye protection and keep your face at least two feet away from the collar. <b>Do not use a cutting torch for removal.</b>

1

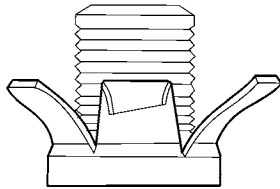


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2 Swagged Section

Using a wheel grinder (preferred method) cut a longitudinal groove into the "swagged" section of the HUCK-BOLT® collar on two or more sides.

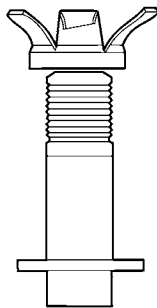
2



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After the collar has been opened over the length of the swagged portion on two or more opposing sides, the pin may become free. If not, additional collar material needs to be pulled away from the swagged section of the collar using vice grips or a chisel.

3



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Remove the pin after sufficient material has been pulled away from the swagged section of the collar.

**Note:** Any fastener that is removed should be replaced with a fastener of equal or greater strength.



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