FIELD SERVICE BULLETIN

Peterbilt
A DIVISION OF PACCAR

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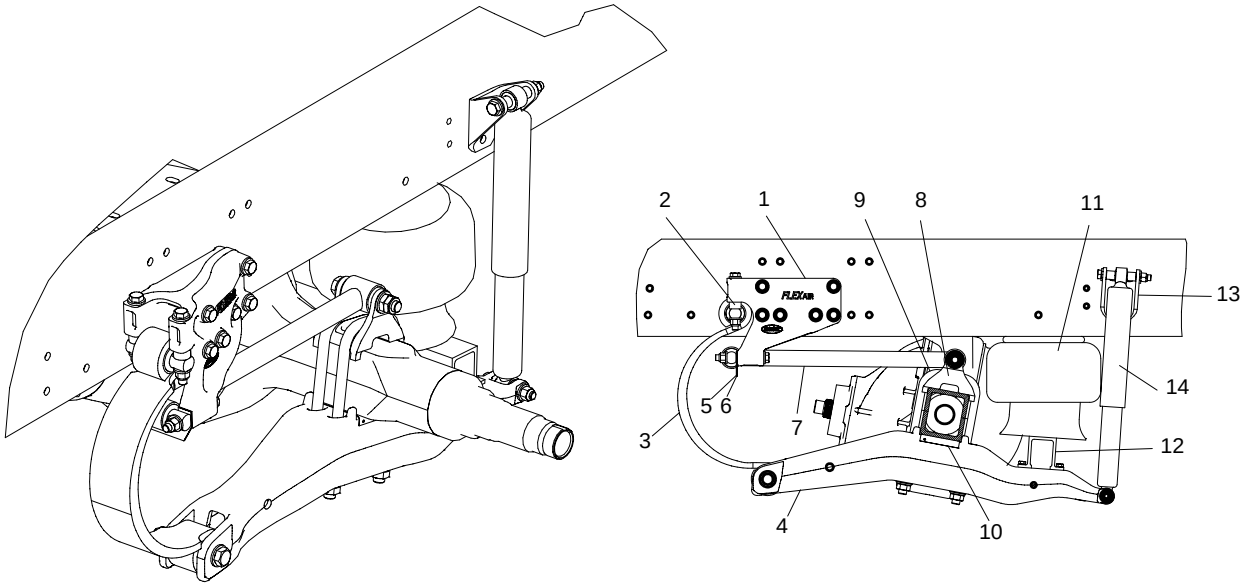
FLEX Air™ Rear Suspension

This bulletin is applicable to all vehicles equipped with *FLEX* Air™ proprietary rear suspensions. It provides information in the following areas:

- Inspection & Maintenance
- Adjusting Lateral Alignment (Tracking)
- Adjusting Ride Height and Pinion Angle
- Balancing Springs

The *FLEX* Air suspension comprises a stiff, lightweight aluminum drive beam with a semi-elliptic, taper leaf spring mounted at one end and an air spring at the other. Rated at 38,000 lb., it is designed for on-highway applications that require low weight combined with low ride height (see Figure 1).



1	Drive Bracket		8	Radius Rod Bracket
2	Link Spring Spacer		9	U-Bolt
3	Link Spring Assembly		10	Transition Shim
4	Drive Beam Assembly		11	Air Spring Assembly
5	Alignment Shim (0.75 mm)		12	Air Spring Support Beam
6	Alignment Shim (1.5 mm)		13	Shock Absorber Bracket
7	Radius Rod Assembly		14	Shock Absorber

Figure 1 Illustration of *FLEX* Air Suspension

Features

- The drive bracket positions and restrains the suspension, providing the attachment interface between the suspension and the frame rail. Connected to the drive bracket is the link spring and radius rod. Axle angle and tracking adjustments are made through spacer and shim adjustments at the link spring and radius rod attachments.
- The link spring, in conjunction with the air spring, reacts to frame loads, providing dampened support between the axle and the frame.
- The radius rod transmits acceleration and braking forces between the axle and the frame.
- The drive beam, which is secured to the axle with the radius rod bracket and u-bolts, is the support for the link spring, air spring, and shock absorber.
- The radius rod bracket is secured to the axle using two U-bolts, and provides the attachment between the axle and the radius rod.
- The air spring is a rolling lobe type. It comprises a rubberized fabric tube coupled to a piston equipped with an internal bump stop.
- The shock absorber dampens road-induced vibrations and serves as an axle-dropout stop.
- A tracking rod similar to the other Peterbilt proprietary air suspensions is utilized to provide lateral load stability.
- A bimetallic transition shim located between the steel axle and the aluminum drive beam prevents galvanic corrosion between the axle and drive beam.
- Some other features of the *FLEX* Air are
  - Low part count
  - No welding of the axle clamp group (drive beam, radius rod bracket, and U-bolts)
  - Rubber bushings at all pivots providing for quiet operation
  - Plastic sleeves in the drive beam U-bolt holes to reduce U-bolt seizing
  - No lubrication required

Parts Notes

The parts referred to in this bulletin are listed below and available from PACCAR Parts using normal ordering procedure.

Part Number	Description
42-00219-001	Ride height tool (gauge)
D8400-7936	Washer, 5/8” x 1 5/16”, Hardened Steel

This bulletin supersedes F.S.B. #6-01 dated December 26, 2002.

Indicates revision

Inspection & Maintenance

The following schedule contains general recommendations and should be used as a guideline for inspecting a *FLEX* Air suspension. As indicated by early inspection and/or service experience, the inspection frequencies may need to be accelerated.

NOTE: A FLEX Air suspension requires no periodic lubrication.

Every 5000 miles (8000 km)

- Inspect rubber bushings in the link spring as well as radius rod and tracking rod ends for squeeze-out or cracking. Replace the component if necessary
- Inspect the shock absorber (see F.S.B. #9-97).

Every 10,000 miles (16,000 km)

- Check the torques of the items listed below:

Component	Torque [Lb. ft. (N.m.)]
Drive Bracket: Frame Bolts Drive Bracket: Link Spring Bolt Drive Bracket: Radius Rod Bolt Drive Beam: Shock Bolt (Lower) Shock Bracket: Shock Bolt (Upper) Tracking Rod Bolts (All)	155 - 195 (211 - 266) " 155 - 195 (211 - 266)
Air Spring Support Beam Bolts	36 - 51 (49 - 69)
Drive Beam: Link Spring Bolt Radius Rod Bracket Bolt	482 - 624 (654 - 846) "
Air Spring Stud Nut	70 - 90 (95 - 122)

- Check the rear axle U-bolt torque.
  - – When using a 2-spindle nut runner, torque one U-bolt at a time; that is, A and B together, and C and D together (see Figure 2 below).
  - – When tightening one nut at a time, use the following sequence:
    1. Tighten U-bolt leg A and U-bolt leg D to 150 - 250 Lb. ft. (203 - 339 N.m.)
    2. Tighten U-bolt leg B and U-bolt leg C to 325-375 Lb. ft. (441 - 508 N.m.)
    3. Tighten U-bolt leg A and U-bolt leg D to 325-375 Lb. ft. (441 - 508 N.m.)

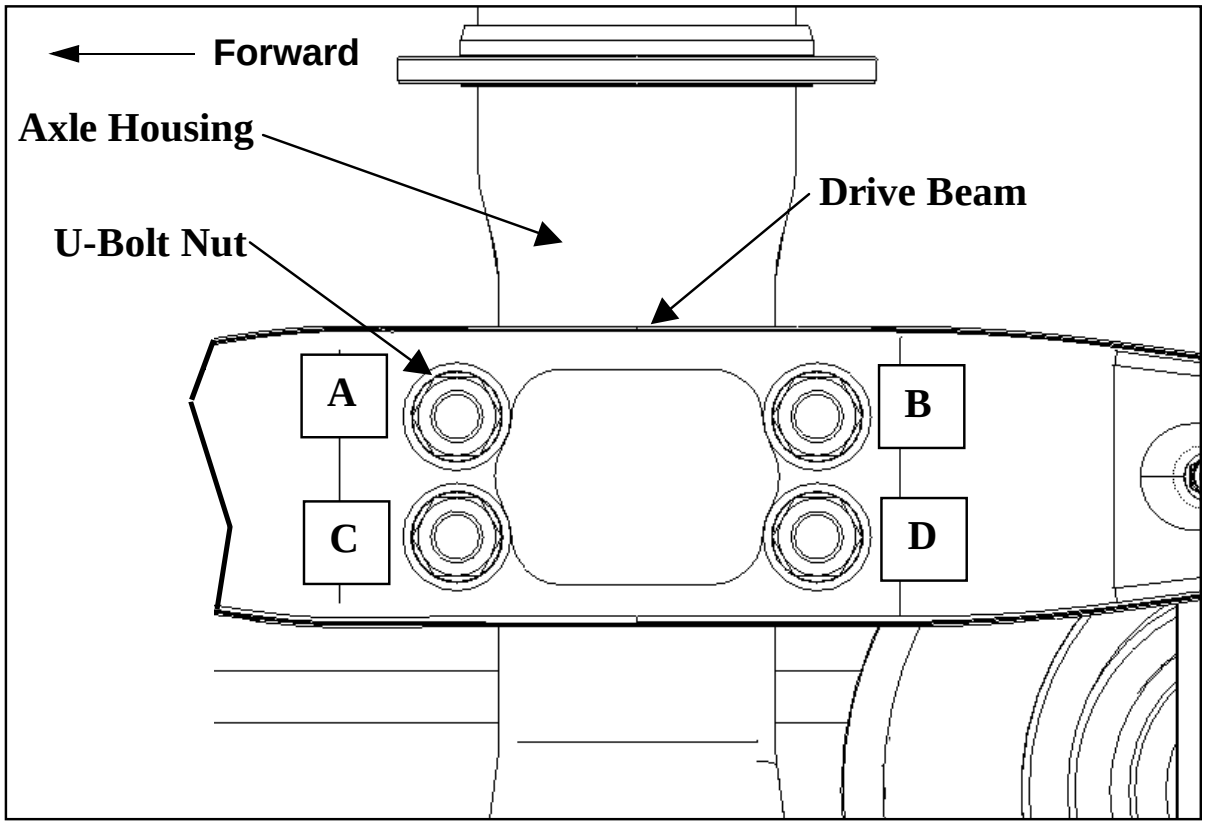


Figure 2 Axle Clamp Torque Sequence

Every 50,000 miles (80,000 km)

- Check the height control valve operation (see “Rear Suspension Components And Servicing” in Section 6, “Rear Suspension” in the master maintenance manual).
- Measure the ride height and pinion angle. If required, adjust these settings as outlined in the next part of this bulletin.

Adjusting Ride Height and Pinion Angle

This adjustment procedure removes the effect of frame rake variation on pinion angles. Using this method permits setting rear driver and interaxle driveshaft angles to provide the best possible axle travel and U-joint cancellation as well as keep torsional acceleration within specifications. The ride height tool required for this procedure is available from PACCAR Parts (see "Parts Notes" at the end of this bulletin).

WARNING! This procedure requires servicing the vehicle with the transmission in neutral and the parking brakes released. The vehicle must be parked on a completely flat/level surface with both front wheels chocked on both sides. Failure to adequately chock the wheels may lead to the vehicle rolling into someone/something, causing an accident and possible serious personal injury and/or equipment damage.

NOTE: Suitable wheel chocks are at a minimum an 18-inch (46 cm) long 4x4.

Follow this procedure to adjust ride height and rear axle angles (pinion angles).

CAUTION:

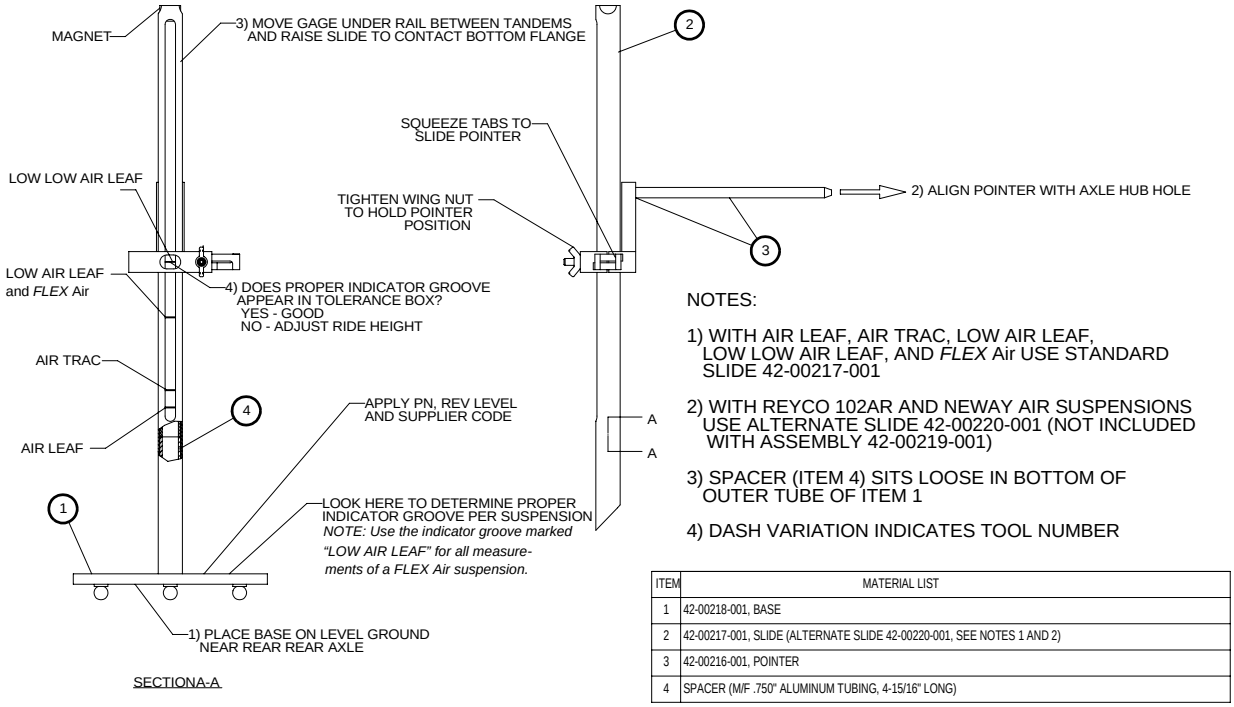
- ***If a drive beam assembly for a rear-drive axle is installed on a forward-drive axle, or vice versa, pinion angle adjustment will be adversely affected. If pinion angles are not set properly, then the drivetrain could be damaged. Although they look similar, the forward and rear drive beams are different. If you experience difficulty adjusting pinion angle, check the part number of the drive beam assembly to ensure that the correct component is installed.***
- ***If a radius rod assembly for a rear-drive axle is installed on a forward-drive axle, or vice versa, pinion angle adjustment or ride quality will be adversely affected. If pinion angles are not set properly, then the drivetrain could be damaged. The forward and rear radius rods have different lengths. If you are experiencing rough ride or difficulty in adjusting pinion angle, verify that the correct radius rod is installed. To do this, either check the part number of the rod or compare the lengths of the installed forward and rear radius rods; a rear radius rod is approximately 1 in. (25 mm) longer than a forward radius rod.***

NOTE: Ensure that a vehicle is in an unladen condition before beginning this procedure

1. Ensure that the following tools are available:

- Ride height tool (gauge)
- Pro-3600 or Pro-360 Anglemaster (inclinometer)
- Adapter for Anglemaster

2. Drive the vehicle onto a flat/level surface. Back straight out for the length of the vehicle and slowly drive back onto the flat/level surface. Gently roll to a stop. Place the transmission in neutral and set the parking brakes.
3. Chock the front wheels on both sides.
4. Release the parking brakes.
5. Ensure that the ride height gauge has the correct slide installed for a *FLEX* Air suspension (see "NOTES" in Figure 3).



ITEM	MATERIAL LIST
1	42-00218-001, BASE
2	42-00217-001, SLIDE (ALTERNATE SLIDE 42-00220-001, SEE NOTES 1 AND 2)
3	42-00216-001, POINTER
4	SPACER (M/F .750" ALUMINUM TUBING, 4-15/16" LONG)

Figure 3 Illustration of Ride Height Gauge

6. Place the ride height gauge near the rear rear axle such that the base is on level ground (see Figure 3 and Figure 4 on next page).

7. Align the pointer of the gauge with the axle hub hole (see Figure 4.)
   a. Squeeze the tabs to slide the pointer into proper position.
   b. Tighten the wing nut to hold the pointer in that position.

Figure 4 Illustration of Aligning The Pointer of a Ride Height Gauge

8. Move the ride height gauge under the frame rail, between the tandem axles (see Figure 5).

Figure 5 Illustration of Measuring The Ride Height

9. Raise the slide to bring the magnet at its tip into contact with the bottom flange of the frame rail.

NOTE: Use the indicator groove marked "LOW AIR LEAF" for all measurements of a FLEX Air suspension.

10. Look in the tolerance box and note what indicator groove appears (see Figure 6 on the next page).

- If the"LOW AIR LEAF" groove appears, skip Steps 11 through 15, then perform all remaining steps in this procedure.
- If the"LOW AIR LEAF" groove doesn't appear, perform all remaining steps in this procedure.

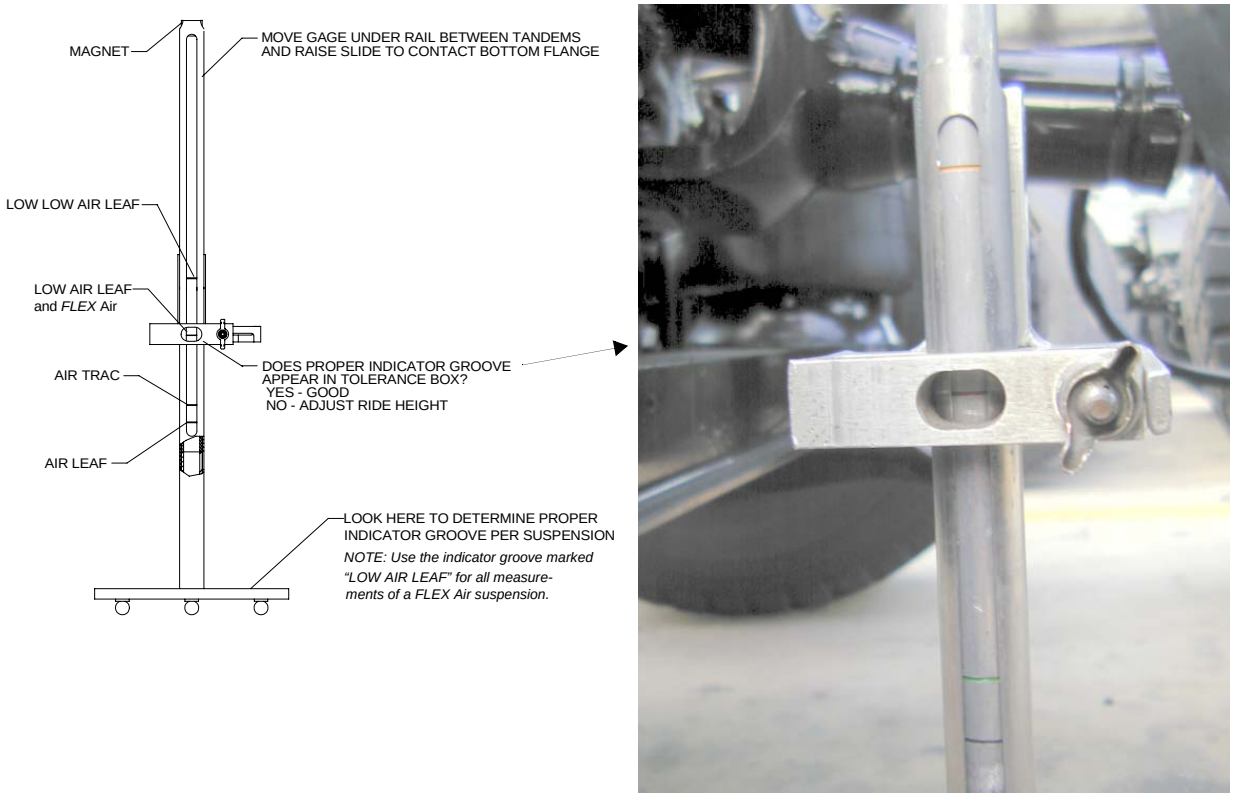


Figure 6 Illustration of Checking Ride Height Indicator

11. Loosen the fasteners mounting the height control valve to its bracket.

NOTE: At least one of the mounting holes in the height control valve bracket will be slotted to permit rotating the valve.

12. Rotate the valve either clockwise or counterclockwise to obtain the"LOW AIR LEAF" unladen ride height as measured with the ride height gauge.
13. When at the"LOW AIR LEAF" unladen ride height, ensure that the height control valve lever is in the neutral position, then install either the built-in alignment pin or a 1/8-inch (3 mm) dowel.
14. Torque the mounting fasteners to 55 — 75 Lb. in. (6.2 — 8.5 N.m.).
15. Remove the alignment pin or dowel.

NOTE: Contact PACCAR Parts Research (1-800-477-0251) to obtain rear axle angle information for newer vehicles whose records are not yet in ECAT.

16. Obtain the specified forward rear axle angle from the vehicle's FCBM. This information is located in the vehicle's record in ECAT. See Figure 7 on the next page for illustration of a sample rear axle angle page in ECAT.

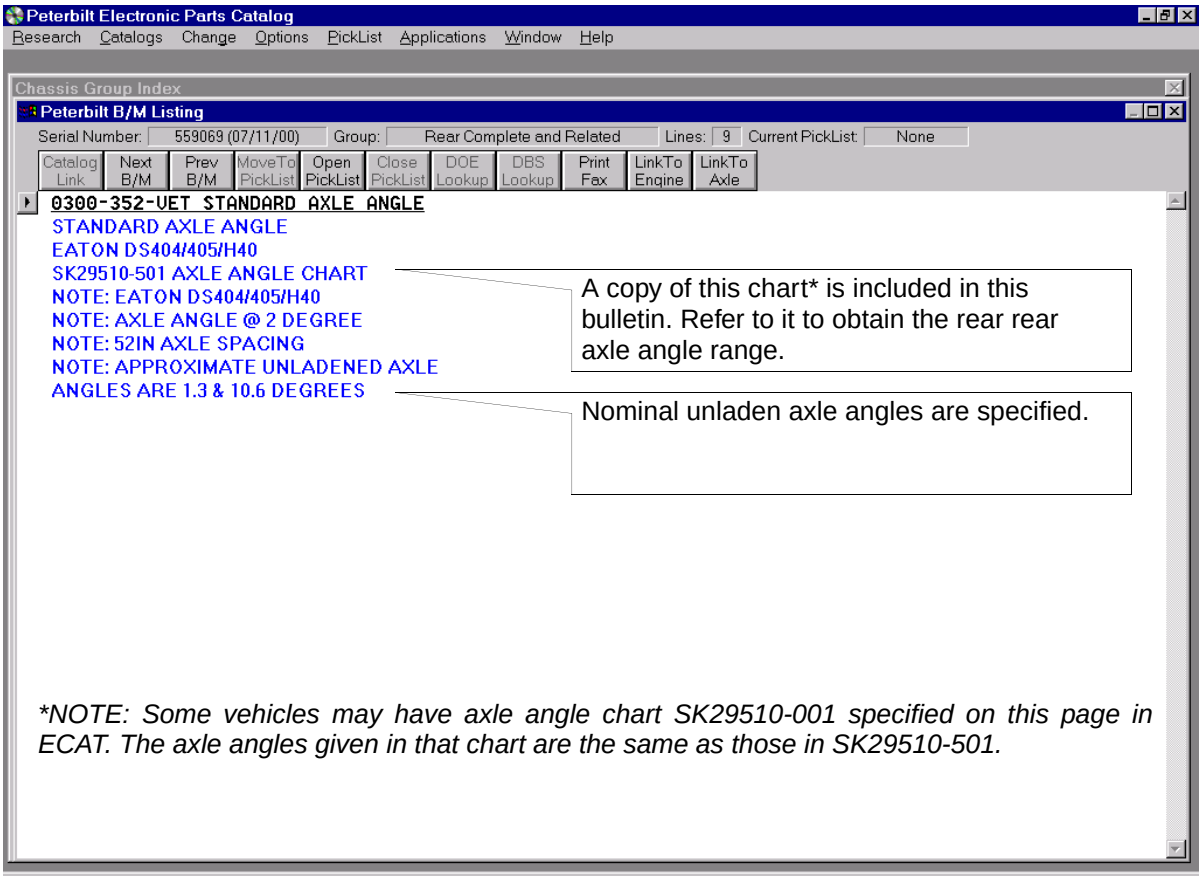


Figure 7 Illustration of a Sample Rear Axle Angle Information Page in ECAT

17. Zero the inclinometer to the LH frame rail with the face of the inclinometer oriented inboard (i.e., toward the passenger side of the chassis) as shown in Figure 8.

Figure 8 Illustration of Inclinometer on the Left-Hand Frame Rail

18. Measure and record the forward rear axle angle at either the top or bottom of the housing, near the radius rod bracket on the long side of the axle, with the inclinometer oriented inboard as shown in Figure 9.

Figure 9 Illustration of Inclinometer on the Forward Rear Axle

19. Compare the forward rear axle angle you obtained to the value listed in the FCBM:

- If the angle is within ± 0.5 degree of the value, proceed to Step 20.

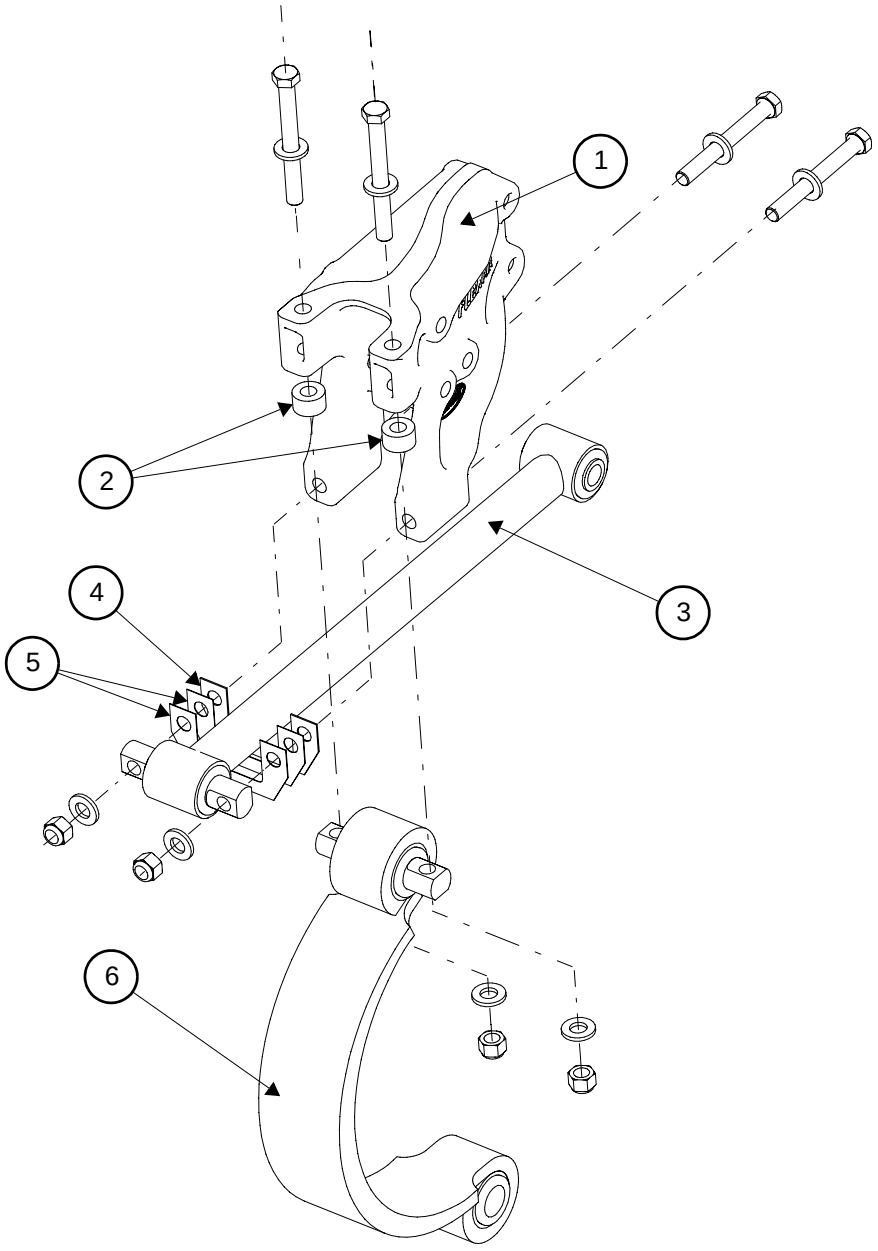
NOTE:

- *Adding or subtracting spacers may not be required if the proper axle angle can be obtained by adjusting the ride height within the tolerance window.*
- *Ensure that the specified ride height is maintained during axle angle adjustment so that a valid inclination measurement is achieved.*

- If the angle differs by more than ± 0.5 degree from the value

  a. Add or remove standard 16 mm frame washers between the link spring end and the drive bracket to adjust the overall spacer stack height (see Figure 10 on the next page).

  b. Repeat Steps 11 through 18.



1	Drive Bracket
2	Link Spring Spacer (19.0 mm, 25.4 mm)
3	Radius Rod Assembly
4	Alignment Shim (1.5 mm)
5	Alignment Shim (0.75 mm)
6	Link Spring Assembly

Figure 10

20. Turn the inclinometer off, then back on (this will zero it to true horizontal).

NOTE: If frame rake exists, the measurement that you obtain in the next step will be different from the one you obtained in Step 18. That measurement was made relative to the frame rail, while this measurement is being made relative to true horizontal.

21. Remeasure and record the forward rear axle angle (now with respect to the true horizontal) at either the top or bottom of the housing, near the radius rod bracket on the long side of the axle (see Figure 9).

22. Measure and record the rear rear axle angle at either the top or bottom of the housing, near the radius rod bracket on the long side of the axle, with the inclinometer oriented inboard as shown in Figure 11).

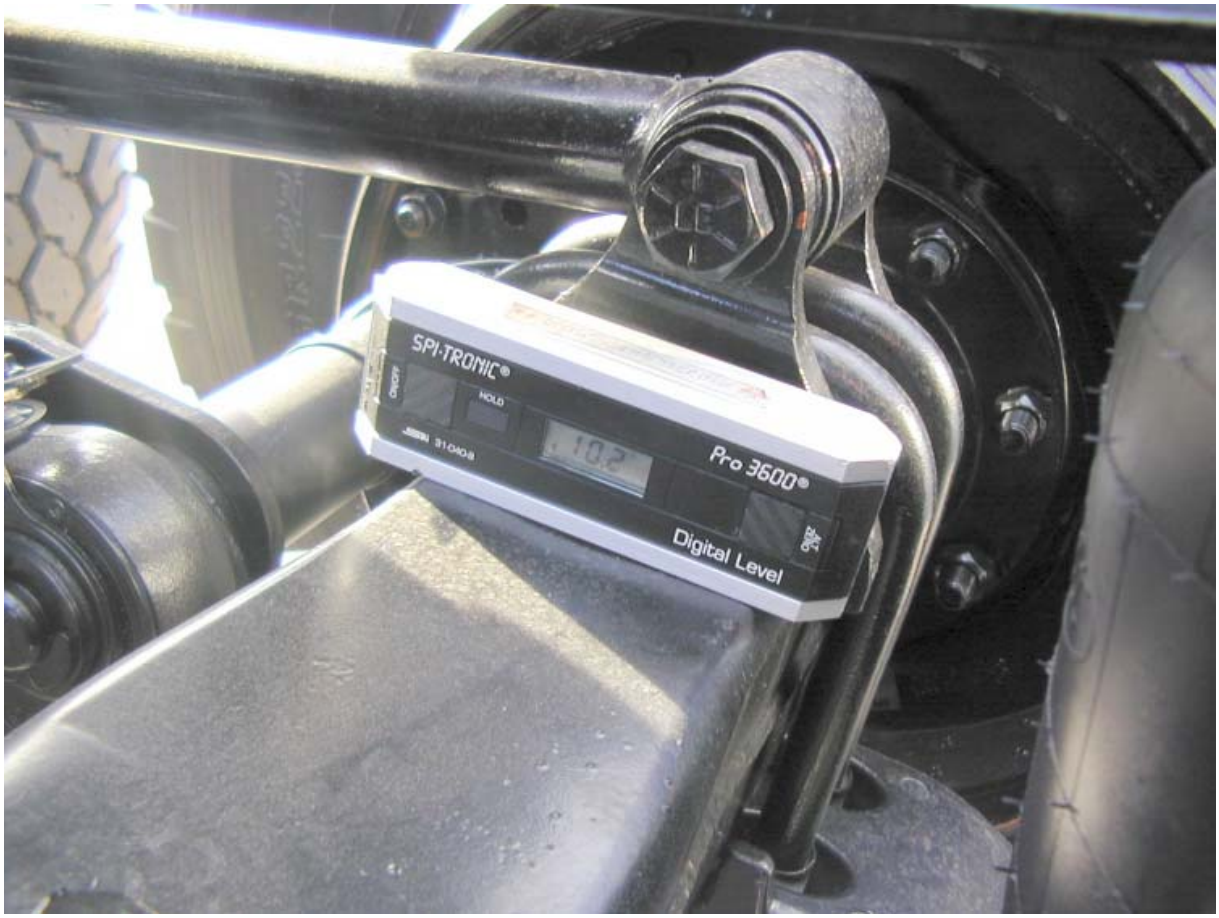


Figure 11 Illustration of Inclinometer on the Rear Rear Axle

NOTE: Ensure that the specified ride height is maintained during axle angle adjustment so that a valid inclination measurement is achieved.

23. Locate the forward axle angle in the chart for the applicable axle (see Axle Angle Charts SK29510 B 01). Determine if the rear axle angle is within the range specified for the rear driver. If the value is outside the range, adjust the spacer stack height (see Step 19) until the angle is within the range.

Adjusting Lateral Alignment (Tracking)

The procedure to align a rear axle is given in the "Checking Rear Axle Alignment" part of "Front Axle" service information. If required by that procedure, the lateral alignment (tracking) of a rear axle can be adjusted by adding or removing alignment shims between the radius rod end and the drive bracket (see Figure 10).

Balancing Springs

NOTE: Ensure that the ride height and pinion angles are within specifications before beginning this procedure (see Adjusting Ride Height and Pinion Angle).

Follow this procedure to balance the springs of a *FLEX* Air™ suspension.

WARNING! This procedure requires servicing the vehicle with the parking brakes released. The vehicle must be parked on a completely flat/level surface with both front wheels chocked on both sides. Failure to adequately chock the wheels may lead to the vehicle rolling into someone/something, causing an accident and possible serious personal injury and/or equipment damage.

1. Drive the vehicle onto a flat/level surface. Back straight out for the length of the vehicle and slowly drive back onto the flat/level surface. Gently roll to a stop. Set the parking brakes.
2. Chock the front wheels on both sides.
3. Release the parking brakes.
4. Disconnect the height control valve link.

NOTE: The jack stand height should approximately equal the distance from the bottom of the frame rail to the level surface if the vehicle is at the proper ride height.

5. Operate the height control valve lever to slightly raise the frame, then slide jack stands under each frame rail and lower the frame onto the jack stands. Return the height control valve lever to the center (neutral) position.
6. Measure and record the EOF height (the distance from the bottom of the frame rail to the level surface at the EOF) for each frame rail - they should be the same.
7. Using a jack, level the front of the frame (see the "Leveling The Frame" part of "Front Axle" service information). (Note: Ensure that any jack is placed under a frame bracket and NOT under the axle. If placed under the axle, the spring load can change and cause the front of the frame to become nonlevel without your knowledge unless you constantly recheck the FOF height.)

8. Measure and record the FOF height and the location of this height measurement.
9. Loosen all 8 bolts that attach the link springs to the drive brackets (see Figure 10). The link springs should drop.
   - Ensure that there is adequate clearance between the nut and the link spring barpin after loosening the bolts [minimum 1/2 in. (13 mm)].
   - Ensure that the bolts and pinion angle spacers are all loose. You should observe a gap between the link spring spacers and the bottom of the drive bracket lugs (see Figure 12).
10. Recheck the levelness of the front of the frame; readjust if required.

CAUTION: Operate the height control valve lever carefully during the next step. As you inflate an air bag, it applies a load to the crossbar, causing the axle to rotate. As the axle rotates, the link will raise up, and the gap between the link spring spacer and the drive bracket lug will begin to close. Inflating air bags too rapidly could cause the frame to be lifted off of the jack stands, which could result in equipment damage.

11. Operate the height control valve lever to inflate the air bags and slightly raise the frame while simultaneously watching the gap between the link spring spacers and the drive bracket lug (see Figure 12). Watch both sides of one axle until the gap on either side is closed. Stop inflating the air bag just as that gap closes so that no load is actually applied to the link spring.

NOTE: If the vehicle is equipped with an outboard fifth wheel angle, you will be unable to completely remove a link spring bolt to add spacers. In these cases, fabricate shims from P/N D8400-7936 washers and use in place of spacers to close a gap (see Figure 13 and Figure 14).

12. Check the other side of the axle and measure/record the gap. Add spacers to that side until the gap is closed. Ensure that the bolts are long enough to accommodate the new spacer stack.
13. Check the other axle and determine if either side has a gap. If you have a gap on one side and no gap on the other, ensure that the side without a gap is not being “loaded up.” You can determine this by trying to spin the spacer on the side without a gap. If it is loaded up, deflate the air bag until the spacer is loose, without any gap showing.
14. Check the other side of the axle and measure/record any gap. Add spacers to that side if required until the gap is closed. Ensure that the bolts are long enough to accommodate the new spacer stack.
15. Torque the drive bracket-to-link spring bolts (see Inspection & Maintenance).
16. Remove any jack or jack stands from the front of the frame.
17. Remove the jack stands from under each rail at the rear of the frame.
18. Reinstall the height control valve link.
19. Recheck the pinion angles (see Adjusting Ride Height and Pinion Angle).

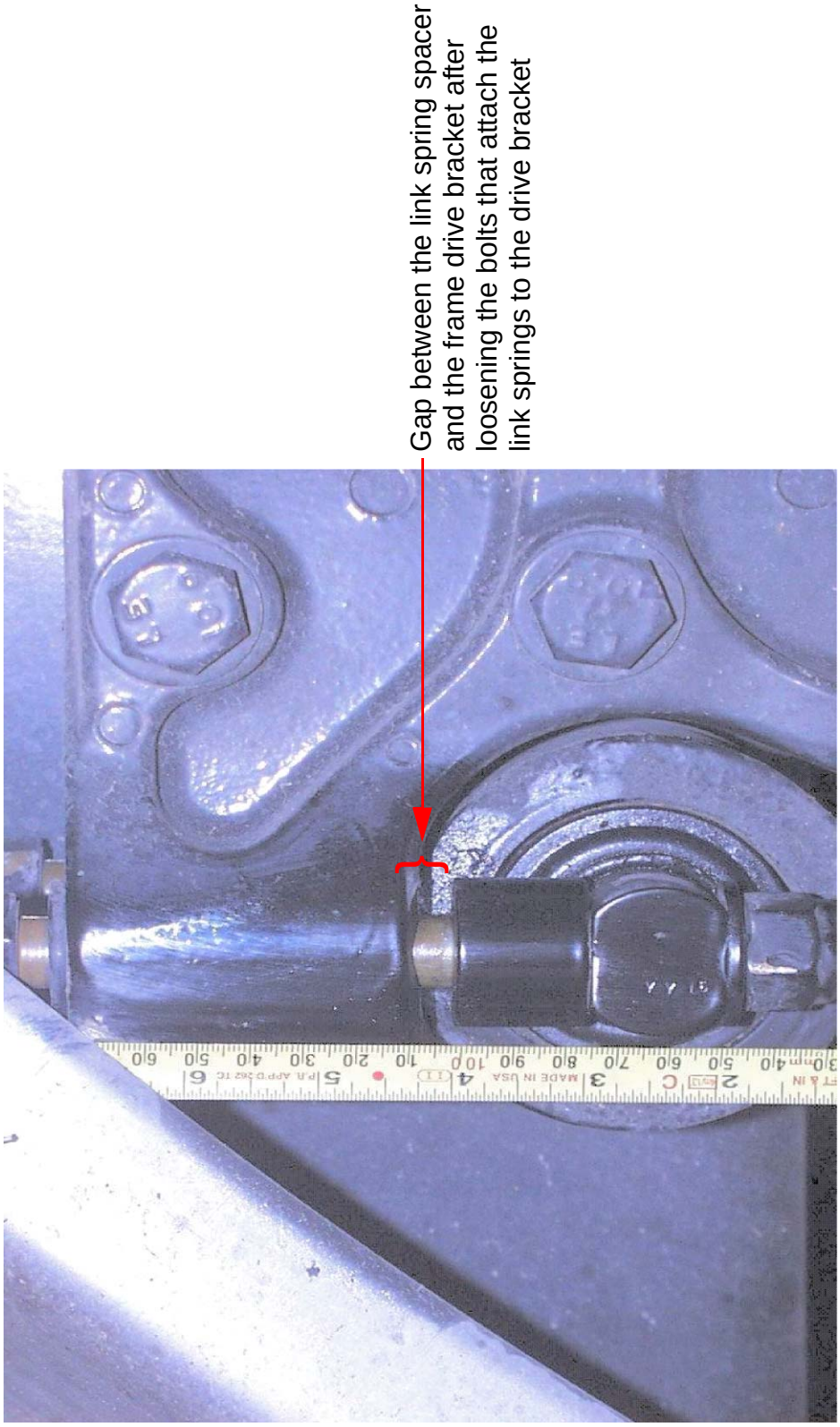


Figure 12 Illustration of Typical Clearance/Gap Occurring During Spring Balancing
(Note: Tape measure shown for reference only to illustrate gap)

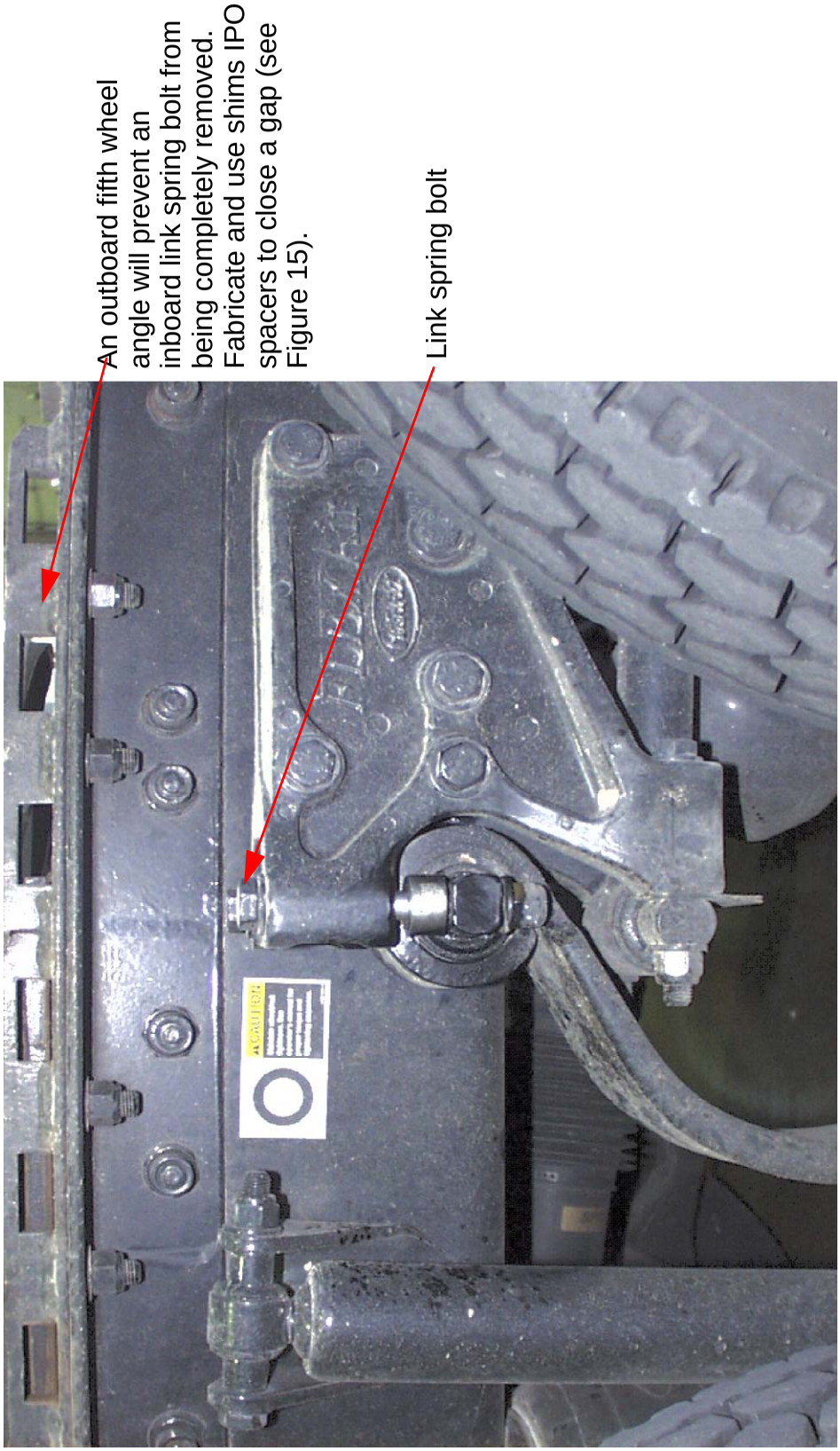


Figure 13 Illustration of *FLEX* Air Suspension With Outboard Fifth Wheel Angle

Figure 14 Illustration of Shim Fabricated From P/N D8400-7936 Washer