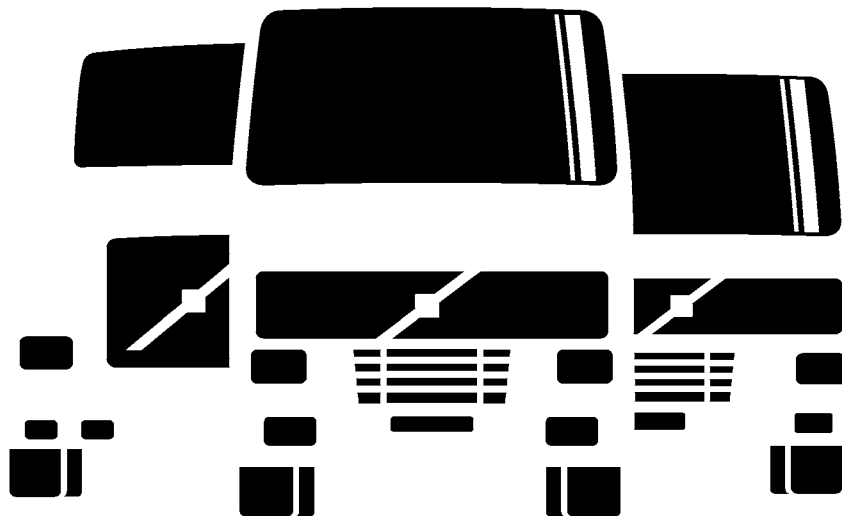


Service Manual Trucks

Group **720–500**

Volvo Optimized Air Suspension
from 5/99
VN



Foreword

The descriptions and service procedures contained in this manual are based on designs and methods studies carried out up to July 2000.

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 S.R.T. (Standard Repair Time).

Service procedures which do not include an operation number in the title are for general information and no reference is made to an S.R.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-TSP143273

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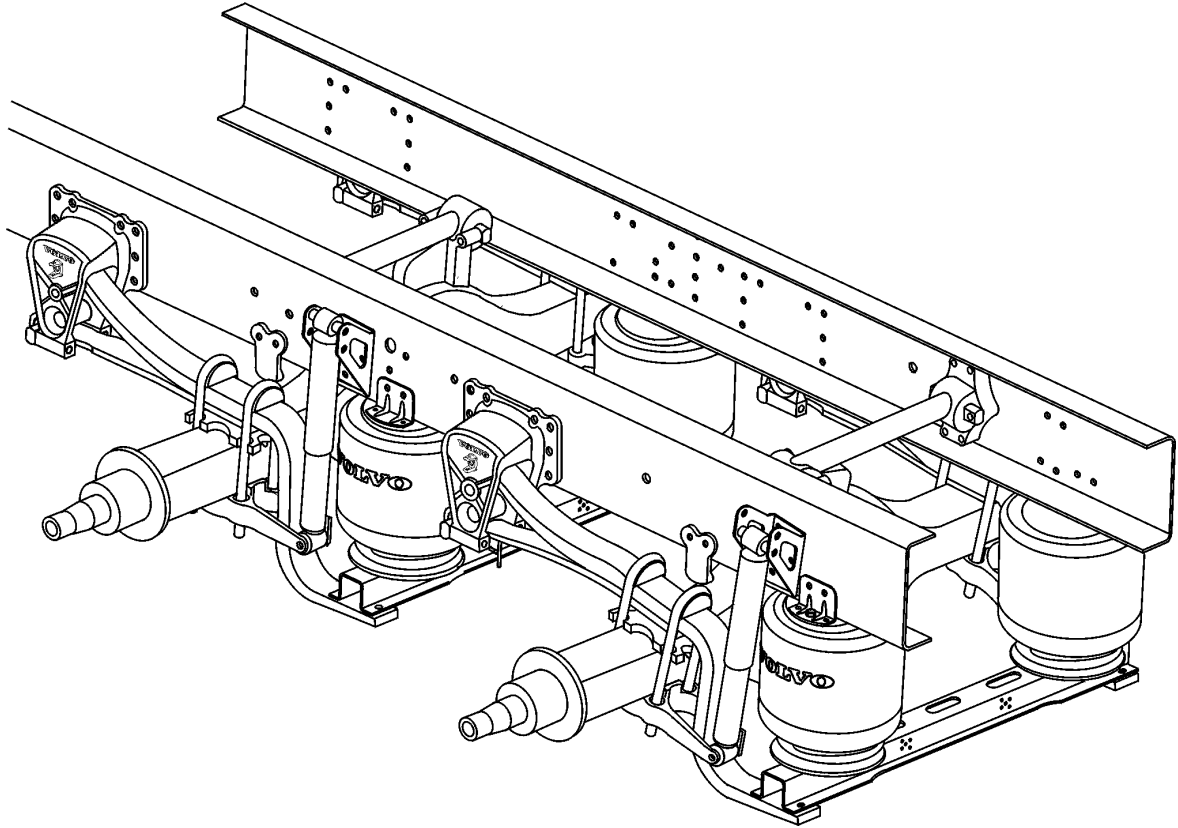
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Contents

General	3
Basic Description	3
Specifications	5
Torque Chart	5
Ride Height and Pinion Angle Specifications	6
Volvo Optimized Air Suspension Applications	7
Tools	9
Special Tools	9
Special Equipment	11
Design and Function	13
Volvo Optimized Air Suspension	13
Troubleshooting	23
Volvo Optimized Air Suspension Troubleshooting	23
Service Procedures	25
Air Suspension, Adjustment (Ride Height and Drive Line Calculation)	25
Rear Spring U-bolt Torque, Adjustment	32
Load Leveling Valve, Adjustment	34
Load Leveling Valve, Replacement	36
Leveling Rod, Replacement	37
Crossbeam (Pedestal), Replacement	38
Z-Spring, Replacement	39
Radius Leaf Spring, Replacement	42
Torque Rod, Replacement	44
Torque Rod Frame Rail Bracket, Replacement	45
Rear Spring Hanger, Replacement	46
Wear Plate (Pad), Replacement	48
Rear Shock Absorber Bracket, Replacement (Upper)	49
Rear Shock Absorber, Replacement	50
Top Plate, Replacement	51
Bottom Plate/Rear Shock Absorber Bracket, Replacement (Lower) ..	53
Axle Seat, Replacement	54
Rear Air Spring, Replacement	57
Pneumatic Switch, Replacement	58
HUCK-FIT® Fastener, Removal	59
Feedback	
Operation Numbers	

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 May 1999. 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

Torque Chart

U-Bolts for Suspension	M20	STD 38K 6X4 500 ± 75 Nm (369 ± 55 ft-lb)
	M22	STD 40K 6X4, 4X2 575 ± 50 Nm (424 ± 37 ft-lb)
Radius Spring to Spring Hanger Bracket	M16	275 ± 45 NM (203 ± 33 ft-lb)
Air Spring Crossbeam (Pedestal) to Leaf	M12	105 ± 20 Nm (77 ± 15 ft-lb)
Air Spring to Crossbeam (Pedestal)	M12	50 ± 10 Nm (37 ± 7.5 ft-lb)
Torque Rod to Frame-Mounted Bracket	M16	320 ± 50 Nm (236 ± 37 ft-lb)
Torque Rod to Axle Housing	M16	320 ± 50 Nm (236 ± 37 ft-lb)
Shock Absorber Bracket to Frame	M14	275 ± 45 Nm (203 ± 33 ft-lb)
Shock Absorber to Bracket (Upper and Lower)	M16	275 ± 45 Nm (203 ± 33 ft-lb)
Bracket for Load Leveling Valve to Frame	M14	275 ± 45 Nm (203 ± 33 ft-lb)
Load Leveling Valve to Bracket	M8	30 ± 5 Nm (22 ± 4 ft-lb)
Load Leveling Valve Control Arm to Lever on Valve and Air Bag Pedestal	M6	10 ± 1.5 Nm (7 ± 1 ft-lb)
Spring Hanger Bracket to Frame	M14	275 ± 45 Nm (203 ± 33 ft-lb)

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)
Meritor RT40-145				
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°
Dana 404				
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°
4X2 VOAS with any Axle				
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 31.

Volvo Optimized Air Suspension Applications

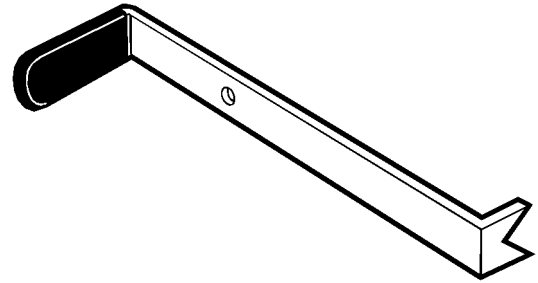
Suspension Configuration	Maximum GAWR Metric Ton (lb)	Maximum GCW Metric Ton (lb)	Axle Spacing mm (in.)	Required Number of Parking Chambers	Available Axles	
					Models	Metric Ton (lb)
4x2	9 (20,000)	50 (110,000) (1)	N/A	TWO	Eaton Meritor	10 (23,000)
6x4	17 (38,000)		1320 (52)	TWO (1st Axle)	Eaton Meritor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

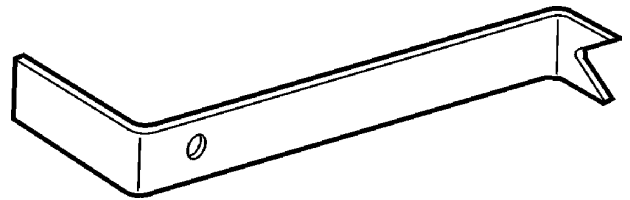
Special Tools

This air line release tool, part no. J-42189 may be used to safely disconnect air lines from switches. This tool is available from Kent-Moore (telephone: 800-328-6657)



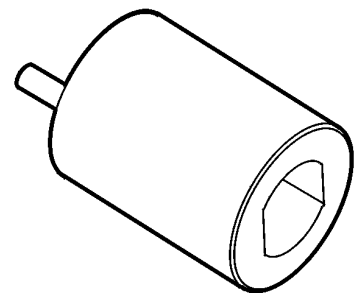
W0001198

The J-44773 is an air line release tool, available from Kent-Moore (telephone: 800-328-6657)



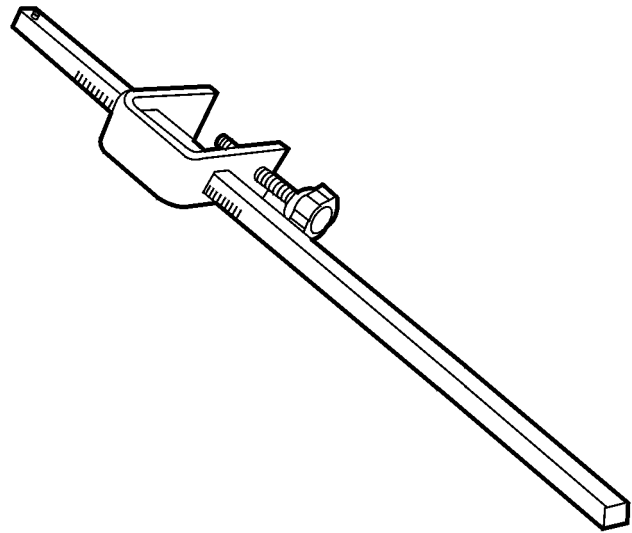
W0001874

The J-44544 adjustment socket is used to adjust the ride height on trucks with Volvo Optimized Air Suspension built after May 1999. It is available from Kent Moore (telephone: 800-328-6657).



W0001815

The J-44684 is a ride height gauge, used to check or measure ride height. It is available from Kent-Moore (telephone: 800-328-6657).

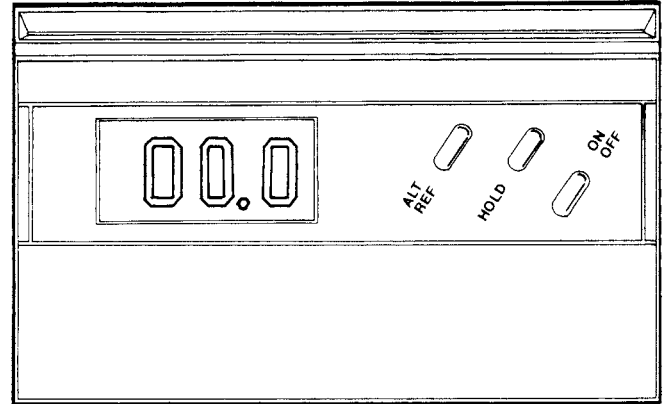


W0001960

Special Equipment

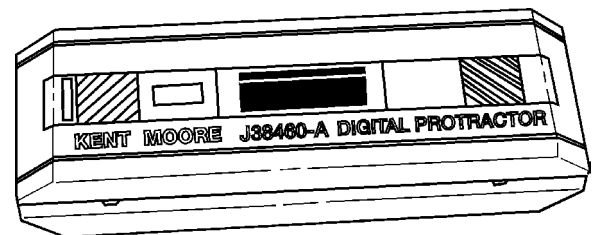
The following tools can be used to ensure proper inclinations and/or angles on the Volvo Optimized Air Suspension:

The Anglemaster is a digital inclinometer, available from Dana-Spicer (telephone: 419-535-4300).



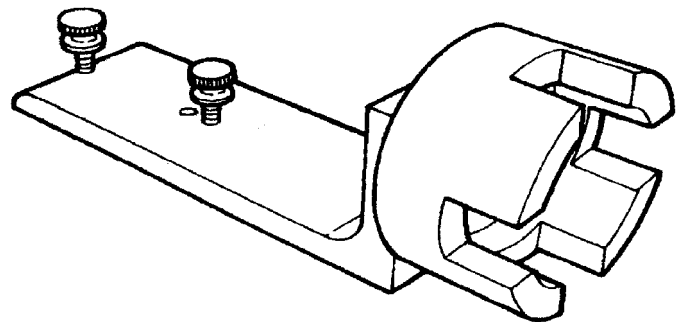
W7000250

The J-38460-A is a digital protractor, available from Kent-Moore (telephone: 800-328-6657).



W7000708

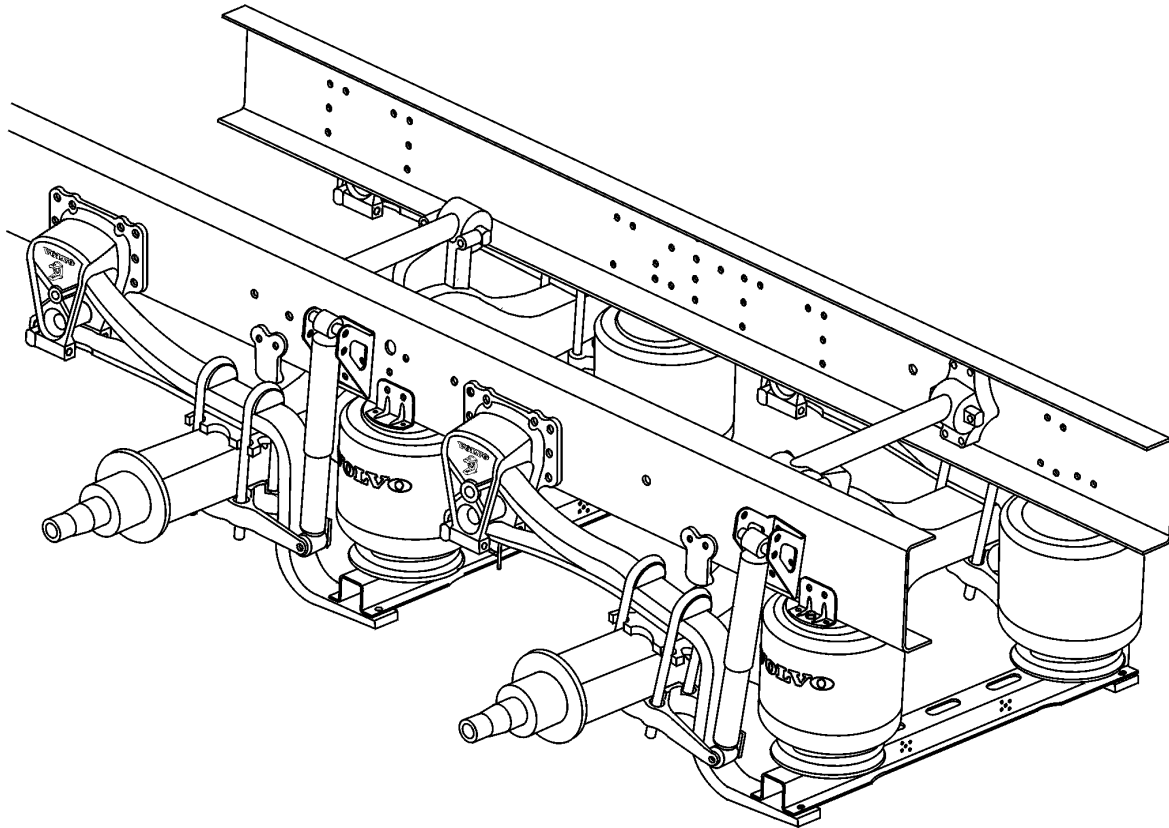
The J-38460-25 is a bracket, this tool is used along with the Kent-Moore digital protractor or the Dana-Spicer digital inclinometer for checking pinion angles. It is available from Kent-Moore (telephone: 800-328-6657).



W7000726

Design and Function

Volvo Optimized 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.

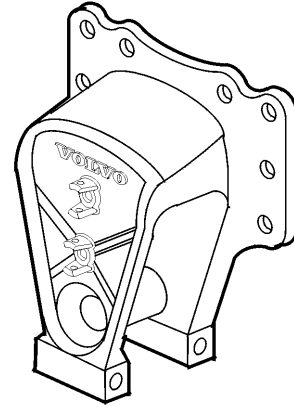
Air Suspension, Adjustment (Ride Height and Drive Line Calculation)

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 Drive Line Calculation)" page 25, 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.

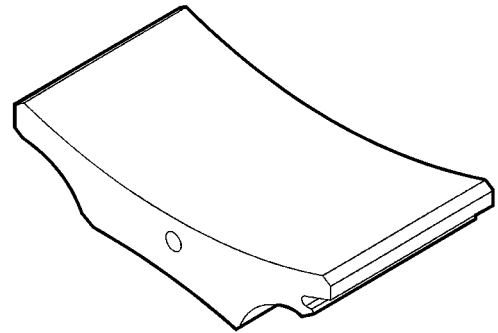


W7001044

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.

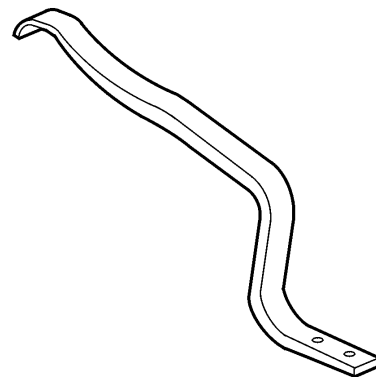


W7000739

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.

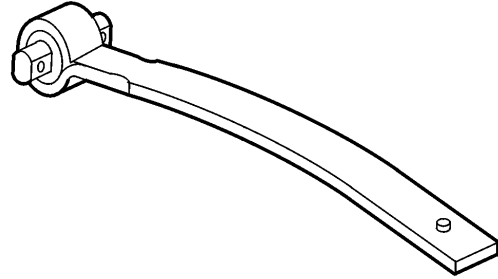


W7001045

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.



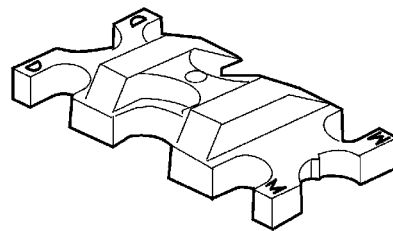
W7000704

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 54.



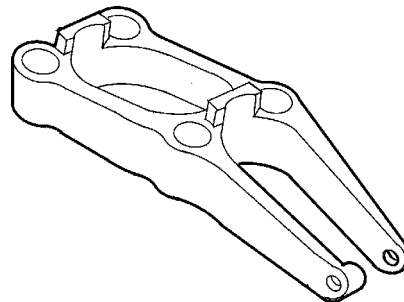
W7001200

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.

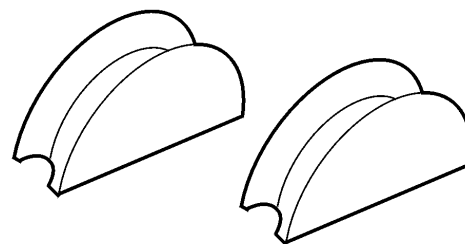


W7001049

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

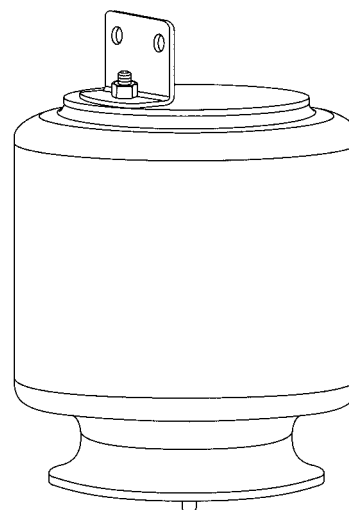
Air Spring

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.



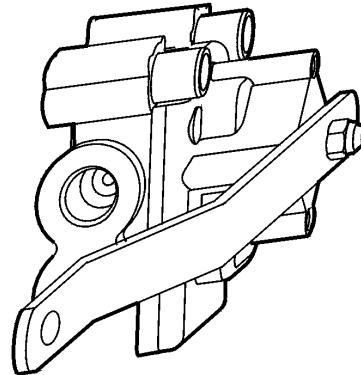
W7001195

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.

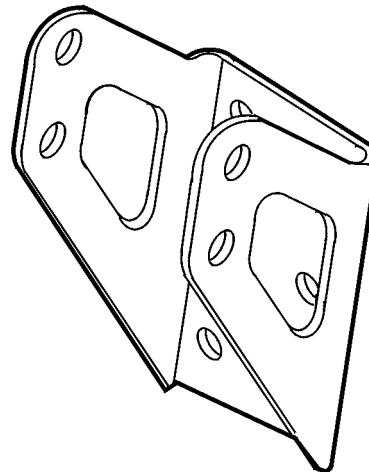
The Volvo Optimized Air Suspension height valve incorporates an integrated dump feature that eliminates the need for a separate valve and allows the rear to be lowered when driving out from under an uncoupled trailer.



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.

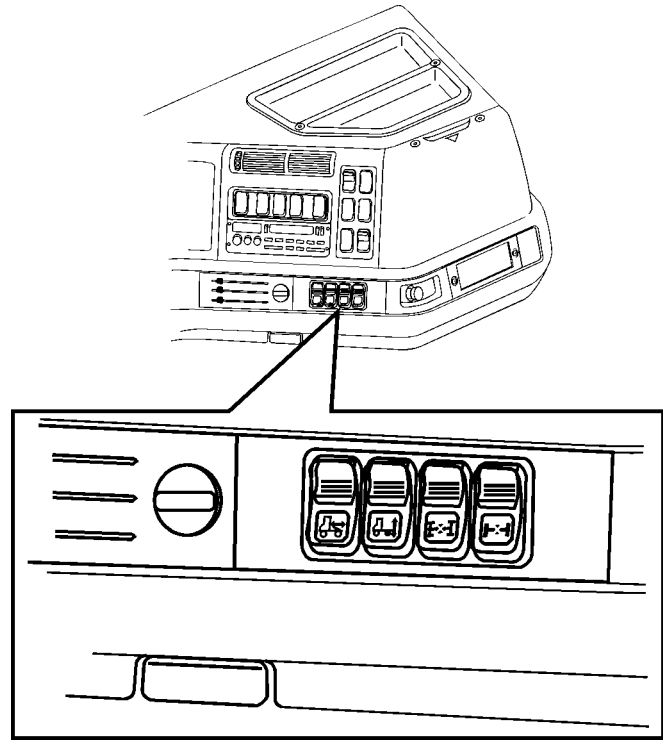
Note: Different models of torque rods should not be interchanged.



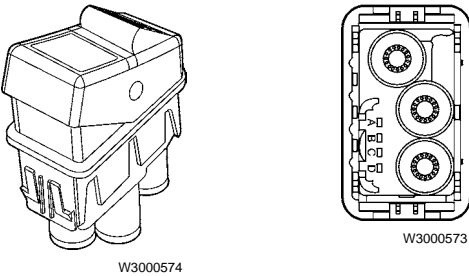
W7000722

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

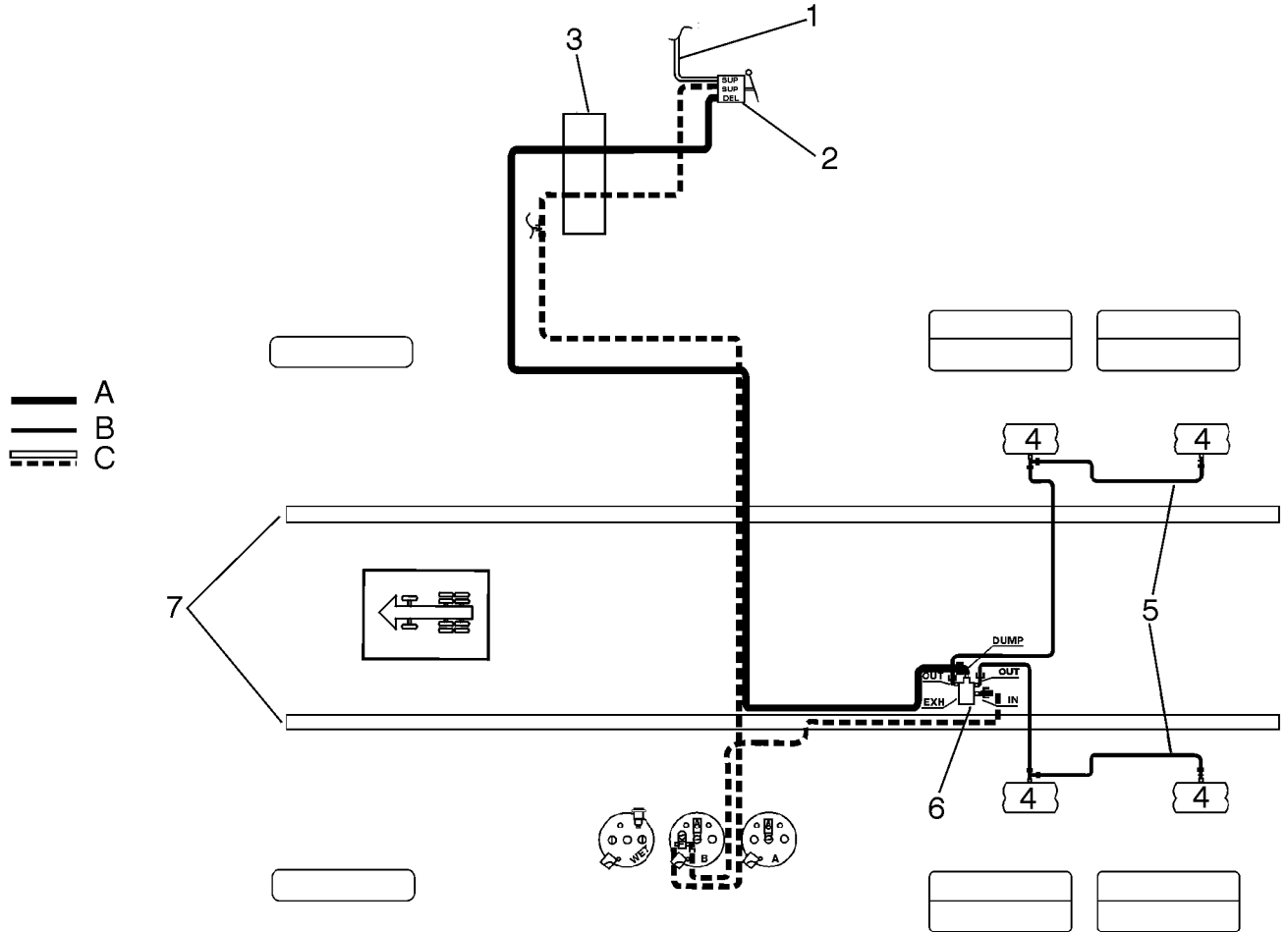
Switch	Switch Function	Terminal			
		A	B	C	D
 <p>W3000574</p> <p>W3000573</p>	Interaxle DLO	To Cluster Telltale Lamp	+12V Supply	Ground	+12V Illumination Control
	Fifth Wheel Slide	To Cluster Telltale Lamp	Not Used	Ground	+12V Illumination Control
	Suspension Dump	To Cluster Telltale Lamp	Not Used	Ground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

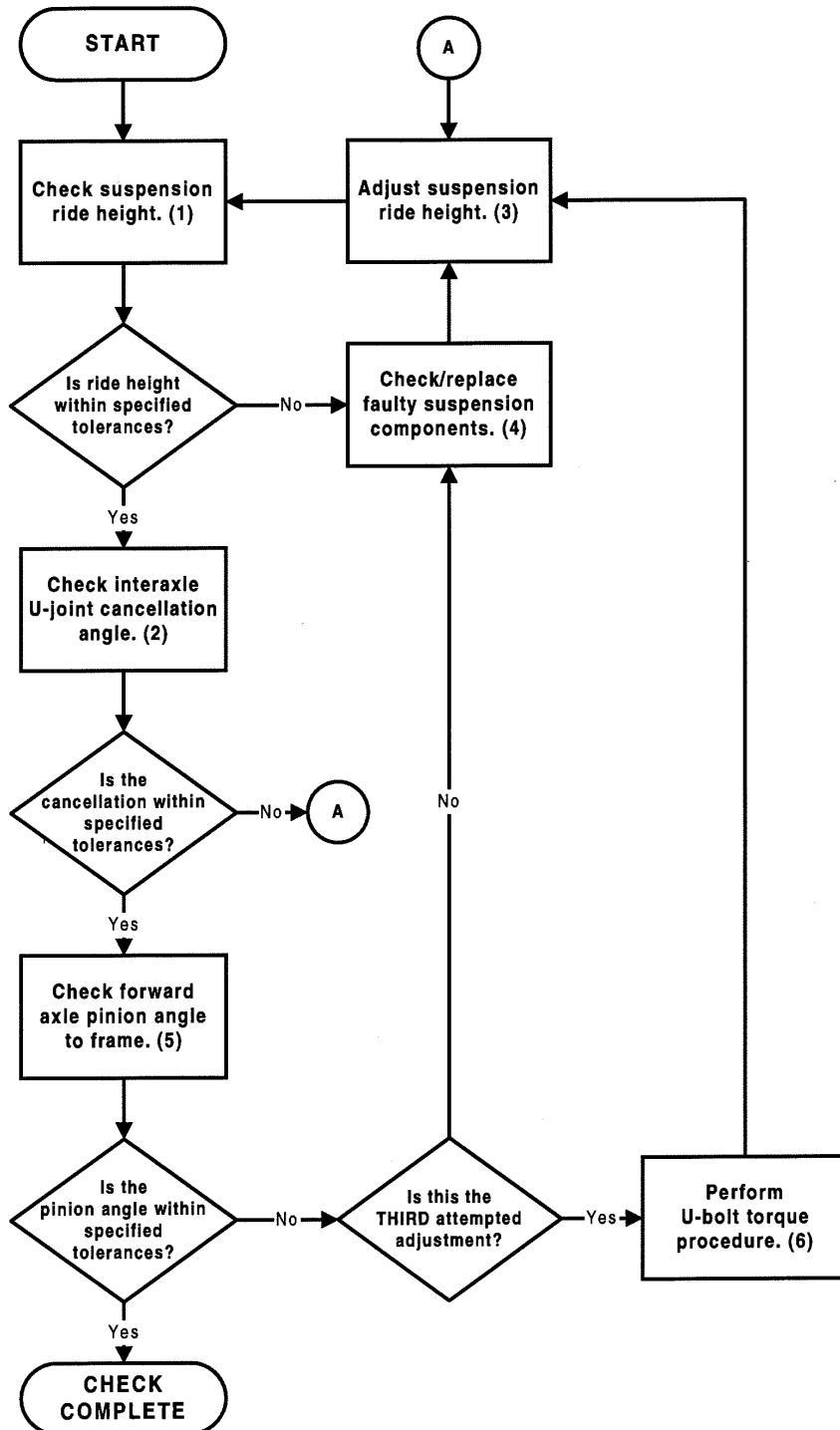
- A Dump System
- B Air Suspension System
- C Air Supply
- 1 Supply for Dash Systems
- 2 Air Suspension Dump
- 3 BulkHead pass through
- 4 Air Spring
- 5 6 X 4 only
- 6 Air Suspension Leveling Valve
- 7 Frame Rail

Troubleshooting

Volvo Optimized Air Suspension Troubleshooting

Problem	Cause
Vibration	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
	Excessible wheel bearing end play
	Mismatched wheels and tires
	Improper axle seat installation
Bottoming Out	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
Tracking	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
Ride Height Incorrect	Defective leveling valve
	Ride height not set properly
	Axle inclination incorrect
	Overloaded vehicle
	Defective air spring
Low Air Pressure	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 Drive Line Calculation)" page 25
- 2 See "Interaxle U-joint Angle Cancellation Check (Calculation)" page 27
- 3 See "Load Leveling Valve, Adjustment" page 34
- 4 See "Forward Axle Pinion Angle to Frame Check" page 29
- 5 See "Rear Spring U-bolt Torque, Adjustment" page 32

Service Procedures

7281-05-02-01 Air Suspension, Adjustment (Ride Height and Drive Line Calculation)

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 Bulletin 601-006
Wheel Alignment Steer and Drive Axles VN/VHD

IMPACT Function Group 601
Information Type: Bulletin
"Alignment Specifications and Procedures"

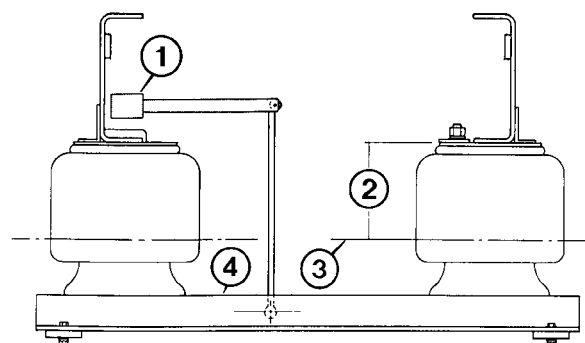
*Other special equipment: J-38460-A,
J-38460-25*

Air Suspension Ride Height Check

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

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.

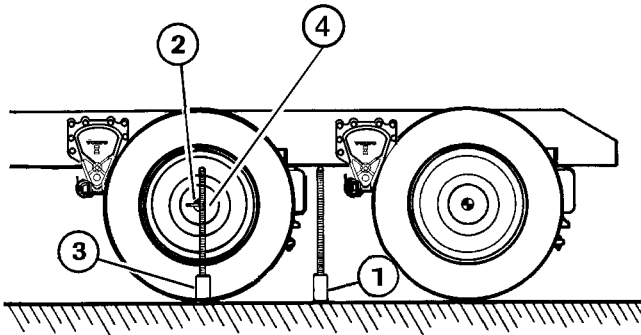
3

Dump (release) the suspension air (see "Dump Switch Operation" page 21).



Stay clear when suspension air is released. Chassis may drop quickly and 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 31). 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 48.

- 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 34).

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 27.

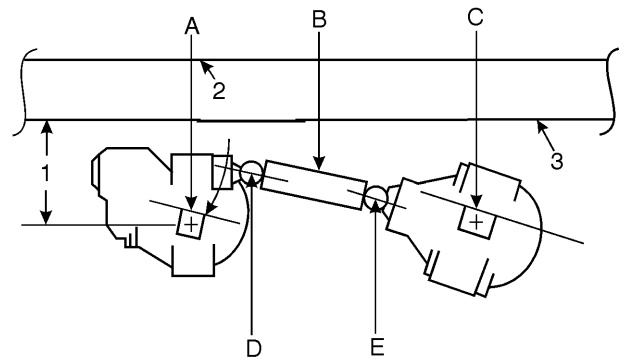
Interaxle U-joint Angle Cancellation Check (Calculation)

1

The steps from "Air Suspension Ride Height Check" page 25 must be performed before continuing with this procedure.

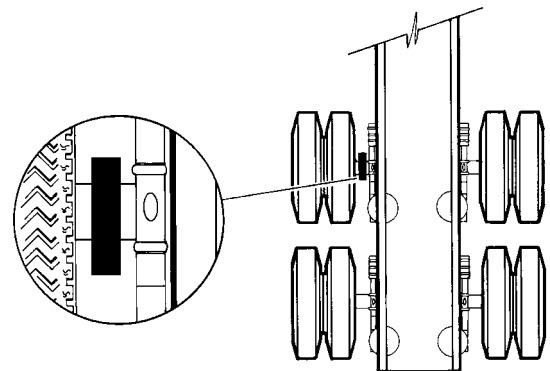
Note: All angle measurements are relative to level ground.

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



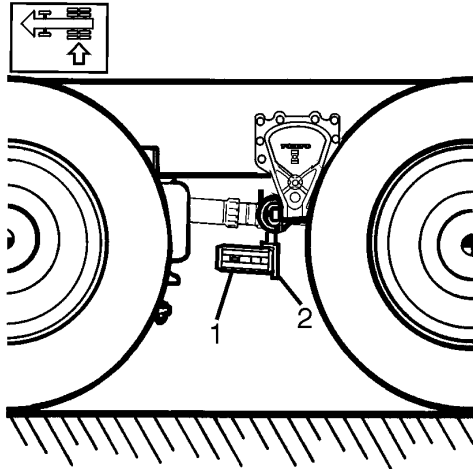
W7000252

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 31).

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

3



W7001202

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

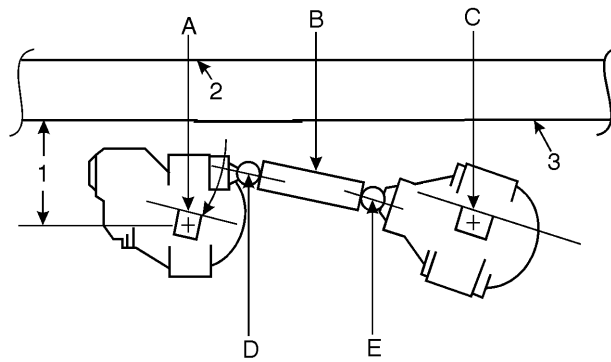
Measure the interaxle shaft angle (**B**) using the recommended tools. Record the measurement for calculation (refer to "Calculation Form" page 31).

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

4

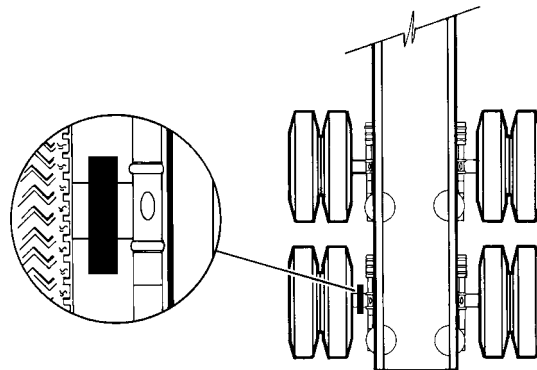
Calculate : $B - A = D$
 The interaxle angle minus the forward axle angle will give the value (**D**) (refer to "Calculation Form" page 31).

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 31).

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 31).

7

Calculate: $D - E = F$

Record the measurement for calculation (refer to "Calculation Form" page 31).

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 34.

8

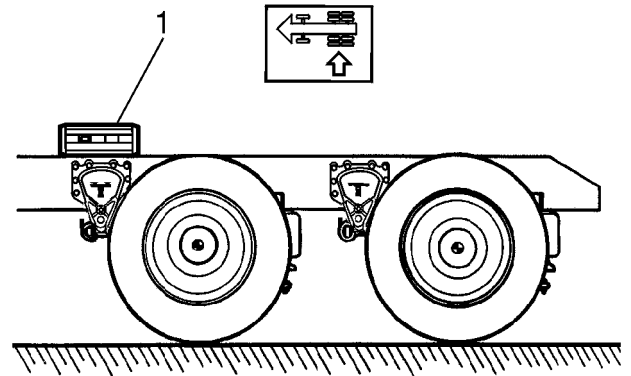
Proceed to "Forward Axle Pinion Angle to Frame Check" page 29.

Forward Axle Pinion Angle to Frame Check



Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

1



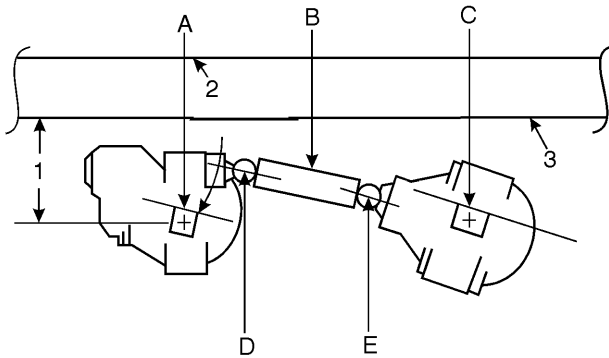
W7001201

1 Digital protractor

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

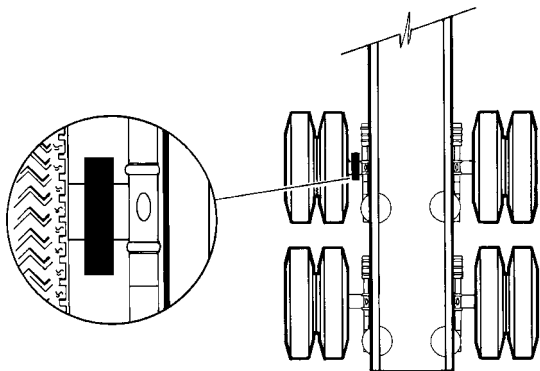
J-38460-A

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, as shown in the following table:

Forward Axle Angle Relative to Frame (P)	
Axle Model	Specification (in degrees)
Tandem, 6x4	2.5 +0/-1
Single, 4x2	3.5 ± 1

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 48.
- 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 34).

4

Repeat all steps in “Air Suspension Ride Height Check” page 25, “Interaxle U-joint Angle Cancellation Check (Calculation)” page 27, and “Forward Axle Pinion Angle to Frame Check” page 29.

Note: If, after the second attempt, the axle pinion angles are still not within specification, perform the “Rear Spring U-bolt Torque, Adjustment” page 32, 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
1) MEASURE THE RIDE HEIGHT: 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.			
2) MEASURE FORWARD AXLE ANGLE (Relative to the ground)	A		
3) MEASURE THE INTERAXLE SHAFT (Relative to the ground)	B		
4) CALCULATE: B - A = The difference between B and A is value "D"	D		
5) MEASURE THE REAR AXLE ANGLE (Relative to the ground)	C		
6) CALCULATE: C - B = The difference between C and B is value "E"	E		
7) CALCULATE: D - E =	± 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.

MEASURE FORWARD AXLE ANGLE (RELATIVE TO FRAME)	SPECIFICATIONS		P		
	Tandem, 6x4	2.5 +0/-1			
	Single, 4x2	3.5 ± 1			

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

7229-05-02-01 Rear Spring U-bolt Torque, Ad- justment

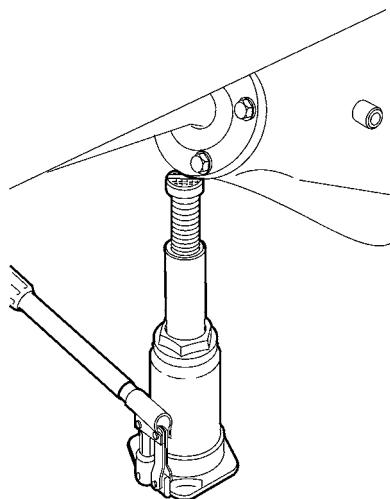
! DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

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.

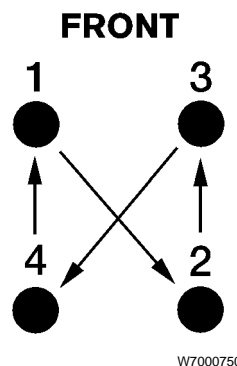
3

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.

4



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 (425 ± 37 ft-lb)


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

Note: Use the “crossover method” (see pattern above) to evenly tighten the U-bolt nuts. Tighten nuts to a torque of approximately 100 Nm (75 ft-lb) increments until fully tightened.

5
Road-test the vehicle to seat components, then re-tighten the U-bolt nuts.

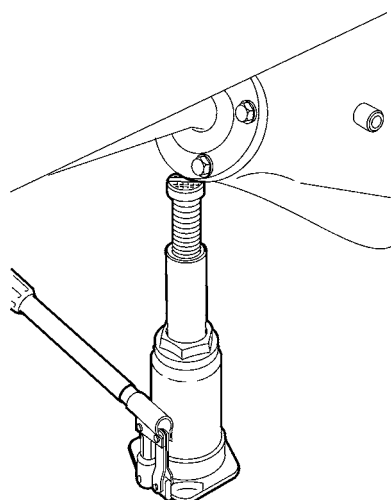
6
Re-perform the procedure: "Air Suspension, Adjustment (Ride Height and Drive Line Calculation)" page 25. If axle pinion angles are still outside the specifications, proceed with Method 2.


Method 2


DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

1




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

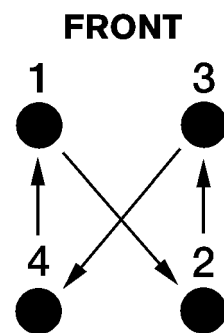
Loosen the U-bolts enough to allow the bottom plate/rear shock absorber bracket to be slightly free from the axle housing. Lower the jack slightly, approximately 10 –15 mm (0.38 – 0.50 in.).

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

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

4



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: Tightening one U-bolt before the other can influence the axle pinion angle.

Tightening the nuts on the U-bolt on the rear side of the axle housing (left and right) first can **decrease** the axle pinion angle.

Tightening the nuts on the U-bolt on the front side of the axle housing (left and right) first can **increase** the axle pinion angle.

5

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

6

Re-perform the procedure: "Air Suspension, Adjustment (Ride Height and Drive Line Calculation)" page 25.

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

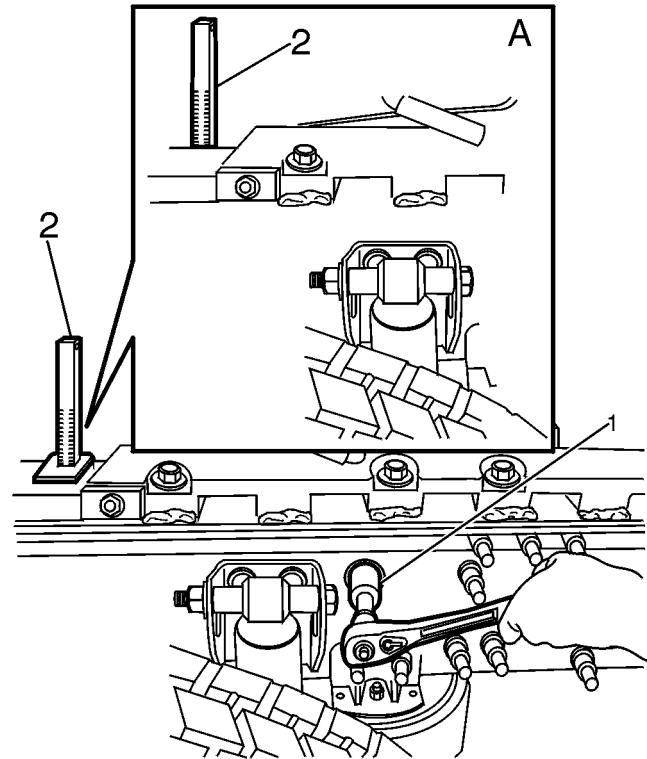
DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

1

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

2



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.

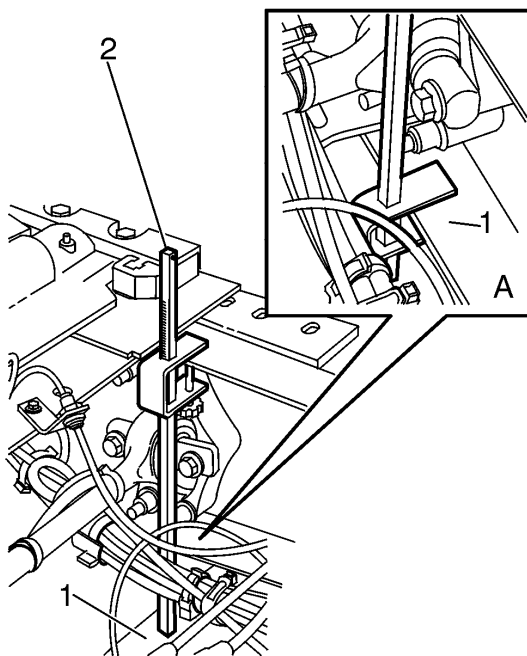
3

⚠ 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

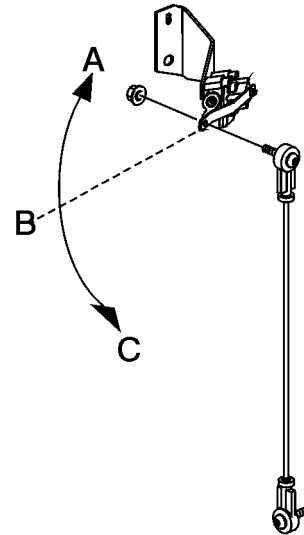


W7001204

- 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 bracket 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 21).

7

Start the engine to build up air pressure to check the ride height (see "Air Suspension Ride Height Check" page 25). 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 27, and the "Forward Axle Pinion Angle to Frame Check" page 29.

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

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

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

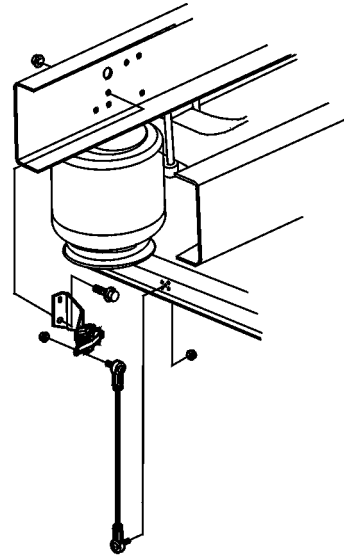
DANGER

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 21).

3
Remove rod from the load leveling valve handle.

4



Remove bolts that hold the valve mounting bracket in place in the frame.

W7001058

Note: These may be Huck®-style fasteners, which require additional effort for removal. See "HUCK-FIT® Fastener, Removal" page 59.

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

M8:
30 ± 5 Nm
(22 ± 4 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 bolts through the valve bracket and the frame. Tighten bolts 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 25).

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



Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

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 21).

2

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

Installation

3

Pre-set the length of the replacement leveling rod to approximately 500 mm (20.0 in.). Except for RRH-160.

Note: Do not crimp or tighten the clamp at the lower end of the leveling rod at this time.

4

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.

5

When completed, start the engine to build up air pressure to check the ride height (see "Air Suspension Ride Height Check" page 25).

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

6

Crimp or tighten clamp at the lower end of the leveling rod.

7262-03-02-03**Crossbeam (Pedestal), Replacement****! DANGER**

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

Removal**1****! DANGER**

Never work under or around a vehicle unless it is supported on jack stands of adequate rating. Failure to use adequate jack stands can result in the vehicle falling, which can cause serious injury or death to anyone under the vehicle.

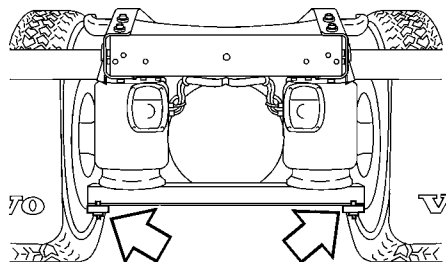
! DANGER

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

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

M12: 50 ± 10 Nm (37 ± 7.5 ft-lb).

M12
50 ± 10 Nm
(37 ± 7.5 ft-lb)

**CAUTION**

Over-tightening will damage the air spring.

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.

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

**DANGER**

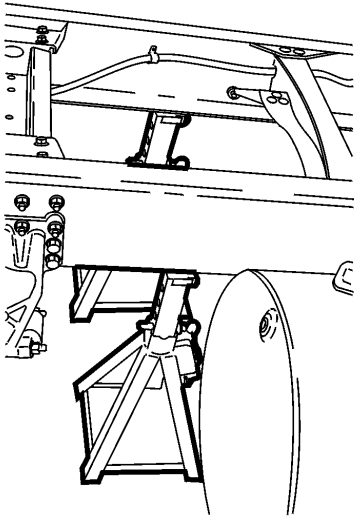
Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

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

⚠ DANGER

Never work under or around a vehicle unless it is supported on jack stands of adequate rating. Failure to use adequate jack stands can result in the vehicle falling, which can cause serious injury or death to anyone under the vehicle.

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

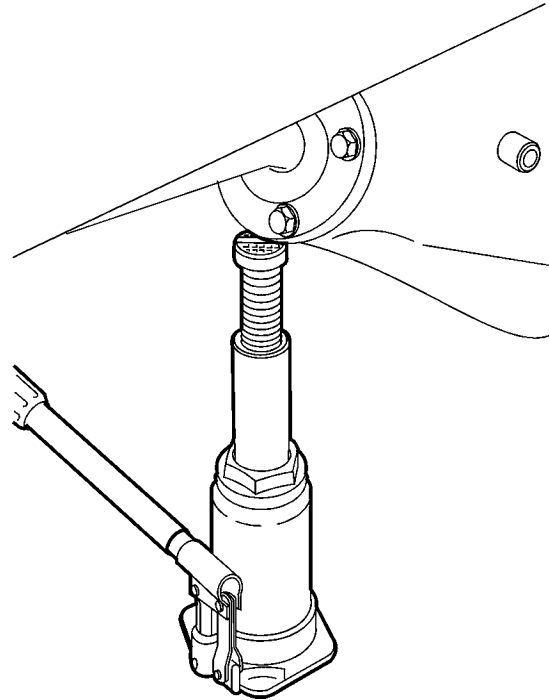
Note: Never install jack directly under the crossbeam. The crossbeam is not designed to support vehicle weight.

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

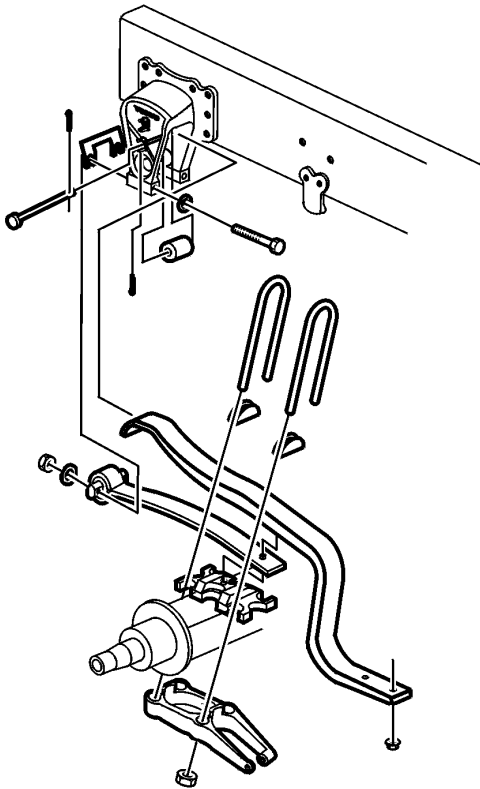
Support the nose of the axle with a jack of adequate rating.

⚠ 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 axles(s) being worked on. While lowering vehicle onto jack stands, support the nose of the axle with a bottle jack.

5



W7001061

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 take tension off the Z-spring for removal.

Installation

9

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

10

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.

11

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)

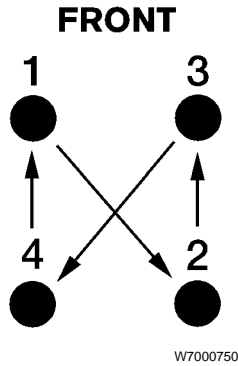
12

Install the shock absorber. Tighten as follows:

M10: 60 ± 10 Nm (45 ± 7ft-lb)

M10:
60 ± 10 Nm
(45 ± 7ft-lb)

13



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

M20: 500 ± 75 Nm (370 ± 55 ft-lb)

M22: 575 ± 50 Nm (425 ± 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 wheel alignment.

Note: Always “snug-up” all the U-bolt nuts before tightening. Use a handheld clicker-style torque wrench.

14

Install the wheels and tires.

15

Remove any jack stands and check wheel alignment.

For proper specifications for checking the wheel alignment, refer to:

Service Bulletin 601-006
*Wheel Alignment
Steer and Drive Axles
VN/VHD*

IMPACT

Function Group 601
Information Type: Bulletin
“Alignment Specifications and Procedures”

7224-03-02-02**Radius Leaf Spring, Replacement****DANGER**

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

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

Removal

1

**DANGER**

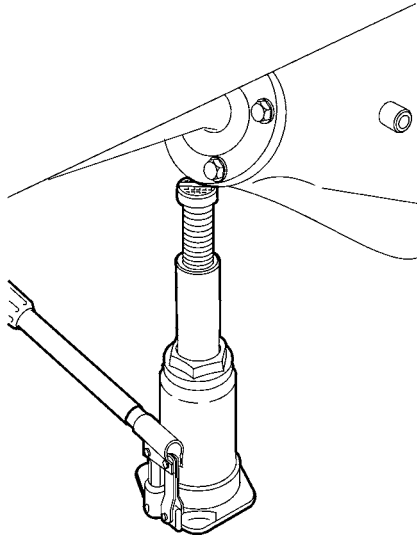
Never work under or around a vehicle unless it is supported on jack stands of adequate rating. Failure to use adequate jack stands can result in the vehicle falling, which can cause serious injury or death to anyone under the vehicle.

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



W7000752

**DANGER**

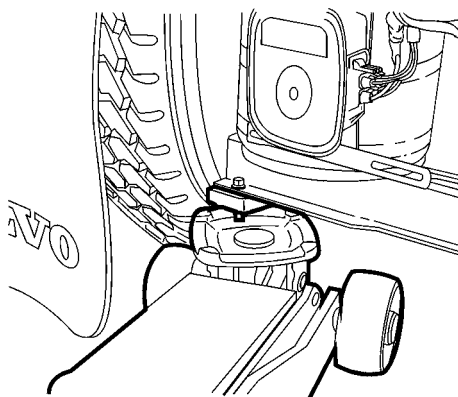
Failure to properly support the nose of the axle may result in the axle rolling forward, causing serious injury or death.

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.

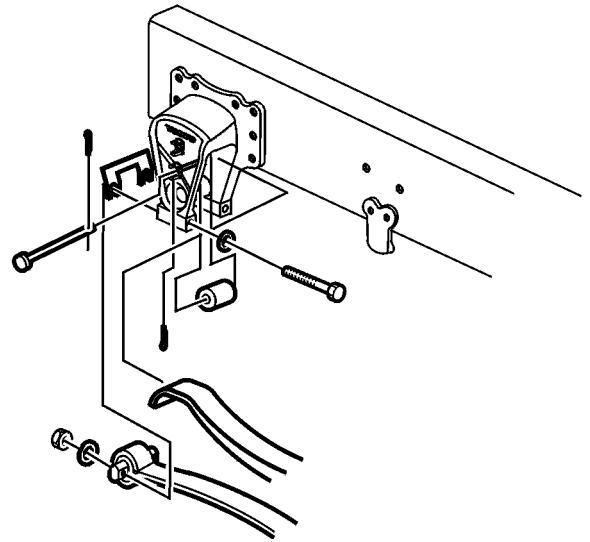
5



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:
275 ± 45 Nm
(204 ± 34 ft-lb)

M14: 275 ± 45 Nm (204 ± 34 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

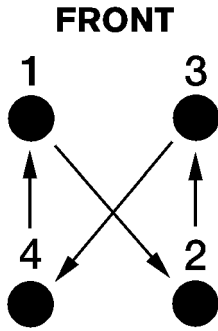
Lower vehicle, be certain that Z-spring and radius leaf spring are properly aligned while lowering.

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



W7000750

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

M20: 500 ± 75 Nm or (369 ± 55 ft-lb)

M22: 575 ± 50 Nm or (424 ± 37 ft-lb)

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

Note: Make sure that the pin in the radius leaf spring has not been pushed out of position. If the pin is set correctly, 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: Always “snug-up” all the U-bolt nuts before tightening. Use a handheld clicker-style torque wrench.

11

Remove any jack stands and check wheel alignment.

6521-03-02-04 Torque Rod, Replacement

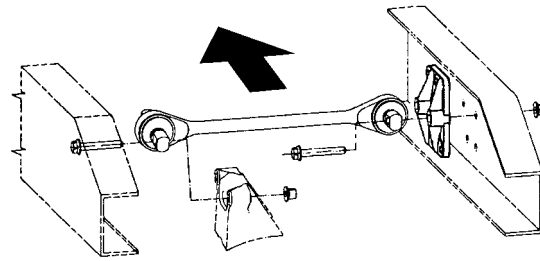
**DANGER**

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

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 “HUCK-FIT® Fastener, Removal” page 59.

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

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

M16:
271 ± 27 Nm
(200 ± 20 ft-lb)

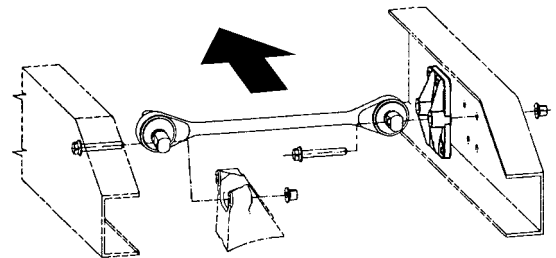
6529-03-02-02 Torque Rod Frame Rail Bracket, Replacement



Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

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.

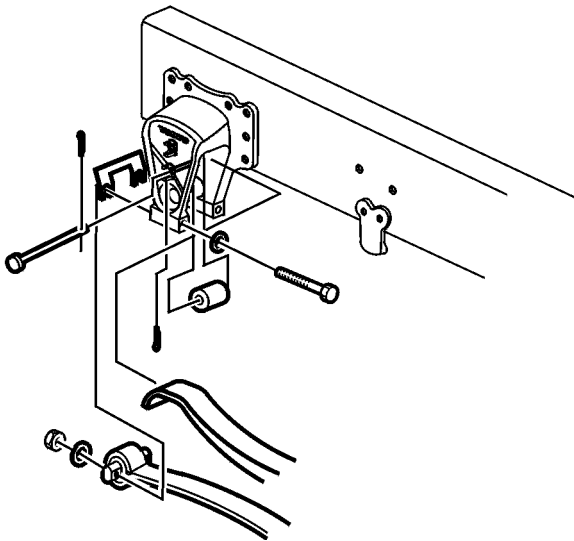
7114-03-02-04 Rear Spring Hanger, Replacement

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

Removal

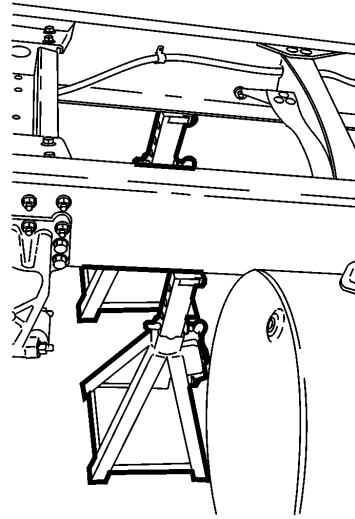
1



W7001062

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

2



W7001139

DANGER

Never work under or around a vehicle unless it is supported on jack stands of adequate rating. Failure to use adequate jack stands can result in the vehicle falling, which can cause serious injury or death to anyone under the vehicle.

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 "HUCK-FIT® Fastener, Removal" page 59.

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

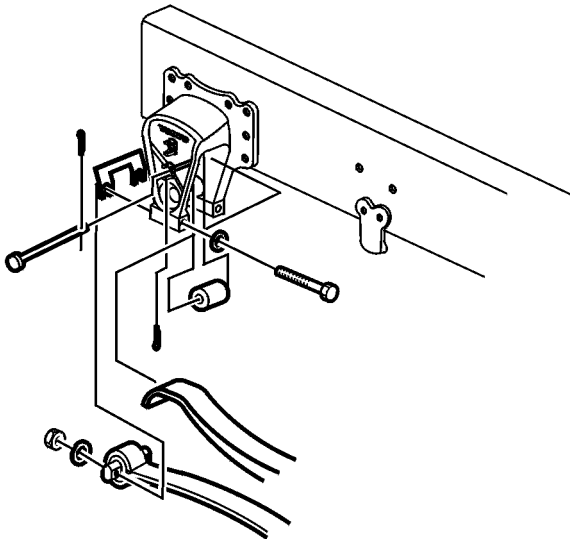
Remove the wear plate (pad) from the spring hanger and place it in the new spring hanger.

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 48.

Installation

9

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

M16: 320 ± 50 Nm (236 ± 37 ft-lb).

M16:
 320 ± 50 Nm
(236 ± 37 ft-lb)

10

Install the radius leaf spring bolts and tighten the bolts as follows:

M16: 275 ± 45 Nm or (204 ± 34 ft-lb).

M16:
 275 ± 45 Nm
(204 ± 34 ft-lb)

11

Install the roller and pin.

12

Raise the vehicle and remove the jack stands.

Note: Ride height adjustment may be required after service.

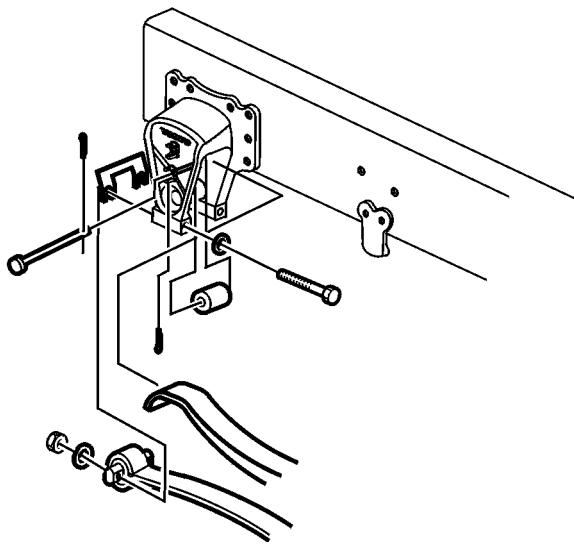
7114-03-02-03 Wear Plate (Pad), Replacement

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

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

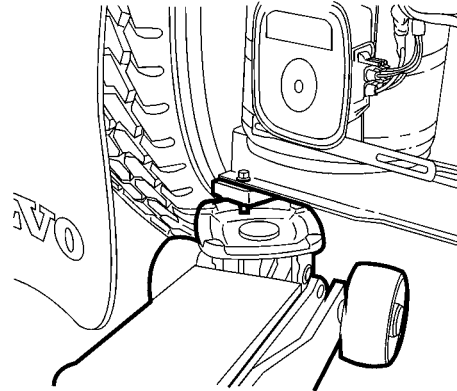
DANGER

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 21).

48

4



W7000725

DANGER

Never work under or around a vehicle unless it is supported on jack stands of adequate rating. Failure to use adequate jack stands can result in the vehicle falling, which can cause serious injury or death to anyone under the vehicle.

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 Drive Line Calculation)" page 25.

7614-03-02-02

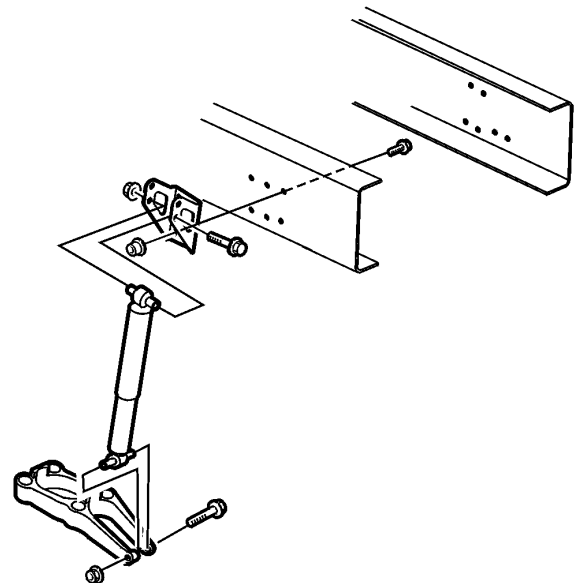
Rear Shock Absorber Bracket, Replacement (Upper)



Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

Removal

1



Remove 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 "HUCK-FIT® Fastener, Removal" page 59.

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

Install shock, bushings, and upper shock mounting bolt. Tighten bolt as follows:

47 ± 7 Nm
(35 ± 5 ft-lb)

47 ± 7 Nm (35 ± 5 ft-lb).

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

7612-03-02-01

Rear Shock Absorber, Replacement

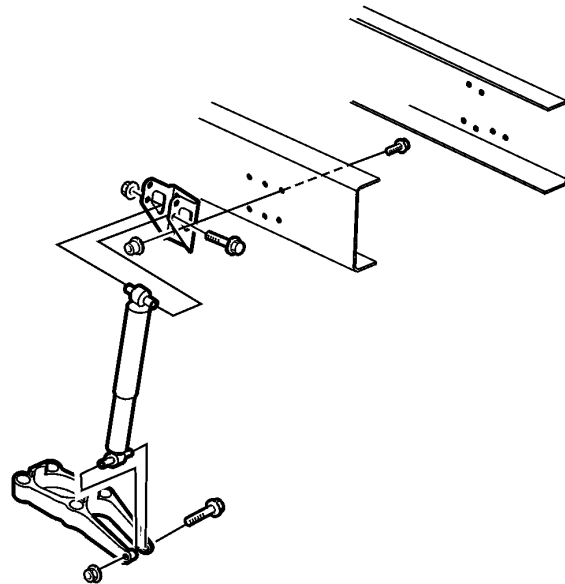


DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

Removal

1



W7001064

Remove lower shock mounting bolt.

2

Remove upper shock mounting bolt and remove shock.

Installation

3

Install shock and bushings. Tighten bolts as follows:

47 ± 7 Nm
(35 ± 5 ft-lb)

47 ± 7 Nm (35 ± 5 ft-lb).

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

7222-03-02-06 Top Plate, Replacement

Removal

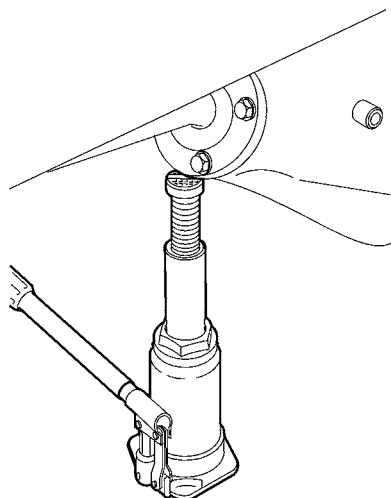
1



Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

Chock front wheels on vehicle.

2



W7000752



Never work under or around a vehicle unless it is supported on jack stands of adequate rating. Failure to use adequate jack stands can result in the vehicle falling, which can cause serious injury or death to anyone under the vehicle.

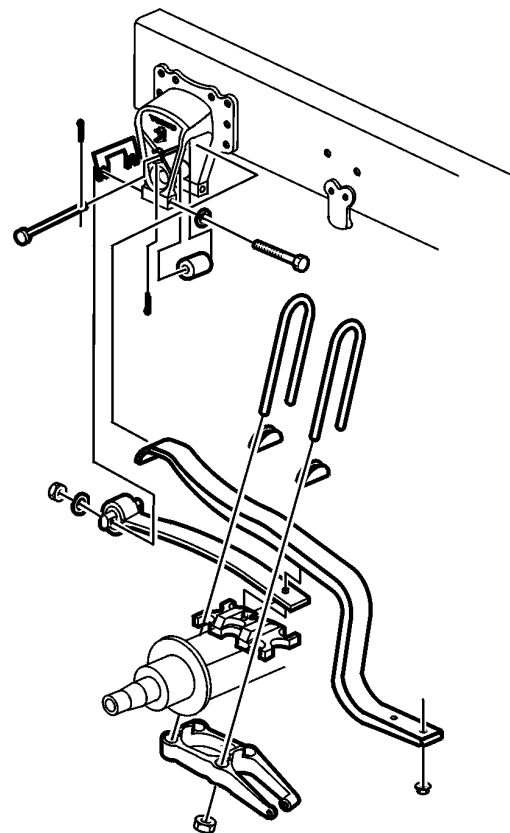
Support the nose of the axle with an adequate jack.

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



W7001061

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.

For models using an earlier-style top plate (without an alignment pin), follow steps "a-e" to locate where the top plate should be placed after the radius leaf spring and Z-spring are resting together on the axle:

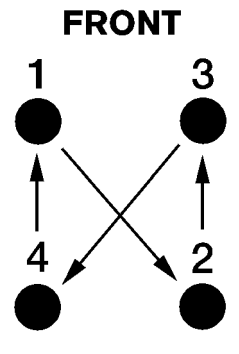
- a. Hold/block the correct lower plate to the axle housing underside and insert a U-bolt over the top plate hanging down through the holes in the lower plate.
- b. Using a small square, make sure that the U-bolt threads sticking through the hole are perpendicular to the "surface" bottom.
- c. The top plate should be positioned so that it is square with the U-bolt, and so that the bolt and curve line up.
- d. Use chalk or marker pen to mark the Z-spring to identify the location for the plate that lines up the clip groove with the U-bolt.
- e. Tighten the U-bolts before tightening with a torque wrench (see "Rear Spring U-bolt Torque, Adjustment" page 32).

6

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.

7



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 "Rear Spring U-bolt Torque, Adjustment" page 32.

8

Note: Ride height and pinion angle may require adjustment. See "Air Suspension, Adjustment (Ride Height and Drive Line Calculation)" page 25.

7614-03-02-05 Bottom Plate/Rear Shock Absorber Bracket, Replacement (Lower)

Removal

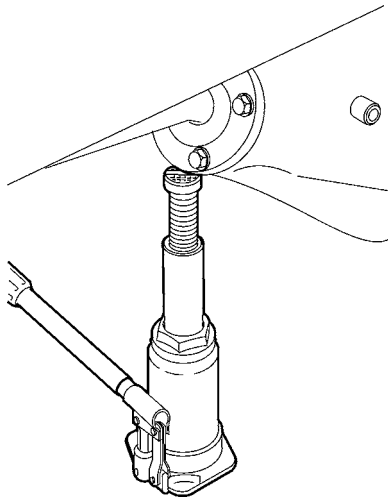
1



Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

Chock front wheels on vehicle.

2



W7000752



Never work under or around a vehicle unless it is supported on jack stands of adequate rating. Failure to use adequate jack stands can result in the vehicle falling, which can cause serious injury or death to anyone under the vehicle.

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.

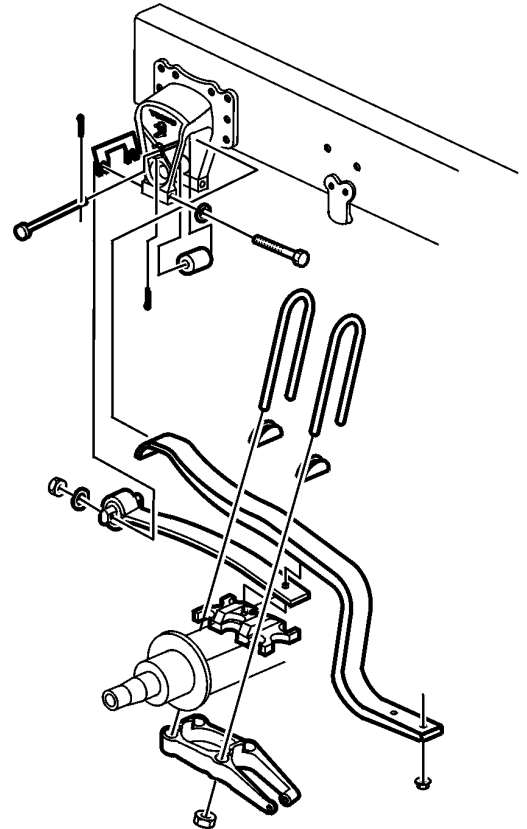
3

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

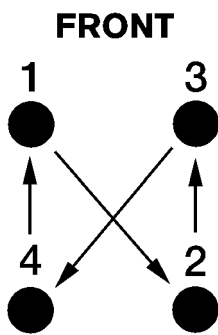
Installation

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



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).

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 "Rear Spring U-bolt Torque, Adjustment" page 32

8

Note: Ride height and pinion angle may require adjustment. See "Air Suspension, Adjustment (Ride Height and Drive Line Calculation)" page 25.

7222-03-02-05

Axle Seat, Replacement

Removal

1

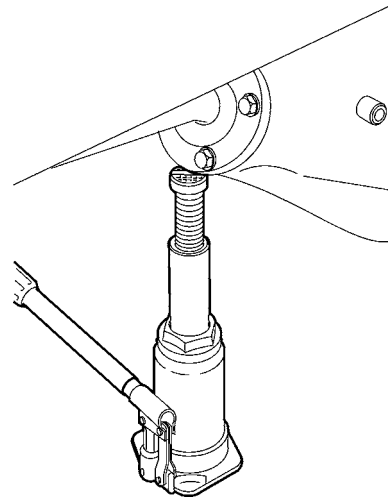


DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

Chock front wheels on vehicle.

2



W7000752



DANGER

Never work under or around a vehicle unless it is supported on jack stands of adequate rating. Failure to use adequate jack stands can result in the vehicle falling, which can cause serious injury or death to anyone under the vehicle.

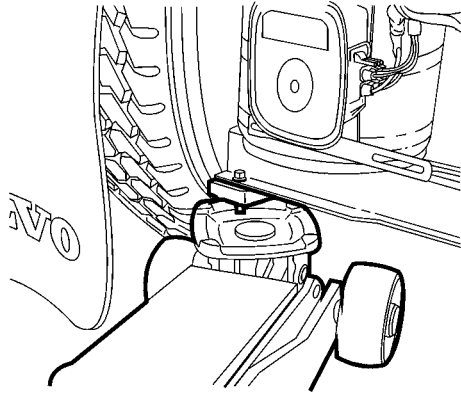
Support the nose of the axle with an adequate jack.

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

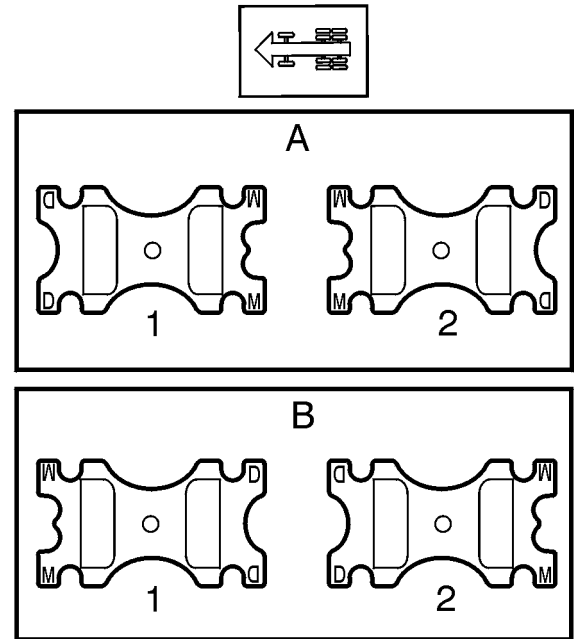


Using a lift, raise the Z-spring from the axle seat, then remove axle seat.

W7000725

Installation

5



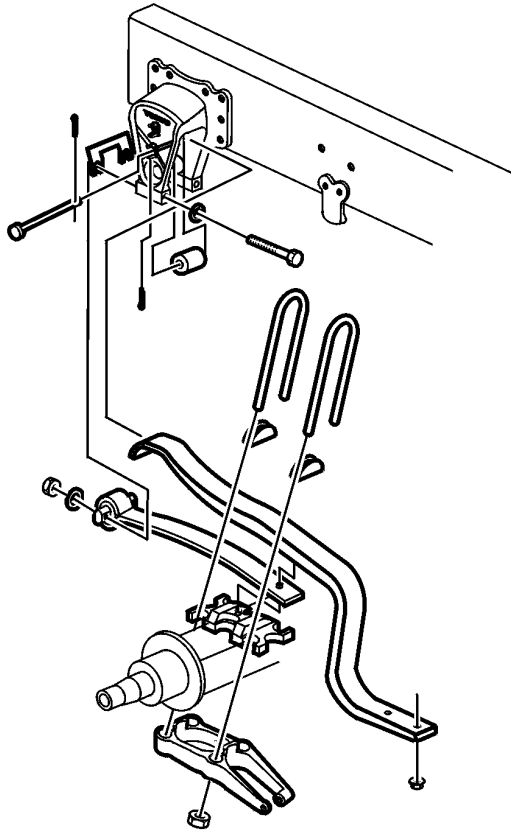
W7001199

- 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.

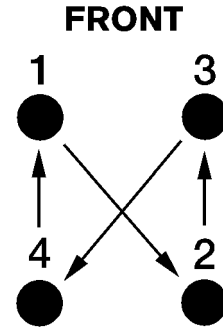
6



W7001061

Install the axle seat.

7



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 "Rear Spring U-bolt Torque, Adjustment" page 32

Note: Ride height and pinion angle may require adjustment. See "Air Suspension, Adjustment (Ride Height and Drive Line Calculation)" page 25.

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



Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

Removal

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

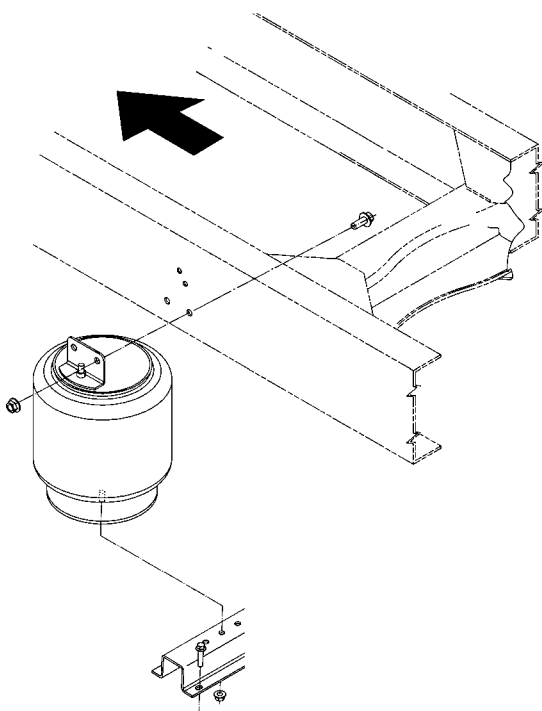
2



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



Note: Remove the upper mounting nut and bottom nut.

W7000719

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

Tighten lower nut as follows:

M12:	50 ± 10 Nm (37 ± 7.5 ft-lb).	M12:	50 ± 10 Nm (37 ± 7.5 ft-lb)
------	------------------------------	------	-----------------------------



Over-tightening will damage air spring.

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 Drive Line Calculation)" page 25).

3646-03-02-32 Pneumatic Switch, Replace- ment

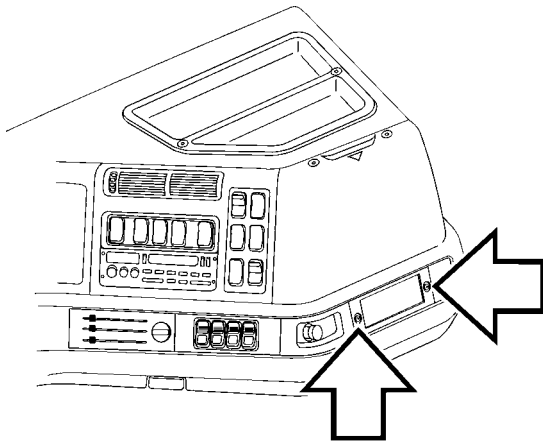
DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

Note: Make sure the vehicle ignition is OFF before beginning this procedure.

Removal

1



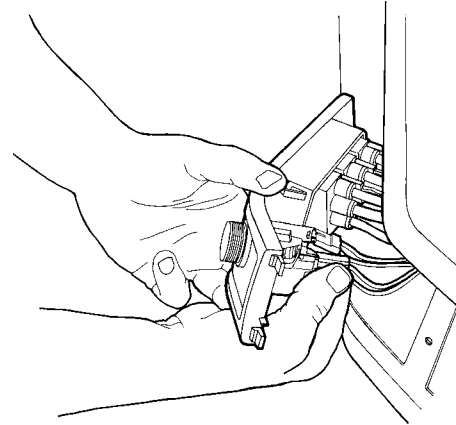
W3000649

Remove the ashtray from ashtray housing. Remove the (two) 2 screws from the ashtray housing, then remove the housing.

2

Once the ashtray housing is removed, the air switch panel can be removed from the dash. Pull the air switch panel away from the dash and to the left, to clear the tip inserts.

3



W3000656

DANGER

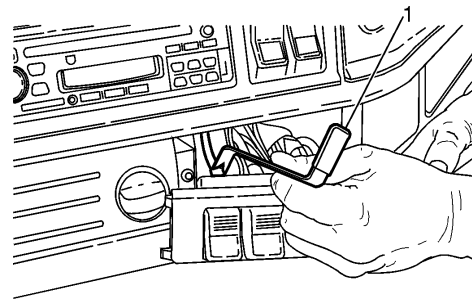
Never disconnect an air system component unless all system pressure has been depleted. Failure to deplete system pressure before disconnecting hoses or components may result in them separating violently and causing serious bodily injury.

Disconnect the two terminal connectors from the cigar lighter and the electrical LED connections on the switch being replaced.

4

Drain air pressure from vehicle system. Mark each air line to keep correct arrangement.

5

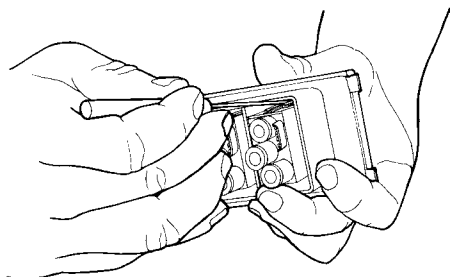


W0001937

1 J-42189

Disconnect air lines at switch being replaced by pushing in on the ring and air line using the air line release tool (J-42189), then pulling the air line out.

6



W3000658

To remove switch, insert a no. 1 flat tip screwdriver into back of switch at top and bottom to release locking tabs. Push switch out of the panel.

Installation

7

Install new air switch into the panel, pushing the switch into the panel until it locks. Push back on the switch to make certain it is locked in the panel.

8

Connect air lines to the switch, making sure they are installed in the correct position. Be sure to insert airline to line indicated.

9

Connect electrical LED connections on switch, and both cigar lighter connections.

10

Align and install switch panel in dash.

11

Install ashtray housing with the two (2) mounting screws. Tighten screws as follows:

0.4 ± 0.1 Nm (3.5 ± 1 in-lb).

12

Place ashtray in housing.

7113-01-02-01 HUCK-FIT® Fastener, Removal

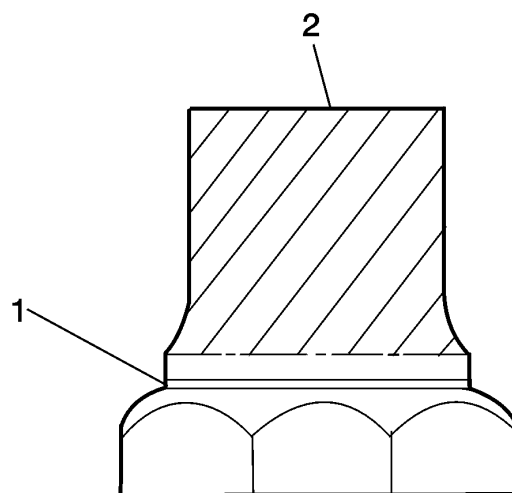


Before working on a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

1

An air impact wrench can generally be used to remove HUCK-FIT® fasteners. Always try to remove the collar with an air impact wrench first. Should you encounter difficulty, increase air pressure to the maximum for your equipment to obtain best results. If the air impact wrench fails to remove a fastener, the collar must be split or cut.

2



W7001135

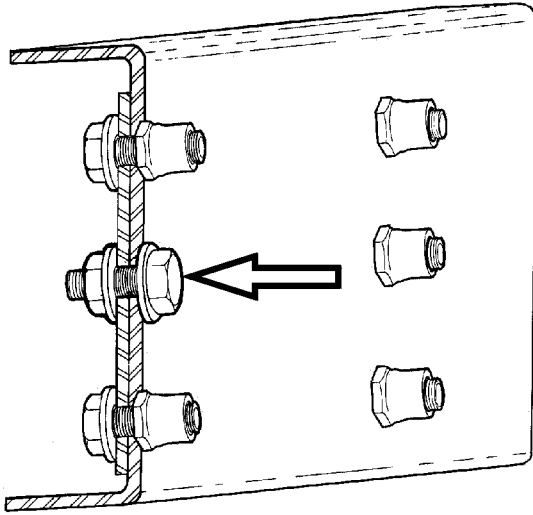
Fig. 1: Where to cut using torch

- 1 Cut through collar and pin at this location.
- 2 Swaged area.

A hydraulic collar splitter is available from HUCK-FIT®. If the splitter is available to you, it should be used. If it is not, cut the collar with a torch as shown in Fig. 1.

Note: Use this method of removal only if the fastener cannot be removed with an air impact wrench or hydraulic splitter.

3

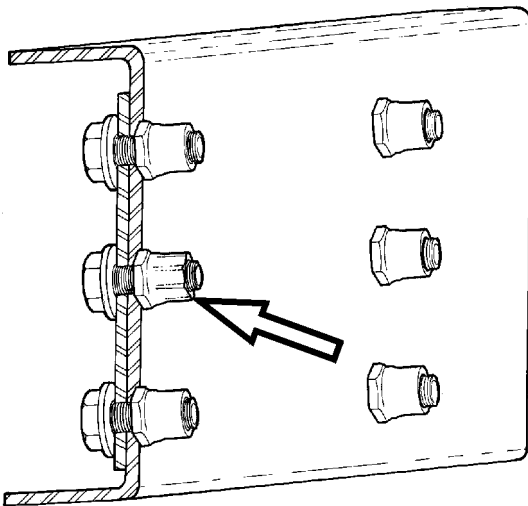


W7001037

Fig. 2: Flange bolts and HUCK-FIT® bolts

HUCK-FIT® bolts and Flange bolts are **not** to be mixed within a hole pattern, unless a specific exception is documented.

4



W7001038

Fig. 3: Scored HUCK-FIT® collar

If the collar is scored, the tool anvil is worn and should be replaced.

Feedback

One of our objectives is that workshop personnel should have access to correct and appropriate service manuals where it concerns fault tracing, repairs and maintenance of Volvo trucks.

In order to maintain the high standards of our literature, your opinions and experience when using this manual would be greatly appreciated.

If you have any comments or suggestions, make a copy of this page, write down your comments and send them to us, either via telefax or mailing directly to the address listed below.

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Comments/proposals

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Concerns Service Manual:

Operation Numbers

3646-03-02-32	Pneumatic Switch, Replacement	58
6521-03-02-04	Torque Rod, Replacement	44
6529-03-02-02	Torque Rod Frame Rail Bracket, Replacement	45
7113-01-02-01	HUCK-FIT® Fastener, Removal	59
7114-03-02-03	Wear Plate (Pad), Replacement	48
7114-03-02-04	Rear Spring Hanger, Replacement	46
7222-03-02-05	Axle Seat, Replacement	54
7222-03-02-06	Top Plate, Replacement	51
7224-03-02-02	Radius Leaf Spring, Replacement	42
7224-03-02-02	Z-Spring, Replacement	39
7229-05-02-01	Rear Spring U-bolt Torque, Adjustment	32
7261-03-02-03	Rear Air Spring, Replacement	57
7262-03-02-03	Crossbeam (Pedestal), Replacement	38
7281-05-02-01	Air Suspension, Adjustment (Ride Height and Drive Line Calculation)	25
7612-03-02-01	Rear Shock Absorber, Replacement	50
7614-03-02-02	Rear Shock Absorber Bracket, Replacement (Upper)	49
7614-03-02-05	Bottom Plate/Rear Shock Absorber Bracket, Replacement (Lower)	53
7641-03-02-01	Load Leveling Valve, Replacement	36
7641-05-02-01	Load Leveling Valve, Adjustment	34
7647-03-02-01	Leveling Rod, Replacement	37

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