



# Volvo Chassis - Driveline (Driveshaft, Propeller Shaft) Ride Height And Angle, Measurement And Calculation; Pinion Angle Measurement - Model Year 1996 And Newer



> Internal Content

## I. Ride Height

This section should be used together with Operation [7281-05-02-01 Air Ride Suspension, Adjustment](#) located under the Service tab in Impact.

### Prior to taking measurements:

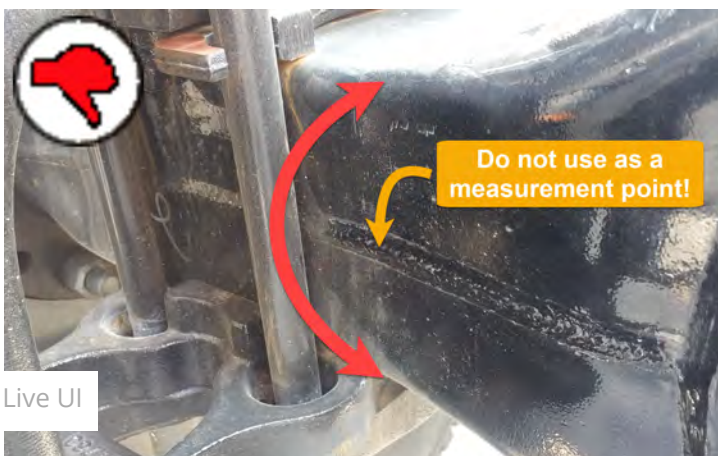
- The vehicle must be moved onto relatively level ground. **Braking should be kept to a minimum during this time.**
- The air suspension should be fully inflated.

**Note:** The suspension may take up to ten minutes to settle after airing up.

- The wheels should be chocked.

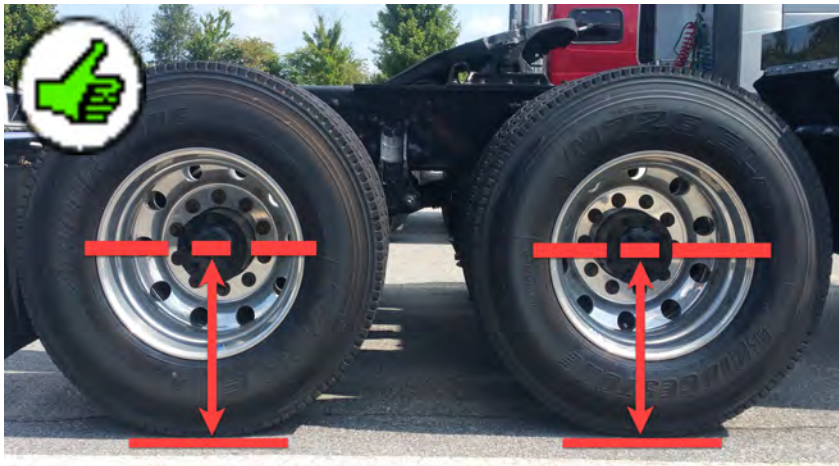
### Measurement

**DO NOT use the seam weld as a point of reference when measuring.** The seam weld's height will move up and down as the axle rotates with changes to pinion angle, and may not be at the same height of the axle center line.



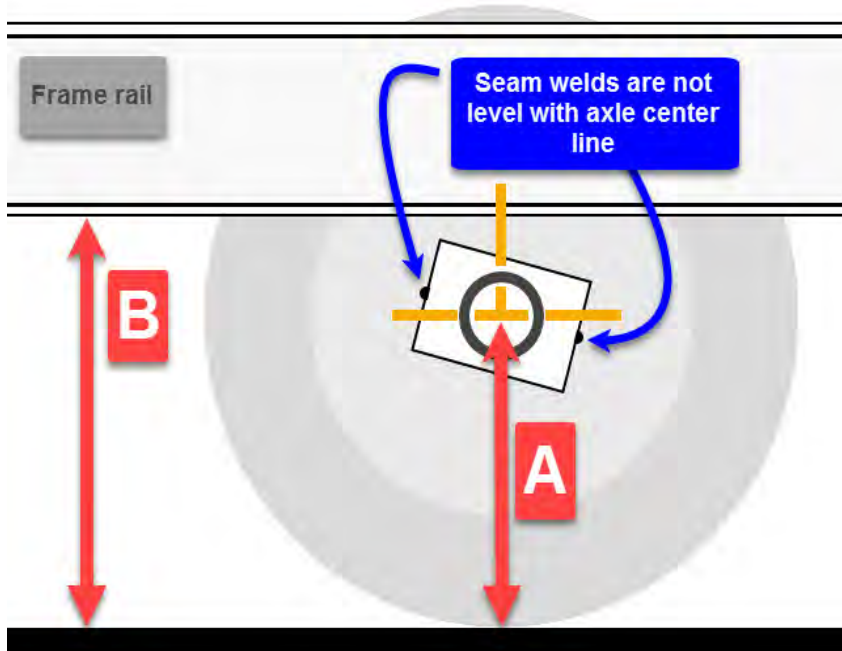


Measurements should be taken from the center line of the rear axle.



A. Measure the distance from the center of the wheel hub to the ground. Record the measurement.

B. Measure the distance from the bottom surface of the frame rail to the ground. Record the measurement.



3. Subtract the center hub measurement (A) from the frame rail measurement (B).

4. The remaining value is the vehicle's ride height.



**Steering Angle**

An Inclinometer (Digital Protractor) is required to calculate pinion angle.

### **Prior to taking measurements:**

- The vehicle must be moved onto relatively level ground. **Braking should be kept to a minimum during this time.**
- The air suspension should be fully inflated.

**Note:** The suspension may take up to ten minutes to settle after airing up.

- The wheels should be chocked.

### **Measurement**

**Note:** For measurement of the transmission and differential yoke angles, there are adapters available so the protractor may be used off of the bearing caps.

**1.** Zero the inclinometer **TO THE FRAME RAIL**. The frame will not necessarily be level to the ground, and pinion angle is measured relative to the frame, not to the ground.

**a.** Zero the tool on the web close to the rear drive axle, or close to the front drive axle if so equipped.

**b.** The inclinometer **must be parallel** to the frame rails.

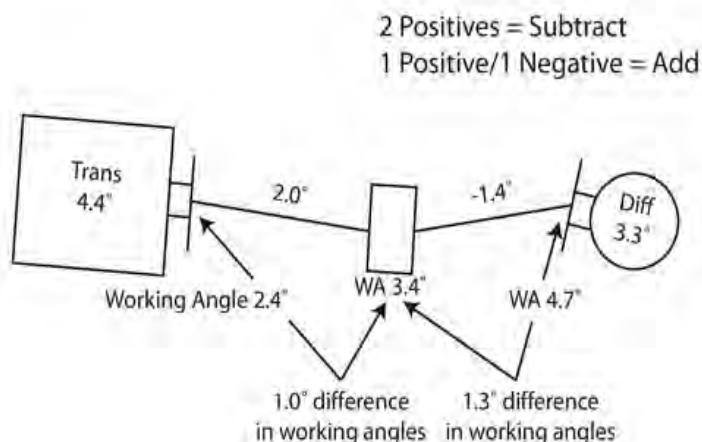
**2.** Measure the following angles, using the chart below for reference. A worksheet to assist with recording values can be found [here](#):

Any angle measured that runs downhill from front to back is **POSITIVE (+)**.

Any angle measured that runs uphill from front to back is **NEGATIVE (-)**.

- Transmission assembly
- Driveshaft from transmission to front rear axle pinion
- Front drive axle pinion
- Interaxle driveshaft

 Live UI Drive axle pinion



## Calculation

Calculate the angle of each joint. This is the **Working Angle**.

1. Starting with measurements taken from the front of the chassis and working rearward, each pair of measurements on either side of each joint need to be added together or subtracted from one another to get the Working Angle:

- If both angles on either side of a joint are **positive**, one angle should be **subtracted** from the other.

- A **positive and negative** angle next to each other should be **added** together.

2. Review each Working Angle.

The maximum Working Angle for any single U-joint should be **less than 5°**.

3. Compare the Working Angles for both ends of each section of driveshaft.

- The difference between the Working Angles of each end of a section should be **between 0.5° and 1.5°**.

• **Example:** Front U-joint Working Angle 2.4°. Rear U-joint Working Angle 3.4°. The difference in Working Angles is  $3.4 - 2.4 = 1.0^\circ$ . Within the values specified above.

 Tags

- [k45171524](#)
- [ride height](#)
- [pinion angle](#)
- [driveline angle](#)
- [driveshaft](#)
- [drive shaft](#)
- [propeller shaft](#)
- [volvo](#)

**Related links and attachments**

[Driveline Worksheet](#)

 **Feedback**

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to help improve the content of this article

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

### Warning

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 service manual procedures.

### Caution

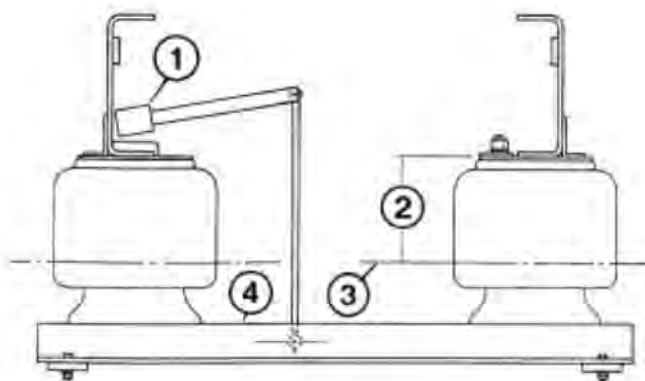
Before beginning any service procedure on the Volvo Air Suspension, be sure to read and understand [Guidelines for Working on the Volvo Air Suspension](#).

Special tools: J-42189

Other special equipment: J38460-A, J38460-25

## Air Suspension Ride Height Check (Calculation)

1



1. 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.

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- Front wheels must be pointed straight ahead.

2

Chock the front wheels on the vehicle.

### Danger

Personal injury hazard. Never work under the vehicle unless the front wheels are securely chocked. Failure to chock the wheels can result in the vehicle rolling, which can cause serious injury or death to anyone under or near the vehicle.

3

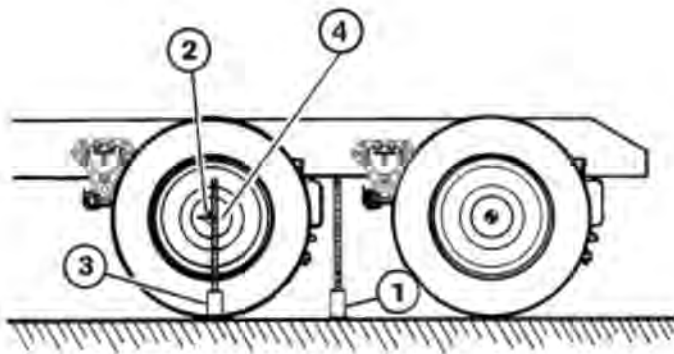
Dump (release) the suspension air (see [Dump Switch Operation](#)).

### Danger

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



The ride height is the distance from the axle centerline to the bottom of the frame rail. The ride height must be within the following specifications:

- Low frame [outside rail height dimension approx. 266 mm (10.5 in.)]: 196–216 mm (7.75–8.5 in.)
- High frame [outside rail height dimension approx. 300 mm (11.75 in.)]: 179–199 mm (7.0–7.75 in.)

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 for low- or high-rail chassis (see above).

5

Record the measurement for calculation (refer to [Volvo Air Suspension, Calculation Form](#)). If the measurement is not within the specified range, it must be corrected before proceeding. If the ride height is not in 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](#).

- Damaged spring hanger frame bracket.
- Damaged air spring, Z-spring, and/or radius spring.
- Damaged link rod.
- Faulty leveling valve.

Replace the components as necessary, then adjust the suspension ride height (see [Air Suspension Height, Adjustment](#)).

6

Remeasure the ride height using steps 4a-d of this procedure. Repeat as necessary until the measurement is within specifications.

7

Proceed to [Interaxle U-joint Angle Cancellation Check \(Calculation\)](#).

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

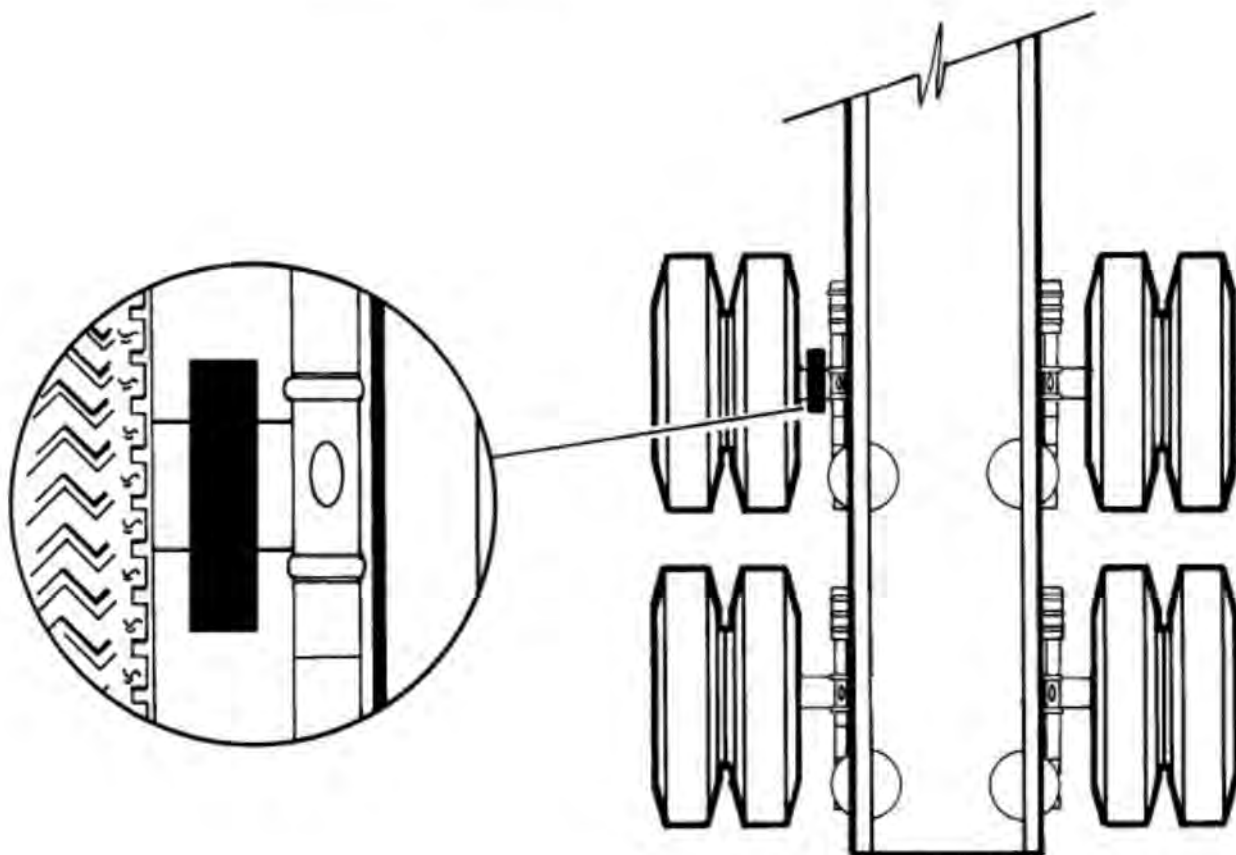
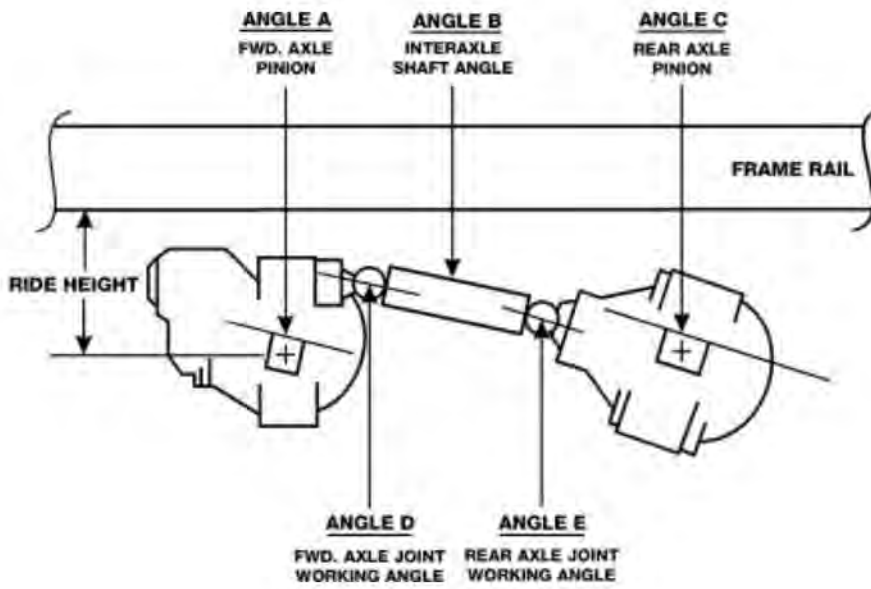
1

The steps from [Air Suspension Ride Height Check \(Calculation\)](#), must be performed before continuing with this procedure.

Note: All angle measurements are relative to level ground.

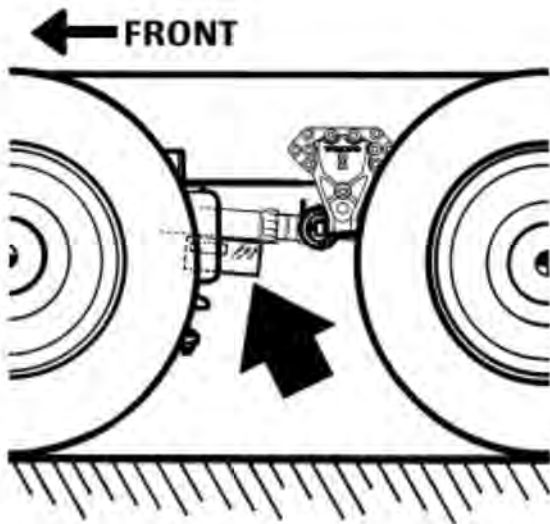
2





Measure the forward axle angle (A) using an inclinometer or recommended tool. Record the measurement for calculation (refer to [Volvo Air Suspension, Calculation Form](#)).

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



Measure the interaxle shaft angle (B) using the recommended tooling. Record the measurement for calculation (refer to [Volvo Air Suspension, Calculation Form](#)).

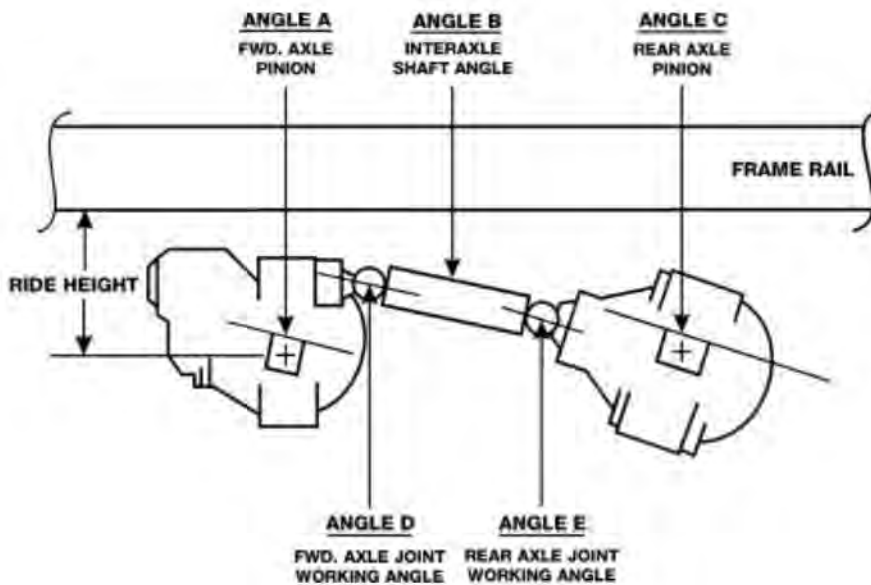
Note: Wipe surface clean of dirt and debris before taking measurement.

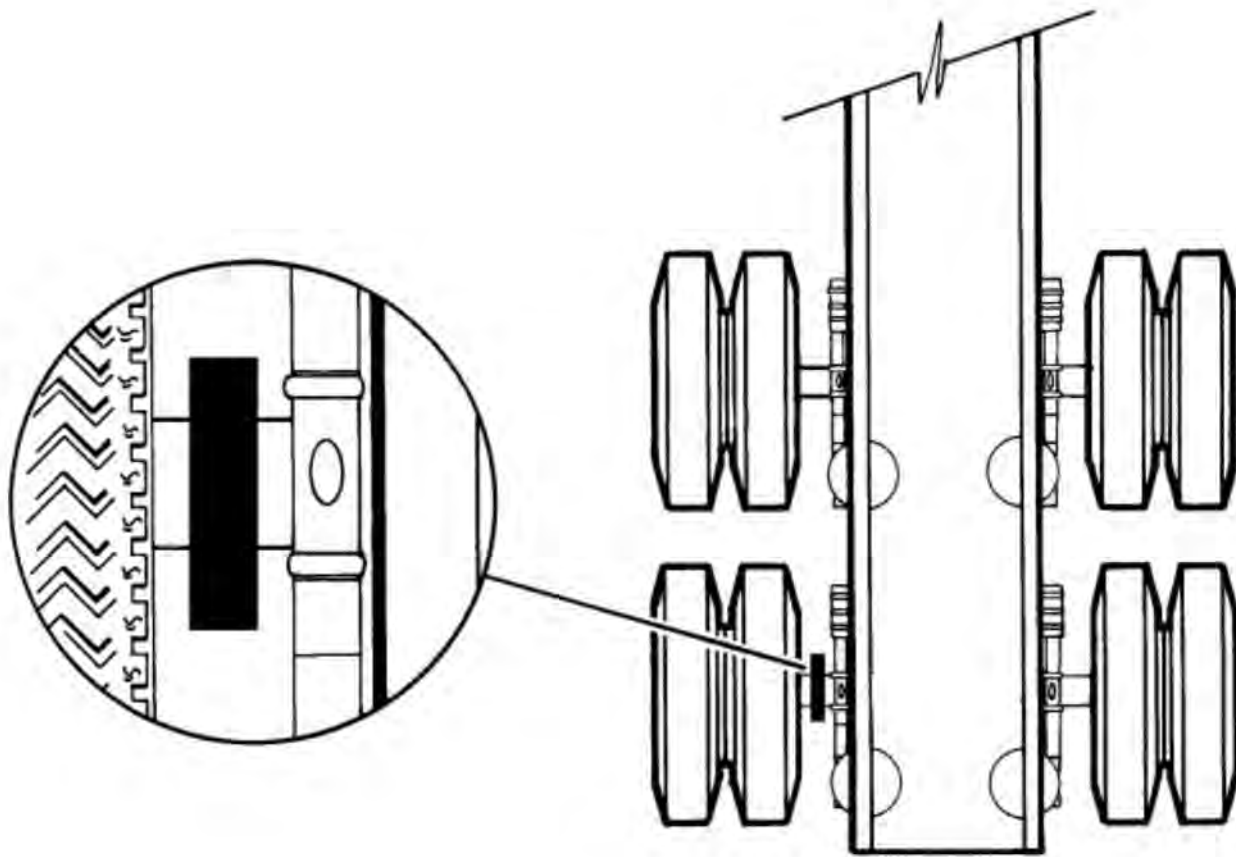
4

Calculate :  $B - A = D$

The interaxle angle minus the forward axle angle will give the value (D) (refer to [Volvo Air Suspension, Calculation Form](#)).

5





Measure the rear axle angle (C) using the recommended tooling. Record the measurement for calculation (refer to [Volvo Air Suspension, Calculation Form](#)).

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 [Volvo Air Suspension, Calculation Form](#)).

7

Calculate:  $D - E = F$

Record the measurement for calculation (refer to [Volvo Air Suspension, Calculation Form](#)).

Compare the value of angle (F) with the following guidelines:

- If (F) is less than -1.5, lower the ride height.
- If (F) is between -1.5 and +1.5, no adjustment is necessary.
- If (F) is greater than +1.5, raise the ride height.

For procedures on lowering or raising ride height, refer to [Air Suspension Height, Adjustment](#).

8

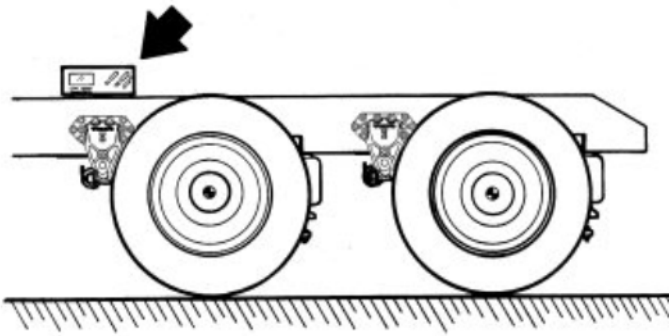
Proceed to [Forward Axle Pinion Angle to Frame Check](#).

## Forward Axle Pinion Angle to Frame Check

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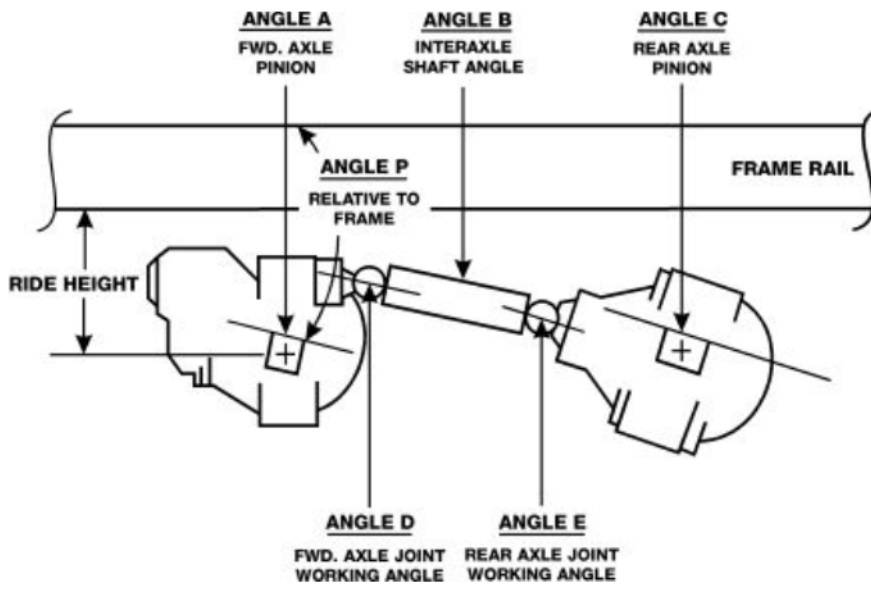
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1

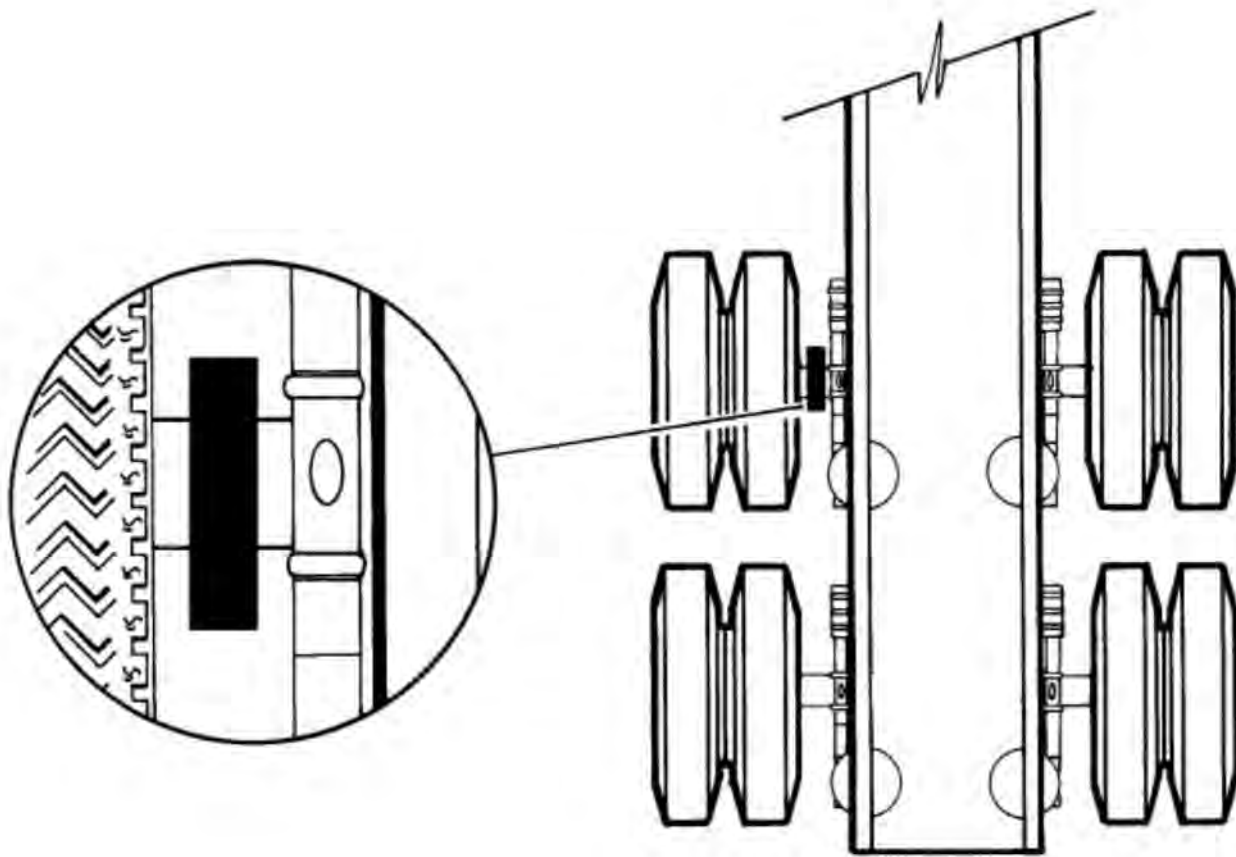


Place an inclinometer or recommended tool on top of the frame. "Zero-out" inclinometer or recommended tool.

2







Measure the forward axle angle (P), using the “zero'd out” inclinometer 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](#).

- Damaged spring hanger frame bracket.
- Damaged air spring, Z-spring, and/or radius spring.
- Damaged link rod.
- Broken/loose U-bolts.
- Faulty leveling valve.



Replace the components as necessary, then adjust the suspension ride height (see [Air Suspension Height, Adjustment](#) ).

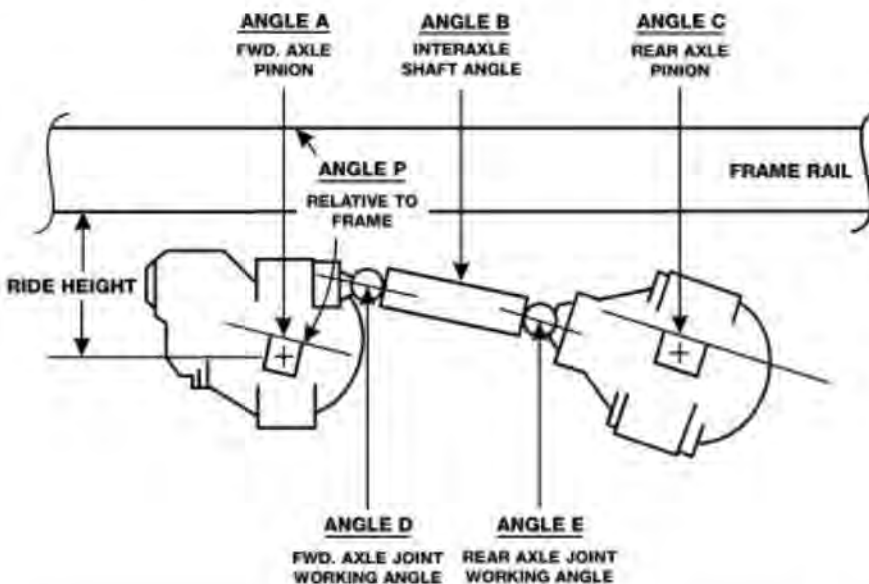
4

Repeat all steps in [Air Suspension Ride Height Check \(Calculation\)](#), [Interaxle U-joint Angle Cancellation Check \(Calculation\)](#), and [Forward Axle Pinion Angle to Frame Check](#).

Note: If, after the second attempt, the axle pinion angles are still not within specification, perform the [U-bolt Torque, Adjustment](#) , as a last attempt to correct the axle pinion angles.

## Volvo Air Suspension, 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 specifications for the following frame types:<br>Low - outside rail height dimension approx. 266 mm (10.5 in.): 196 - 216 mm (7.75 - 8.5 in.)<br>High - outside rail height dimension approx. 300 mm (11.75 in.): 179 - 199 mm (7.0 - 7.75 in.)<br>If ride height is not within specification, it must be corrected before continuing. |       |              |       |
| 2) MEASURE FORWARD AXLE ANGLE   | A     |              |       |
| (Relative to the ground)  |       |              |       |
|   |       |              |       |

|  |     |  |  |
|--|-----|--|--|
| 3) MEASURE THE INTERAXLE SHAFT<br>(Relative to the ground)           | B   |  |  |
| 4) CALCULATE: B - A =<br>The difference between B and A is value "D" | D   |  |  |
| 5) MEASURE THE REAR AXLE ANGLE<br>Relative to the ground             | C   |  |  |
| 6) CALCULATE: C - B =<br>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 [Rear Suspension Troubleshooting](#).

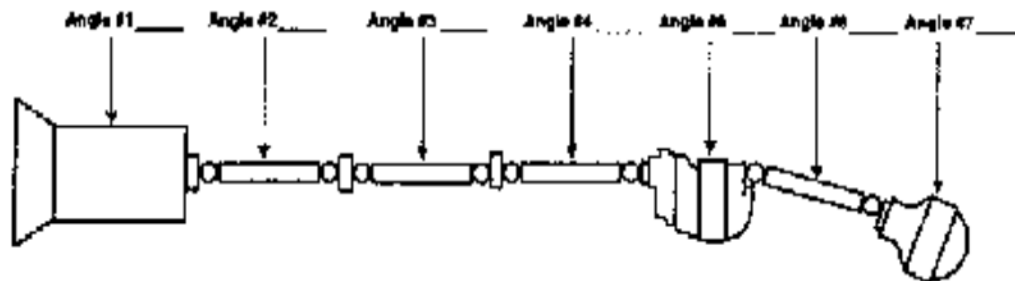
| MEASURE FORWARD AXLE ANGLE (RELATIVE TO FRAME) | SPECIFICATIONS |            | P |  |  |
|--|----------------|------------|---|--|--|
|  | Tandem, 6x4    | 2.5 + 0/-1 |   |  |  |
|  | Single, 4x2    | 3.5 ± 1    |   |  |  |

Note: If angle (P) is not within tolerance, see [Rear Suspension Troubleshooting](#).

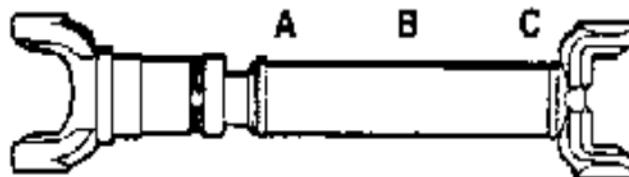
**Record Driveshaft/Axis Angles:**

**NOTE**

Essential tool J 38460-A, Driveline Angle Gauge, must be calibrated and used to measure and record the driveline angles.



Steer Axle Loaded \_\_\_\_\_ lbs  
Front Rear Axle Loaded \_\_\_\_\_ lbs  
Rear Rear Axle Loaded \_\_\_\_\_ lbs  
Fifth-Wheel Offset \_\_\_\_\_ inches  
Driveline Series No. \_\_\_\_\_  
Driveshaft Runout Check:



GB9072B

Record in Thousandths A= \_\_\_\_\_  
B= \_\_\_\_\_  
C= \_\_\_\_\_

Driveshaft Balance:  Yes  No

**NOTE**

Balancing must be done at a minimum of 3500 rpm, and unbalance to be 1 oz-in for each 10 lbs. of weight divided equally at each end, less the flange and end yokes.

**DISTRICT SERVICE MANAGER CONTACT**

Name \_\_\_\_\_

Date Contacted \_\_\_\_\_

\_\_\_\_\_  
Service Technician Signature