UNITED TECHNOLOGIES CARRIER

Commercial Division
Carrier Corporation

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SERVICE BULLETIN

SUBJECT:

IMPELLER SPACING

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PURPOSE

To recommend a procedure for removing, installing, and spacing an impeller.

MACHINES AFFECTED

19D Series machines.

TOOLS AND MATERIALS REQUIRED

1 - 5 ft steel straight edge or aluminum carpenter's level.
1 - Wheel puller (see Fig. 2 and 3).
1 - Tempilstik, 200-250°F temperature range.
1 pr. asbestos gloves.
1 - Acetylene or Prestolite torch with rosebud tip.
1 - Depth micrometer or vernier-type depth gage.
1 pc lumber, 2" x 4", approximately 3 ft long.
1 - Torque wrench, 200 ft-lb range, capable of torquing left-handed.
1 - Telescoping gage set, 3/4" thru 2-1/8" range.
1 - Socket wrench to remove nose piece.

11-Size	Compressor:	3/4"
21-Size	" :	1-1/16"
31-Size	" :	1-1/2"

1 - Center punch.
1 - Outside Micrometer, 2".

REMOVING IMPELLER

A. Index the lockwasher and nose piece to the impeller hub with the center punch.

B. Shape the end of the 2 x 4 as shown in Fig. 1 so that it fits against the base of the impeller blade for greatest strength.

IMPORTANT: The 2 x 4 and torque wrench are placed on the same side. The 2 x 4 is placed near the blade tip, and the wrench direction is *downward*, toward the 2 x 4. This minimizes the force on both the journal bearing and impeller blade, thus preventing damage to these components.

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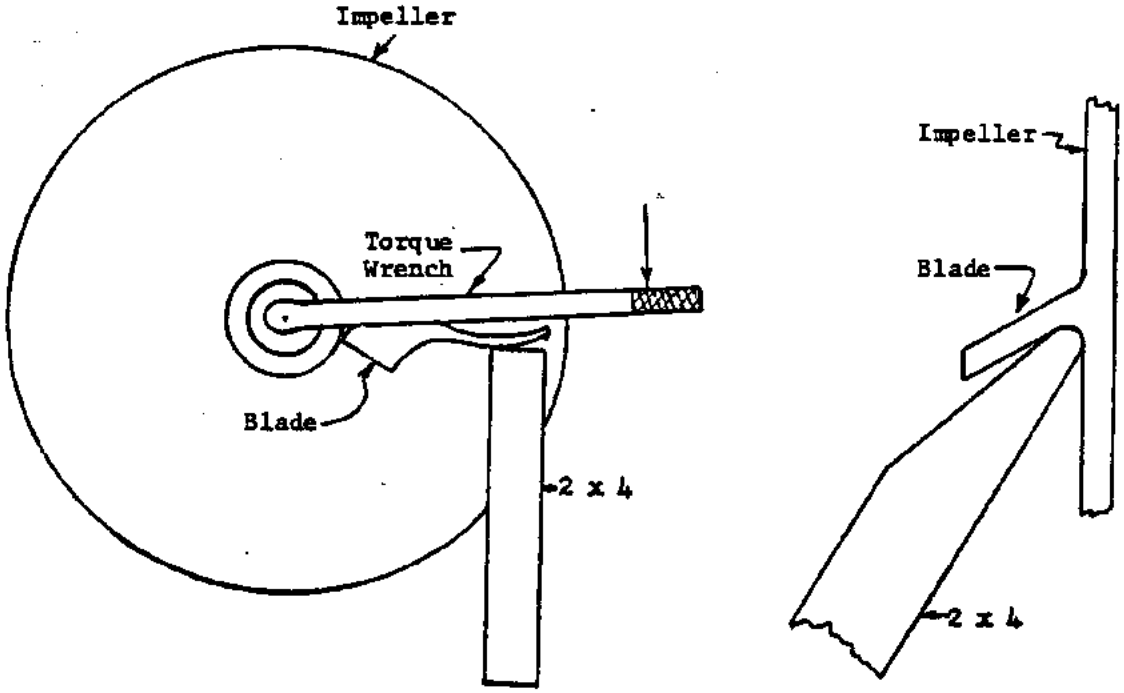
C. Remove the setscrews, nose piece, lockwasher, and pins. The nose piece has a left-hand thread.



D. Fig. 1. Placement of 2 x 4 and Torque Wrench to Remove Nose Piece

Index the impeller to the shaft with a center punch.

E. With light tension only, install a wheel puller onto the impeller. Reference "Impeller Puller Instructions," page 3.

NOTE: *To remove an impeller which has been heat shrunk, it is necessary to heat it.* The 0.001/0.0025" shrink fit occurs at the "heel" of the impeller. A close inspection of the shaft will reveal a slight step at the shrink area (see Fig. 4).

19D Series machines, except those with 21 and 31 size compressors with a serial number lower than 20358, all have an impeller which is heat shrunk onto the shaft.

F. Using a rosebud tip with an acetylene or Prestolite torch, heat the impeller. Keep the torch moving to prevent over-heating at any one spot.

CAUTION: Do not heat the impeller to more than 250°F. Check the temperature periodically with a Tempilstik.

G. Partially remove the impeller and index the impeller keys to the shaft keyway with a prick punch.

Impeller Puller Instructions

Figure 2 shows a puller that can be fabricated to fit the 19D Series 11, 21, and 31 size impellers. Figure 3 shows a puller that can be purchased from Snap-on-Tools, No. CJ-83B.

IMPORTANT: Before removing the balancing bolts from the hub of the impeller, mark their location to be certain they are replaced in their original locations. The length of the balancing bolts may vary.

The two 3/8-16 capscrews of the wheel puller fit into the balancing bolt holes.

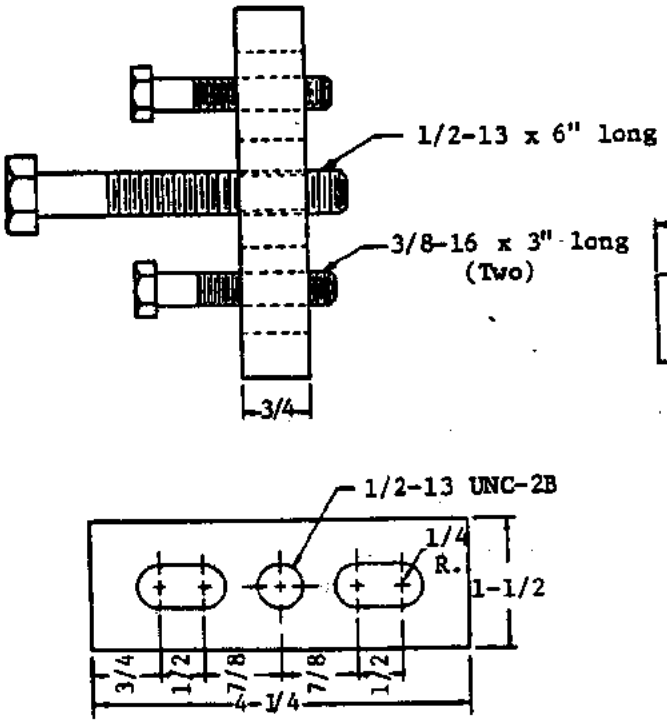


Fig. 2. Fabricated Wheel Puller Assembly

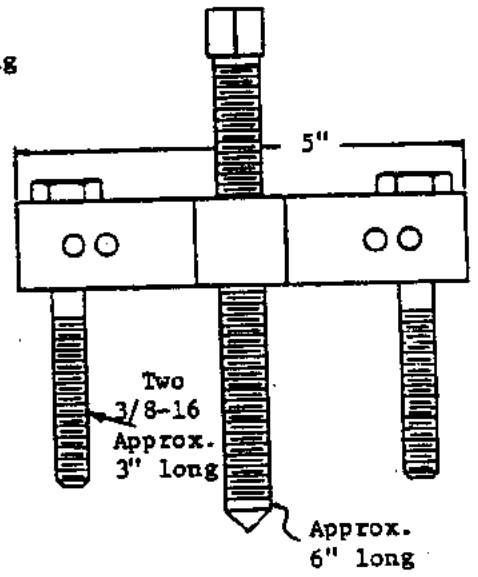


Fig. 3. Purchased Wheel Puller Snap-on Tools, No. CJ-83B

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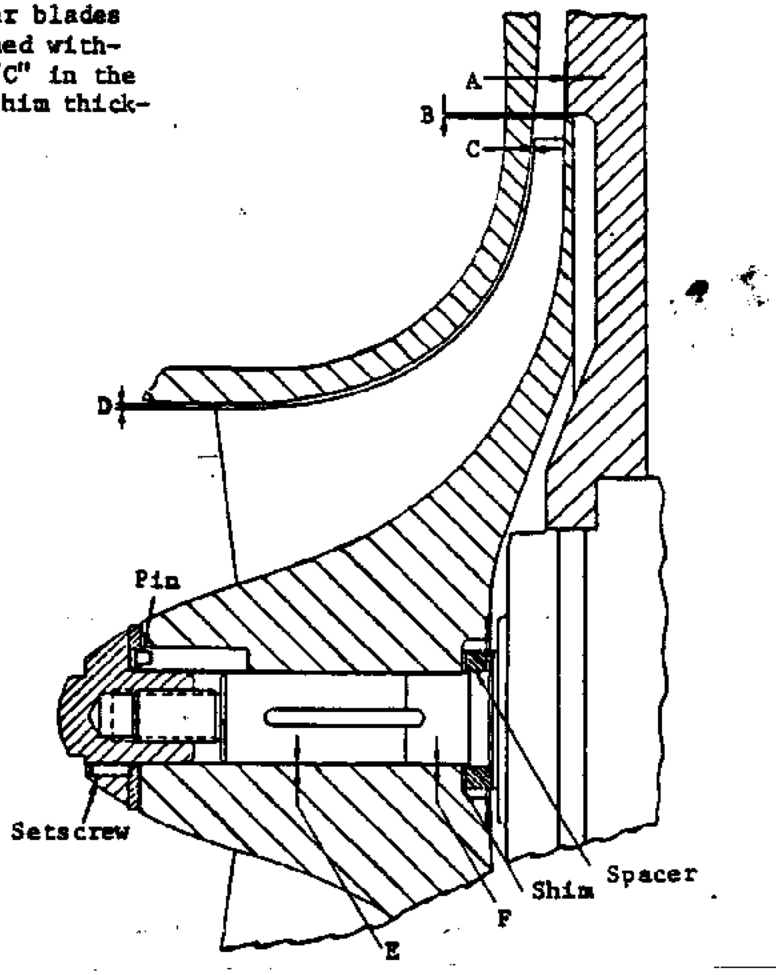
IMPELLER CLEARANCES

When the impeller, journal bearing, thrust shoes, slinger ring, or thrust disc is replaced, it is recommended that impeller clearances be checked.

The clearance from the impeller blades to the volute wall is maintained within the tolerances designated "C" in the table below by adjusting the shim thickness behind the impeller.



Clearance Point	Machine Model	19D11 Min. (in.)	19D11 Max. (in.)	19D21 Min. (in.)	19D21 Max. (in.)	19D31 Min. (in.)	19D31 Max. (in.)
A	All	0.001	0.024	+0.004	-0.019	-0.001	-0.024
B	All	1/8 ± 1/32		1/8 ± 1/32		1/8 ± 1/32	
C	19D,DA,DG	0.035	0.040	0.045	0.050	0.055	0.060
	19DH	0.032	0.036	0.040	0.045	0.048	0.060
D	All	0.024	-	0.020	-	0.018	-
E	All	0.0005	0.002	0.0005	0.002	0.0005	0.002
F	All	-0.001 Min., -0.0025 Max. (Shrink Fit)					

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To determine impeller clearance "C" and the shim thickness required, refer to Fig. 5 and proceed as follows:

A. Place the impeller in the discharge volute and center it in position. With the straight-edge in place against the discharge volute flange, measure Dimensions A_1 and A_2, using the depth micrometer. Average the two readings and record.

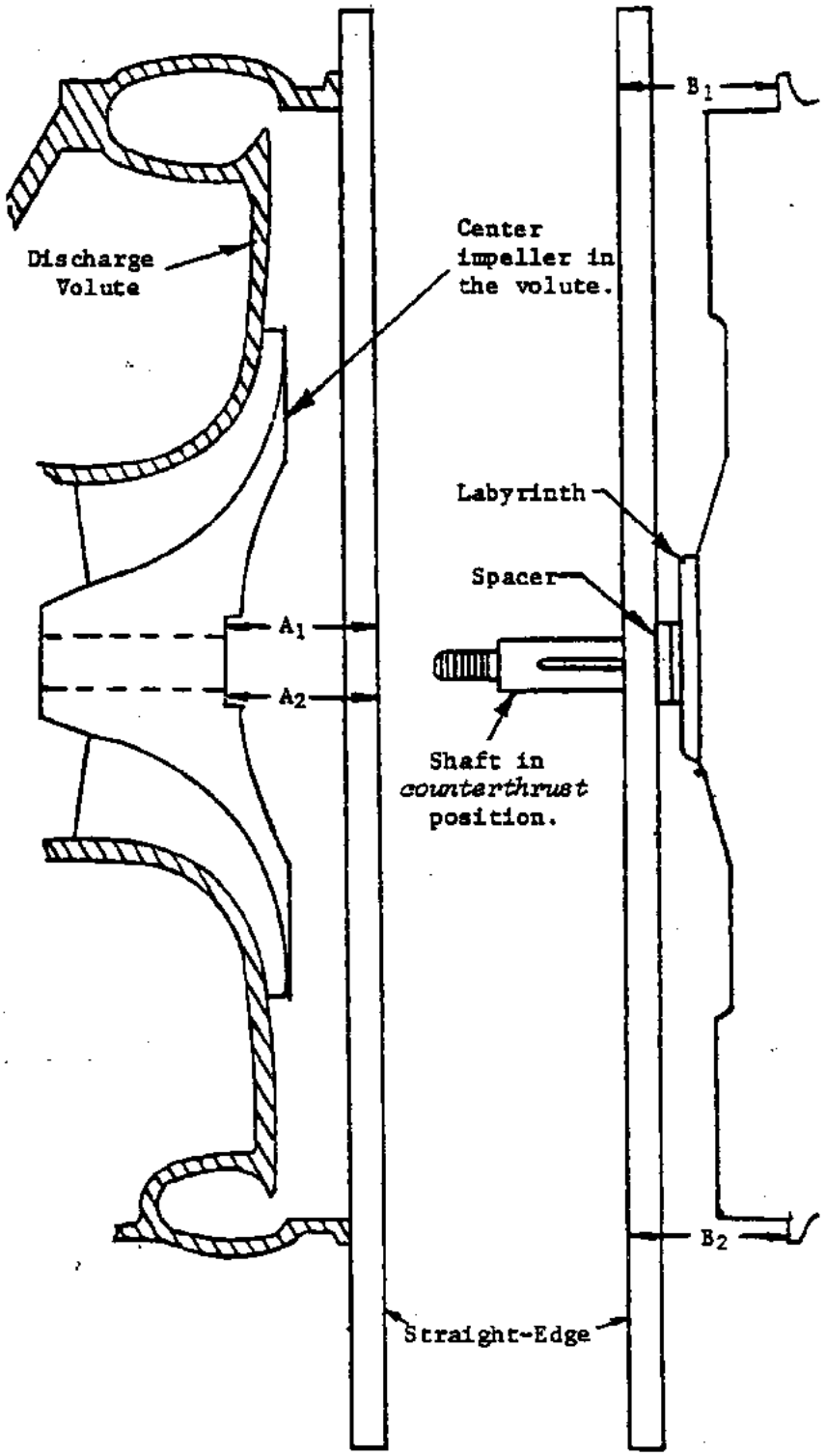
B. Rotate the impeller 180°, use the other edge of the straight-edge, and recheck the measurements taken "A".

C. Be sure that the labyrinth and spacer are in place and the shaft is in the *counterthrust position* (toward the motor).

D. Place the straight-edge in a vertical position, resting it on top of the compressor base and against the spacer. Adjust the straight-edge until Dimensions B_1 and B_2 are nearly equal. Average the two readings and record.

E. Turn the straight-edge around and use the other edge to recheck the measurements taken in "D".

F. Knowing the thrust clearance and the desired impeller clearance "C", follow the example calculation to determine the shim thickness required.



Example Calculation

Dimension A	6.158"
Minus Dimension B	-6.039"
Total Clearance	0.119"
Minus Thrust Clearance	-0.011"
	0.108"
Minus Desired Impeller Clearance	0.045"
Shim Thickness Required	0.063"

REINSTALLING THE IMPELLER

Be sure all necessary tools are on hand before starting to install the impeller. If the impeller is being replaced, check the part number stamping on the back of the replacement impeller to be sure it is the correct one for that machine. Record the part number.

A. Check the shim thickness with a micrometer before installing it over the shaft against the spacer. Part of the shim is made of a solid brass ring, and part of it has 0.003" laminations which can be peeled off.

B. Check to be sure that the impeller keys fit properly by placing them in the impeller keyway. Then place the impeller keys in their proper shaft keyway slots by using the index marks.

NOTE: The side of the key with the *wide* chamfered edge fits into the *impeller* keyway; the side with the *narrow* chamfered edge fits into the *shaft* keyway (Fig. 6).

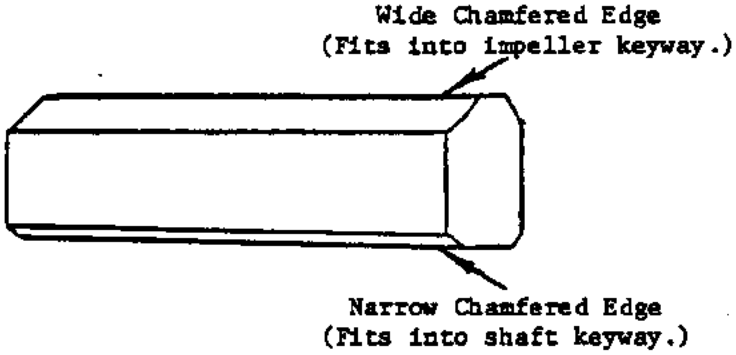


Fig. 6. Impeller Key

C. Measure the shaft outside diameter with the outside micrometers in the area where the shrink fit occurs at the heel of the impeller (Fig. 4).

D. Set the telescoping gage 0.001" wider than the shaft diameter at the shrink fit.

E. Using a rosebud tip with an acetylene or Prestolite torch, heat the back of the impeller near the bore. Keep the torch moving to prevent overheating at any one spot. While heating the impeller, check the bore inside diameter periodically with the telescoping gage. When the bore inside diameter has expanded sufficiently to allow the telescoping gage to fit into the bore, the impeller has been heated enough.

CAUTION: *Do not heat the impeller to more than 250°F. Check the temperature periodically with a Tempilstik.*

F. Using asbestos gloves, immediately place the impeller on the shaft. Be sure the impeller is all the way onto the shaft and that the index marks are aligned.

G. IMPORTANT: *Install the nose piece and tighten it with the lockwasher to be sure that the impeller seats against the shim.* Leave the nose piece in place while the impeller cools on the shaft. Periodically check the tightness of the nose piece.

H. After the impeller has cooled, remove the nose piece. Follow the procedure in Section 7.0 to permanently install the nose piece.

INSTALLING THE NOSE PIECE

Compressors Serial No. 20308 and higher have the impeller locking arrangement shown in Fig. 7. Earlier compressors should be modified to this arrangement whenever the compressor is open. Replace the nose piece and add the lockwasher, locking pins, and setscrews listed in Table 1, page 8.

Refer to Fig. 7 and 8, and proceed as follows:

A. Place the lockwasher and three lock pins on the impeller so that the lock pins fit into the impeller keyways. Scribe a mark on the impeller hub opposite the impeller keyways so the lock pins can be located after the nose piece is in place.

B. Block the impeller by placing a 2 x 4 as closely as possible against the base of the impeller blade.

C. Install and tighten the nose piece (left-hand thread) to the required torque.

NOTE: The 2 x 4 and torque wrench should be on the same side to minimize damage to the impeller and bearing (reference Fig. 8).

After tightening, scribe a mark across the nose piece, lockwasher, and impeller hub.

Compressor Size	Required Torque (ft-lb)
11	110
21	130
31	180

D. Select two holes in the nose piece, *180° apart*, that do not line up with a locking pin. Center punch the lockwasher through these two holes. The scribe marks in "A" locate the locking pins.

E. Remove the nose piece, lock pins, and lockwasher. Spot drill the lockwasher 1/16" deep x 3/16" diameter at each of the two punch marks.

F. Reinstall the lockwasher, lock pins, and nose piece. Retighten the nose piece until the reference mark scribed in "C" lines up.

G. Install two setscrews 180° apart in the holes that line up with the spot drilled holes in the lockwasher. Tighten the setscrews and stake them by upsetting one or two threads in the nose piece.

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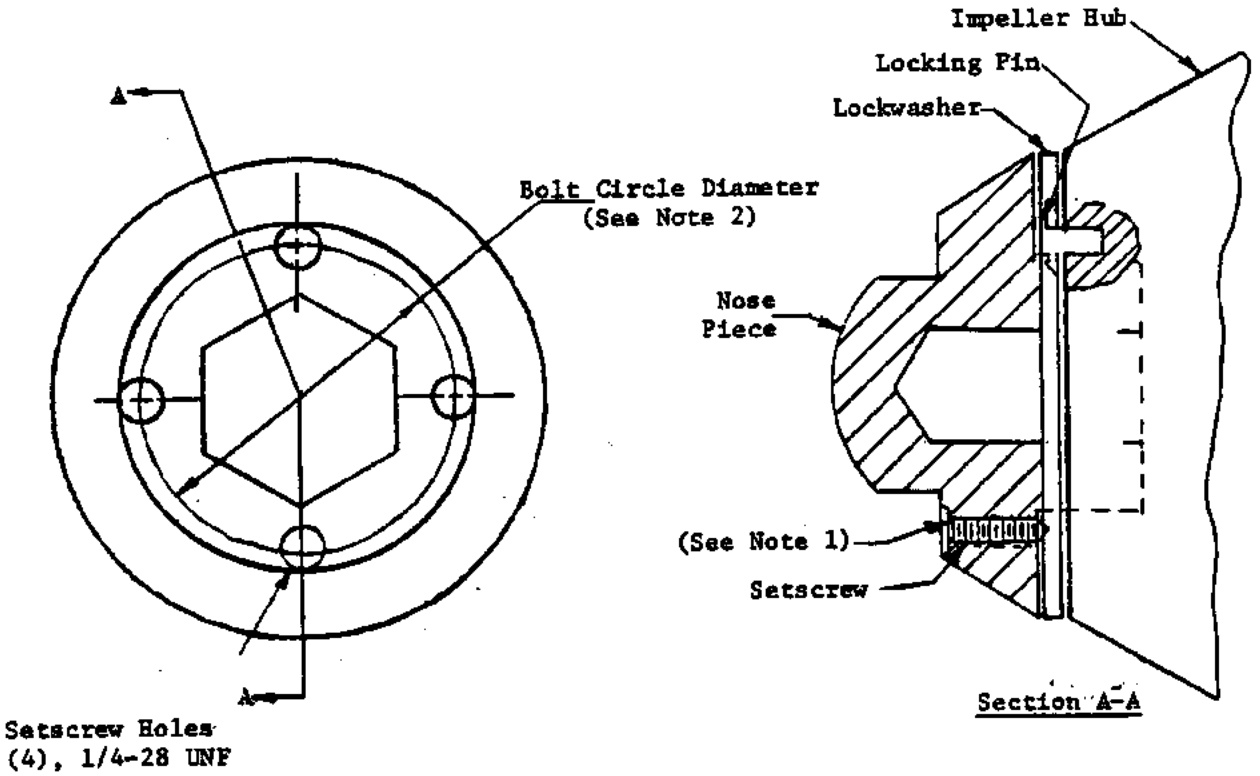

NOTES: 1. Stake setscrews by upsetting one or two threads in the nose piece.

2. Bolt Circle Diameter: Compressor Size 11, 1-5/16"
" " 21, 1-3/4"
" " 31, 2-1/8"

Fig. 7. Impeller Locking Arrangement

Table 1. Parts Required for Impeller Locking Arrangement

Description	Part Numbers for Compressor Sizes: 11	21	31
Nose Piece	19D11-2282 19DH11-1002*	19D21-2282	19D31-2282 19DH31-1002*
Lockwasher	19D11-2181	19D21-2181	19D31-2181
Locking Pin (3 Required)	19D11-2191	19D21-2191	19D31-2191
Setscrew (2 Required)	AE54FR164	AE54FR164	AE54FR167

*Compressor Serial No. 25691 and higher; approximate Machine Serial No. 17,000 and higher.

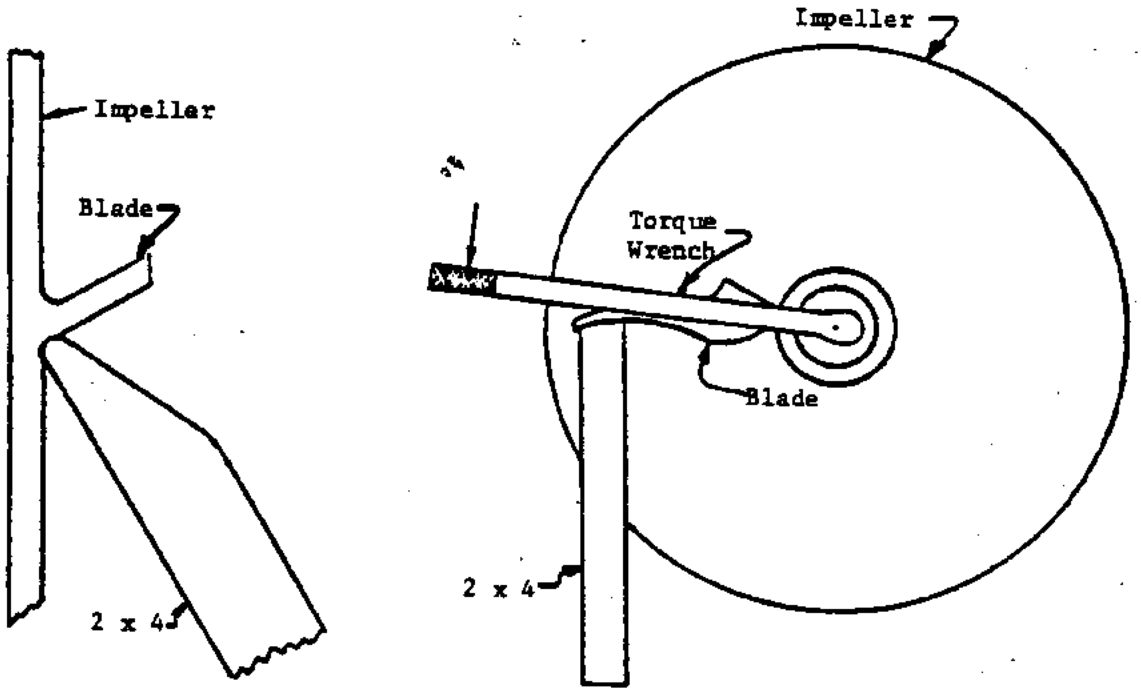

Fig. 8. Placement of 2 x 4 and Torque Wrench
To Tighten Nose Piece