

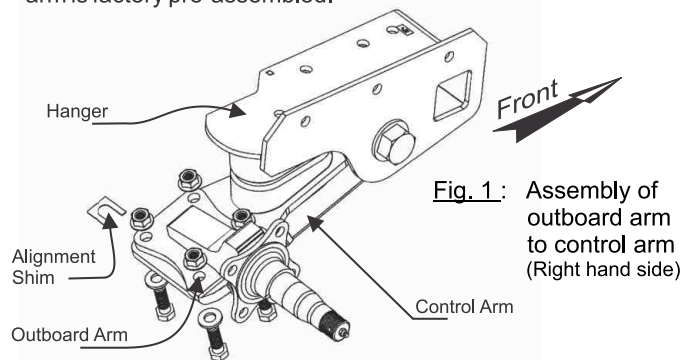
## Installation Instructions

### IMPORTANT NOTE

- ◆ The **Axle•Less** suspension provides many advantages and permits many innovative designs for trailers. There is no thru axle and therefore the two sides of suspension are completely independent. The absence of an axle tube, however, means there will need to be comparable strengthening of the trailer frame, especially at the areas where the suspension is installed. The function of a regular axle as a structural member must be compensated by strengthening / reinforcing the trailer frame itself to prevent excessive bending or twisting of the frame. At the very least this means that the top plate of the suspension frame bracket be fully supported and firmly fastened (bolted/welded) to robust cross members of the frame or to the inboard extension of the frame rail itself or both. Timbren will not be responsible for damage caused by insufficient strengthening of the frame<sup>(1)</sup>.
- ◆ Use extra caution in case you need to disassemble the suspension; be aware that both Aeon rubber springs (Jounce and Rebound) are factory pre-loaded.
- ◆ **Axle•Less** suspensions are NOT recommended for tri-axle applications. Even loading is important (Since there is no equalization between axles).

### Procedure:

1. Install outboard arm on control arm using 4 bolts and washers and shims as required (verify that bolts are grade 8). Fig. 1 shows what the right hand side should look like; the left hand side is the mirror image. Torque fasteners to 90-95 ft-lbs (122-129 N.m). Skip this section if outboard arm is factory pre-assembled.

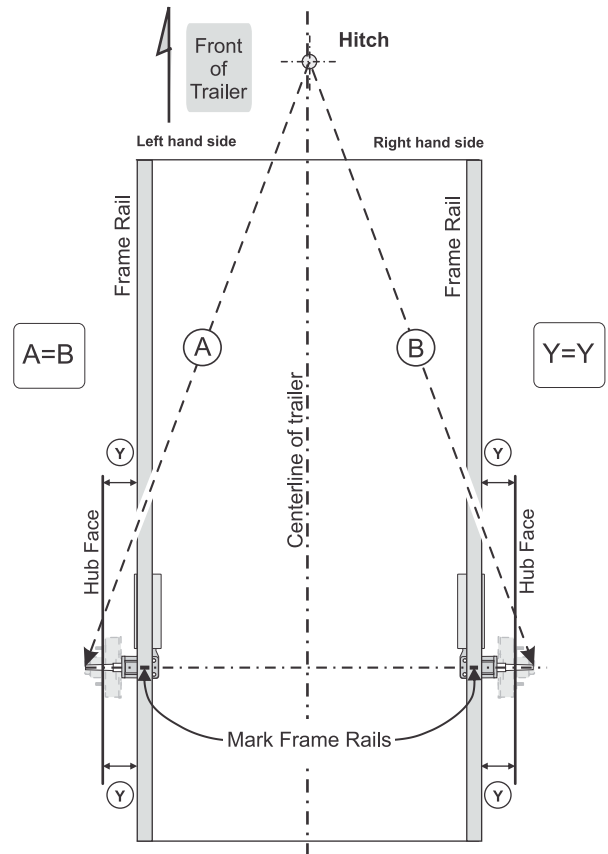


**Fig. 1:** Assembly of outboard arm to control arm (Right hand side)

2. Make sure frame is perfectly square. Measure and compare the diagonal distances from one corner of frame to the opposite corner. Also measure and compare the distances from the hitch to each rear corner of frame. Ideally the measurements are identical (in each case the difference should be less than 1/8" (3 mm). Mark frame rails where centerline of spindles (wheels) should cross frame (fig. 2)<sup>(2)</sup>.

### Procedure: (Cont.)

3. Locate the left hand and right hand side hangers on frame rails, opposite to each other. Move hangers along frame until center of spindles line up with marks on the frame rails, viewing from top (fig. 2). Clamp hangers to frame. Measure and compare distances "A" and "B". Reposition hangers until the difference between "A" and "B" measurements is less than 1/8" (3 mm).
4. Be aware that the suspension has camber angles built in. The correct alignment can be obtained ONLY if frame and its crossmembers or mounting surfaces to the suspension are perfectly square and they are sufficiently strong to remain square under maximum loads. Slight camber adjustments and corrections may be necessary by using the shims between the outboard arm and control arm before tightening the 4 bolts.



**Fig. 2** Spindle Alignment (View from the top)

(1) To add rigidity to the trailer frame structure we recommend using rectangular-shape or fabricated box-form steel sections combined with crossmembers of larger sizes; ultimately it will be the trailer manufacturer's responsibility to make sure that the frame is strong enough to be used with the AxleLess suspension.

(2) Be aware that the driver side and passenger sides have their own factory built-in camber and therefore the two spindles do not need to be exactly parallel.

## Installation Instructions

### Procedure: (Cont.)

5. Bolt hanger side plate: <sup>(3)(4)</sup> (fig. 3): Use holes in the hanger side plate as a template (3 holes). Drill horizontal holes to the side of frame at each side of trailer. Use 1/2" UNC Gr 8 bolts, lock-nuts, and washers to mount hangers to frame (fasteners are not included). Torque mounting bolts to 90-95 ft-lbs (122-129 N.m).

6. Do either 6a or 6b (whichever is easier or more practical):

6.a) Bolt hanger top plate to frame<sup>(3)</sup>: Hanger top plate must be in full contact with the frame so that it can be bolted to frame. Use holes in the hanger top plate as a template and drill vertical holes (note that two 1/2" nuts are tack welded inside hanger). In case frame is not wide enough, hanger top plate can be bolted to crossmembers of frame instead (as long as those crossmembers are strong enough). If crossmembers exist but there is a gap between bottom surface of crossmembers and top of hanger then steel spacers (plates) should be used to fill up the gap. Drill common holes to bolt hanger to crossmembers. Use 1/2" UNC (grade 8) bolts and washers to mount hanger top plate to frame (fasteners are not included). The length of vertical bolts is critical. If bolt is too long then end of bolt inside hanger will interfere with control arm during operation of suspension which could lead to failure of bolt. If bolt is too short then it will not fully engage with nut and therefore, under full tension, it would cause stripping of threads of nut or bolt or fracture of bolt. Size of bolt: 1/2 UNC; Grade 8. Length of bolt must be only 7/8" longer than thickness of frame flange.

Example: if hanger of suspension is to be bolted to a C-channel crossmember, with 3/8" flange then use: Hex Head bolt, 1/2" UNC x 1-1/4" long Grade 8 ( $3/8" + 7/8" = 1-1/4"$ ). If trailer does not have crossmembers (but frame main beam itself is sufficiently strong to overcome torsion of frame) then fabricate an inboard extension and attach it to the frame. Reinforce it by gusset as necessary (fig. 3) to make it rigid.

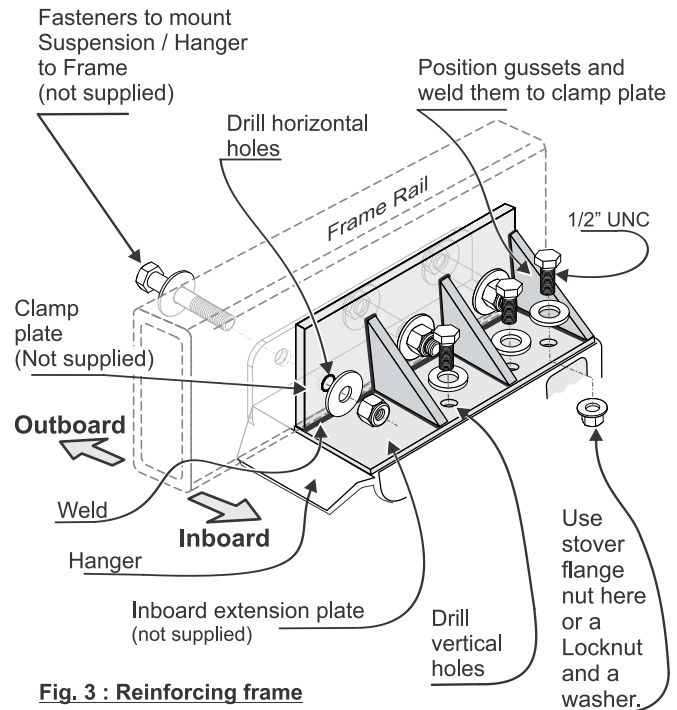
6.b) Skip procedure (6.a) and install a simple suspension crossmember if one or more of the following applies:

- You are retrofitting axles / suspensions on a standard trailer;
- The design of the trailer does not allow drilling vertical holes for bolting hanger top plate;
- Frame could be aluminum; creating frame inboard extension may not be practical;
- Frame crossmembers may not be located directly above hanger top plate and modifying or relocating them is not

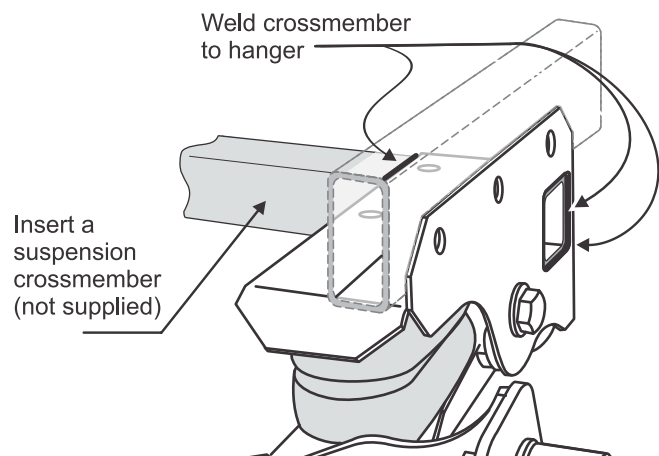
optional procedure:

Use a 2"x2"x 1/4" (minimum) structural steel tube section. Measure width of trailer and saw cut a piece to that length. Slide tube through corresponding opening in the driver and passenger-side hangers. Drill two holes at each end and bolt suspension crossmember to hanger or weld it at each end (fig. 4).

7. Remove clamps.



**Fig. 3 : Reinforcing frame**



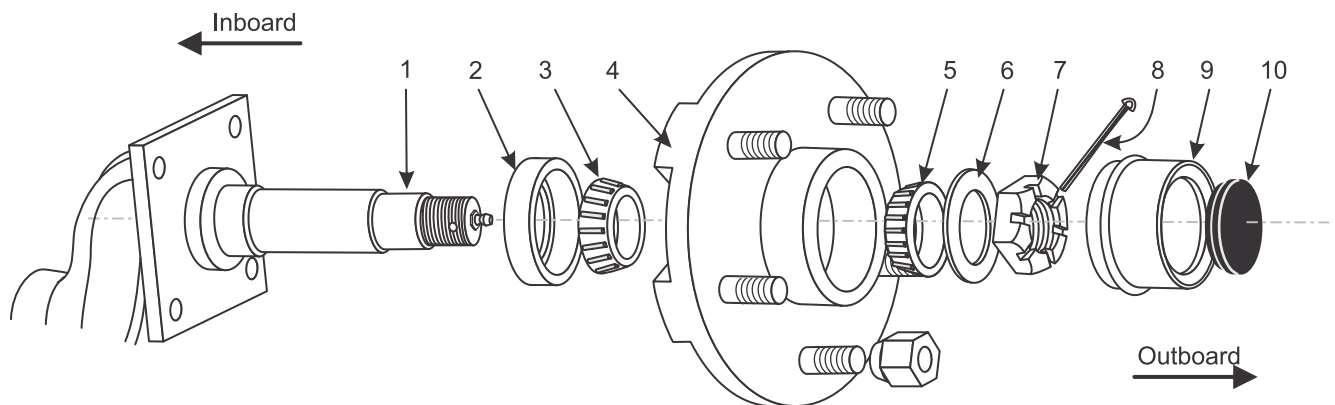
**Fig. 4 : Suspension crossmember installed**

(3) Welding the hanger is optional (instead of bolting it), but be aware that all paint around welding edges need to be ground off prior to welding. Protect Aeon® rubber spring from extreme heat generated during welding.

(4) When bolting the frame be aware that hollow (tubular) sections of frame may not be sufficiently strong to withstand compression of bolted joints and therefore may collapse unless they are reinforced; consider fabricating a bracket similar to the one shown in fig 3 which has a clamp plate to go between the nut/head of bolt and tube. Such bracket must be rigid enough to allow you to apply a full torque to bolts.

## Installation of Idler Hubs<sup>(a)</sup>

Grease<sup>(b)</sup> inner and the outer bearings ((3)&(5)). Insert inner bearing in its housing on the inboard side of hub (4). Insert the grease seal (2) on top of the bearing and make sure it is fully seated. Turn hub around, lift it and place it on the spindle (1) and slide it over into place. Insert outer bearing (5). Put washer (6) and install the castle nut (7) onto spindle. Tighten nut. Gently loosen it approximately 1/8 of a turn. Insert cotter pin (8) through castle nut and spindle hole and then bend the end around the spindle with a screw driver or pliers. Put the grease cap (9) and rubber plug (10) on.



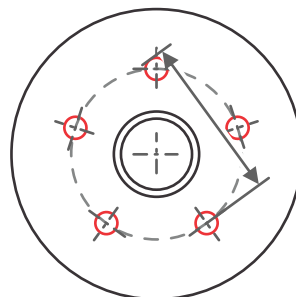
**Fig. 1 Typical 5 Bolt Idler Hub Assembly**

(a) Parts of this document regarding the installation and maintenance of hubs are applicable ONLY if hubs are supplied by Timbren Industries Inc.  
 (b) Use a high temperature automotive type wheel bearing grease. We recommend using Lithium complex type products with NLGI consistency of 2, with additives for EP (extreme pressure), corrosion and oxidation, dropping point of 419° F (min.) (or 215° C), with minimum viscosity index of 80.  
 (c) Always use NEW cotter pins (8).

## Identifying the bolt pattern of a hub

The bolt circle is the diameter of an imaginary circle formed by the center of the wheel hub

545 hub



545 hub = 5 bolts on a 4.5" bolt circle

An easy way to estimate a 5 lug bolt circle is to measure from the center on one hole to the BACK of the third hole.

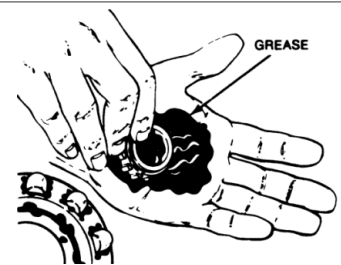
## Installation of Hubs <sup>(a)</sup> with Electric Brakes

Identify the left hand side (or L) and the right hand side (or R) brake (3A). You should be able to find either a label inside each brake assembly or a note stamped on the body of the brake itself for the purpose of identification. Install each brake to the backing plate of spindle arm at its corresponding side. The orientation of brake is important: the magnet inside the assembly must be towards the bottom (the slack adjuster then, will be at the bottom, brake shoe with shorter brake lining be at the front and the wires on the top). Position brake assembly against the flange. Place four 7/16" lockwashers (#5) and four 7/16" UNF nuts (6) to mount each brake. Apply 50-55 ft-lbs (68-75 N.m) of torque to each nut. Two wires on the inside of the backing plate must be connected to a brake controller which might be on either the trailer or the tow vehicle (not supplied).

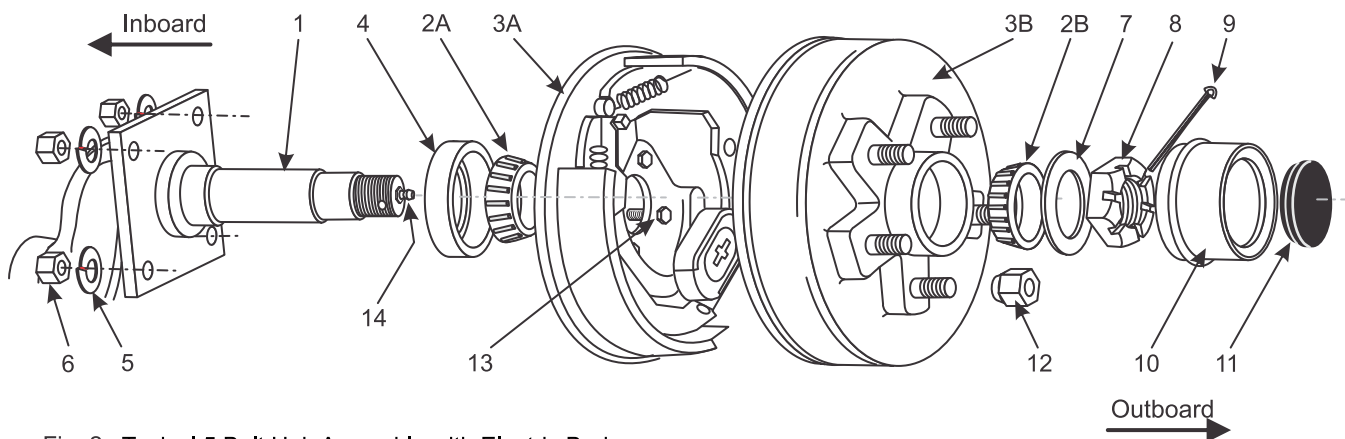
Hand pack <sup>(b)</sup> inner and outer bearings with grease ((2A)&(2B)). Insert inner bearing (2A) in its housing on the inboard side of hub (3B). Insert the grease seal (4) on top of the bearing and make sure it is fully seated.

Position hub (3B) and insert outer bearing (2B). Put washer (7) and castle nut (8) onto spindle. Tighten nut (8) to 200 ft-lbs. while rotating the hub. Back off one full turn. Tighten to 50 ft-lbs. while rotating the hub. Back off 1/4 turn. Insert cotter pin (9) through castle nut and spindle hole and then bend the end around the spindle with a screw driver or pliers. Put the grease cap (10) and fill hub with grease through grease zerk (14) while rotating hub. Stop greasing when grease uniformly comes out of the bearings.. Install rubber plug (11).

If available, bearings should be packed by machine. If unavailable, packing by hand is an acceptable method. Pack bearings by placing an amount of grease in the palm of your hand. Press the bearing into the outer edge of the grease, moving it across the pile. Roll the bearing to force grease into the rollers. Continue this process until you have the entire bearing filled with grease.



Before reinstalling the bearing, apply a light coat of grease onto the bearing cup mating surface.




**Fig. 2 Typical 5 Bolt Hub Assembly with Electric Brake**

(a) Parts of this document regarding the installation and maintenance of hubs and brakes are applicable ONLY if hubs and brakes are supplied by Timbren Industries Inc.  
 (b) Use a high temperature automotive type wheel bearing grease. We recommend using Lithium complex type products with NLGI consistency of 2, with additives for EP (extreme pressure), corrosion and oxidation, dropping point of 419° F (min.) (or 215° C), with minimum viscosity index of 80.  
 (c) Always use NEW cotter pins (9).



## Maintenance <sup>(a)</sup>

 **PRIOR** to doing any repair, inspection, or maintenance work under the trailer:

1. Park the trailer on solid, level ground such as a concrete or paved surface. Place the vehicle in park, set the emergency brake and use wheel chocks to prevent the vehicle from moving.
2. No work may be done under any vehicle supported only by a hydraulic or mechanical jack.
3. Additional safety devices such as jack stands are required in order to provide extra protection.

### Within the first week of operation:

- Retorque outboard arm (outboard arm) bolts to 90-95 ft-lbs (122-129 N.m).
- Retorque control arm pivot bolts to 430-470 ft-lbs (583-638 N.m).
- Retorque ALL bolts that are used to mount the hanger to frame (2 vertical bolts & 2 to 3 horizontal bolts) to 90-95 ft-lbs (122-129 N.m).
- Lift the trailer, turn wheels individually by hand and make sure they are running smoothly and there is no slack in the wheels when moved side to side. Tighten hub nut to take the slack out and re-check.

### Periodic maintenance (once after 4 months and then every 12 months afterwards or sooner)

Do a complete visual inspection of the suspension / hubs. Inspect all metal components, hangers, control arms, outboard arm and frame for cracks, deformed surfaces or broken welds. Check the bearings. Repair or replace according to the manufacturers recommendations. Check the alignment. Check that all bolts are tightened to a torque specified. Repack bearings and hubs with new grease. Spinning the bearing during grease application is often recommended to evenly coat the bearing. Replace grease seals if necessary.

### Bushing Lubrication

Grease suspension bushings every 12,000 miles or twelve months. Securely lift suspension. Find grease nipple (nozzle) underneath tube of control arm where arm is attached to hanger; use grease gun / applicator (either a hand gun applicator or automatic pistol one); fill bushing housing with grease until grease flows out at both ends of control arm. Continue until old grease is replaced with new grease. Wipe excess grease. Do not mix Lithium, calcium, sodium, or barium complex greases due to the possibility of contamination problems.

(a) Parts of this document regarding the installation and maintenance of hubs are applicable ONLY if hubs are supplied by Timbren Industries Inc.

**Note on  
 TOE-IN Alignment**

Definition of "Toe"

Toe is defined as the inward and outward angle of the tires with respect to the front of the vehicle. With toe-in, the front of the tires is closer together than the rear. Toe-out is the opposite.

Measuring Toe

While frame is upside-down and suspensions & hubs are installed:

Use two 30 inch long straight edges. Hold each against the hub face.

Measure the distance F from the front of one straight edge to the other with respect to the front of the trailer and record the measurement.

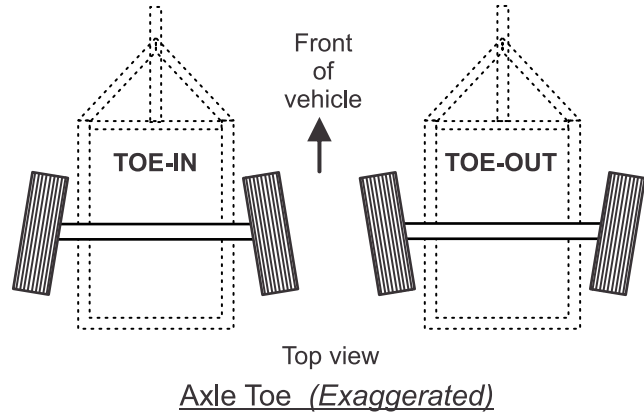
Measure the distance R from the rear of one straight edge to the other and record the measurement.

Subtract F from R to find the toe.  $R - F = \text{TOE}$

If TOE is a positive number, then the suspension will be toed-in.  
 If TOE is a negative number, then the suspension will be toed-out.

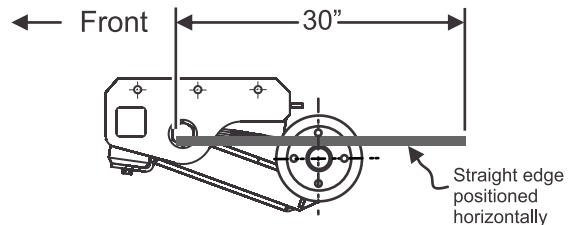
Adjusting Toe-In

Loosen all 4 mounting fasteners of each outboard arm. Rotate outboard arm until proper toe is reached (see Proper Toe Criteria). Torque bolts as per specified values in the installation instructions.



**CRITERIA**

**$0'' \leq (\text{TOE-IN}) \leq +1/16''$**



Side view of suspension

