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19HR Thrust Bearing and Shaft Assembly

1.0 PURPOSE

To forward a procedure for measuring and adjusting slinger clearance and axial float on the subject assembly.

2.0 MACHINES AFFECTED

19HR (Heat Reclaim) machines only.

3.0 GENERAL

Figure 1 shows a cross-section of a typical 19HR thrust bearing and shaft assembly. Note that the thrust bearing has a set of shoes, leveling pads, and adjusting pads on both the thrust and counterthrust ends of the assembly.

The clearance between the bearing housing face and slinger (slinger clearance) is adjusted with the thrust end adjusting pads. Axial float is adjusted with the counterthrust end adjusting pads.

Whenever adjustments are needed, the slinger clearance must be checked and, if necessary, adjusted to .050" + .010" before the axial float adjustment is made. Even though slight differences exist between the 19HR-21 and -31 thrust assemblies, the procedures for adjusting the slinger clearance and axial float are the same.

The recommended method for selecting adjusting pads is to determine the average thickness of the original pads, and add or subtract the required change in slinger clearance or axial float to determine the new average pad thickness. Working with an average pad thickness rather than individual thicknesses eliminates the possibility of using more than two different adjusting pad sizes in either side of the thrust assembly.

Two adjusting pad kits, Part No. 19D23-841 may be required to obtain the correct slinger clearance (thrust end) and axial float (counterthrust end).

FILING INSTRUCTIONS: CENTRIFUGAL FER
TAB: COMPRESSOR DRIVE GEARS

Prepared By [signature] Approved By [signature] Date 11/6/82
[signature] 11/16/82

4.0 MEASURING AND ADJUSTING TECHNIQUES

The procedures given are general and thus lend themselves to additional service techniques, depending upon the experience of the individual. The following information should be beneficial in the event other techniques are used.

4.1 Slinger clearance should never be taken with a dial indicator because the shoes and leveling pads may disengage.

4.2 By using a dial indicator, axial float can be measured when the thrust bearing assembly and impeller are in place.

4.3 If axial float is found to be within tolerance when measuring in place, it is unlikely that slinger clearance would be out of tolerance.

4.4 Axial float can be adjusted without affecting slinger clearance. However, slinger clearance cannot be adjusted without affecting axial float.

4.5 If axial float is excessive, always check and reset slinger clearance close to nominal rather than just within tolerance.

4.6 If axial float is excessive (say, + .005" above nominal) and slinger clearance is above nominal (say, + .006"), adding + .005" to the thrust side adjusting pads will reduce axial float to nominal and also reduce slinger clearance to .001" above nominal.

5.0 MEASURING SLINGER CLEARANCE

Slinger clearance is the dimension between the thrust bearing housing face and the slinger (Fig. 2). This measurement must be made with the shaft in the thrust position (thrust disc against the thrust shoe assembly) and the slinger held tightly against the shaft shoulder by one of the following methods:

Method 1

Wedge several blades of a feeler gage between the slinger and retaining ring.

Method 2

Make a sleeve from a piece of standard Sch. 40 pipe (see below). Place the sleeve over the impeller end of the shaft, and press the slinger against the shaft shoulder by hand tightening the impeller locknut.

Compressor Size	Sch. 40 Pipe Size (in.)	Length (in.)
21	2	3.5
31	2-1/2	4.5

5.1 Stand the thrust bearing and shaft assembly on its splined end, inside a restraining device (see Fig. 2).

5.2 Push firmly down on the thrust bearing housing and, using a feeler gage, measure the clearance between the slinger and the thrust bearing housing face.

5.3 Note and record the actual slinger clearance. If the measured slinger clearance is not .050" ± .010", it must be adjusted by changing the thickness of the adjusting pads at the thrust end. Determine how much the measured clearance differs from the nominal .050" and proceed to Section 6.0.

6.0 ADJUSTING SLINGER CLEARANCE

Refer to Fig. 1 and proceed as follows:

6.1 Make a reference mark across Items (2), (6), and (7) to facilitate orientation during reassembly.

6.2 Remove retaining ring (3) and slinger (4).

6.3 Remove socket head screws (8) while holding the thrust bearing assembly together.

6.4 With one hand on the thrust bearing housing (2) and the other on the splined end of the shaft and against the counterthrust bearing end plate (7), gently invert the assembly and stand on impeller end. Lower the thrust bearing assembly off the impeller end of the shaft and set aside. The shaft and counterthrust bearing assembly must be kept intact to prevent disengagement of the shoes and leveling pads. (Remove from shaft if desired).

6.5 Remove the thrust shoes (12) and leveling pads (13) from the thrust bearing housing (2) exposing the adjusting pads (9).

6.6 Remove the adjusting pads by inserting a wire in the hole behind them.

6.7 Measure and record the thickness of each adjusting pad and add the thicknesses. Divide this sum by six to determine the average adjusting pad thickness.

6.7.1 If the actual slinger clearance is less than the minimum tolerance, subtract the clearance difference (determined in 5.3) from the average pad thickness.

Example:

Assume: Actual slinger clearance measured = .038"
Average pad thickness = .090"

Calculations:

1. Determine slinger clearance difference

nominal slinger clearance	.050"
less actual slinger clearance	- .038"
Clearance Difference	= .012"

2. Determine average new pad thickness

Average old pad thickness	.090"
less slinger clearance difference	- .012"
Average New Pad Thickness	= .078"

Proper Pad Selection: 5 pads @ .080" = .400"
1 pad @ .070" = .070"
Average pad thickness = .470 ÷ 6 = .0783"

6.7.2 If the actual slinger clearance is more than the maximum tolerance, add the clearance difference (determined in 5.3) to the average pad thickness.

Example:

Assume: Actual slinger clearance measured = .063"
Average pad thickness = .090"

Calculations:

1. Determine slinger clearance difference

actual slinger clearance	.063"
less nominal slinger clearance	- .050"
Clearance Difference	= .013"

2. Determine average new pad thickness

average old pad thickness	.090"
plus slinger clearance difference	+ .013"
Average new pad thickness	= .103"

Proper Pad Selection: 4 pads @ .100" = .400
2 pads @ .110" = .220
Average pad thickness = .620 ÷ 6 = .1033"

The final thickness calculated in either Step 6.7.1 or 6.7.2 is the average adjusting pad thickness required to obtain the nominal slinger clearance of .050".

WARNING: Notice that the pads in the adjusting pad kit are in .010" thickness increments. Selections must be made from no more than two different thicknesses and if different thicknesses are used, they must be within .010" of each other.

6.8 Using no more than two pad sizes whose thicknesses are within .010" of each other, select a combination of six pads whose average thickness is closest to the final thickness determined in Step 6.7.1 or 6.7.2.

6.9 Reassemble the adjusting pads, leveling pads and shoe assembly in the thrust bearing housing. Lower the shaft into the thrust bearing assembly. Install slinger and retaining ring, and recheck slinger clearance.

CAUTION: DO NOT permit the shaft to float within the .040" - .060" clearance before assembling to the counterthrust bearing assembly because the leveling pads and shoes in the thrust end may become disengaged. This can be prevented by leaving the feeler gage wedged between the thrust bearing housing face and the slinger after rechecking clearance.

7.0 MEASURING AXIAL FLOAT

Axial float is the total distance the shaft moves between the full thrust and full counterthrust positions, and should be measured with a dial indicator as follows:

7.1 Thread one end of a 5/16" dia. x.12" long rod and attach it to the thrust bearing housing by bolting it through one of the holes in the flange, or screwing it into a metal block and securing with a "C" clamp as shown in Fig. 3.

7.2 Mount a dial indicator on the rod and adjust it so that the button rests on the center of the snugly tightened locknut.

7.3 Stand the thrust bearing and shaft assembly on its splined end. With both hands, grasp the underside of the flange with the fingers so that the thumbs rest approximately 180^0 apart on the slinger flange.

7.4 Apply pressure between the thumbs and fingers so as to force the flange upward and the slinger downward. Move the housing assembly back and forth on the shaft to the full thrust and counterthrust positions. Record from the dial indicator the total reading (axial float).

7.5 If the axial float recorded in Step 6.4 is not within the following tolerances, it must be adjusted by changing the thickness of the adjusting pads at the counterthrust end. Determine how much the axial float differs from the nominal listed below. according to compressor size and proceed to section 8.0.

	Axial Float (in.)		
Compressor Size	Minimum	Nominal	Maximum
-21	.006	.009	.012
-31	.008	.011	.014

8.0 ADJUSTING AXIAL FLOAT

Refer to Fig. 1, page 7, and proceed as follows:

8.1 Make a reference mark across Items (2), (6), and (7) to facilitate orientation during reassembly.

8.2 Remove socket head screws (8) while holding the assembly together.

8.3 With one hand on the counterthrust bearing end plate (7) and the other on the impeller end of the shaft, gently invert the shaft assembly and lower the counterthrust bearing assembly off the splined end of the shaft.

8.4 Remove the shoes (12) and leveling pads (13) from the counterthrust bearing housing exposing the adjusting pads (9).

8.5 Remove the adjusting pads by disassembling the counterthrust bearing housing (6) from the end plate (7), being careful not to lose the dowel pin (11).

8.6 Measure and record the thickness of each pad and add the thicknesses. Divide this sum by six to determine the average pad thickness.

8.6.1 If the actual axial float is <u>less</u> than the minimum tolerance, <u>subtract</u> the axial float difference determined in 7.5 from the average pad thickness.

Example:

Assume: 19HR-31 compressor
Actual axial float measured = .006"
average pad thickness = .100"

Calculations:

1. Determine axial float difference

Nominal axial float	.011"
Less actual axial float	-.006"
Axial Float Difference	= .005"

2. Determine average new pad thickness

Average old pad thickness	.100"
Less axial float difference	-.005"
Average New Pad Thickness	= .095"

Proper Pad Selection: 3 pads @ .100 = .300
3 pads @ .090 = .270
Average pad thickness = .570 ÷ 6 = .095"

8.6.2 If the actual axial float is greater than the maximum tolerance, add the axial float difference determined in 7.5 to the average pad thickness.

Example:

Assume: 19HR-31 compressor
Actual axial float measured = .017"
Average pad thickness = .100"

Calculations:

1. Determine axial float difference

Actual axial float	.017"
Less nominal axial float	-.011"
Axial Float Difference	= .006"

2. Determine average new pad thickness

Average old pad thickness	.100"
Plus axial float difference	+.006"
Average New Pad Thickness	= .106"

Proper Pad Selection: 4 pads @ .110" = .440
2 pads @ .100" = .200
Average pad thickness = .640 ÷ 6 = .1067"

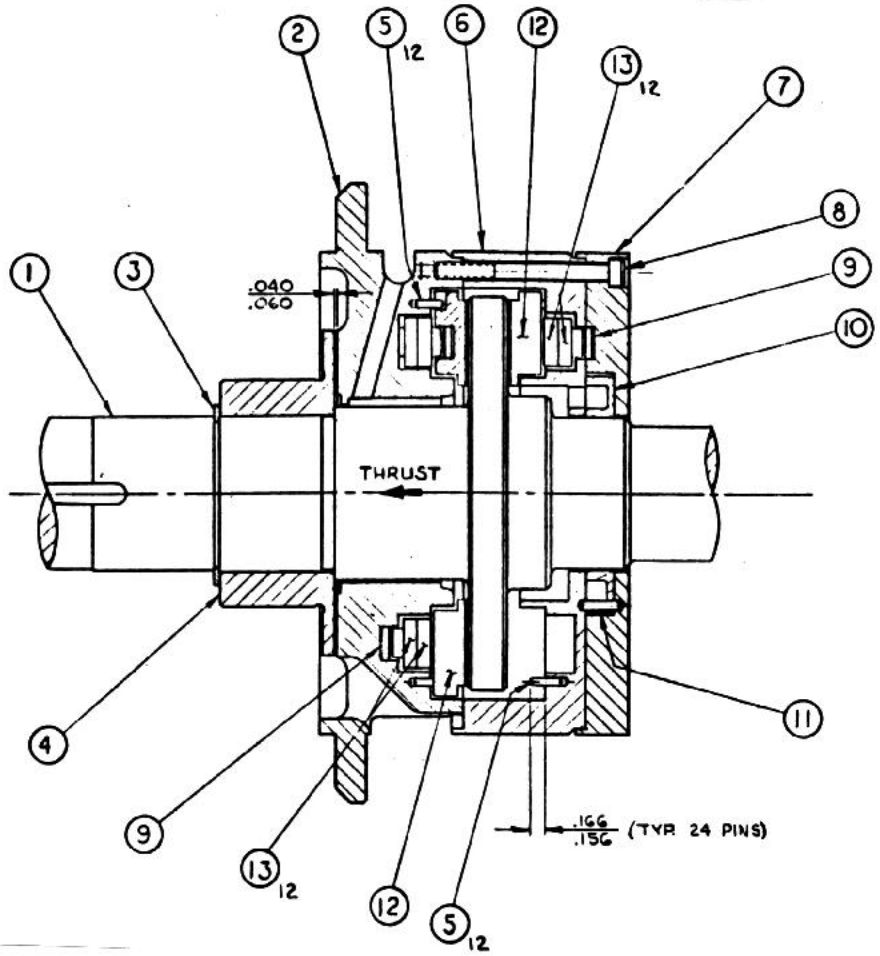
The final thickness calculated in 8.6.1 or 8.6.2 is the average adjusting pad thickness required to obtain the nominal axial float given on page 2.

WARNING: Remember that the pads in the adjusting pad kit are in .010" thickness increments. Selections must be made from no more than two different thicknesses and, if two different thicknesses are used, they must be within .010" of each other.

8.7 Reassemble the counterthrust bearing housing (6) and end plate (7), making sure to replace the dowel pin (11) in its correct location.

8.8 Reassemble the adjusting pads, leveling pads and shoe assembly in the counterthrust bearing housing. Lower the splined end of the shaft into the counterthrust bearing assembly.

8.9 Tighten socket head screws (8) and recheck axial float. Turn thrust bearing and shaft assembly and check for binding. If the shaft does not turn freely, remove the counterthrust end of the thrust bearing and inspect for correct assembly.



Legend

Item	Description	Item	Description
1	Shaft	7	C'thrust Bearing End Plate
2	Bearing Housing	8	Socket Head Screw, 10-24x2
3	Retaining Ring	9	Adjusting Pad
4	Slinger	10	Seal Ring (19HR212-1123)
5	Lock Pin, 5/32 dia. x 3/8 lg.	11	Dowel Pin, 1/8 x 1/2
6	C'thrust Bearing Housing	12	Thrust Shoe Assembly
		13	Leveling Pad

Fig. 1. Thrust Bearing and Shaft Assembly

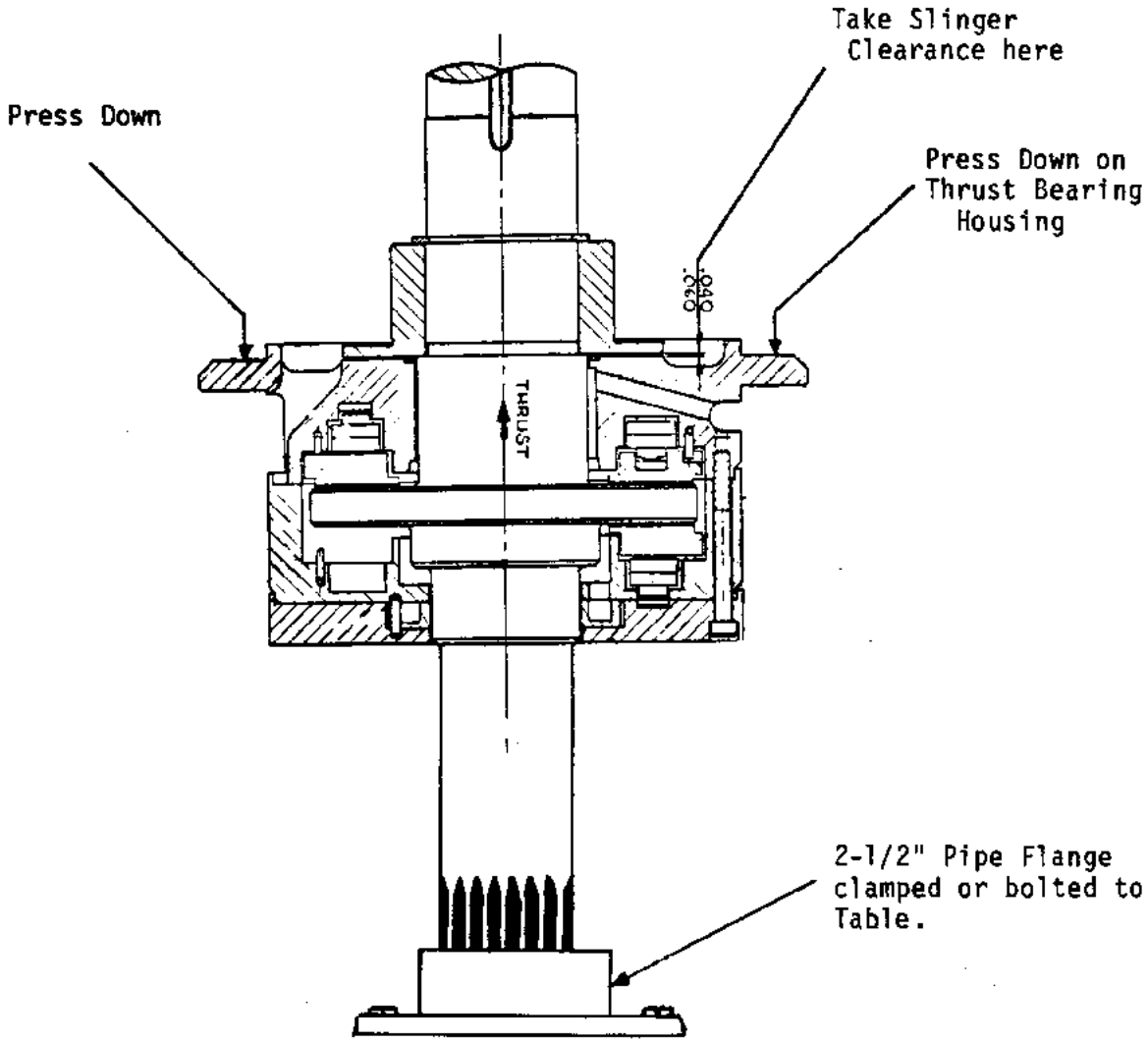


Fig. 2. Measuring Slinger Clearance

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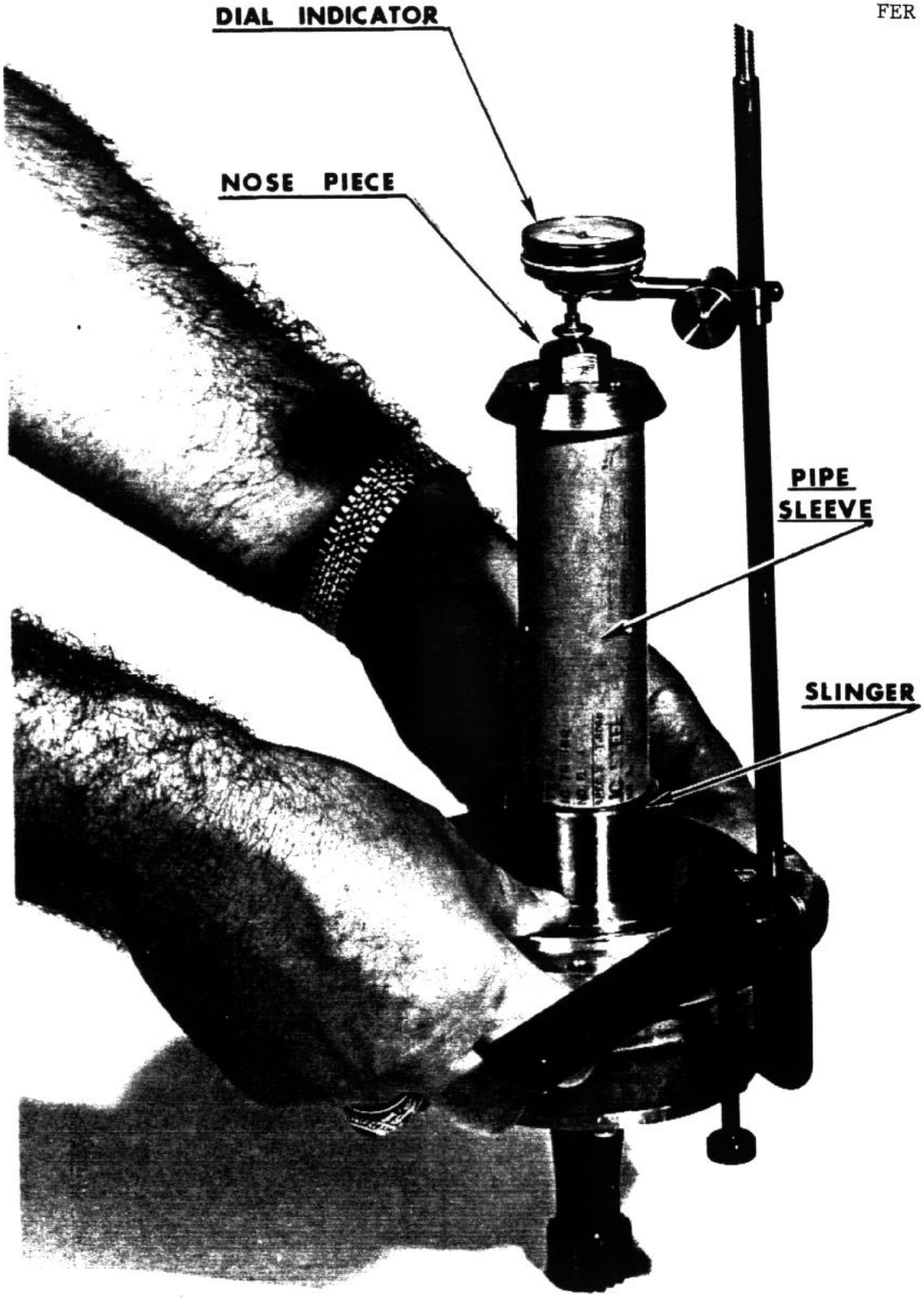
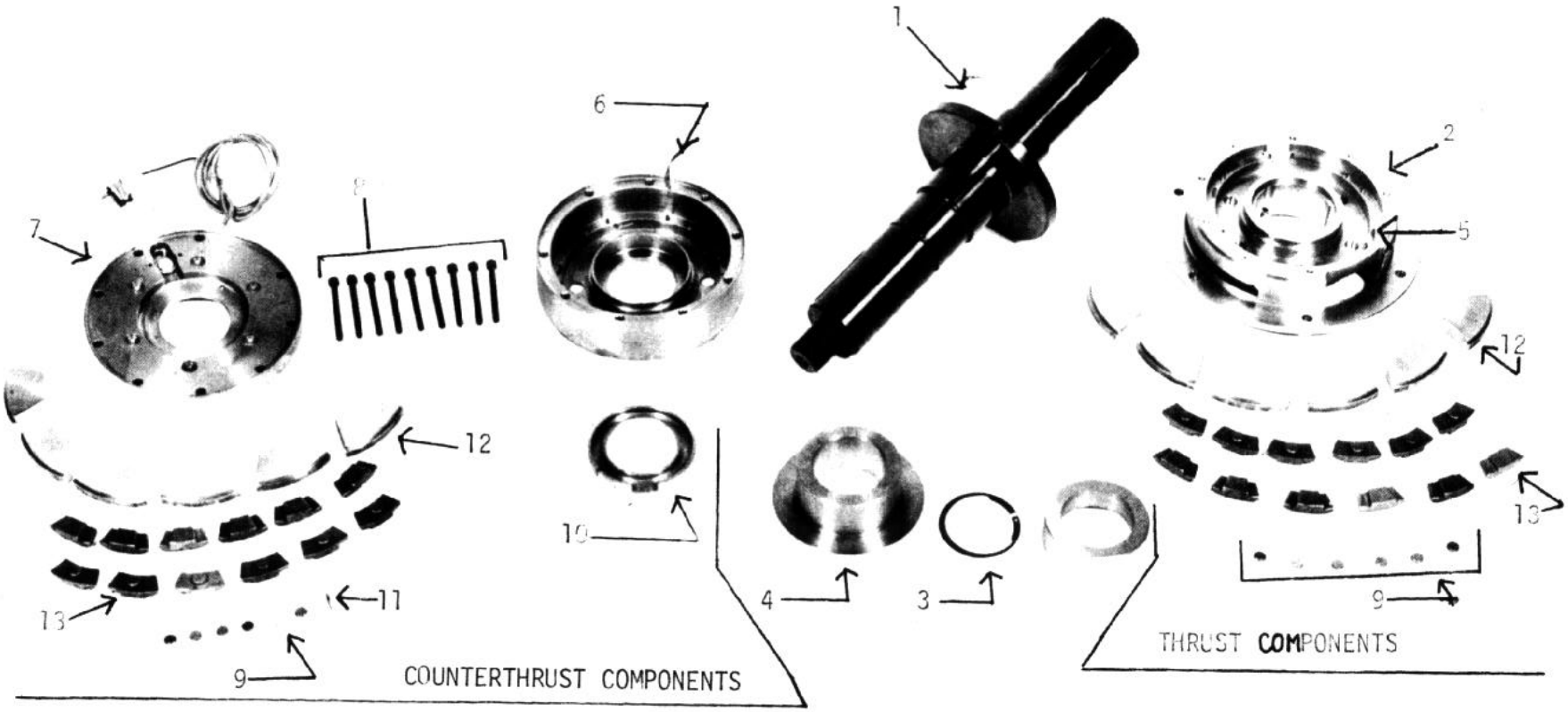


Fig. 3. Measuring Axial Float



Legend

Item	Description	Item	Description
1	Shaft	7	C-thrust Bearing End Plate
2	Bearing Housing	8	Socket Head Screw, 10-24x2
3	Retaining Ring	9	Adjusting Pad
4	Slinger	10	Seal Ring (19HR212-1123)
5	Lock Pin, 5/32 dia. x 3/8 lg.	11	Dowel Pin, 1/8 x 1/2
6	C-thrust Bearing Housing	12	Thrust Shoe Assembly
		13	Leveling Pad

Fig. 4. Thrust Bearing and Shaft Assembly Components