

**Trunnion Adjustment - Double Barrels Only**

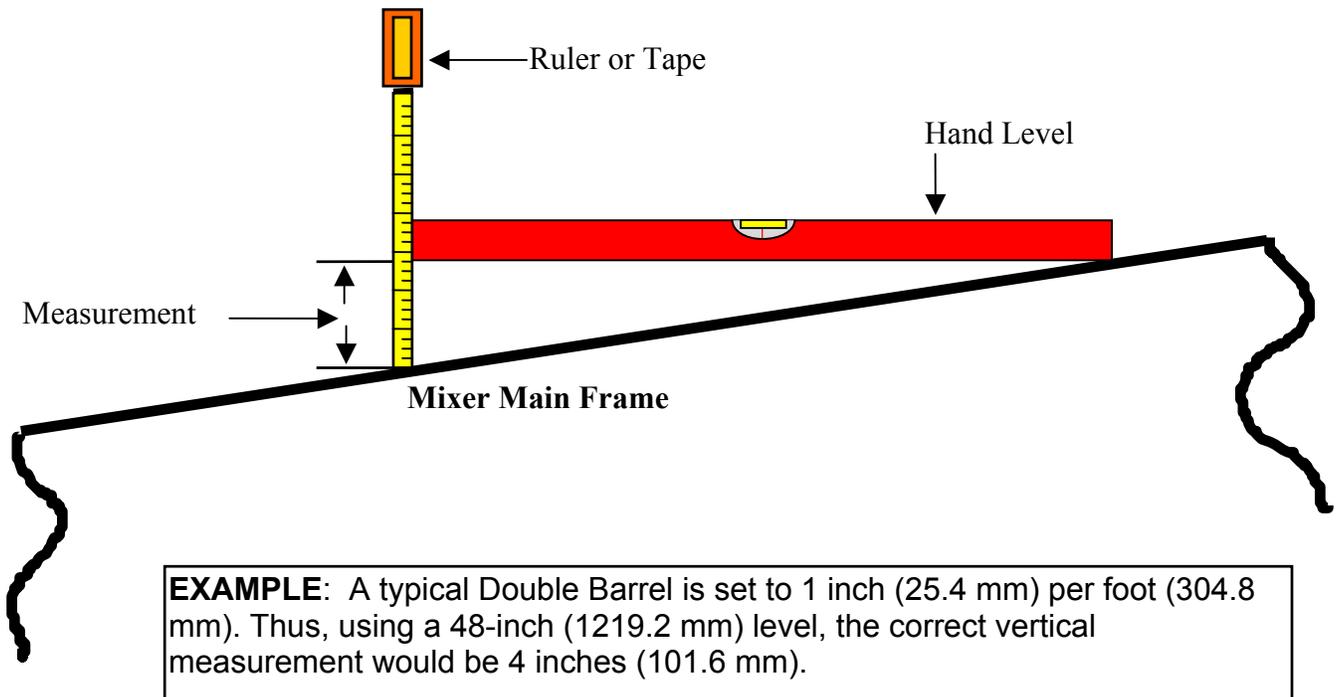
<b>Equipment:</b>	Double Barrels With Sloped Trunnions	<b>Date Issued:</b>	9-24-03
<b>Additional:</b>	SIL # 016	<b>Revised:</b>	5-13-2004
<b>Reference:</b>		<b>Revision #:</b>	1
<b>By:</b>	R. L. Worth Jr., Service Support Coordinator	Astec Service Department	

The following instructions are intended for use with an Astec Double Barrel Drum Mixer® with sloped style trunnions only. If you are not sure if these instructions should apply to you, contact the Astec Service Department at (423)-867-3754. Applying these procedures to machines other than a Double Barrel Drum Mixer, with sloped style trunnions, may result in premature wear or failure of components. For a detailed explanation of trunnion adjustments refer to SIL # 016, Trunnions by R. L. Worth, Astec Service Support Coordinator.

First, the plant site must be flat, level, and hard. The proper fit up of all components depends on it. If the site is not firm enough to properly support the equipment, no amount of adjusting can correct to problems that will result. **The drum must set on a firm, flat, and level foundation.**

The following three procedures (slope, level, and string line) actually are all done at once. This is because adjusting one may change one or both of the others. For simplification they will be addressed individually. The order this author is going to follow may or may not work best for you.

**SLOPE:** The end-to-end slope of the Double Barrel is predetermined and set at 1 inch per foot (25.4 mm / 304.8 mm). **Figure 1**, demonstrates the correct way to use a level and tape to measure slope.



**Figure 1.** Using a level and ruler to establish slope.

**STRING LINE:** String line means straight. Make sure the frame members are straight from one end to the other. You can sight down the frames on most Double Barrels. On others you may have to run a line down both sides of the drum frame. It is usually easiest to go along the bottom of the frame. If you have to use spacers at each end to clear structure or components, then do so. Spacers can be made of anything. Just make sure they are of equal length. On portable plants you may want to make them permanent. With the string held away from the frame a measurement can be taken from the string to the frame to find high or low areas. On portable plants use the jacklegs to straighten the frame. On permanent installations use shims, or whatever, between the frame and legs (or foundation), to do the same.

String-line accuracy directly affects how many shims will have to be used under the trunnions. This procedure is more critical on a portable unit than a stationary. On a portable unit you do not want to have to repeat everything every time you move. It is a lot of work to set face contact! The only way to insure you do not have to re-shim is to bring the frame back to a known position every **time** you move. The easiest position to find every time is also the right one ... **straight!**

**LEVEL:** Check the side-to-side level of the drum frame, using a device long enough to span straight across the frame (if possible), or a water level. Of particular importance are the blocking points, which are generally also right under the trunnions. Make sure the frame is level side to side. Use the jacklegs, shims or whatever is necessary to level the frame.



## **DANGER**

- **Lockout and tag-out the drum, and any other equipment necessary to insure a safe work area.**
- **Death and injury may result from working with this equipment without following a “LOCK-OUT” procedure as described in the OSHA regulations.**
- **Any item that is subject to shifting during maintenance should be secured in a way that will prevent it from moving (even if all potential sources of energy have been locked-out).**
- **To avoid falls when working above ground level, use the proper safety, supporting, lifting, and suspension equipment. Inspect all such equipment and be sure it is in good condition.**
- **Account for all persons before starting any equipment.**

**FACE CONTACT:** Refers to the contact area between the trunnion and tire. Basically, add or remove shims under the trunnion bearings until the surface contact is as even as possible. This sounds simple, but the catch is that the drum must be jacked up to change shims and lowered to check the results.

**SKREW :** Refers to the angle, or twist, of the trunnion in relationship to the tire. Skewing the trunnions is how we control the drum. The trunnions are used to “steer” the drum.

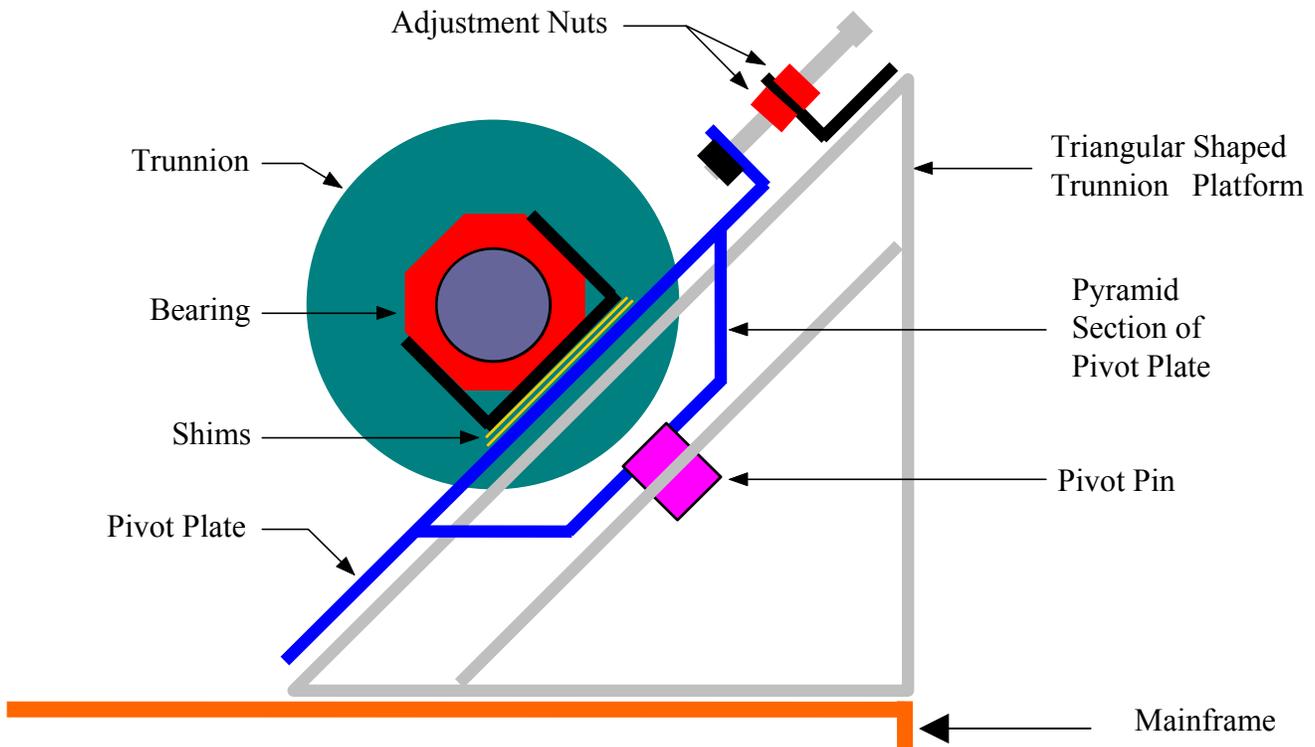
**NOTE:** On “sloped” style trunnions the two adjustments (face contact and skew) can be made independently of each other without adverse affects. On “flat” style trunnions one affects the other.

## SETTING FACE CONTACT

Remove the guards so that the contact area between the tire and trunnion can be seen. See if there is gap, how large it is, and which side it is on. Determine the amount of shims it will be necessary to add or remove. If you add or remove a shim from only one side of a trunnion, the effect will be 1/2 the thickness of the shim.

To change shims you must take the weight of the drum off the trunnion. If possible, raise one entire end at once. You may have to lift just one side at a time, by “tipping” the drum onto the opposite trunnion. If you do this, be sure to block between the tire and trunnion so the drum cannot roll. In either case, do not raise the drum any higher than necessary. Just take the weight off enough to add or remove shims. Once you get the weight off of the trunnion, you will have to raise the trunnion, shaft, and bearing(s). This can usually be done with a pry-bar.

The shim packs go under the bearings, on top of the pivoting plate. **Do not shim under the pivoting plate!** This will negate the benefit of the trunnion base design. See **Figure 2**, for shim location.



**Figure 2.** Side view of trunnion assembly.

## FINDING ZERO

Zero skew is when the sides of the trunnion are parallel with the sides of the tires. In this condition the trunnions are not trying to steer the drum in either direction. Failure to find zero after repairs or at start up is one of the major causes of trunnion failures. Start up refers to any time a drum is moved.

Loosen the bolts that hold the trunnion pivot plate to the base frame. These are usually 7/8 bolts that pass through 1 inch slotted holes. Starting in late 1997 this will be a bolt welded to the frame extending up through slotted holes in only the pivoting plate. This will place the “nuts” up. If the bolt head is up, pre-1998, there is a nut on the bottom you will have to hold.

Using at least a four-foot straightedge (the longer the better), place the straightedge firmly against the side of the trunnion so that it extends up along side of the tire (see **Figures 3 and 4, page 5**). The trunnion is wider than the tire, so it will extend past the tire on at least one side. It does not matter which side you use. However, the side that overlaps the tire most is usually easiest to use.

Measure the distance from the straight edge to the tire at two points (refer to **Figure 4**). These points need to be as far apart from each other as possible. In other words, get as high (A) and as low (B) as possible. Beware of the rolled edge that naturally develops on the outside of the tire; **do not measure to it. This measurement is critical! Best results are obtained using a dial caliper or some other type of precision measuring device.** Zero skew is the point where both measurements are equal.

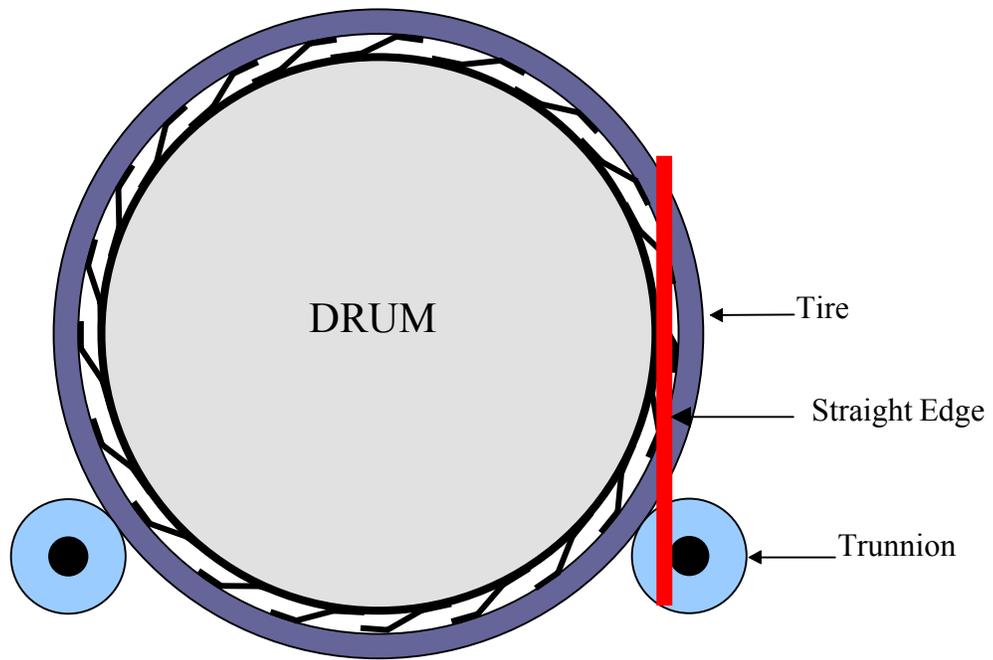
To skew the trunnion, you turn the adjustment nuts, **not the bolt!** There are two nuts on each bolt. They work together, you have to loosen one before you can tighten the other. Many times trunnions are neglected because the adjustment nuts are too hard to turn. Often this is because the pivot plate is jammed tight against the pivot pin. Please refer to **Figure 2, page 3**, for a reference of part locations. This pin fits quite snugly into its hole. There is less than 1/32 of an inch of clearance. Thus, it is easy to jam the pin by applying too much force to the adjustment nuts on just one side. **If you cannot move a nut do not force it. Go to the other side.** As you push (or pull) on one side of the pivot plate the bolts basically get longer or shorter. Since the plate is pivoting, the bolts must be able to slide within their slots. It may be necessary to loosen all the nuts except the one you are trying to tighten.

**Come “up” to zero from the downhill direction.** This will take the backlash out of the threads, of the adjustment nuts and bolts. We know that if we are going to skew a trunnion, any amount, it will be in the up-hill direction (this means the trunnion will be trying to move the drum in the up-hill direction). For an explanation of how to determine skewing direction read the following section -- on determining which way to skew trunnions.

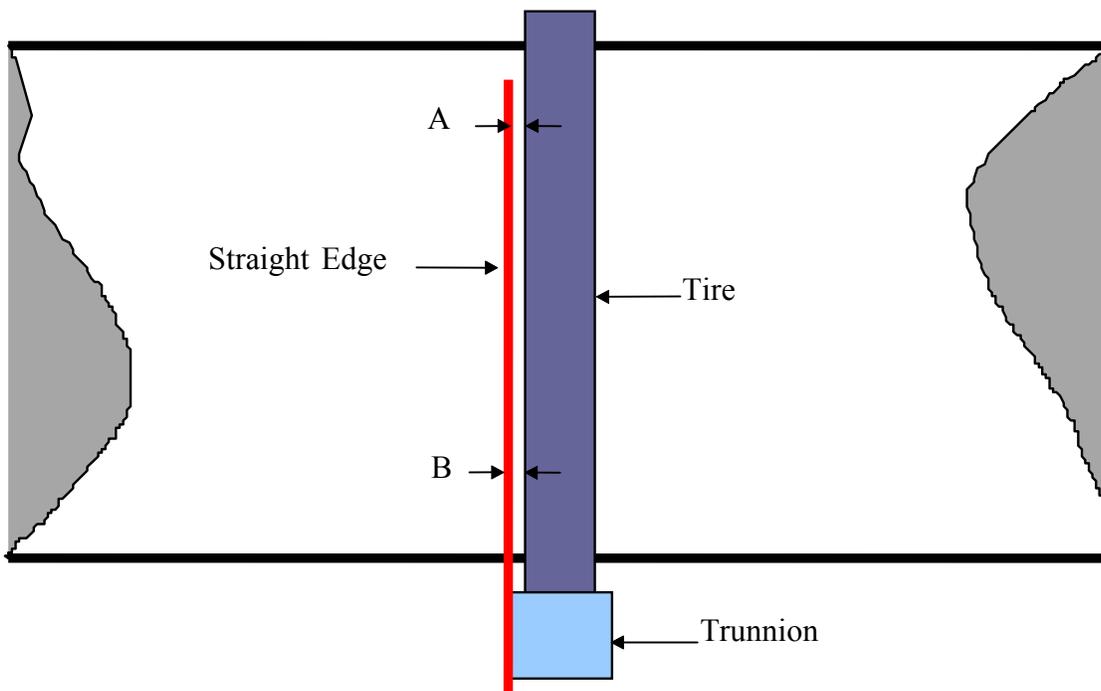
After you have all the trunnions set to zero, run the drum for a few minutes with the four locking bolts loose. This will allow excess stresses in the trunnion assemblies to “average out”. Then check zero again. If it has changed then set it again and run the drum again. If it continues to change you have a problem. One possibility is the tire is not straight on the drum. If the trunnion is still at zero then tighten the locking bolts.

If in doubt as to whether a trunnion is at zero or skewed, be sure the trunnion is **NOT** skewed downhill. Be sure you error in the up hill direction if you are not sure. Every time we have seen a major trunnion, or tire, wear problem ... one trunnion, or more, has been skewed in the downhill direction.

After you have finished setting zero on all trunnions, **replace all guards.** It will not be necessary to have them off any longer.



**Figure 11.** Using a straight edge along side of tire.



**Figure 12.** Measurement points A and B for setting

## DETERMINING WHICH WAY TO SKEW TRUNNIONS

**Go to the side of the drum that would be turning down towards you.** In other words, while the drum is running, if it were to jump off the frame it would roll over you. Pretend you have hold of a trunnion shaft with one hand on each side of the trunnion—like the handlebars of a bike. It can be either trunnion **on this side of the drum** it does not matter. If you want the drum to go to the right, turn right. In other words, pull back with your right hand and push in with your left. If you want the drum to go to the left, turn left. Once you have determined whether you need to make a right or left turn **on this side**, go to the other side. You will make the same turn on the other side to go the same direction. In other words, once the skewing direction is determined, the same turn on any trunnion will direct the drum the same direction. Just remember which hand pushed and which pulled.

## SKEWING TRUNNIONS



# DANGER

- **Do not attempt to adjust or service any machine while it is running.**

From zero, some trunnions will need to be skewed in the up-hill direction. In regard to trunnion loading the Double Barrel is better balanced than most drums. Double Barrels require very little up-hill skew. Still, all the trunnions are not always caring the same load. So to adjust the Double Barrel we are going to start with the trunnion(s) with the most consistent load characteristics.

## ADJUSTMENT ORDER

It is very important to maintain an order. All the time spent to establish zero on every trunnion will be wasted if you just start randomly skewing them now. Make yourself a map of the drum and trunnions. Label it in such a way that you can remember, and identify, which trunnion is which. When you skew a trunnion note on this map which trunnion you turned and how much. Adjustments should be one flat at a time, on only one trunnion at a time. A flat refers to one flat side of an adjustment nut (1/6 of a turn).

Given the Double Barrel's well-balanced characteristics it is difficult to determine which trunnions are caring what percent of the load. We are relatively sure, most of the time, the downhill discharge side trunnion is the heaviest loaded, and the up-hill trunnion opposite the discharge is the least loaded. However, the remaining two trunnions can vary greatly given different operating conditions.

**On Double Barrels only**, start by adjusting the downhill discharge trunnion. Give the trunnion adjustment nuts one flat (1/6 of a turn). If more adjustment is needed, give this same trunnion another flat. If more adjustment is still needed, then go to either the other downhill or the other discharge side

trunnion (take your pick). Adjust that trunnion one flat, then another flat if necessary. **Do not adjust any trunnion more than two flats in a row** ... move to another trunnion.

It takes very little up-hill skew to control a Double Barrel. Go slow! Give each adjustment time to take affect before making another adjustment. It may take an hour, or more, before you will see the results of an adjustment. Most of the time it is only necessary to adjust one trunnion. If you have to adjust more than three trunnions – then there is probably another problem.

If you go to far ... you have to start over. You cannot back up. Trying to back up only takes the backlash out of the threads between the adjusting nuts and rod. However, by recording how far you have gone you can go back to zero and come up to just below where you were.

**Caution! The last thing you want is for a trunnion to be adjusted below zero!**

When making your final adjustments the secret is to go slow and easy. Do not make large adjustments. Do not adjust more than one trunnion at a time. Wait ... give the drum time to react to the adjustment. You must make you adjustments based on how the drum acts when running at capacity. However, **never** under any circumstances attempt to adjust a machine while it is running. You will have to allow the machine to be shut down before making adjustments. Another good reason for going slow.

Another very common mistake is to set them and leave them. I agree that if everything is running and looking good -- do not touch them. Remember, improperly adjusted trunnions may run for weeks without evidence of trouble. However, once the trouble shows up, the effect is cumulative and the trouble usually advances rapidly to a critical stage. The problem is the mistaken assumption that once they are adjusted they never need to be touched again. **Trunnion adjustment is a continual process, especially on new or portable equipment.** You may need to make an adjustment several times a day in the beginning. Soon this will become once a day, or once a week, then once a month. If the plant is never moved again you may never have to touch them again unless they wear out naturally.