



Spicer® Axles & Brakes P/N: SHAIS133

WORK INSTRUCTIONS – DANA KIT PART NUMBER: 326837

Reference:

Kenworth Campaign Number: 01KW7

Kenworth Recall Bulletin Number: C-E-101

Below are work instructions for the replacement of specific tie rod end crosslink and brake assemblies from vehicles equipped with Dana E-1000I or E-1200I steer axles and Dana ES165-5L ES brakes.

Tie Rod Assembly Replacement

1. Disconnect the tie rod end.
2. If the cross tube is being replaced, count the number of exposed threads on the tie rod end.
3. Loosen the clamp nut and unscrew the tie rod end.
4. Install new tie rod ends or new cross tube.

NOTE: Cross tube has right-hand and left-hand threads for corresponding sides of the vehicle.

5. Thread tie rod end into cross tube past the tube split. The number of threads exposed from the tube should be equal on both left and right tie rod ends.

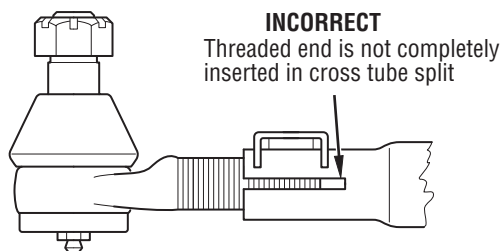
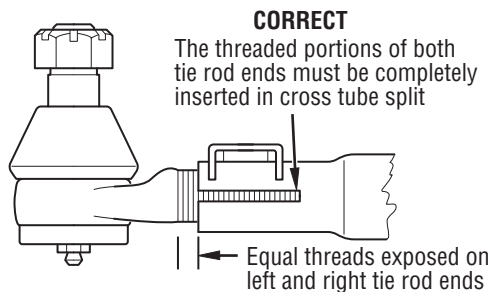
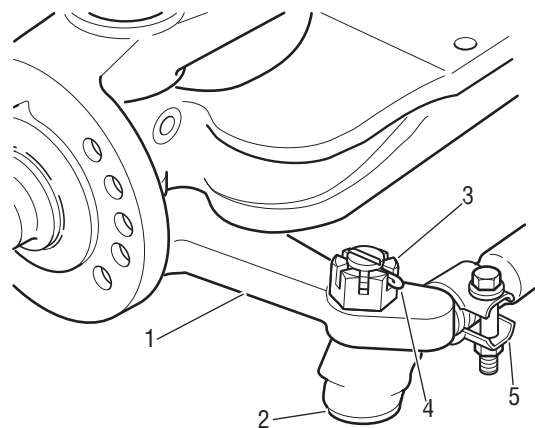


Figure 1

6. Tighten the clamp nut to 45-60 ft. lbs. (61-81N \cdot m). Make sure the tab on the clamp holds the end of the cross tube.

7. Install tie rod end into knuckle tie rod arm. Secure with slotted nut and tighten to 120-160 ft. lbs. (163-217 N \cdot m).



- 1 – Tie rod arm
- 2 – Tie rod end
- 3 – Slotted nut
- 4 – Cotter pin
- 5 – Position clamp fastener away from beam

Figure 2

8. Install the cotter pin in the slotted nut and bend the ends to secure. If necessary, tighten the nut until the holes align.
9. Adjust toe-in.

NOTE: On tie rods with rotating clamp, position clamp with fastener away from beam.

General Information

! **DANGER:** Avoid creating dust possible cancer and lung disease hazard

While Dana does not offer asbestos brake linings, the long-term effects of some non-asbestos fibers have not been determined. Current OSHA Regulations cover exposure levels to some components of non-asbestos linings but not all. The following precautions must be used when handling these materials.

1. **AVOID CREATING DUST.** Compressed air or dry brushing must never be used for cleaning brake assemblies or the work area.
2. **DANA RECOMMENDS THAT WORKERS DOING BRAKE WORK MUST TAKE STEPS TO MINIMIZE EXPOSURE TO AIRBORNE BRAKE LINING PARTICLES.** Proper procedures to reduce exposure include working in a well ventilated area, segregation of areas where brake work is done, use of local filtered ventilation systems or use of enclosed cells with filtered vacuums. Respirators approved by the Mine Safety and Health Administration (MSHA) or National Institute for Occupational Safety and Health (NIOSH) should be worn at all times during brake servicing.
3. Workers must wash before eating, drinking or smoking; shower after working, and should not wear work clothes home. Work clothes should be vacuumed and laundered separately without shaking.
4. OSHA Regulations regarding testing, disposal of waste and methods of reducing exposure for asbestos are set forth in 29 Code of Federal Regulations §1910.001. These Regulations provide valuable information which can be utilized to reduce exposure to airborne particles.
5. Material safety data sheets on this product, as required by OSHA, are available from Dana.

Brake Maintenance Preliminary Steps

Prior to performing any maintenance requiring removal of the tire and wheel, the following preliminary steps must be taken to ensure your safety. Refer to Figure 3.

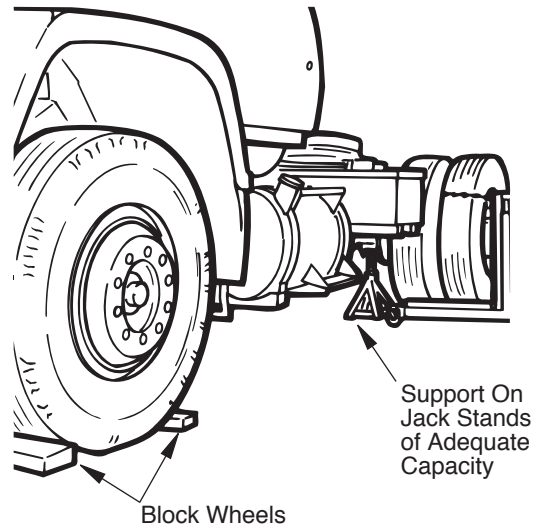


Figure 3

1. Set parking brake and block wheels to prevent vehicle movement.
2. Raise drive axle with a jack and support on suitable stands.

! **WARNING:** Never work under a vehicle supported by a jack.

3. Cage spring-type brake chamber following vehicle manufacturer's instructions.

Removal/Disassembly

Drum Removal

1. Perform “**Brake Maintenance Preliminary Steps**”.
2. While depressing locking sleeve, back off brake adjuster adjustment nut on manual brake adjusters. Refer to Figure 4. Continue turning until shoes are fully returned to released position and clear of drum. On self adjusting brake adjusters, follow manufacturer’s instructions.

NOTE: With outboard mounted drums go to step 6.

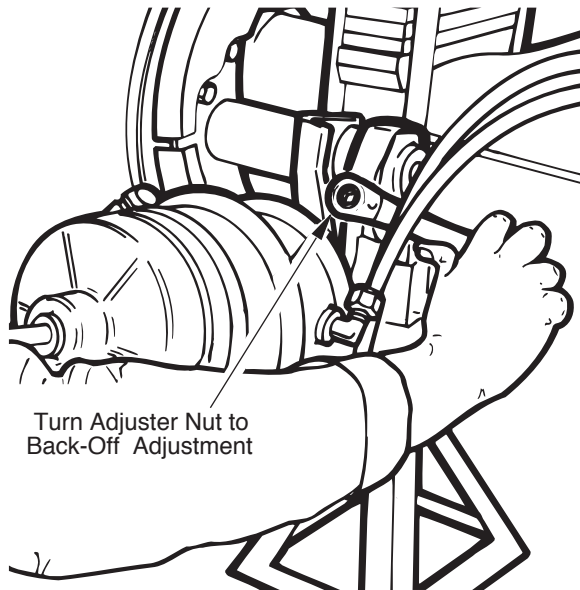


Figure 4

3. On drive axles, remove stud nuts and axle shafts. If used, remove lockwashers and taper dowels. If necessary, loosen dowels by holding a brass drift in the center of the shaft head and striking it a sharp blow with a hammer. On trailer and steer axles, remove hub cap.

! WARNING: Do not strike the axle shaft flange with a hammer. Do not use chisels or wedges to loosen shaft or dowels.

4. Remove axle spindle nut(s) and washer.
5. While rocking drum, pull outboard enough to allow removal of outer wheel bearing.
6. Remove drum by pulling outboard while rocking from side to side. If shoes are not clear of drum, return to Step 2 above.

! CAUTION: If difficulty is found on removal, do not force drum. Excessive pulling force may damage brake components.

Brake Shoe Removal

EB models (except EB-150-4L) / ES-165-5D,L / ES-165-6D,L / ES-165-7D, F, L / ES-150-8D, F / ES-150-4D / ES-150-6D / ES-165-8D, F, L

1. Perform steps in **Removal/Disassembly: Drum Removal**.
2. **ES-165-5,6,7,8,D,L,F, ES-150-4D, ES-150-8D, F & 6D ONLY:** Pry roller retainer coiled loops out of both shoe web holes as shown in Figure 5. Pivot roller retainer to swing loops clear of shoe webs.

NOTE: EB models do not have roller retainers.

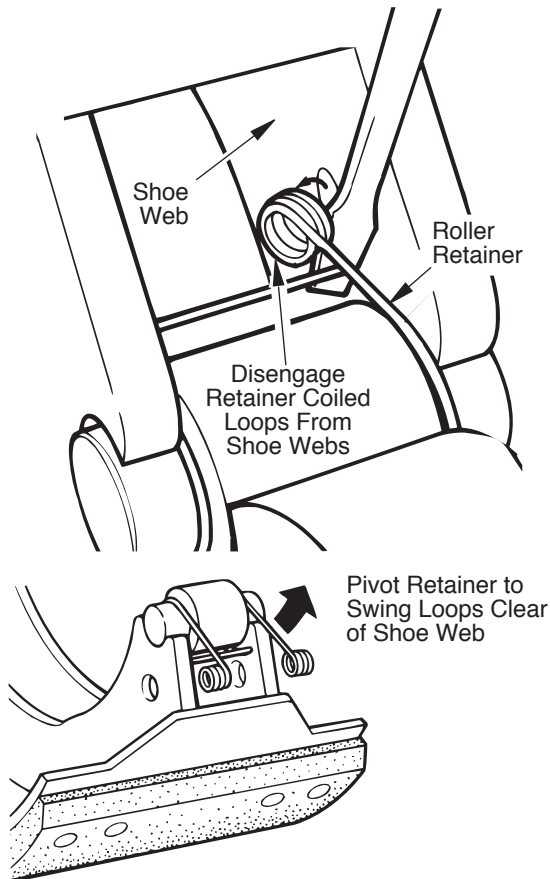


Figure 5

WARNING: The long term effects of non-asbestos fibers have not been determined. Therefore, precautions should be used when handling these materials. See General Information / Lining Material Warning

3. Using a large screwdriver or lever, lift upper shoe to stretch return spring as shown in Figure 6.

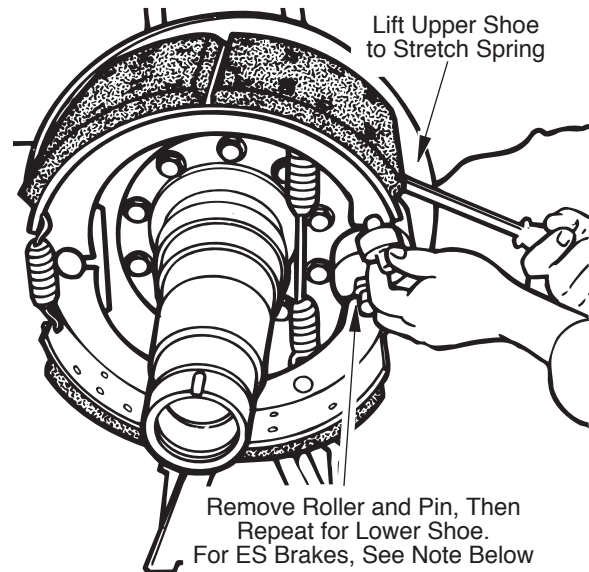


Figure 6

4. Remove upper cam roller and pin.

NOTE: ES-165-5,6,7,8D, L, F, ES-150-4D, ES-150-8D, F & 6D ONLY: Remove roller and roller retainer as a unit.

5. Repeat Steps 2 through 4 to remove lower shoe roller and pin.

NOTE: Dana recommends the use of a suitable brake tool when removing rollers and return springs.

6. Push cam end of both shoes toward cam and unhook shoe return spring. Remove and discard spring.

NOTE: To remove return spring, position a lever or suitable tool with notch to engage spring rod. Refer to Figure 7. Apply downward force to stretch spring, allowing removal of upper spring hook. Remove and discard spring.

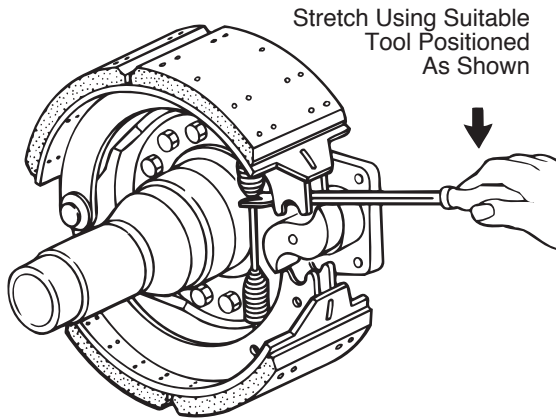


Figure 7

NOTE: ES-165-5,6,7L,D/ES-150-6D steer axle brakes may use two return springs with a horse collar or dual spring post. To remove return springs, position a lever or suitable tool with notch to engage spring. Return to Figure 7. Apply downward force to stretch upper spring, allowing removal of upper spring hook. Remove and discard. Repeat procedure for lower spring.

7. Rotate both shoes around anchor pin and remove from vehicle. Refer to Figure 8.
8. Clean and inspect remaining parts as outlined in removal/disassembly section of this manual.

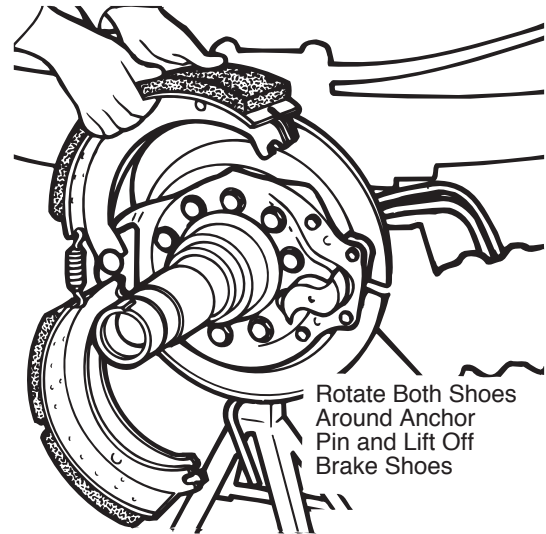


Figure 8

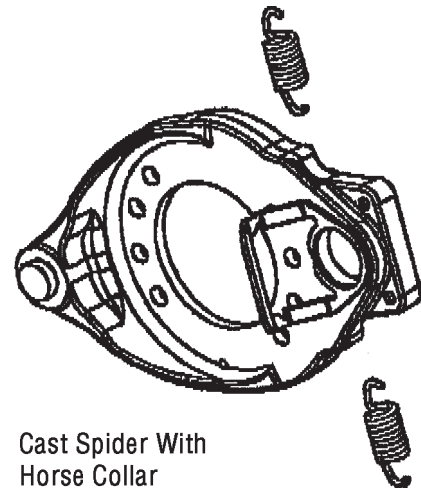


Figure 9

Installation/Assembly

Brake Shoe Installation and Adjustments

All EB (except EB-150-4L) and ES-165 5/6/7/8D, F, L

NOTE: The following procedures are divided into sections, identified by brake model numbers.

1. See **Inspection & Repair / Replacement** to verify that spider camshaft, bracket, and brake adjuster are serviceable and properly installed.
2. During shoe installation, lubricate:
 - Shoe roller recess - one-piece roller.
 - Roller I.D. - two-piece roller.

CAUTION: Use only grease conforming to NLGI grade #1, high-temperature, waterproof.

Do Not Lubricate:

- Cam head surface. For efficient operation, this surface must remain free of oil, grease or other contaminants.
3. Hook ends of new retainer springs into holes in both shoe tables, hooks pointing out.
 4. Position upper and lower shoes around anchor pin. Refer to Figure 10.

WARNING: The long term effects of non-asbestos fibers, have not been determined. Therefore, precautions should be used when handling these materials.
See General Information / Lining Material Warning

5. Install a new shoe return spring. Refer to Figure 11.

NOTE: On ES-165-D, 1, F, a lever may be required to assist in hooking shoe return spring.

With Retainer Springs
Installed, Position
Upper and Lower Shoes
Around Anchor Pin

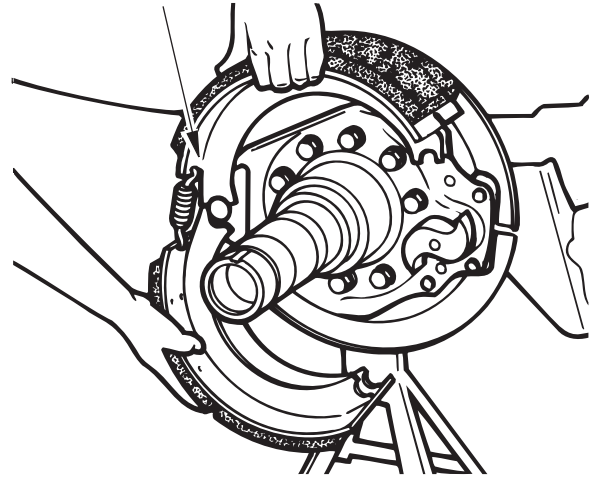


Figure 10

ES-165-D,L,F Only:
Stretch Spring Using Suitable
Tool Positioned as Shown

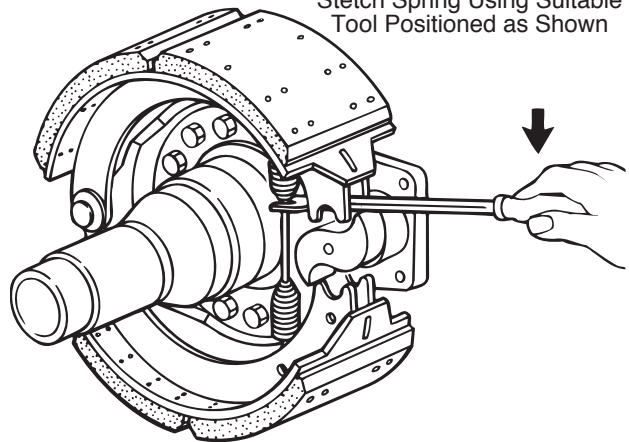


Figure 11

- For ES-165 5/6/7/8D, L, F, ES-150-4D, ES-150-8D, F & 6D only:

Assemble roller retainer on ends of roller as shown in Figure 12.

Install Retainer on Roller

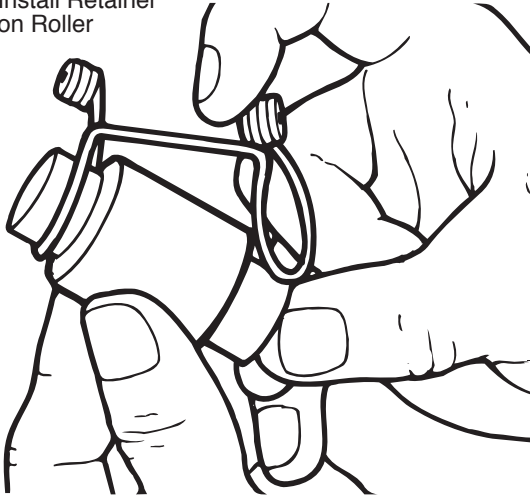


Figure 12

- Using a lever or large screwdriver, stretch shoe return spring to allow insertion of new pin and roller, (or roller and retainer assembly) on the lower shoe web. Refer to Figure 13.

NOTE: If drums are oversized, use oversize rollers, see **Inspection-Drum Inspection**.

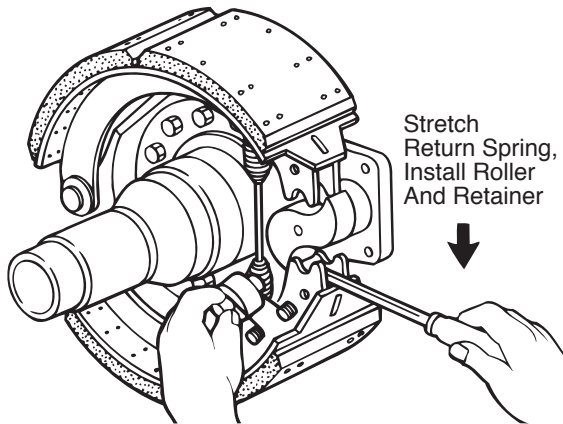


Figure 13

- For ES-165 5/6/7/8D, L, F, ES-150-4D, ES-150-8D, F & 6D only:

Position assembly in roller recess as shown. Squeeze loops and swing retainer into position to snap loops into web holes. Refer to Figure 14. Verify that both retainer loops are engaged in web holes before proceeding.

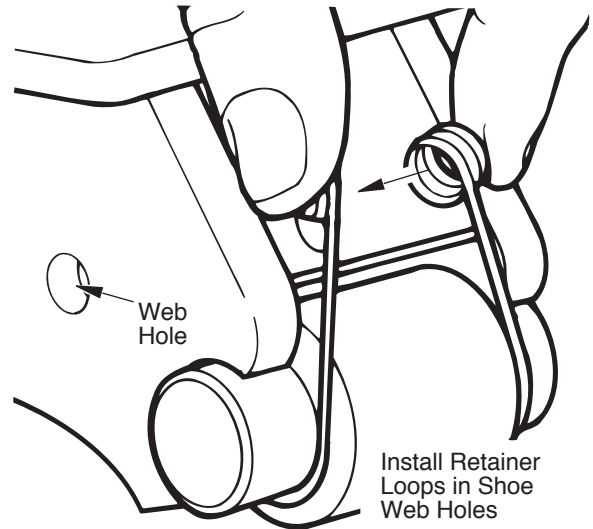


Figure 14

- Repeat process on upper shoe.

NOTE: For all EB Models a roller retainer is not used.

Brake Adjustment - Manual Brake Adjuster

NOTE: An assistant is required to make a brake adjustment.

WARNING: Block all wheels before beginning this adjustment procedure

To determine whether Dana Brakes require adjustment, applied stroke is measured and compared to the maximum value for the air chamber size in use on the vehicle.

1. Perform “**Brake Maintenance Preliminary Steps**” described earlier.
2. With air chamber pushrod fully retracted, measure distance from face of air chamber to centerline of clevis pin hole. Refer to Figure 15. If the measurement is not within ranges shown in Table 1, reposition clevis. Remeasure the distance and repeat until within range. Record exact measured distance as dimension “A”.

Distance: Clevis Pin Hole Centerline to Air Chamber Face	
All brakes (except Mack and Trailer Axle)	2-5/8" ± 1/16" (66.7 ± 1.59 mm)
Mack brakes	4-3/8" ± 1/16" (111.1 ± 1.59 mm)
Trailer Axle brakes	6-1/2" ± 1/8" (165.1 ± 3.175 mm)

Table 1

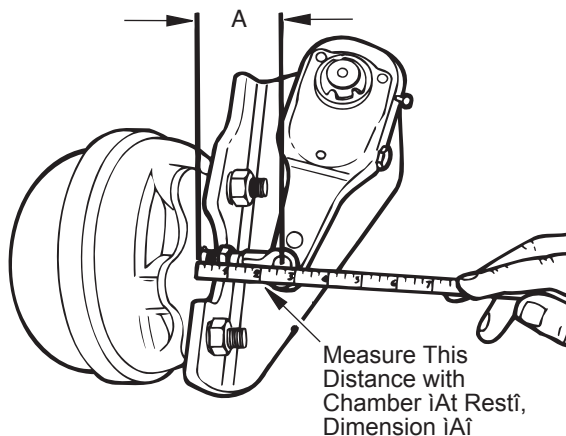


Figure 14

3. Apply and hold an 80 psi brake application, and again measure from face of air chamber to clevis pin centerline. Refer to Figure 16. Record distance as dimension “B”.

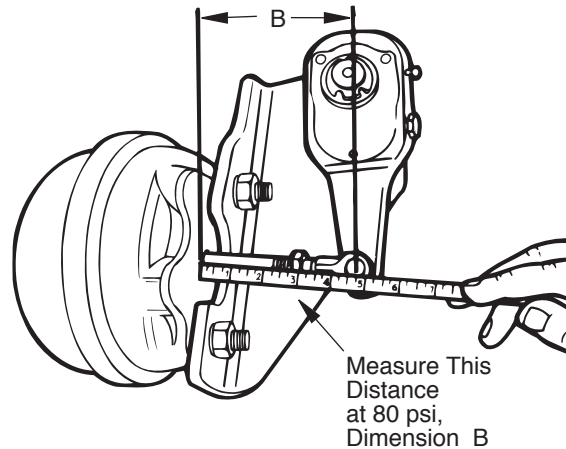


Figure 15

4. Subtract dimension “A” from “B”. The difference is applied stroke. Compare applied stroke to maximum value in Table 2. If applied stroke equals or exceeds maximum applied stroke shown, adjust brakes. If less than the maximum, no adjustment is required and you may perform Brake Operation Check.

80 - 90 PSI		
Air Chamber Size	Maximum Applied Stroke	Desired Free Stroke
Type 30" Long Stroke	2.5"	3/8" to 5/8" (Without Drag)
Type 30"	2"	
Type 24"	1-3/4"	
Type 24" (with 2-1/2" extended stroke)	2"	
Type 24" (with 3" extended stroke)	2.5"	
Type 20" and 16"	1-3/4"	3/8" to 1/2"
Type 12"	1-3/8"	3/8" to 1/2"

Table 2

NOTE: If adjustment is necessary, Dana Brakes are adjusted to achieve proper free stroke. The difference between free stroke and applied stroke is merely the method used to move the brake adjuster from rest. Applied stroke uses an 80 psi brake application; free stroke is measured using a lever to move the brake adjuster until the brake shoes contact the drum. If applied stroke exceeded the maximum and adjustment is necessary, adjust the brakes as described in steps 5 through 8 below.

- Take "A" dimension exactly as before. Take "B" measurement using a lever to move brake adjuster as shown until the shoes contact drum. Refer to Figure 17. The result of "B" - "A" is brake free stroke. Adjust free stroke to within range specified in Table 2.

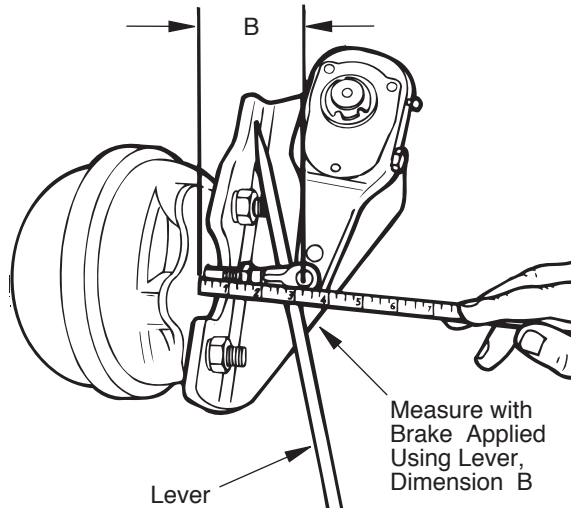


Figure 16

- To adjust free stroke, depress locking sleeve on brake adjuster adjustment nut and turn in direction required. Recheck free stroke to verify it is within range. Make sure sleeve is "locked" when adjustment is completed.
- Verify that brakes are not dragging by spinning wheels by hand or tapping drum lightly with a hammer and listening for a sharp ringing sound.
- Perform **Brake Operation Check**, to verify proper operation of brakes before releasing vehicle for service.

Brake Adjustment - Self Adjusting Brake Adjuster

- Brake adjustment for self adjusting brake adjusters is the same as for manual brake adjusters.
- Refer to the **Self Adjusting Brake Adjuster Manufacturer's Instructions** for proper installation.

Brake Operation Check

NOTE: An assistant is required to make a thorough brake operation check.

- Apply brakes to 80 psi and hold. Check all air line fittings and air chambers for leakage.
- Apply and release brakes while observing operation of brake adjusters on each axle. As brakes are applied and released, brake adjusters should move in unison visually.
- Investigate source and make corrections for any discrepancies found in Steps 1 and 2.
- Drive vehicle at low speeds in a safe area and make several brake applications to verify safe operation and absence of pulling, grabbing, or noise. If any of these are noted, investigate and repair prior to releasing vehicle for service.



CAUTION: Never release a vehicle for service if any brake discrepancy - no matter how minor - is evident.

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Dana Corporation
Commercial Vehicle Axle Division
P.O. Box 321
Toledo, Ohio 43697-0321