Preview Solution CBR-2016-18

Frame Or Cab Lean

Published 18 November 2025

Valid For

Volvo Models - All
Mack Chassis - PR (4)
Model year 2016 to current.

1.0 Vehicle Preparation

Troubleshooting cab lean should only begin after completing a vehicle preparation procedure to ensure all components are in place and settled.

- The complete truck must be run for 16 kilometers (10 miles) minimum.
- Ensure that all tires are inflated to the correct pressure.
- If the vehicle is equipped with rear air suspension, you must cycle the suspension before taking measurements. This will reset the rear suspension to the correct ride height and ensure the vehicle rake (i.e. inclination) is correct.

To do so:

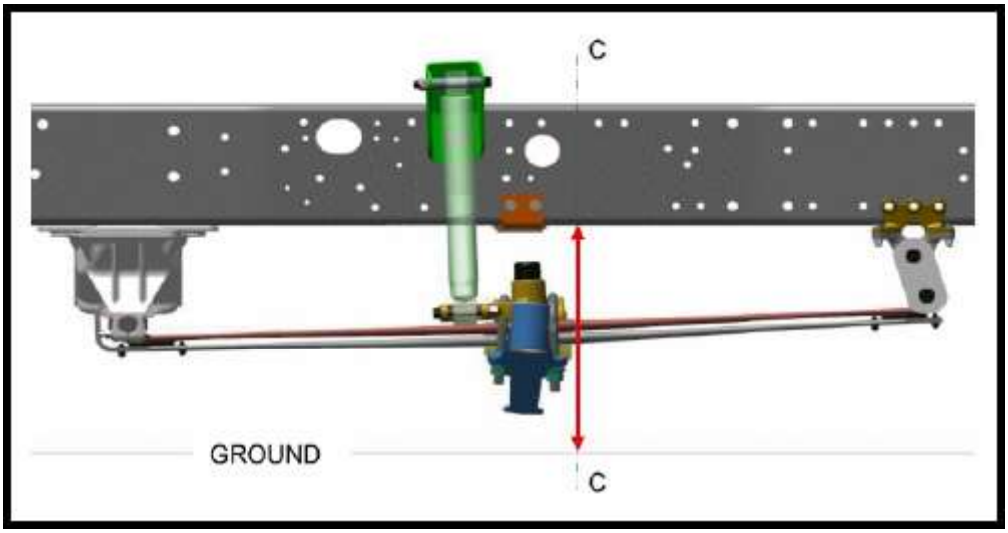
» Ensure that the parking brake is released and no service brake is being applied
» Release the air from the air springs to lower the suspension
» Raise the suspension back up to the nominal drive level height

2.0 Taking Measurements

2.1 Where to Measure

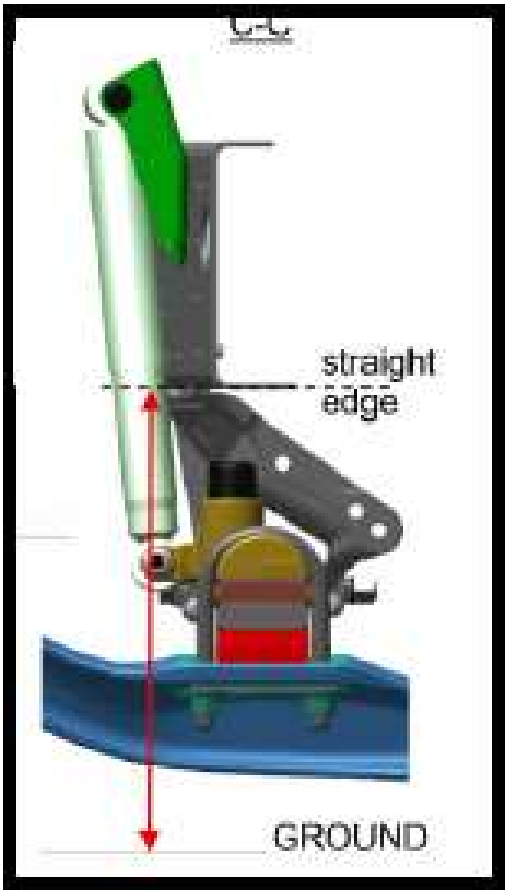
With the truck on a flat and level surface, the frame height from ground will be measured on both the left and right hand side separately using a vertically oriented measuring tool.
This shall be done from the bottom side of the frame near the frame side web, as near as possible to the front axle location.

Live UI



Obtaining this measurement can be complex - the front springs are directly below the frame rail lower flange, making it difficult to drop a tape measure straight down to the floor.

The process may be made easier by placing a straight edge against the lower flange of the frame (pictured right), then measuring outboard of the frame. Additionally, you may need to crawl beneath the truck to take this measurement.



2.2 Measurement Standards

A difference in height (measuring as instructed above) between both sides must be ≤ 11mm (an incline of 0.6° maximum). If the measurement is found to be greater than

the standard, a ride height difference of ≤ 11mm should be attainable in most instances by following the instructions which follow.

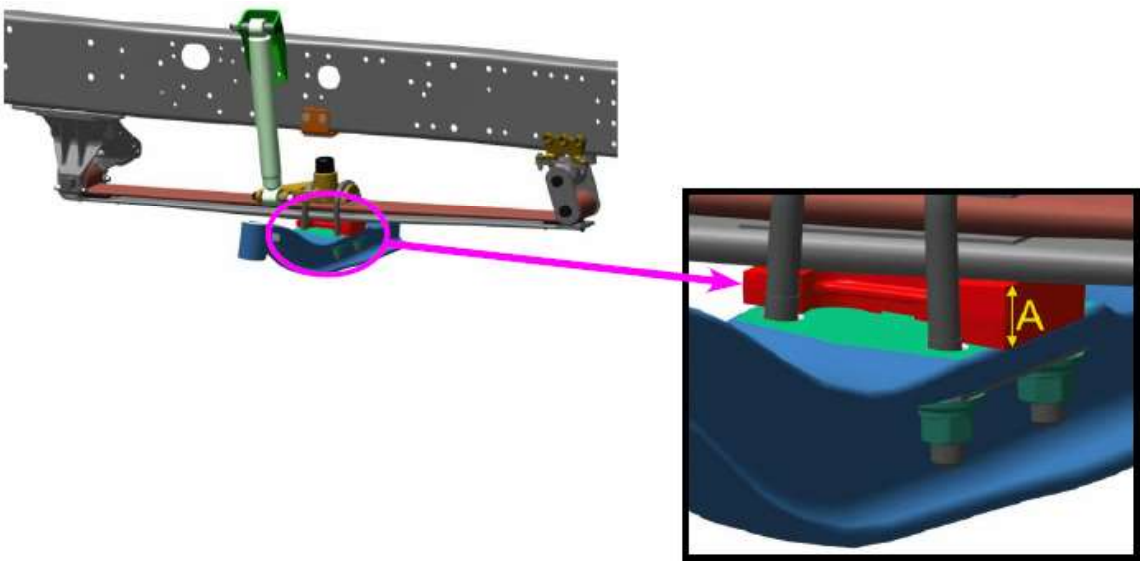
Click HERE for a printable worksheet.

3.0 Front Correction Process

3.1 Process to Correct Front Cab Lean

3.1.1 Determine if the vehicle has a Standard or High front ride height

Determine the front ride height by measuring the rear height (A) of the wedge located on the left hand side of the truck (pictured below).



Utilize the following table along with the measured rear height of the wedge to determine the front ride height designation:

(A) Measurement	Front Ride Height
37MM	STANDARD
73MM	HIGH

3.1.2 Measure the difference in chassis height (right-hand vs. left-hand)

In accordance with the measurement location requirements outlined in section 2.0, measure the distance from the floor to the bottom of the frame on the left-hand and right-hand sides individually.
Calculate the frame height difference (B) with the following formula:
B = right hand frame height - left hand frame height

3.1.3 Find the parts required to correct the lean

Consult the tables provided in Section 4.0 to determine the wedges, U-bolts, and nuts required to level up the chassis. If the calculated height difference (B) does not match the number in the table exactly, choose the closest one - there is no preference for measurements slightly over or under the calculated (B).

NOTE: When replacing the wedge on the left-hand side, the U-bolt hardware MUST also be replaced.

NOTE: Performing suspension work may result in load redistribution. Before remeasuring the cab lean, follow the guidelines in the Vehicle Preparation Section.

Once the vehicle has been remeasured and it has been determined that the lean has been corrected and no further suspension adjustments are needed, the final step is to
perform a vehicle alignment.

4.0 Part References

4.1 Factory Installed Right-Hand Side WedgeFactory Installed Right-Hand Side Wedge

FRONT RIDE HEIGHT	WEDGE PART NUMBER	THICKNESS (MM)
Standard	20435531	20
High	20435533	56

4.2 Left-Hand Wedge Selection, Highway Vehicles

4.2.1 Standard Front Ride Height

RIDE HEIGHT DIFFERENCE (B)	REQUIRED PART NUMBERS	INDIVIDUAL WEDGE THICKNESS (MM)**	INDIVIDUAL WEDGE ANGLE (°)	FRONT STABILIZER BAR?	RECOMMENDED U-BOLT PART NUMBER ***		NUT
					FRONT	REAR	
0*	20435532	28	6.25°	Yes	20529990	20560239	21823706
				No	20529989		
8	20836936	36	6.25°	Yes	20529990	20560239	
				No	20560239		
12	20435531 21602505	20 20	6.25° 0°	Yes	20560240	20529990	
				No	20560239		
16	20836939	44	6.25°	Yes	20560240	20529990	
				No	20560239		
20	20435532 21602505	28 20	6.25° 0°	Yes	20560240	20529990	
				No	20560239		
28	20836936 21602505	36 20	6.25° 0°	Yes	20560240	20560240	
				No	20529990		

* NOTE 1: Factory installed left-hand side wedge arrangement

** NOTE 2: This wedge thickness is at the center of the wedge. It is not the rear of the wedge (A)

Live UI

*** NOTE 3: U-bolts should have at least 3mm thread sticking out beyond the top of the nut. In case this is not achieved with the suggested U-bolt part number, replace and use a longer part number from section
4.4

4.2.2 High Front Ride Height (FIH220)

RIDE HEIGHT DIFFERENCE (B)	REQUIRED PART NUMBERS	INDIVIDUAL WEDGE THICKNESS (MM)**	INDIVIDUAL WEDGE ANGLE (°)	FRONT STABILIZER BAR?	RECOMMENDED U-BOLT PART NUMBER ***		NUT
					FRONT	REAR	
0*	20435534	64	6.25	Yes	24427625	20560240	21823706
				No	20529990		
11	22968914	75	6.25	Yes	24427625	24427625	
				No	20560240		
20	20435534	64	6.25	Yes	21180646	24427625	
	21602505	20	0	No	20560240		
31	22968914	75	6.25	Yes	21246746	21180646	
	21602505	20	0	No	24427625		

* NOTE 1: Factory installed left-hand side wedge arrangement
** NOTE 2: This wedge thickness is at the center of the wedge. It is not the rear of the wedge (A)
*** NOTE 3: U-bolts should have at least 3mm thread sticking out beyond the top of the nut. In case this is not achieved with the suggested U-bolt part number, replace and use a longer part number from section
4.4

4.3 U-Bolt List for Highway Vehicles

PART NUMBER	LENGTH (MM)
20529989	180
20560239	200
20529990	215
20560240	235
22427625	255
21180646	265
21246746	285

Example for how to find out what shim you need.

Live UI

1. Determine ride height.

1.1 Measure front right axle shim.

1.2 Use chart in this CBR to determine the front axle right height.

2. Measure Front Axle.

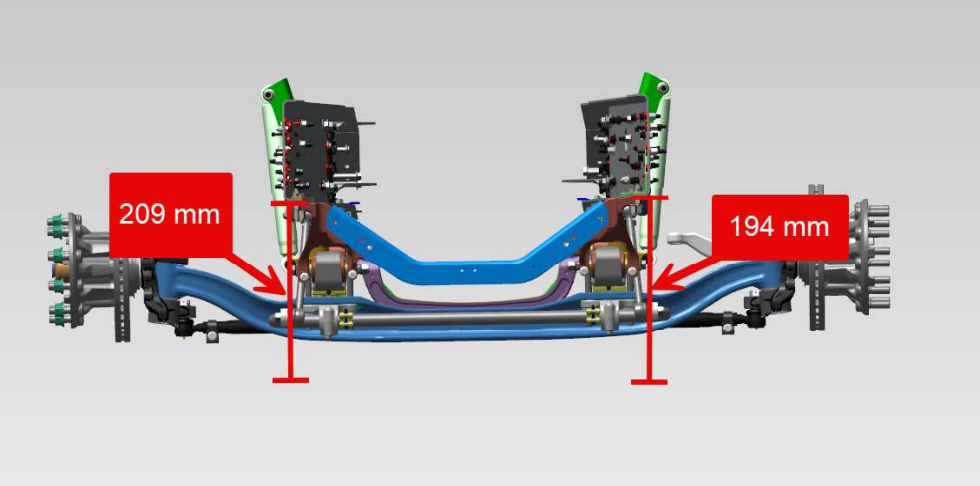
2.1 Measure the Right and Left side of the front axle to determine height

2.2 Measurement should be done from bottom of frame to ground.

2.3 Record measurements so next step.

3.Determine Ride Height Difference

3.1 Take the right-side measurements subtract from left-side measurements. Using picture below as example 209mm (right-side) – 194 (left-side) =15mm difference.



4. Determine Shim

Note: the picture above is a standard front axle ride height.

4.1 With a difference of 15mm using the chart from earlier in CBR 16mm would be the best option for this truck.

Note: If the required parts needed box show two shims they will need to be stacked. 0° is always touching axle while the 6.5° is always touching the spring.

5. Installing shim(s)

5.1 Once you have determined your shim(s) needed. Install them on the Left side of the front axle.

5.2 Use the chart for your ride height to determine which ubolts you will need.

Note: when installing shim(s) the largest part of the shim will always go towards the rear of the truck.

Related links and attachments

KC-2016 CHART PDF

Share
to others that might find it helpful

Feedback
Give feedback
to help improve the content of this article

Live UI

ROUGH RIDE / VIBRATION QUESTIONNAIRE

RO Number _____Date _____

Customer Name _____

Chassis Number _____ Model _____ Mileage_____

Vehicle Application _____ Trailer Type _____

Customer Complaint (check one) ☐ **Rough Ride** ☐ **Vibration**

The Service Manager or Shop Foreman **must** ride with the customer to verify the ride/vibration complaint under the conditions that it occurs. Whenever possible, a loaded trailer with similar weight and configuration as the customer's should be used. To help confirm the customer's complaint, answer the following questions before and during the road test.

1. **When did the condition start?**
   - ☐ Since vehicle was new
   - ☐ Gradually occurred at _____mi/km
   - ☐ Suddenly occurred at _____mi/km
   - ☐ After a previous repair

   Describe:
   _____
   _____
   _____
   _____

2. **Where is the condition most notably felt?**
   - ☐ Seat
   - ☐ Steering Wheel
   - ☐ Instrument Panel
   - ☐ Floor
   - ☐ Hood & Fenders
   - ☐ Mirrors

3. **When is the problem most noticeable?**
   - ☐ Smooth road
   - ☐ Rough road
   - ☐ Both

4. **What loading conditions affect the complaint?**
   - ☐ Loaded
   - ☐ Empty
   - ☐ Bobtail

5. **What driving conditions affect the complaint?**
   - ☐ Light to medium acceleration
   - ☐ Hard acceleration - UNDER FULL LOAD
   - ☐ Deceleration (foot off accelerator pedal)
   - ☐ Constant speed
   - ☐ Coasting with clutch disengaged

6. **Is the complaint speed dependent?**
   - ☐ Yes At what speed? _____
   - ☐ No

7. **Is the complaint engine rpm dependent?**
   - ☐ Yes At what rpm? _____
   - ☐ No

8. **Does the condition go away when the clutch is disengaged?**
   - ☐ Yes
   - ☐ No

9. **Are there any unusual noises evident when this condition occurs?**
   - ☐ Buzz
   - ☐ Moan
   - ☐ Drone
   - ☐ Rumble
   - ☐ Hum
   - ☐ Other

   Describe:
   _____
   _____
   _____

10. **Identify the specific trailer or type of trailer:**
    _____
    _____
    _____

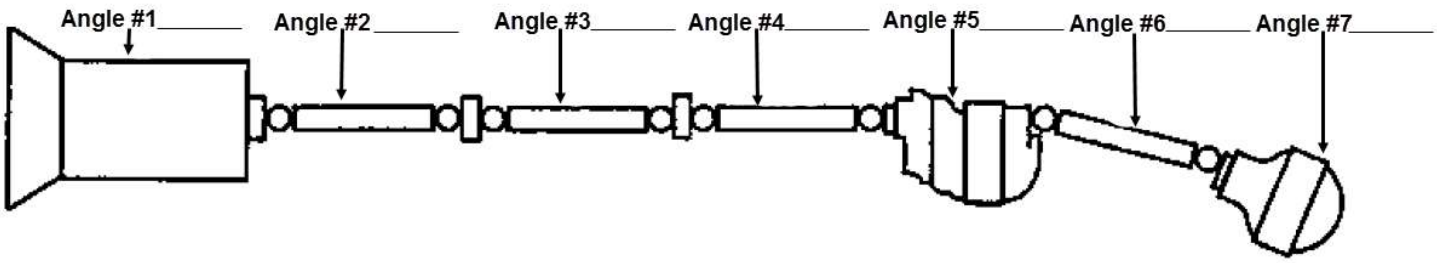
NOTE: There may be times when the customer's complaint cannot be duplicated during the road test. If this occurs, you must tell the customer that no further action will be taken at this time, and that the ride quality of his truck is within acceptable limits for a commercial vehicle.

Record Driveshaft/Axle Angles:

NOTE

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

The tool must be calibrated **to the vehicle's frame** prior to taking measurements.



Steer Axle Loaded _____lbs

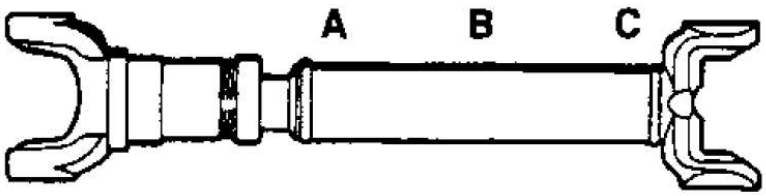
Front Rear Axle Loaded _____lbs

Rear Rear Axle Loaded _____lbs

Fifth-Wheel Offset _____lbs

Driveline Series No. _____lbs

Driveshaft Runout Check:



Record in thousandths

	Runout Driveshaft 1	Runout Driveshaft 2	Runout Driveshaft 3	Runout Driveshaft 4
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 yoke.

ROUGH RIDE / VIBRATION CHECK SHEET

If you were able to confirm the customer's ride/vibration complaint during road test, visually inspect the vehicle to help determine the source of the problem by following the step-by-step procedures below.

1. Rear Suspension Ride Height

- ☐ Check rear suspension ride height. Record information on Data Sheet.
- ☐ Adjust if necessary.

Note: Refer to the Suspension or Vendor Suspension sections to find the correct ride height and adjustment procedures for the suspension you are working on.

2. Frame & Suspension Crossmembers

- ☐ Check all frame crossmembers/gussets for damage, loose or missing fasteners.
- ☐ Check all suspension components for damage, loose or missing fasteners.

3. Shock Absorbers

- ☐ Check shocks for signs of leaking.
- ☐ Check shocks for loose or damaged components.
- ☐ After driving vehicle on a rough road, check to make sure all shocks are equally "warm".
- ☐ Inspect shock bushings for wear.
- ☐ Check shock mounting brackets for looseness or failure.

Note: Shock absorber bushings should be compressed so they extend approximately 1/16" beyond the washer diameter.

4. Tires & Wheels

- ☐ Check tire inflation.
- ☐ Check tires for uneven wear.
- ☐ Check wheels for loose or missing fasteners.
- ☐ Check wheels for damage.
- ☐ Check for foreign objects between tires/wheels.
- ☐ Check tires/wheels for radial and lateral runout.
- ☐ If runout is excessive, also check tires for improper mounting.

Note: Radial runout should not exceed <0.060” TIR (TIR - Total Indicator Reading) Lateral runout should not exceed <0.030” TIR 1

5. Engine, Transmission, & Cab Supports

- ☐ Check engine supports for damage, worn bushings, loose or missing fasteners.
- ☐ Check transmission support spring (if equipped) for damage, loose or missing fasteners.
- ☐ Check cab supports/ for damage, worn bushings, loose or missing fasteners.
- ☐ Look for evidence of hard contact between any components and the frame.

6. Driveline Components (Initial Inspection)

☐ Check input and output driveshaft end-fittings for any gaps or indications of movement or looseness between mating surfaces.

☐ Check fastener torques on U joint bearing cups, bearing straps, flange yoke/companion flange, and center bearing.

☐ Check driveshaft slip joints for excessive radial looseness

☐ Check center bearing bracket fasteners for looseness.

☐ Check center bearing rubber cushion for damage and misalignment. Verify cushion is properly seated in bracket.

☐ Check driveshafts for damaged, bent or dented tubing.

☐ Check to be sure the driveshaft/coupling shaft is phased correctly.

☐ Check for missing balance weights (indicated by a bare spot in the paint where the weight was located or a failed balance weight weld).

Check to be sure that the slip joint has sufficient slip to allow change in the length of the driveshaft.

☐

Driveline Component Angles

7. Check driveline component angles to determine correct universal joint operating angles. Record information on Data Sheet

. Shim and/or adjust driveline components as necessary to bring driveline operating angles into specification.

If angles were re-set, was vibration issue resolved?

Yes _____ No _____

8. Driveline Troubleshooting

If the ride/vibration cause is not evident after all of the above checks have been performed, follow the procedure below:

1. With the parking brakes released and wheels chocked, pull all four drive axle shafts.
2. Test the truck at the engine rpm or vehicle speed where the vibration occurs.
3. Record all information on Data Sheet

- **If the vibration is still present**:

1. Starting with the rear most driveshaft utilize a suitable dial indicator and appropriate secure mounting base measure and record driveshaft run outs as near as possible to the U joints (avoid indicating off rough castings and boot cans). Disregard ovality and insure relative movement between mounting base and driveshaft is nonexistent. Mark high and low run out points on driveshaft.
2. Review run outs recorded. Note highest run out points and their relationship to corresponding end yokes.
3. At the point of highest run out mark the relationship of the U joint/driveshaft to the adjacent end yoke, remove the U joint/driveshaft from the end yoke, note the fastener torque and inspect the bearing seats and locating nibs in the end yoke for debris, damage or wear, inspect the u joint bearings for damage or debris also. Rotate the U joint/driveshaft 180 degrees in the end yoke. Insure the bearings are completely seated in clean un-damaged bearing seats and accurately located and secured with proper retaining straps and fasteners.
4. Recheck the run out as previously checked – same indicator point, same mounting.
    a. If run out has degraded, note high point relationship to previous high point on shaft and to end yoke. If so indicated, return U joint/driveshaft to original orientation in the end yoke.
    b. If the run out has improved, test for vibration as above.
    c. If run out / vibration is unchanged, remove driveshaft and continue process for each driveshaft working forward in the vehicle power train.

- **If the vibration is no longer present** after removing one of the driveshafts and the u joint seating/run out has been optimized, the source of the problem may be that driveshaft is damaged or has excessive imbalance.

(Note; Recognize each driveshaft contributes mass / inertia to the power train and incremental reductions in vibration as driveshaft(s) are removed does not indicate / confirm driveshaft as root cause of vibration.)

9. Final Road Test

☐ After all repairs and/or adjustments have been performed, road test vehicle again to ensure the problem has been corrected.

☐ If you feel the problem has been corrected, you must verify this with an additional road test with the customer.

Before initiating any major disassembly or adjustments beyond the checks listed above, contact Techinical Service Manager / TSM for authorization to proceed.