SERVICE MANUAL SECTION

SUSPENSION ALIGNMENT

s03003x, Formerly CTS-5033K

12/17/1999

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1. REAR SUSPENSION ALIGNMENT

Excessive tire wear results from misalignment of the rear axles. It is possible for this condition to be caused by worn and loose parts or improper adjustment.

To achieve the longest tire life on both the steering and drive axles, it is important that the tandems are parallel to each other and to the vehicle centerline.

Figure 1 illustrates an exaggerated version of a vehicle with a tandem suspension system not aligned. This same condition can exist with a single rear axle installation as well. Therefore it is important that the suspension alignment be inspected when complaints of tire wear are experienced.

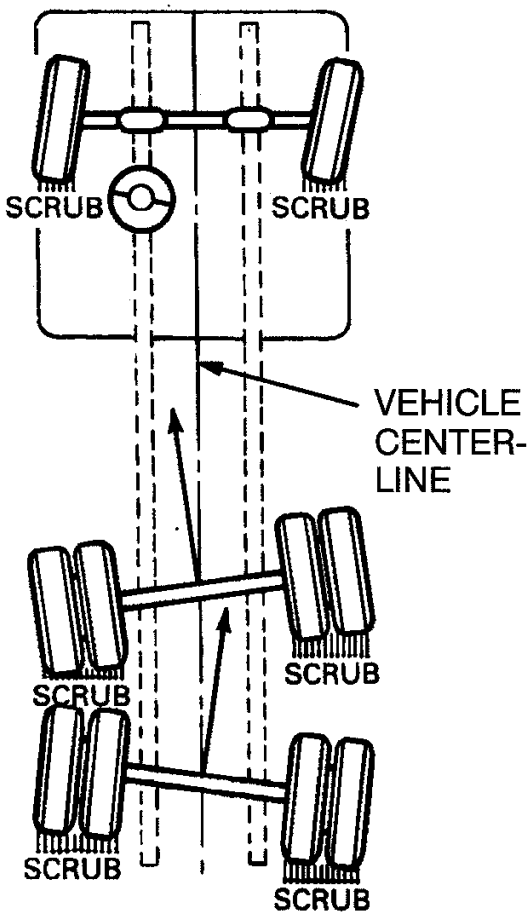

Figure 1 Tandem Suspension With Improper Alignment

There are three methods that may be used in performing the suspension alignment. The three methods are:

- Straightedge and Trammel
- Laser
- Computer.

Any of these methods will assure proper suspension alignment when performed properly.

The straightedge and trammel method and laser alignment equipment provide dimensions in inches while computer alignment equipment provides a "print out" with thrust angle in degrees.

Figure 2 , Figure 3 , Figure 4 , and Figure 5 illustrate the relationship and measurement readings between axle squareness readings on the laser, computer, and tram alignment equipment.

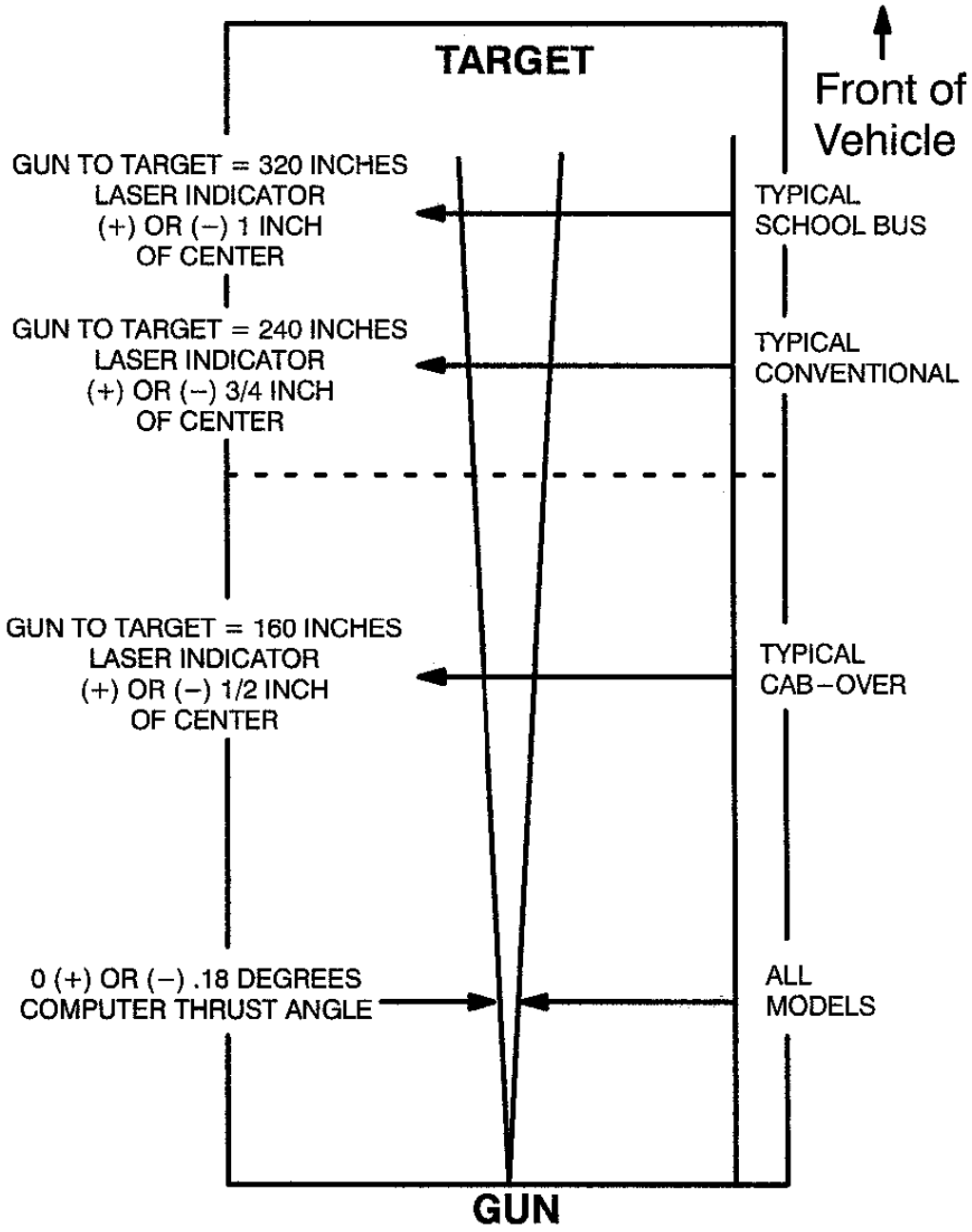

Figure 2 Laser Target Values/Computer Thrust Angle Reading

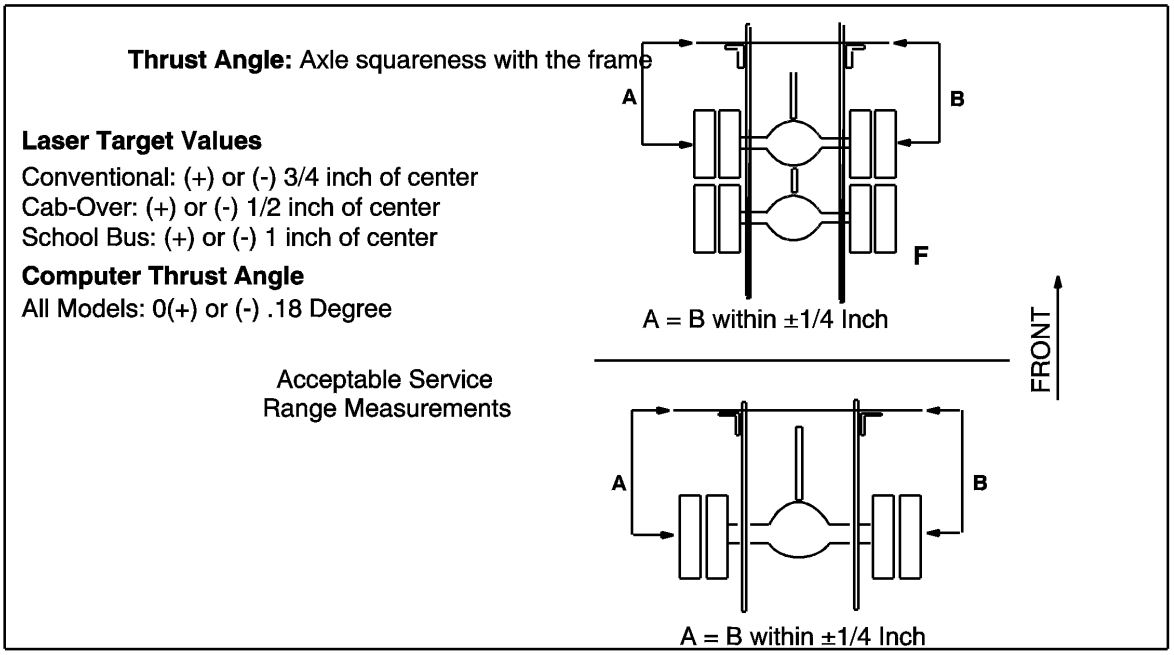

Figure 3 Squaring Tandem And Single Axle

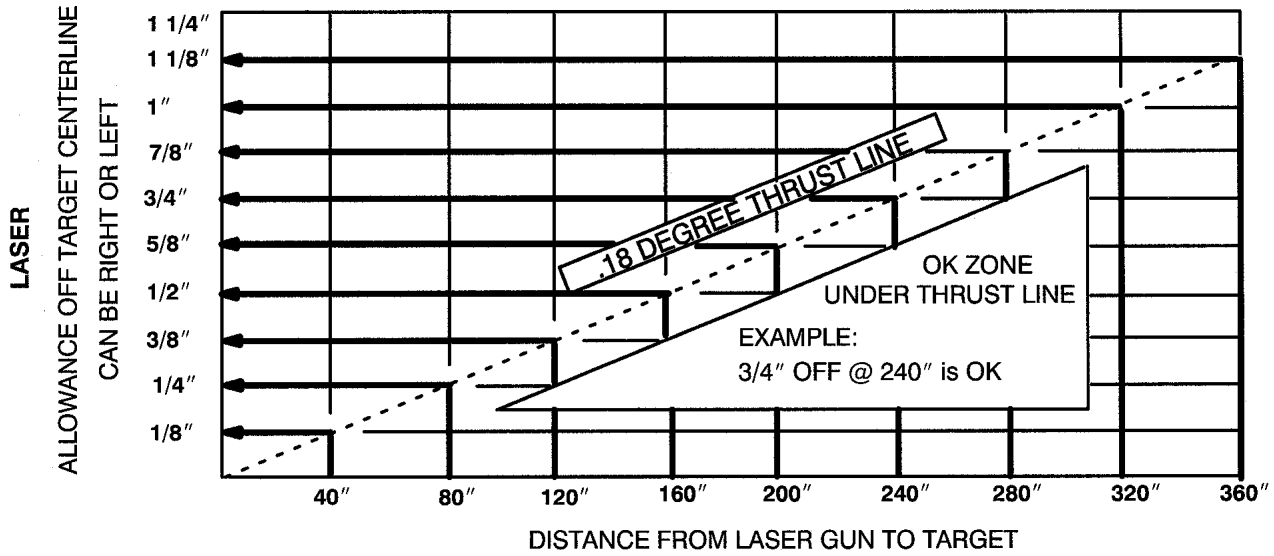

Figure 4 Thrust Angle Chart

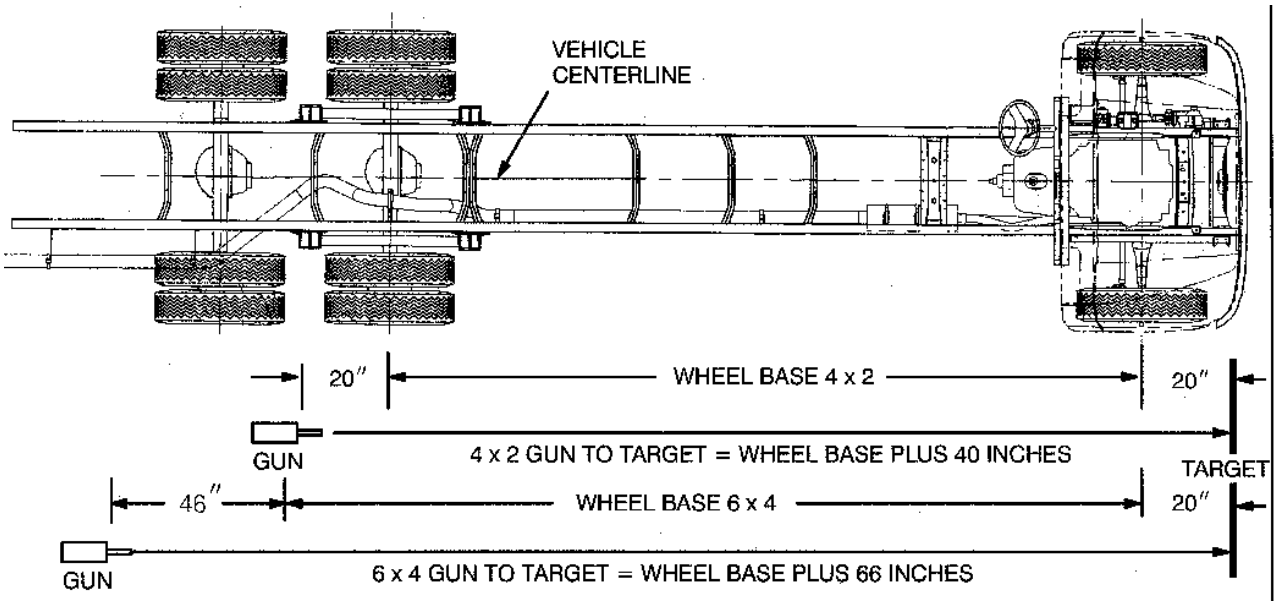

Figure 5 Gun Target Distance

2. REAR AXLE ALIGNMENT

Before performing axle alignment or upper torque rod adjustment, remove all road debris from suspension and perform the preliminary procedures listed below.

NOTE – Wheel not being aligned should be blocked at all times during alignment procedures.

1. Park vehicle on a level floor.
2. Block front wheels.
3. Release parking brake.
4. Check rear wheels for run-out and correct if necessary.
5. With the front wheels in the straight ahead position, remove wheel blocks and move vehicle forward and rearward several times to relieve internal stress; then block front wheels.
6. On vehicles equipped with air suspension, verify that the suspension height is correct.

NOTE – The straightedge and trammel method should only be used when laser or computer alignment equipment is not available. The more accurate alignment equipment is preferable.

Due to the different varieties of alignment equipment, always refer to the manufacturer's recommended operating procedures.

2.1. LASER

Alignment equipment using laser technology can be used to check rear axle alignment of a tractor or trailer. Figure 6 shows a laser aligner connected to a tandem axle tractor.

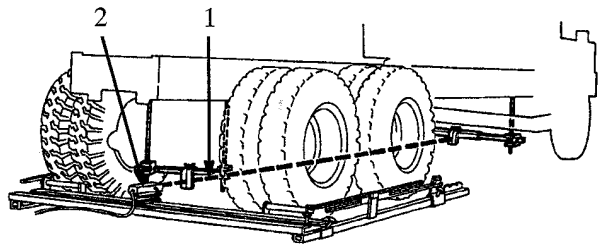

Figure 6 Laser Aligner

1. REAR FRAME GAUGE TARGET
2. LASER PROJECTOR

Laser aligners use a "soft" laser light that is projected from the center of the rear frame gauge target to the front frame gauge target. The self-centering frame gauge targets are used to find the centerline of the chassis. The rear axle is in precise alignment when the beam of light is centered between the front and rear frame gauge targets. If the beam of light is not centered, the rear axle must be adjusted. Refer to REAR AXLE ADJUSTMENT.

After the rear axle is properly aligned, the position of the forward rear axle is found using a tram bar (Figure 7). The forward rear axle is then adjusted until it is parallel with the rear rear axle.

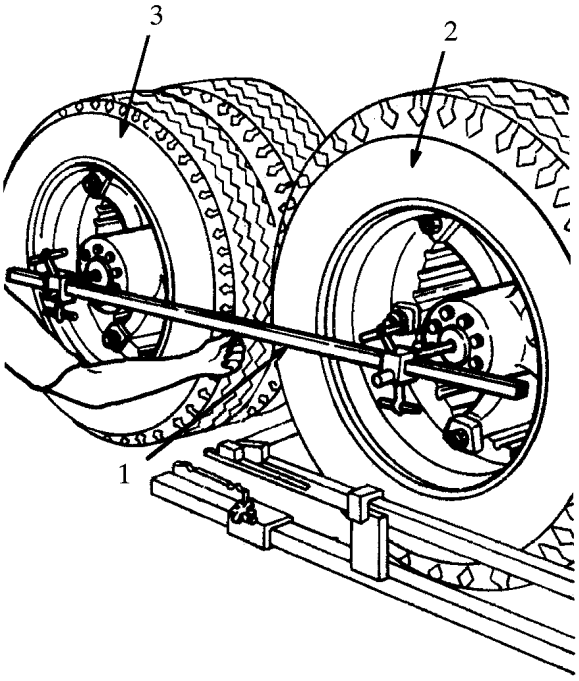

Figure 7 Tram Bar

1. TRAM BAR
2. REAR REAR AXLE
3. FRONT REAR AXLE

2.2. COMPUTER

The alignment readings, specifications and step-by-step instructions are displayed on a screen similar to a TV screen. Figure 8 illustrates a computerized wheel aligner set up on a tandem rear suspension. The system uses a computer at the wheels on an axle being checked. Specifications are entered on a keyboard and are automatically compared to the actual angles of the vehicle. The results are displayed on the screen. The system can check one or two axles at the same time.

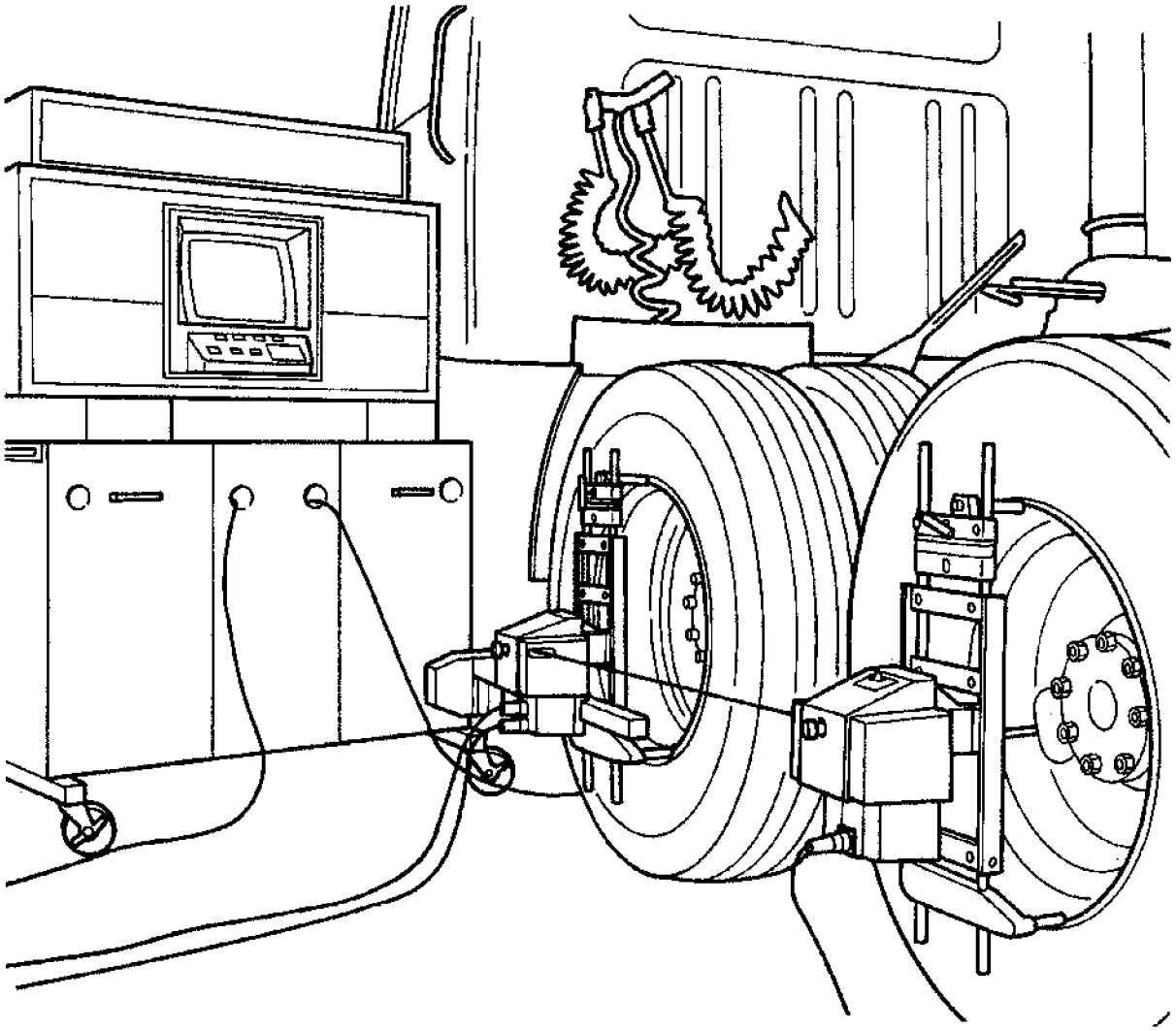

Figure 8 Computer Aligner

2.3. STRAIGHTEDGE AND TRAMMEL

The following alignment check (measuring of the suspension) applies to:

All tandem suspensions covered in this manual.

All 4x2 vehicles having spring suspensions with torque rods.

All International air suspensions with tapered leaf springs.

In the event axle adjustment is necessary, refer to REAR AXLE ADJUSTMENT and the appropriate procedure for the suspension being serviced.

1. Clamp a straightedge to top of frame rail ahead of forward rear axle on 6x4 vehicles and ahead of rear axles on 4x2 vehicles. Use a framing square against straightedge and outside surface of frame sidemember to insure straightedge is perpendicular to frame as in Figure 9 .

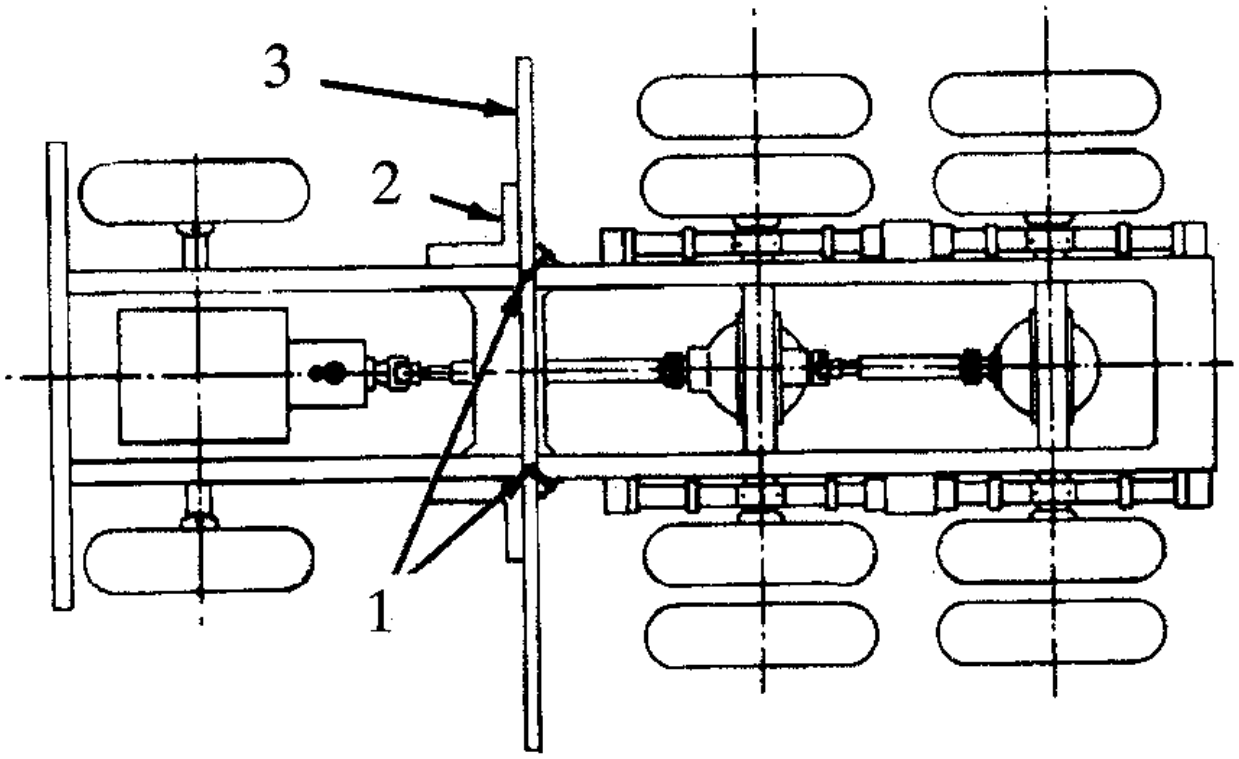

Figure 9 Straightedge Location On Frame

1. "C" CLAMPS
2. FRAMING SQUARE
3. STRAIGHTEDGE

2. Suspend a plumb bob from the straightedge in front of the tire and on outboard side of the forward rear axle on 6x4 vehicles or rear axle on 4x2 vehicles (Figure 10).

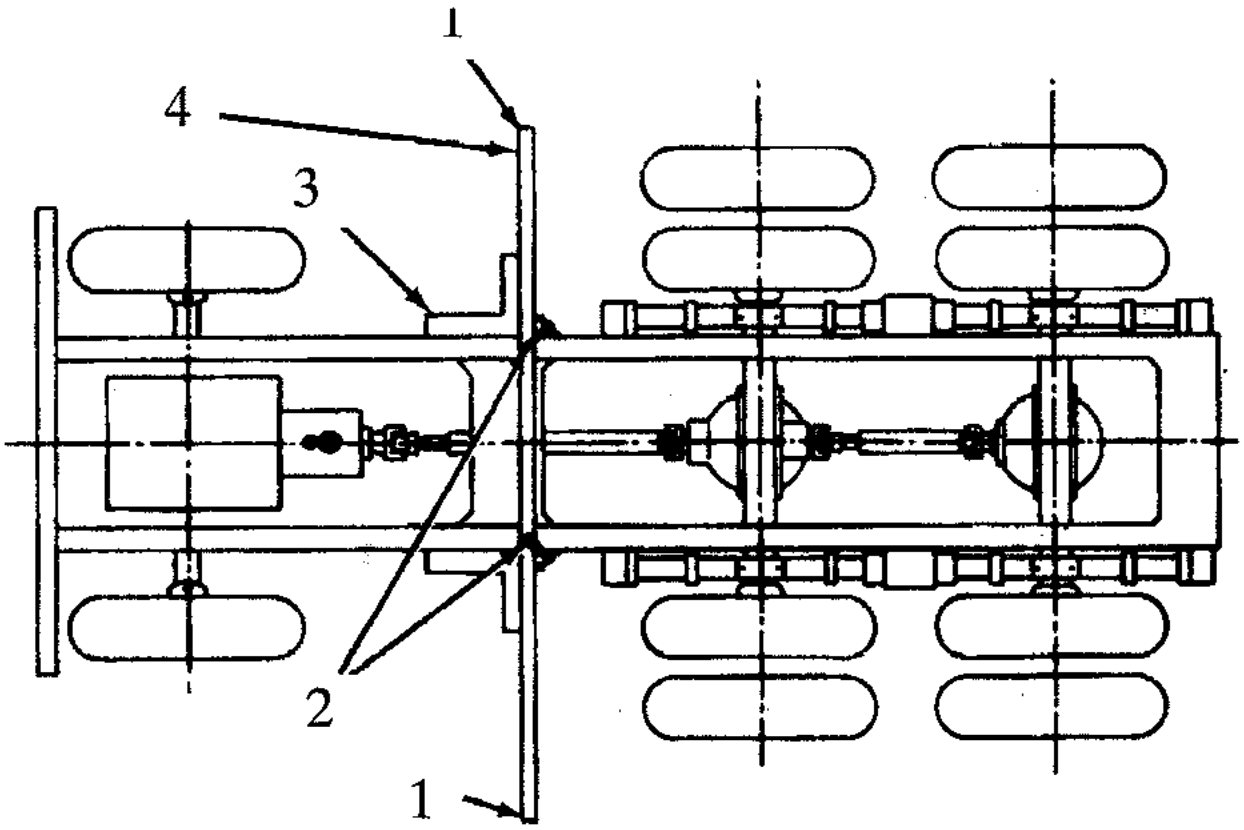

Figure 10 Plumb Bob Location

1. SUSPEND PLUMB BOB AT THIS LOCATION
2. "C" CLAMPS
3. FRAMING SQUARE
4. STRAIGHTEDGE

3. Position a slotted bar such that pointers are engaged in center hole of forward rear axle (6x4) or rear axle (4x2) and plumb line (Figure 11).

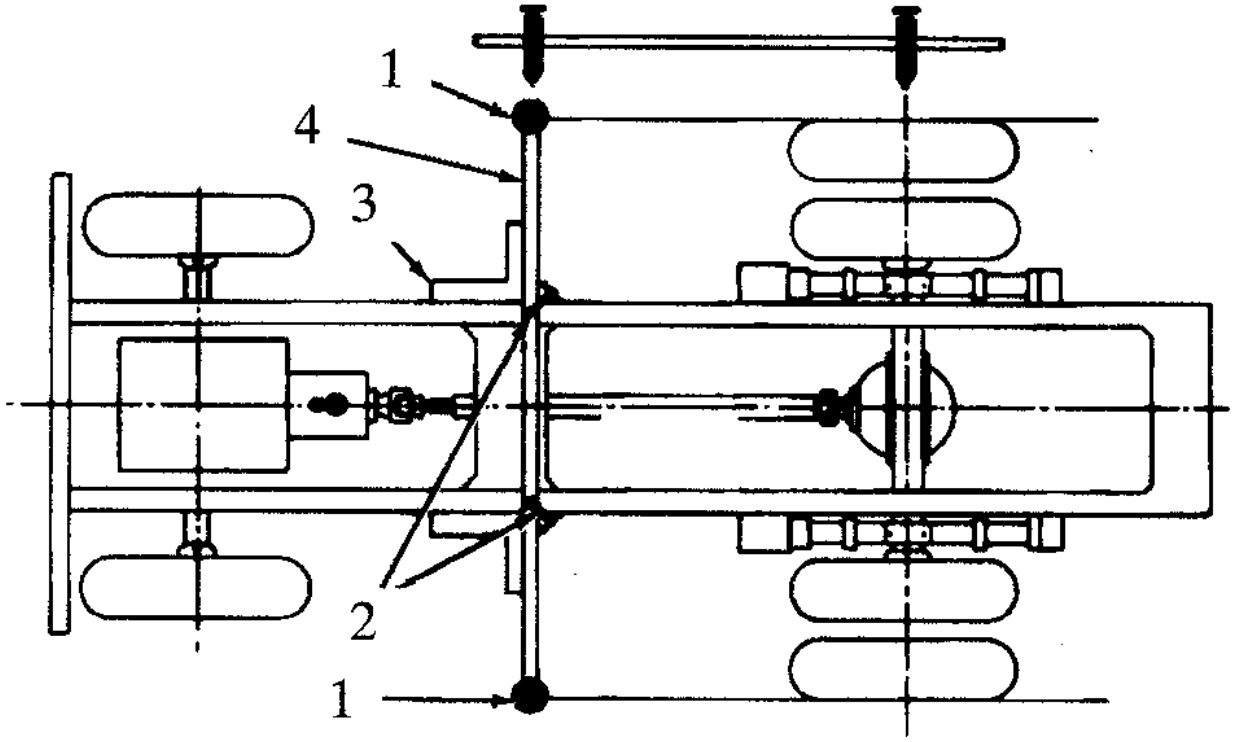

Figure 11 Measure Distance From Plumb Bob Line And Centerline Of Axle, 4X2 Chassis

1. SUSPEND PLUMB BOB AT THIS LOCATION
2. "C" CLAMPS
3. FRAMING SQUARE
4. STRAIGHTEDGE

4. Measure distance between cord of plumb bob and pointer on forward rear axle of 6x4 vehicles or rear axle on 4x2 vehicles. Record dimension "P" as in Figure 12 .

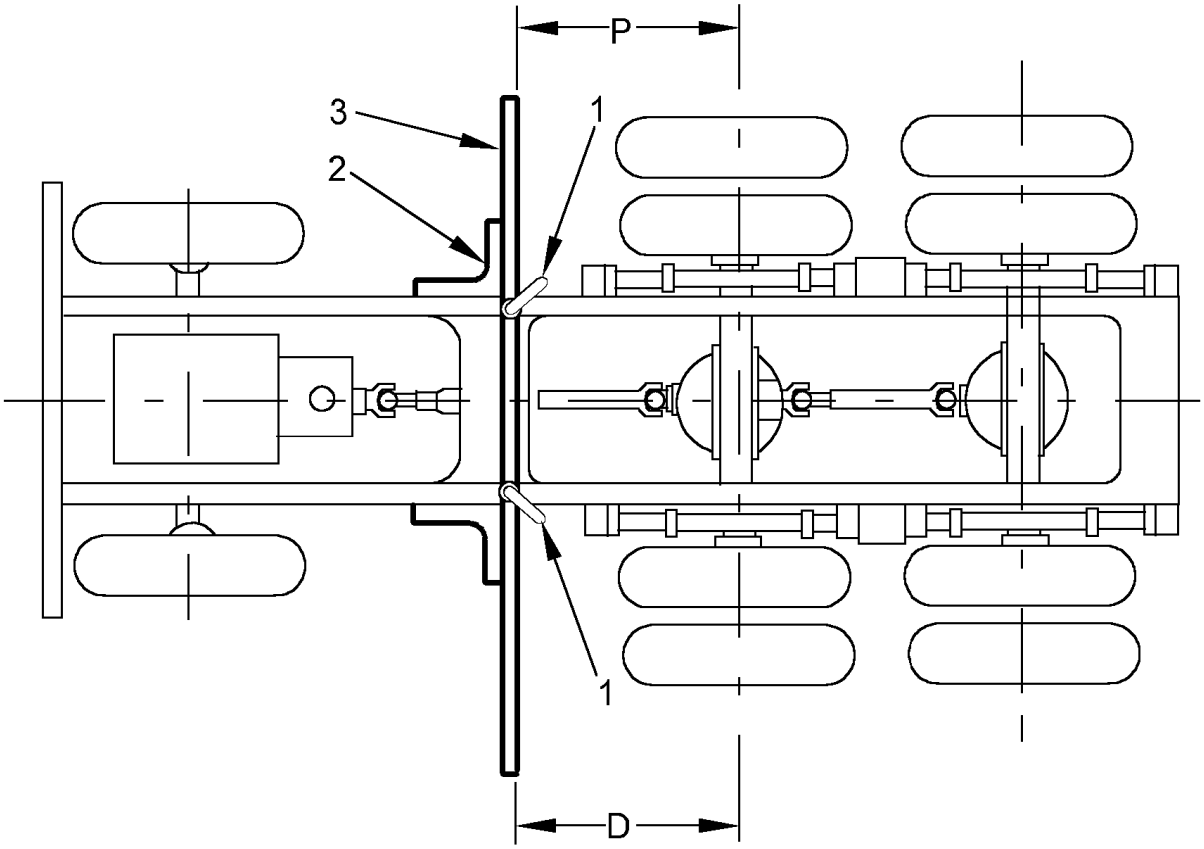

Figure 12 Measure Dimensions "P" And "D," 6X4 Vehicle Illustrated

P = PASSENGER SIDE
D = DRIVER'S SIDE
1. "C" CLAMPS
2. FRAMING SQUARE
3. STRAIGHTEDGE

5. Position slotted bar with pointers on opposite side of vehicle in same manner and measure corresponding distance as in Step 4. Record dimension "D".

6. Refer to Figure 1 , Figure 2 , Figure 3 , Figure 4 , and Figure 5 for proper measurements in regard to rear axle alignment.

7. Refer to the . REAR AXLE ADJUSTMENT in this section for procedures to correct alignment problems.

This completes the adjustment of a forward rear axle (tandem suspension) or rear axle on a 4x2 chassis.

Continue for the alignment procedures for rear rear axle on a 6x4 chassis.

8. Position slotted bar one side of vehicle so that pointers are engaged in center hole of both rear axles (Figure 13).

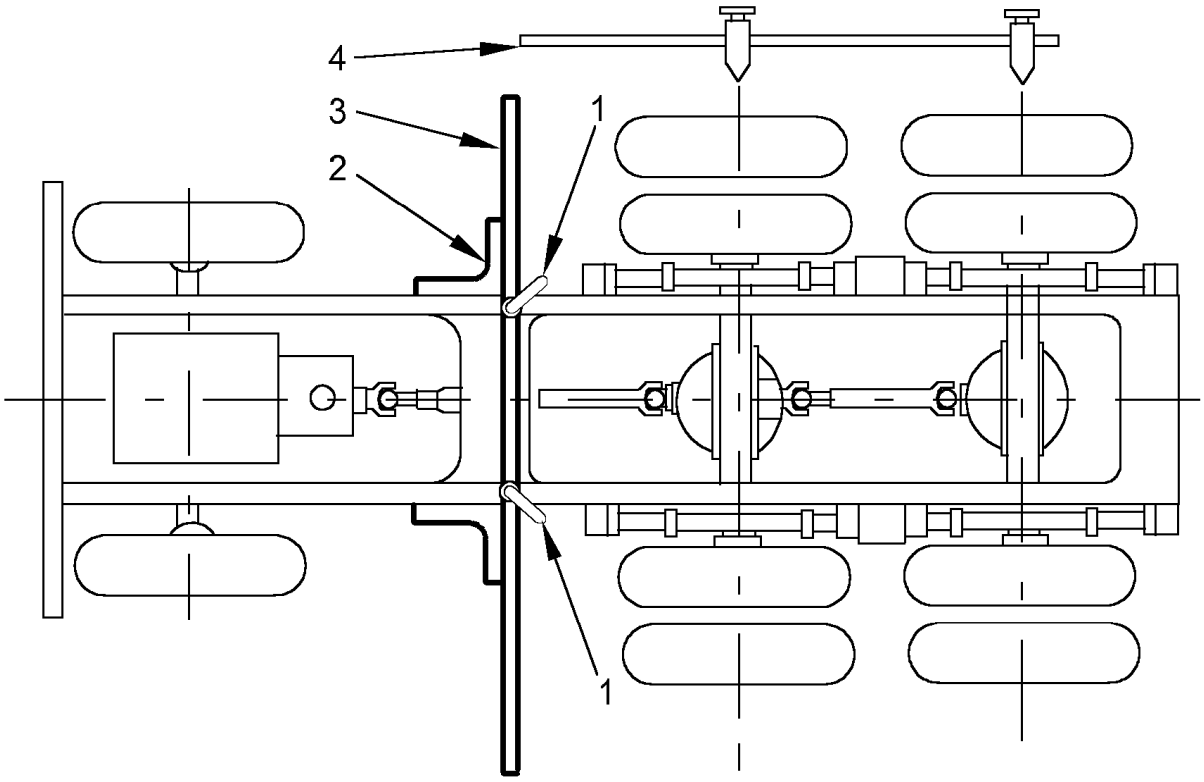

Figure 13 Position Bar With Pointers Centered In Both Rear Axles

1. "C" CLAMPS
2. FRAMING SQUARE
3. STRAIGHTEDGE
4. SLOTTED BAR

9. Position slotted bar on opposite side of vehicle with the same pointer being used (Figure 14). With the pointer in forward rear axle center, the other pointer must be within 1/8 inch of rear rear axle center line mark.

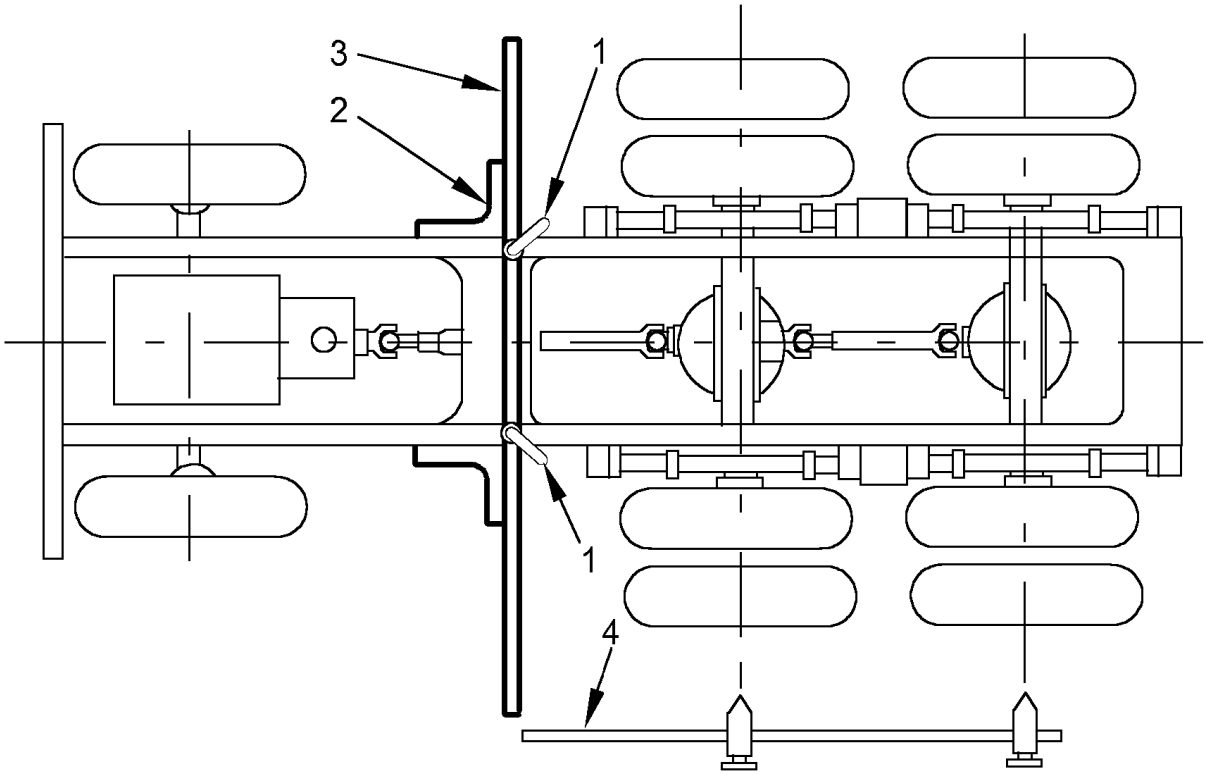

Figure 14 Check Dimension On Opposite Side Of Rear Axles, Within 1/8 Inch

1. "C" CLAMPS
2. FRAMING SQUARE
3. STRAIGHTEDGE
4. SLOTTED BAR

10. Any difference in dimensions from side to side must be equalized if in excess of 1/8 inch.

11. Refer to REAR AXLE ADJUSTMENT for procedures to equalize differences.

12. After alignment adjustments have been completed, road test the vehicle and make corrections if needed.

3. REAR AXLE ADJUSTMENT

3.1. REYCO 102W

Adjustment of axle location for alignment purposes on the Dayton Four-Spring suspension is accomplished by means of adjustable lower torque rods as shown in Figure 15 .

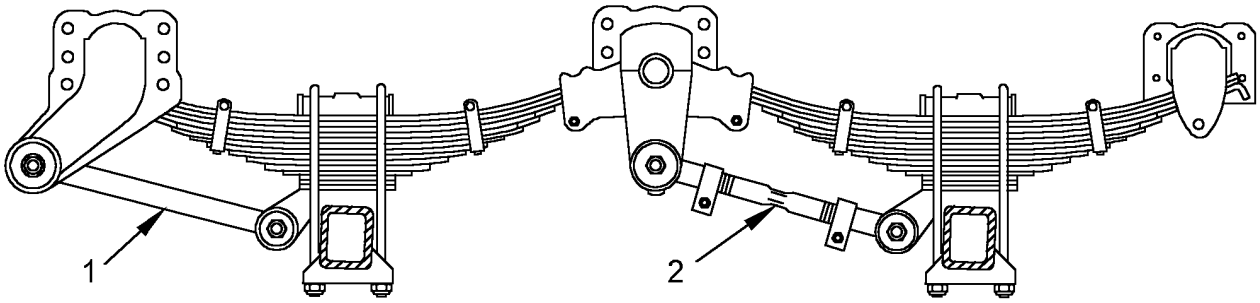

Figure 15 Reyco Torque Rod

1. RIGHT SIDE RIGID
2. LEFT SIDE ADJUSTABLE

Adjust as follows:

1. Equalize dimensions "P" and "D" in the alignment procedure (Figure 12) by loosening clamp bolts on the lower adjustable torque rod on forward rear axle and adjusting length of rod.

2. Tighten clamp bolts to specified torque. Refer to TORQUE CHART.

3. Equalize the difference of dimension from side to side in the alignment procedure (Figure 13 and Figure 14) by loosening the clamp bolts on the lower adjustable torque rod on the rear rear axle and adjusting length of rod.

4. Tighten clamp bolts to specified torque. Refer to TORQUE CHART.

5. Upon completion of axle alignment, the upper torque rods should be adjusted. Improper upper torque rod adjustment can impose unnecessary strain on vehicle crossmembers, torque rod mounting brackets and torque rods.

3.2. REYCO 101A

Adjustment of the axle location for alignment purposes on the Reyco 101 suspension is accomplished by means of eccentric bushings located at torque leaf mounting eyes.

1. Equalize dimensions "P" and "D" in alignment procedure (Figure 12) by loosening torque leaf bolt nuts enough to free rubber bushings in castings. Mark adjusting bolt, washer and front hanger with chalk or paint (Figure 16). This provides a means of visually identifying eccentric bushing movement.

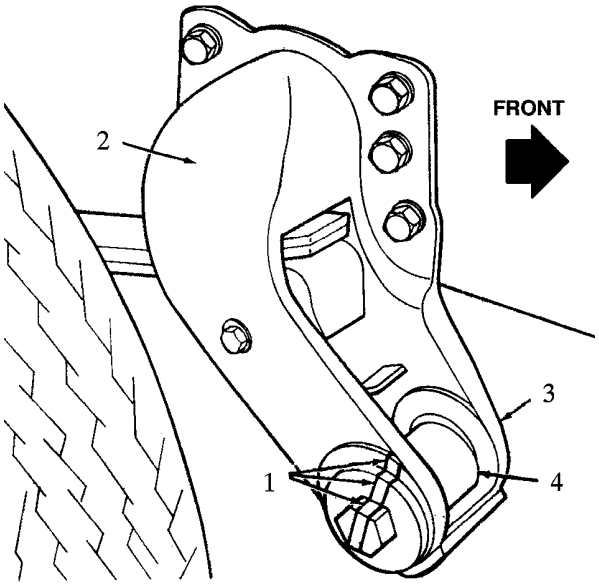

Figure 16 Mark Eccentric Bushing

1. MARK BOLT HEAD, WASHER AND FRONT HANGER WITH CHALK OR PAINT
2. FRONT HANGER
3. NUT HIDDEN BY HANGER
4. TORQUE LEAF

2. To adjust, place a crescent wrench on torque leaf bolt and turn bolt in the opposite direction of desired axle movement. Maximum adjustment is 7/16 inch on each side of axle.

3. After adjustment is made, tighten torque leaf bolt nuts to specified torque and recheck alignment dimensions on forward rear axle. Refer to TORQUE CHART, for specifications.

4. Equalize the difference of dimensions from side to side in alignment procedure (Figure 14) by loosening torque leaf bolt nut at equalizer bracket enough to free rubber bushings in castings. Mark adjusting bolt, washer and equalizer bracket with chalk or paint (Figure 17). This provides a means of visually identifying eccentric bushing movement.

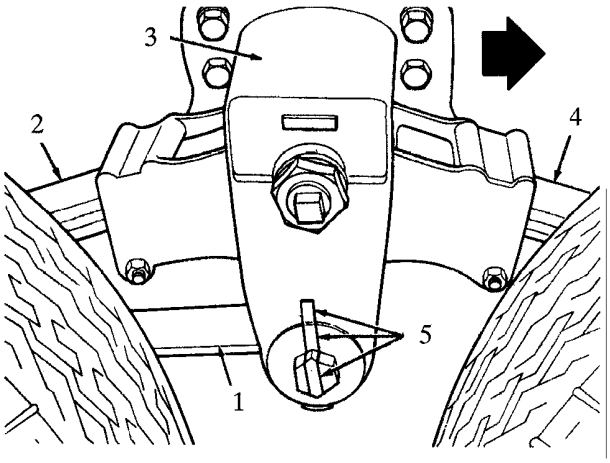

Figure 17 Mark Eccentric Bushing

1. TORQUE LEAF
2. REAR SPRING
3. EQUALIZER HANGER BRACKET
4. FRONT SPRING
5. MARK BOLT HEAD, WASHER AND BRACKET WITH CHALK OR PAINT

5. To adjust, place a crescent wrench on torque leaf bolt and turn bolt in the opposite direction of desired axle movement. Maximum adjustment is 7/16 inch on each side of axle.

6. After adjustment is made, tighten torque leaf bolt nuts to specified torque and recheck alignment dimension on rear rear axle. Refer to TORQUE CHART, for specifications.

3.3. INTERNATIONAL SUSPENSIONS

Spring Suspension with Torque Rods

Air Suspensions with Tapered Leaf Springs

Adjustment of the axle location for alignment purposes is accomplished by means of shims installed at the torque rod end mounting.

1. Equalize dimensions "P" and "D" in alignment procedure (Figure 12) by installing or removing shims at the forward rear axle torque rod end mounting (Figure 18). Installation of shims at the torque rod FORWARD end mounting moves the axle forward.

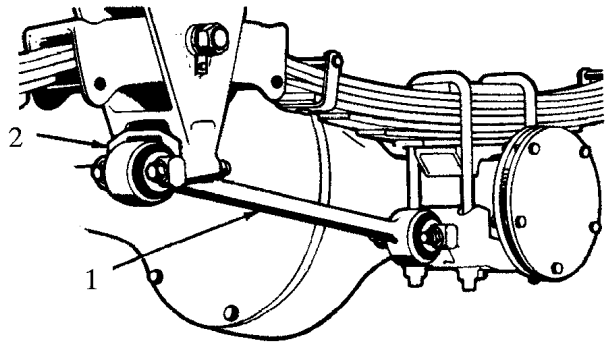

Figure 18 Alignment Shim

1. TORQUE ROD
2. ALIGNMENT SHIM

2. Installation of shims at the torque rod AXLE end mounting moves the axle rearward. Tighten torque rod mounting nuts and check alignment dimensions on forward rear axle. Refer to TORQUE CHART, for specifications.

   IMPORTANT – Following installation of alignment shims, inspect the torque rod mounting nuts. A minimum of two threads of the mounting bolt must extend through the nut to allow the mounting nut locking feature to function properly.

   NOTE – When performing axle alignment, it is preferred to have alignment shims installed at the torque rod forward mounting. However, if axle alignment cannot be obtained by installing shims at the forward mounting, it is permissible to install additional shims at the axle end mounting.

3. Equalize the difference of dimensions from side to side (6x4 vehicles only) in alignment procedure (Figure 13 and Figure 14) by installing or removing shims at the rear rear axle torque rod end mounting (Figure 18).

4. Installation of shims at the FORWARD end mounting moves the axle forward. Installation of shims at the torque rod axle end mounting moves the axle rearward. Tighten torque rod mounting nuts. Refer to TORQUE CHART, or specifications. Check alignment dimensions on rear rear axle.

Adhere to the **IMPORTANT** in Step 1 of this adjustment procedure.

3.4. HENDRICKSON (WITHOUT BAR PIN DESIGN)

This design of Hendrickson suspensions does not provide for axle adjustment for alignment purposes. If the axles are measured to be significantly out of alignment, the following areas should be investigated as the possible cause and corrected as necessary.

1. Severely worn walking beam center or end bushings.

2. Worn spring pins.

3. Improper location of frame brackets on frame.

4. Any other worn or damaged parts.

3.5. HENDRICKSON (WITH BAR PIN DESIGN)

The bar pin design comes in both non-adjustable and adjustable designs, but only the adjustable design offers axle alignment capability. The adjustable bar pin alignment feature consists of specially designed shims (Figure 19 , Figure 20 , and Figure 21).

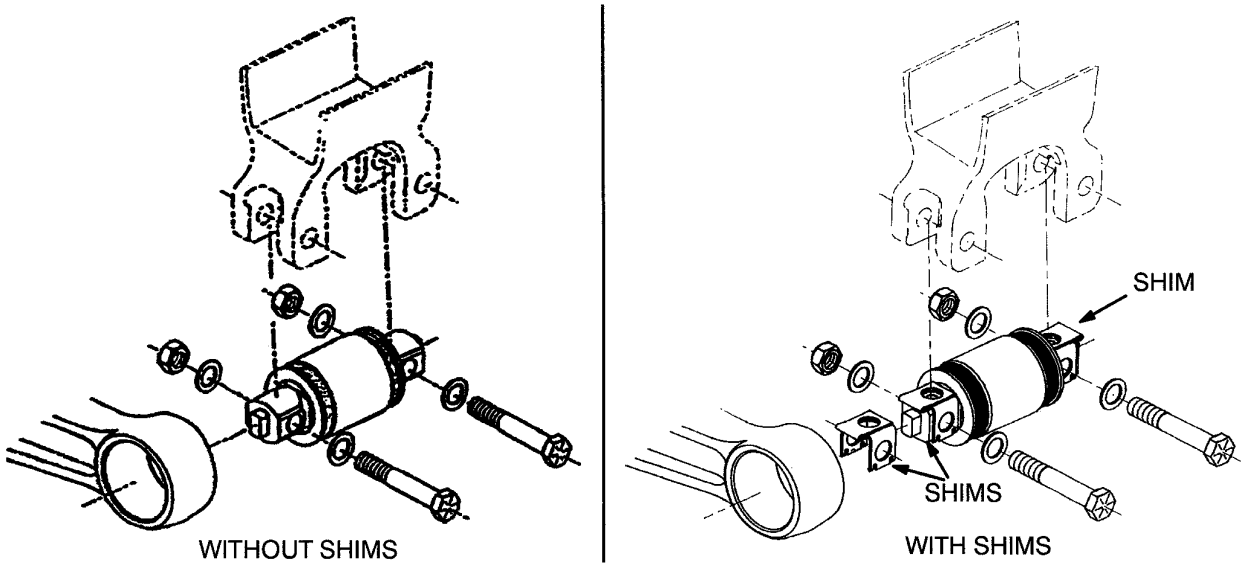

Figure 19 Beam End Bar Pin With And Without Shims

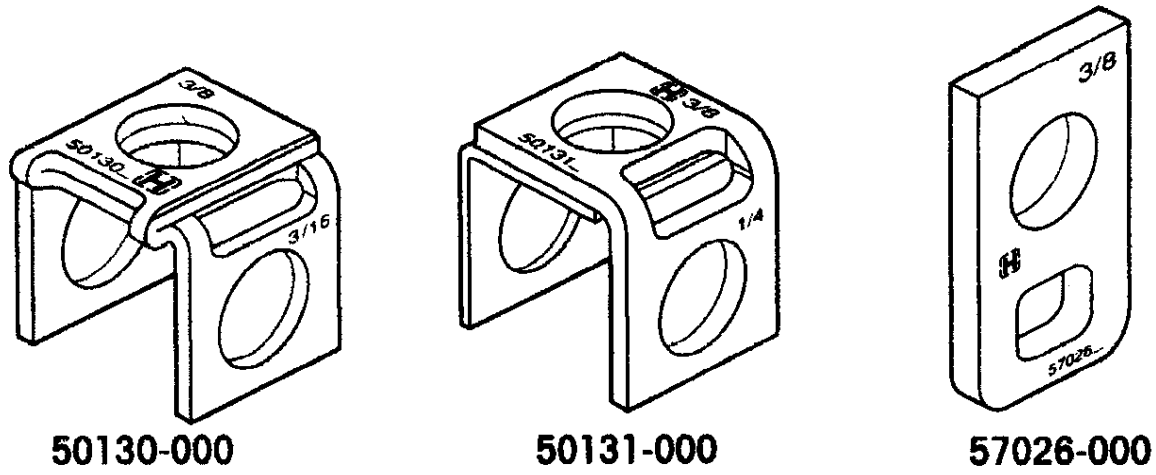

Figure 20 Hendrickson Bar Pin Adjustment Shims

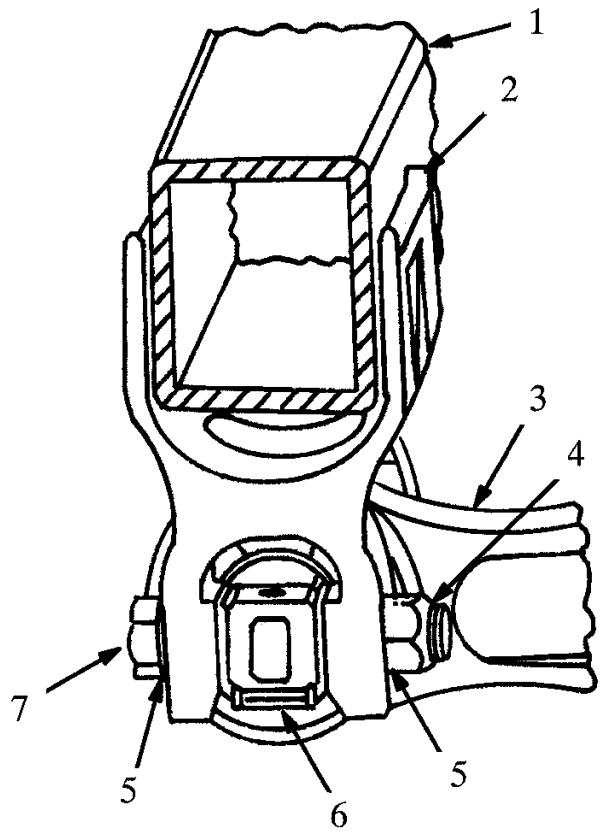

Figure 21 Walking Beam End Components

1. AXLE HOUSING
2. AXLE BRACKET (BEAM)
3. WALKING BEAM
4. LOCK NUT
5. WASHER
6. SHIM
7. BOLT

Rear axle adjustments on a vehicle with bar pin type walking beam tandem axles are accomplished by measuring and determining the rear drive axle thrust angle in relation to the vehicle centerline or front steer axle.

If the thrust angle is measured to the left of the vehicle centerline, the rear drive axle must be rotated clockwise to achieve accurate alignment. If the thrust angle is measured to the right of the vehicle centerline, the rear drive axle must be rotated counterclockwise to achieve accurate alignment (Figure 22). The amount of misalignment will determine how much adjustment (or shim thickness correction) is required.

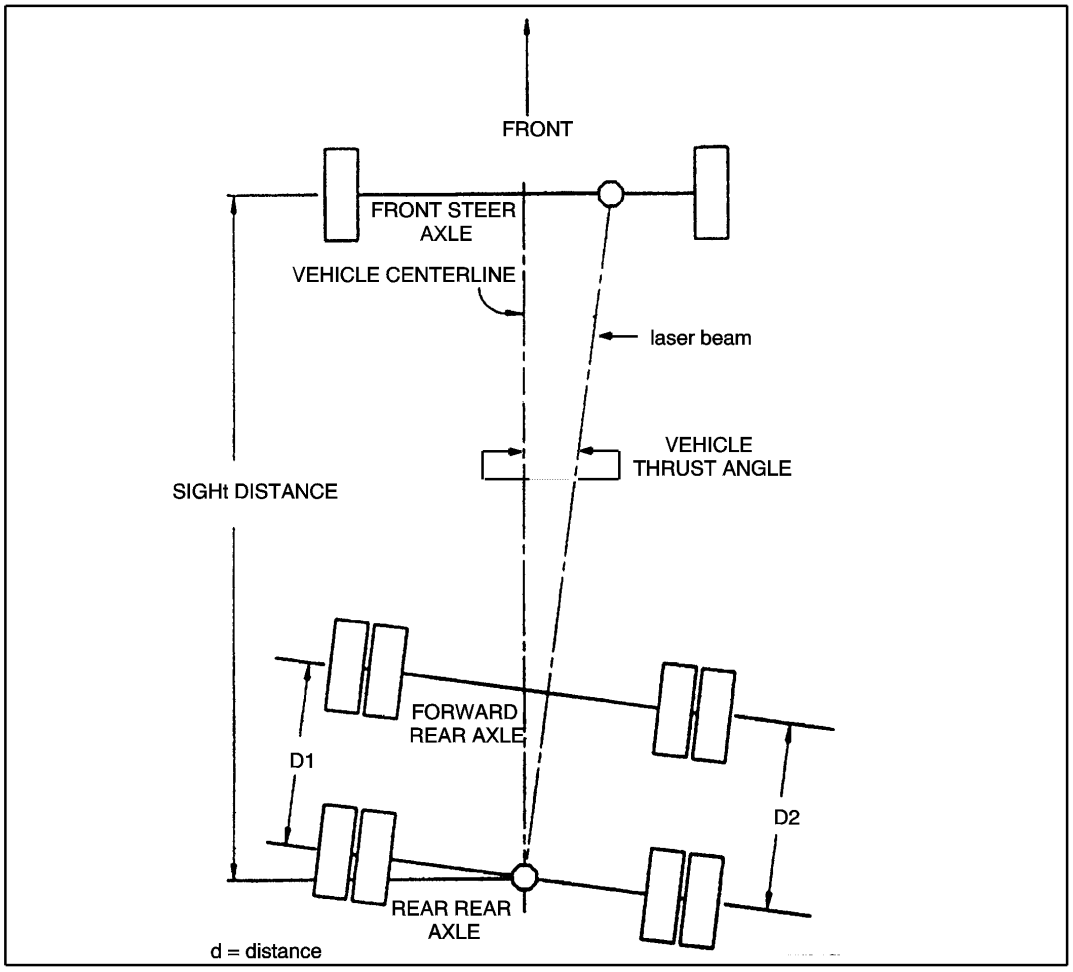

Figure 22 Tandem Suspension With Improper Alignment

If the thrust angle is measured either to left or right of the centerline, and the tandem axles are not parallel, the rear drive axle needs to be aligned first. This will set the thrust angle to zero degrees. Next the front drive axle should be adjusted to make it parallel to the rear drive axle. This sets both rear axles parallel to the front steer axle and perpendicular to the centerline of the vehicle.

To replace the alignment shims, remove the bar pin beam end connection bolts and the alignment shims. Replacement shims should be installed carefully. The alignment shims have been designed for installation from the bottom, thus permitting the bar pin to remain inside the axle bracket.

Once alignment is completed, tighten the beam end connection bolt/nuts to 450-600 ft-lbs. (610-813 N•m).

When the adjustable bar pin bushing is used, a shim must be installed at each bolt location. The same shim part number must be installed in the same shim location on both ends of the bushing.

Align Rear Suspension with Bar Pin Design (Rear Rear Axle)

The following procedure is recommended when axle alignment is required using the adjustable bar pin beam end connection.

NOTE – Do not stack shims or use standard type washers as substitutes. The use of any parts except genuine Hendrickson parts is strictly PROHIBITED. Torque all nuts/bolts to specifications. Follow all recommended procedures. Failure to comply can cause the components being serviced to come loose and loss of vehicle control may occur.

1. Determine the thrust angle of the rear tandem axle relative to the vehicle centerline. When using computerized alignment equipment, the thrust angle is read directly from the computer screen or from a computer printout. When using laser projection alignment equipment, the light beam offset from the centerline of the front target must be measured. This measured offset must then be related to Table 1 and Reference Figure 24 or Table 2and Reference Figure 26 to determine the actual thrust angle. Table No 1 and Table No. 2, are used to convert measured offset to thrust angle. The sight distance in Table 1 and Table 2 is the distance from the front laser target near the front steer axle to the centerline of the rear tandem axle. For example, when using laser alignment equipment on a vehicle with a 287 inch sight distance, an offset measurement of 1.0 inch converts to a thrust angle of 0.20 degrees.

2. The following formulas determine exactly how much increase in shim thickness is needed to correct any thrust angle condition depending on the method of correction. Use a thrust angle of .20 degrees as an example.

   ONE BEAM END CORRECTION - REAR TANDEM AXLE

Example: Thickness increase (inches) = 0.63 x Thrust Angle .20 degrees = .1260

TWO BEAM END CORRECTIONS - REAR TANDEM AXLE

Example: Thickness increase (inches) = 0.31 x Thrust Angle .20 degrees = .620

Round the calculated thickness to the nearest 1/16 inch. Table 1 and Table 2 provide a quick means of determining thickness increase versus thrust angle and sight distance. For those cases not shown in these tables, the above formulas must be used.

3.

Table 1 Light Beam Offset/Thrust Angle/Shim Thickness Increase Clockwise Correction

Thrust Angle	Sight Distance (IN)	Increase in Shim Thickness @ Location 1 or Location 2 (IN)	Increase in Shim Thickness @ Location 1 and Location 2 (IN)
Refer to Figure 19 for shim location.			
Offset = 1/4 inch			
.10	143.50	1/16	-
.20	-	-	-
.30	-	-	-
.40	-	-	-
Offset = 1/2 inch			
.10	267.00	1/16	-
.20	143.50	1/8 or	1/16
.30	-	-	-

Table 1 Light Beam Offset/Thrust Angle/Shim Thickness Increase Clockwise Correction (cont.)

Thrust Angle	Sight Distance (IN)	Increase in Shim Thickness @ Location 1 or Location 2 (IN)	Increase in Shim Thickness @ Location 1 and Location 2 (IN)
Refer to Figure 19 for shim location.			
.40	-	-	-
Offset = 3/4 inch			
.10	430.50	1/16	-
.20	215.25	1/8 or	1/16
.30	143.50	3/16	-
.40	-	-	-
Offset = 1 inch			
.10	574.00	1/16	-
.20	287.00	1/8 or	1/16
.30	191.33	3/16	-
.40	143.50	1/4 or	1/8
Offset = 1 1/4 inch			
.10	-	-	-
.20	358.75	1/8 or	1/16
.30	239.16	3/16	-
.40	179.37	1/4 or	1/8
.50	143.49	-	-
.60	-	-	-
.70	-	-	-
.80	-	-	-
Offset = 1 1/2 inch			
.10	-	-	-
.20	-	-	-
.30	287.00	3/16	-
.40	215.24	1/4 or	1/8
.50	-	-	-
.60	143.49	3/8 or	3/16
.70	-	-	-
.80	-	-	-
Offset = 1 3/4 inch			
.10	-	-	-

Table 1 Light Beam Offset/Thrust Angle/Shim Thickness Increase Clockwise Correction (cont.)

Thrust Angle	Sight Distance (IN)	Increase in Shim Thickness @ Location 1 or Location 2 (IN)	Increase in Shim Thickness @ Location 1 and Location 2 (IN)
Refer to Figure 19 for shim location.			
.20	-	-	-
.30	-	-	-
.40	251.12	1/4 or	1/8
.50	-	-	-
.60	167.41	3/8 or	3/16
.70	143.49	-	-
.80	-	-	-
Offset = 2 inch			
.10	-	-	-
.20	-	-	-
.30	-	-	-
.40	286.99	1/4 or	1/8
.60	191.32	3/8 or	3/16
.70	-	-	-
.80	143.49	-	1/4

NOTE – Wheel not being aligned should be blocked at all times during alignment procedures.

Reference for Table 1

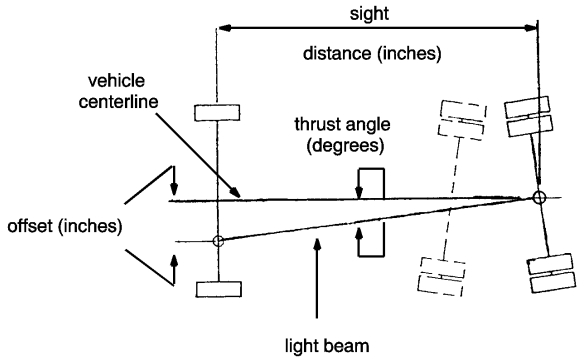

Figure 23 Reference For Table 1

Table 2 Light Beam Offset/Thrust Angle/Shim Thickness Increase Counterclockwise Correction

Thrust Angle	Sight Distance (IN)	Increase in Shim Thickness @ Location 3 or Location 4 (IN)	Increase in Shim Thickness @ Location 3 and Location 4 (IN)
Refer to Figure 20 for shim location.			
Offset = 1/4 inch			
.10	143.50	1/16	-
.20	-	-	-
.30	-	-	-
.40	-	-	-
Offset = 1/2 inch			
.10	267.00	1/16	-
.20	143.50	1/8 or	1/16
.30	-	-	-
.40	-	-	-
Offset = 3/4 inch			
.10	430.50	1/16	-
.20	215.25	1/8 or	1/16
.30	143.50	3/16	-
.40	-	-	-
Offset = 1 inch			
.10	574.00	1/16	-
.20	287.00	1/8 or	1/16
.30	191.33	3/16	-
.40	143.50	1/4 or	1/8
Offset = 1 1/4 inch			
.10	-	-	-
.20	358.75	1/8 or	1/16
.30	239.16	3/16	-
.40	179.37	1/4 or	1/8
.50	143.49	-	-
.60	-	-	-
.70	-	-	-
.80	-	-	-
Offset = 1 1/2 inch			
.10	-	-	-

Table 2 Light Beam Offset/Thrust Angle/Shim Thickness Increase Counterclockwise Correction (cont.)

Thrust Angle	Sight Distance (IN)	Increase in Shim Thickness @ Location 3 or Location 4 (IN)	Increase in Shim Thickness @ Location 3 and Location 4 (IN)
Refer to Figure 20 for shim location.			
.20	-	-	-
.30	287.00	3/16	-
.40	215.24	1/4 or	1/8
.50	-	-	-
.60	143.49	3/8 or	3/16
.70	-	-	-
.80	-	-	-
Offset = 1 3/4 inch			
.10	-	-	-
.20	-	-	-
.30	-	-	-
.40	251.12	1/4 or	1/8
.50	-	-	-
.60	167.41	3/8 or	3/16
.70	143.49	-	-
.80	-	-	-
Offset = 2 inch			
.10	-	-	-
.20	-	-	-
.30	-	-	-
.40	286.99	1/4 or	1/8
.60	191.32	3/8 or	3/16
.70	-	-	-
.80	143.49	-	1/4

Reference for Table 2

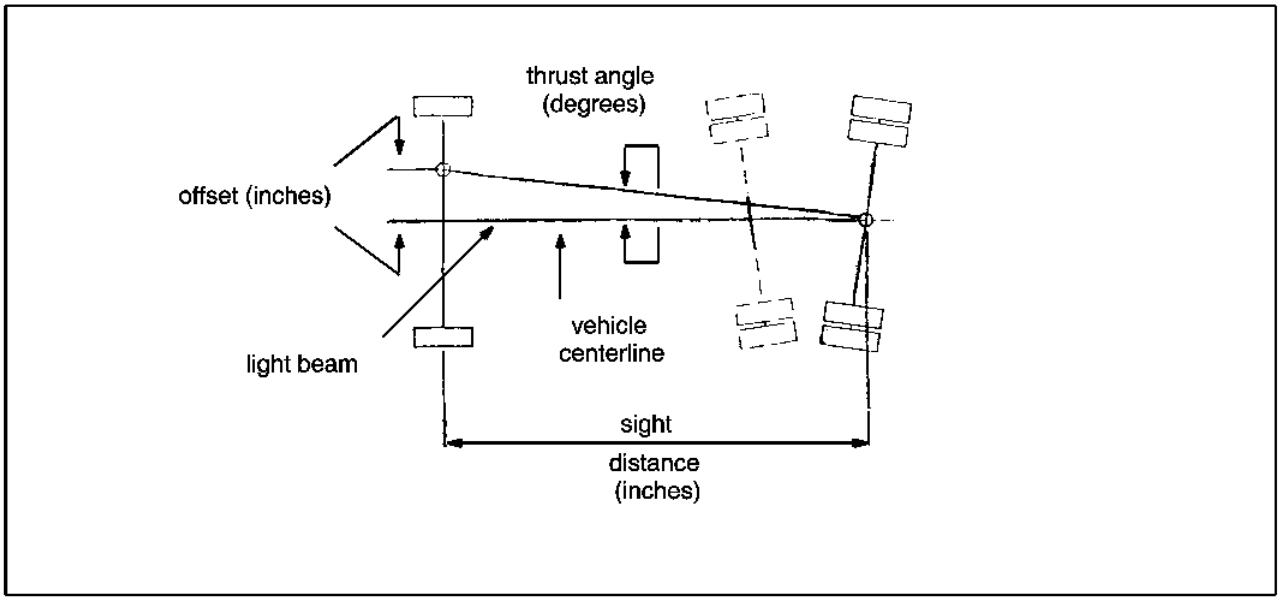

Figure 24 Reference For Table 2

Figure 25 and Figure 26 show you where the shim thickness must be increased to correct any thrust angle condition.

NOTE – For correction requiring that only one shim be changed, the change in thickness can occur at either location. For correction requiring that two shims be changed, the change in thickness will occur at both locations.

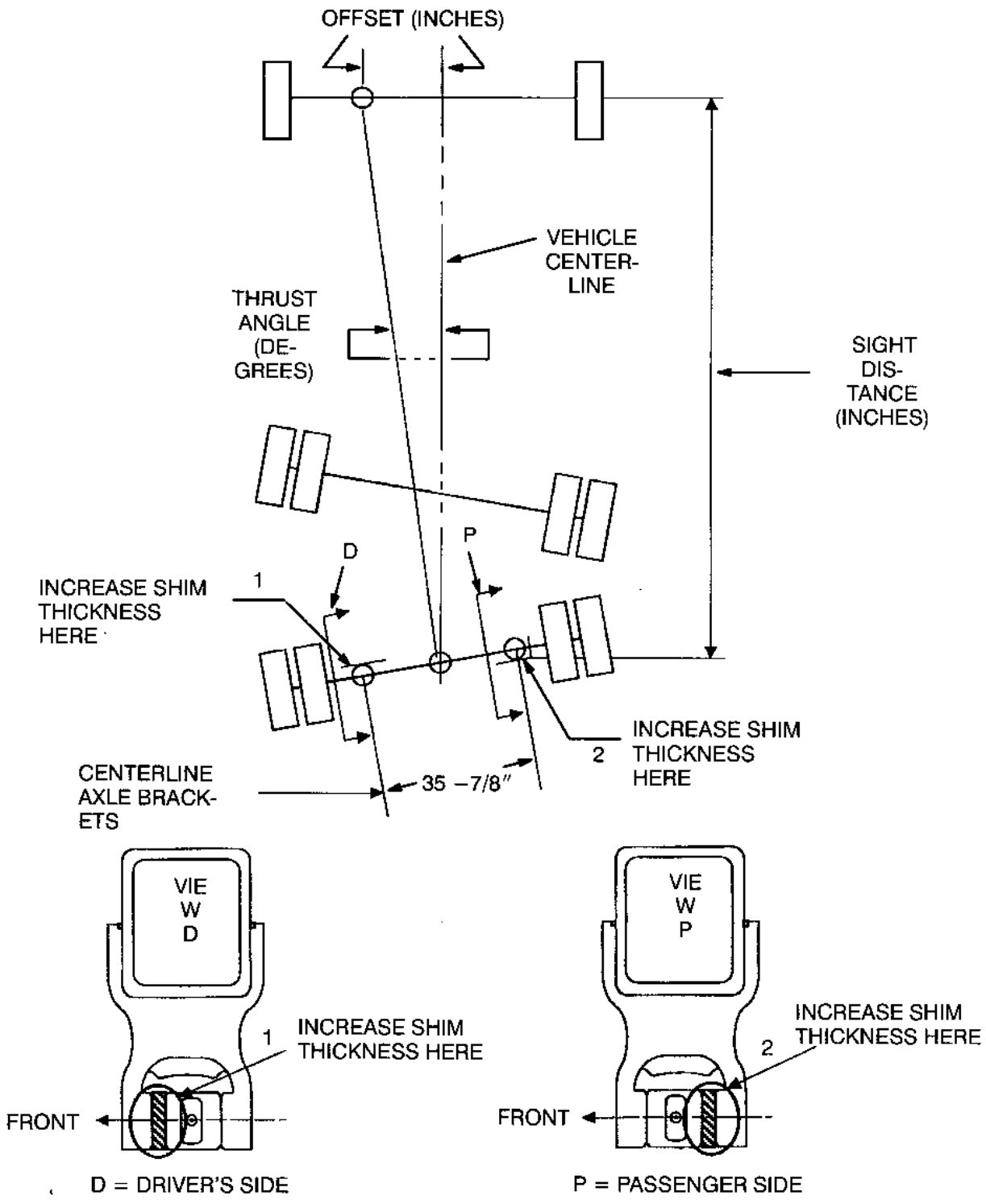

Figure 25 Clockwise Thrust Angle Correction

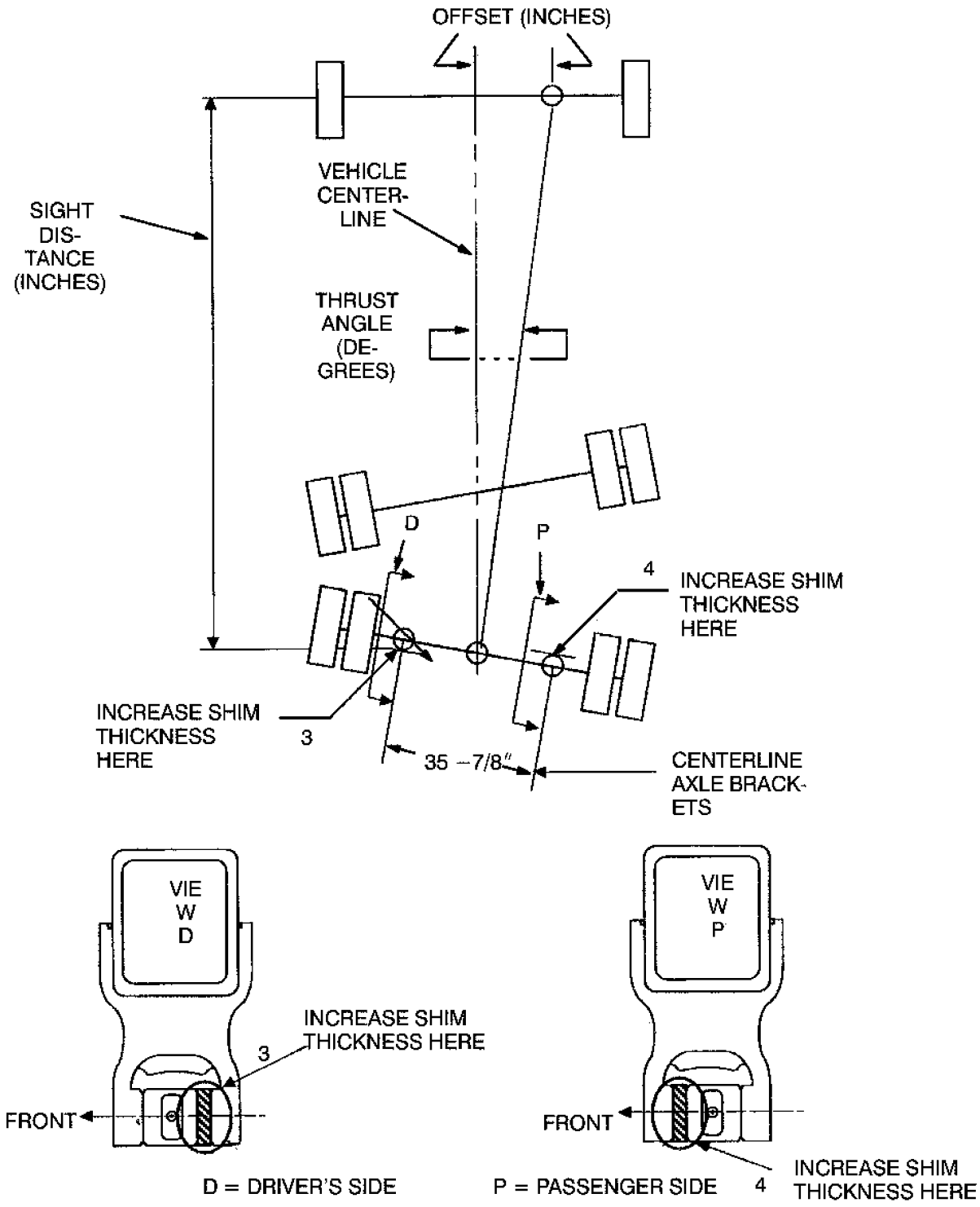

Figure 26 Counterclockwise Thrust Angle Correction

4. There are two methods which can be used to gain access to the shims for adjustment. Method B is the recommended procedure.

a. Remove the four nuts from the saddle cap studs and remove the bar pin bolts from the side of the vehicle that is to be adjusted. Then lower the beam for access to the shims.

b. The shims can be removed without dropping the beam end. To remove the shims, it is necessary to closely match the angle on the bar pin casting with the angle of the legs on the axle bracket. By matching these angles, the preload or pinching action on the shim is relaxed and the shim can be removed. These angles can be matched by jacking against the bottom of the axle differential carrier. Use a screwdriver or a pair of pliers to remove the shim.

5. Take the necessary precautions to prevent the vehicle from rolling.

6. Disconnect the upper torque rods at either the vehicle frame or the axle end.

7. Remove the weight from the tandem axles by jacking at the rear of the vehicle frame.

8. Remove both 1.0 inch bolts from the bar pin beam end connection(s) that requires adjustment to correct the thrust angle misalignment. Most vehicle conditions can be corrected by adjusting only one beam end connection with two shims.

9. Install corrective shims to the bar pin beam end connection that is being adjusted. If the beam end was dropped from the axle bracket, it must be jacked back up into the axle bracket. If the beam end remained in place within the axle bracket, the shims are slipped by hand into the gap(s) between the axle bracket and the bar pin casting. Proper angular alignment between the axle bracket legs and the bar pin casting should be maintained to permit easy insertion of the shims.

   NOTE – There must be two shims at each beam end connection. Both shims at any connection MUST have the same orientation. The same part number shim MUST be used at both locations on any beam end.

10. When the beam end connection holes align with the axle bracket holes, install new 1.0 inch bolts and washers. The bolts can be inserted from either direction. Tighten nuts to specifications. Refer to TORQUE CHART.

11. Recheck the thrust angle to insure that the proper adjustment has been made. Make corrections if necessary.

Front Rear Tandem Axle Adjustment

After the proper thrust angle adjustment is corrected on the rear axle of the tandem, the spacing between tandem axles can be adjusted.

1. First determine axle spacing by means of a tape measure, trammel bar or direct computer readout. Record axle spacings on driver and passenger sides of the vehicle. Determine the difference in axle spacing from side to side.

2. If the axle spacing difference is less than 1/4 inch, do nothing.

3. If the axle spacing difference equals or exceeds 1/4 inch, the following procedure is recommended.

4. The illustration in Figure 27 requires a clockwise front tandem axle rotation to correct the non-parallel axle condition. Figure 28 requires a counterclockwise front tandem axle rotation to correct the non-parallel axle condition. The amount of parallel misalignment will determine how much adjustment is required.

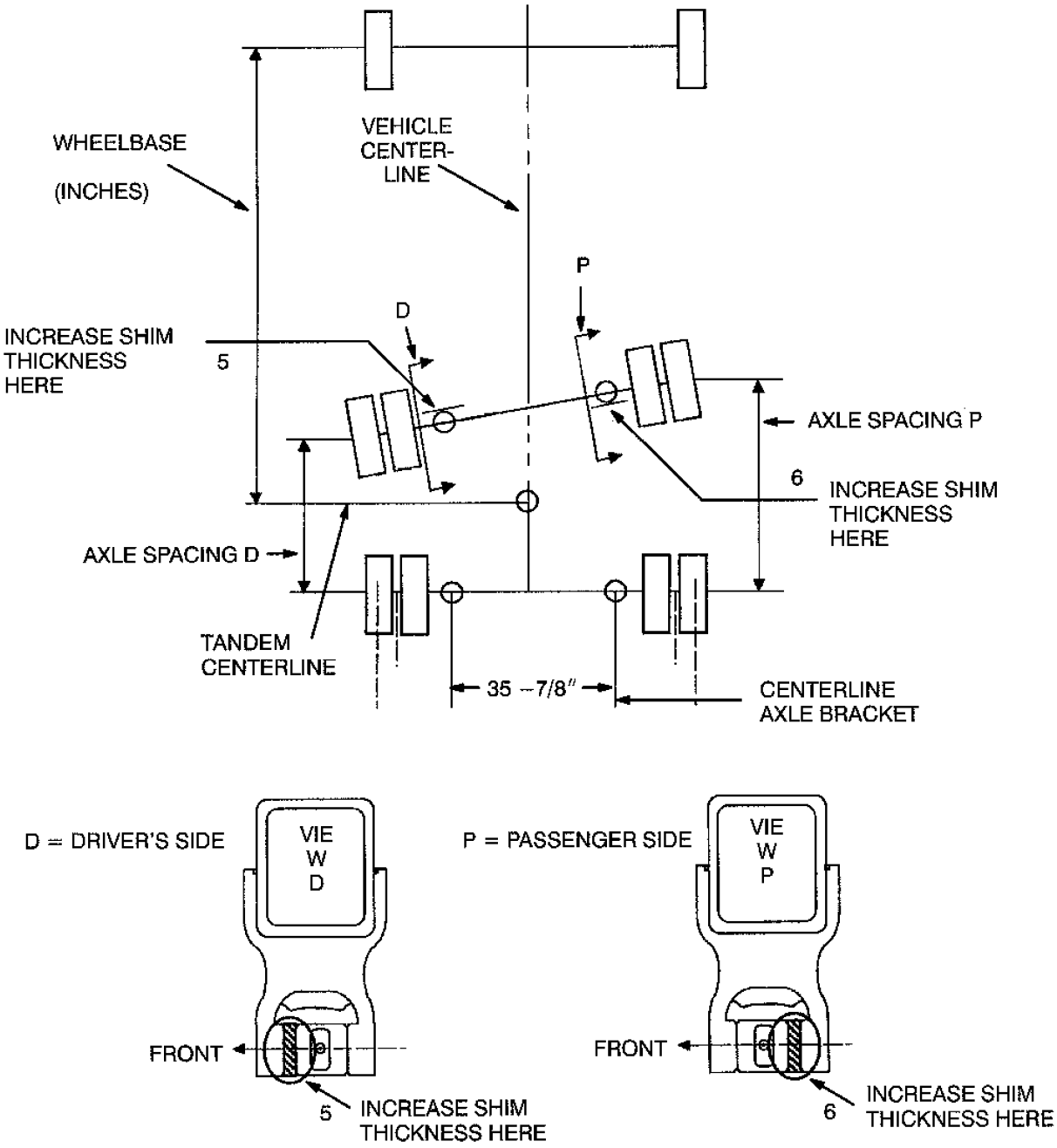

Figure 27 Clockwise Out-Of-Parallel Correction

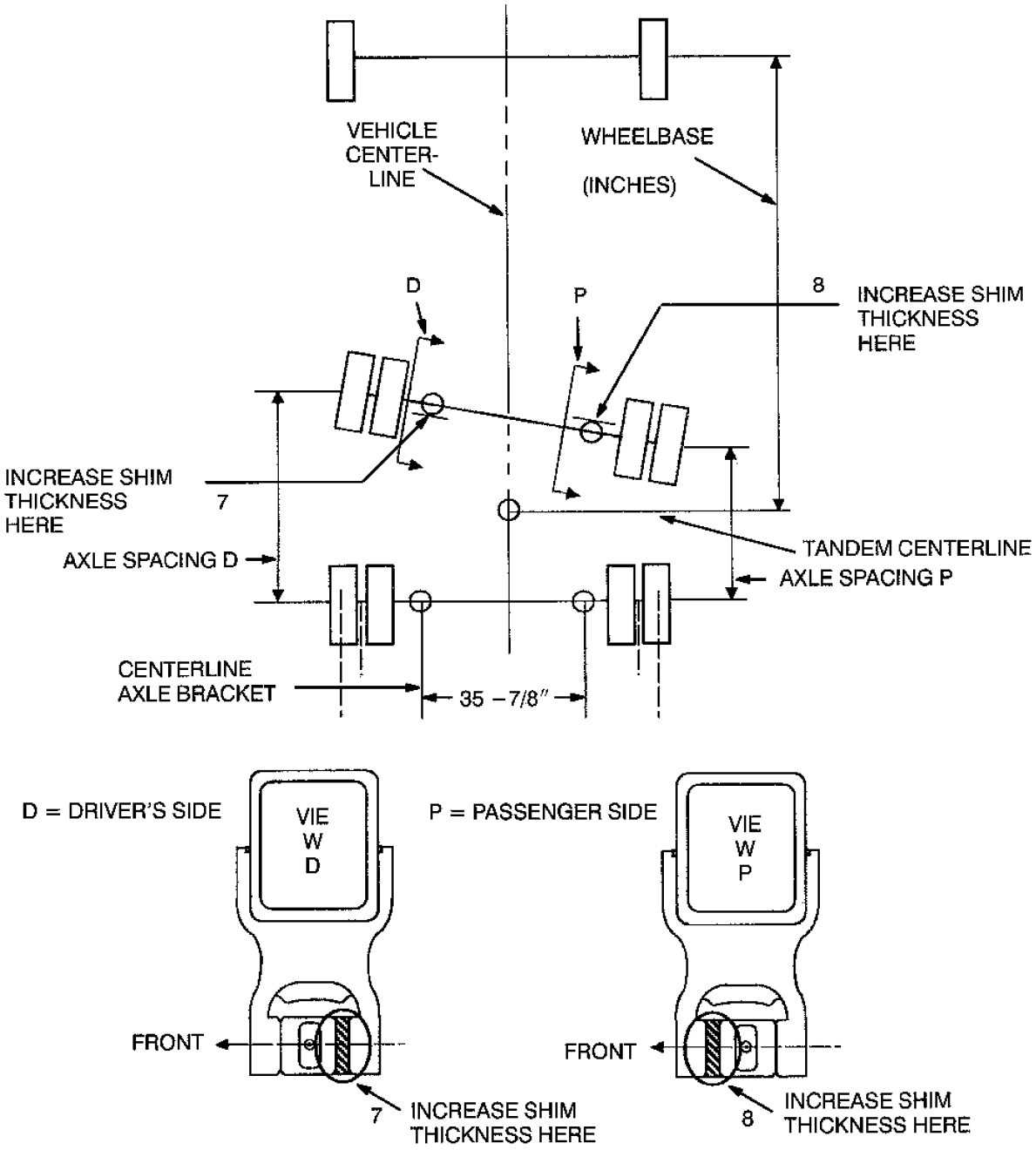

Figure 28 Counterclockwise Out-Of-Parallel Correction

5. The following formulas determine exactly how much increase in shim thickness is needed to correct any tandem axle non-parallel condition depending on the method of correction.

   ONE BEAM END CORRECTION - FRONT TANDEM AXLE

Thickness increase (inches) = 0.374 x Difference between tandem axle spacing on passenger and driver sides (inches)

TWO BEAM END CORRECTION - FRONT TANDEM AXLE

Thickness increase (inches) = 0.187 x Difference between tandem axle spacing on passenger and driver sides (inches)

Round the calculated thickness increase to the nearest 1/16 inch. Table 3and Table 4 provide a quick means of determining thickness increase versus tandem axle out-of-parallel measurement. For those cases not shown in these tables, the above formulas must be used.

6.

Table 3 Axle Spacing/Shim Thickness Clockwise Correction

Rear Tandem Axles Out of Parallel by (IN)	Increase in Shim Thickness @ Location 5 or Location 6	Increase in Shim Thickness @ Location 5 and Location 6
See Figure 21 for reference.		
0	-	-
1/16	-	-
3/16	1/16	-
1/4	-	-
5/16	1/8 or	1/16
3/8	-	-
7/16	-	-
1/2	3/16	-
9/16	-	-
5/8	-	-
11/16	1/4 or	1/8
3/4	-	-
13/16	-	-
7/8	-	-
15/16	-	-
1	3/8 or	3/16
1 1/16	-	-
1 1/8	-	-
1 3/16	-	-
1 1/4	-	-

Table 4 Axle Spacing/Shim Thickness Counterclockwise Correction

Rear Tandem Axles Out of Parallel by (IN)	Increase in Shim Thickness @ Location 7 or Location 8	Increase in Shim Thickness @ Location 7 and Location 8
See Figure 22 for reference.		
0	-	-
1/16	-	-
3/16	1/16	-
1/4	-	-
5/16	1/8 or	1/16
3/8	-	-
7/16	-	-
1/2	3/16	-
9/16	-	-
5/8	-	-
11/16	1/4 or	1/8
3/4	-	-
13/16	-	-
7/8	-	-
15/16	-	-
1	3/8 or	3/16
1 1/16	-	-
1 1/8	-	-
1 3/16	-	-
1 1/4	-	-

Figure 27 and Figure 28 show where the shim thickness must be increased to correct any tandem axle non-parallel condition.

7. Before the actual correction procedure can begin, you must know the "before adjustment" shim part number and the orientation at the beam end(s) requiring adjustment. Inspect the vehicle and relate the actual vehicle shim part number and orientation to determine the "before adjustment" shim thickness at the beam end(s).

8. Loosen and remove the 1.0 inch bolts at the beam to axle connection(s) which requires adjustment. Remove the shim from the beam end/axle bracket connection.

9. Install the proper shims to the bar pin beam end connection that requires adjustment.

NOTE – There MUST be two shims at each beam end connection. Both shims at any connection MUST have the same orientation. The same part number shim MUST be used at both locations on any beam end connection.

10. With the shims properly adjusted and positioned, install new 1.0 inch bolts and washers. Recheck the axle spacing to confirm that the axle spacing from side to side is within 1/4 inch. Tighten nuts to specifications. Refer to TORQUE CHART.

11. Reassemble the upper torque rods. Refer to TORQUE CHART, for specifications.

12. Remove the vehicle from the frame jacks.

4. LOAD EQUALIZATION

Substantial changes in fifth wheel location or suspension load will affect equal load distribution between the axles. Load equalization is affected by installing spacers between the leaf spring assemblies and the axle housings.

Check load distribution as follows:

1. If vehicle is equipped with an adjustable fifth wheel, place in normal operating location.

2. Apply a load to the suspension equal in capacity to the normal operating load.

   IMPORTANT – Avoid using a full platform scale. Use only a single or tandem axle scale. Make sure the scale is level when taking a weight reading.

3. When weighing the forward rear axle, the flat portion of the tire tread of the rear rear axle should be just at the edge of the scale, as in Figure 29 .

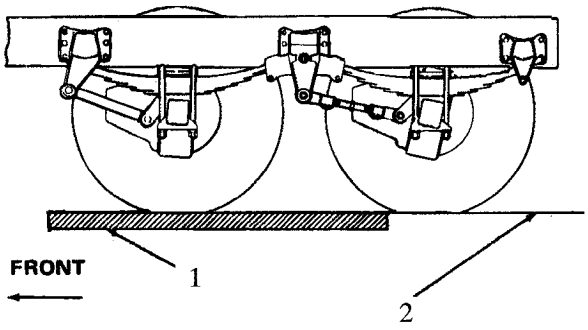

Figure 29 Weighing The Forward Rear Axle

1. TANDEM SCALE
2. GROUND LINE

4. To weigh the rear rear axle, the flat portion of the tire tread of the forward rear axle should be just at the opposite edge of the scale, as in Figure 30 .

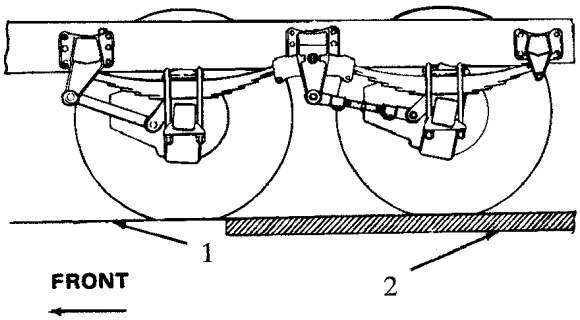

Figure 30 Weighing The Rear Rear Axle

1. TANDEM SCALE
2. GROUND LINE

5. Weigh and record (forward and rear) rear axles individually. When placing vehicle on scale, bring vehicle to an easy stop, using trailer brakes only.

6. Equalize weight differences in (forward and rear) rear axles by installing spacers between the leaf spring assemblies and the axle housings. If the tandem axle can be adjusted to within 500 pounds (1102 kg), it is generally acceptable. Spacers must be installed on both sides of the lighter axle. Use the charts in Figure 31 and Figure 32 to determine the amount of spacers required and at which axle they should be installed.

   Examples:

   a. Forward rear axle 1100 pounds heavier. Use 1/2 inch spacer under rear rear axle.

   b. Rear rear axle 1800 pounds heavier. Use 3/4 inch spacer under forward rear axle.

   CAUTION – Do not use more than two spacers of any combination per side.

   Spacers for the International Four-Spring suspension are available through the Parts Distribution Centers and are listed in SPECIFICATIONS. Spacers for other four-spring suspensions used on International vehicles will have to be made locally.

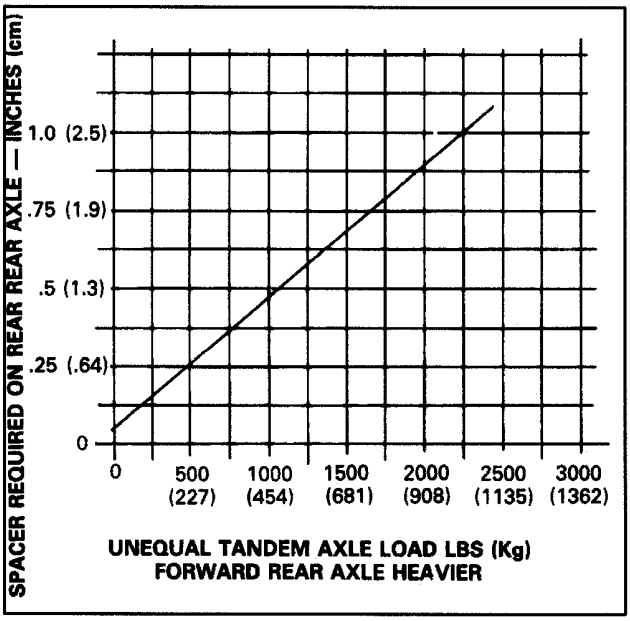

Figure 31 Spacers Required With Heavier Forward Rear Axle

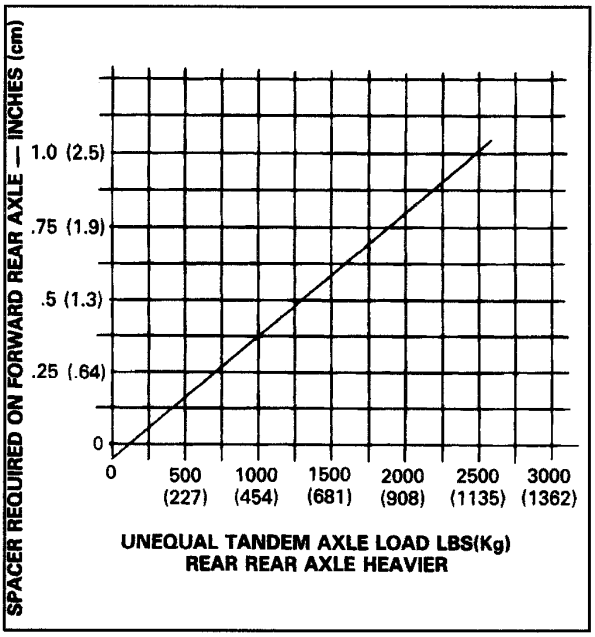

Figure 32 Spacers Required With Heavier Rear Rear Axle

5. REAR SUSPENSION ALIGNMENT (COMPONENTS)

5.1. SPACERS FOR INTERNATIONAL SUSPENSIONS

Table 5 Spacers for International Suspensions

Description	International Number
Spacer 0.25 inch	493720-C1
Spacer 0.50 inch	493721-C1
Spacer 0.80 inch	493722-C1

6. SPECIFICATIONS

6.1. TORQUE CHART

Table 6 Torque Chart

Location	Ft-Lbs.	N•m
Torque Rod Clamp Bolt Nuts (Reyco)	80	108
Torque Leaf Bolt Nuts (Reyco)	160 - 200	317 - 270
Torque Rod Mounting Bolts (International)	200 - 240	271 - 325
Torque Rod Mounting Nut (Hendrickson)	500 - 600	675 - 810
Bar Pin Bolt/Nuts (Hendrickson)	450 - 600	610 - 810