

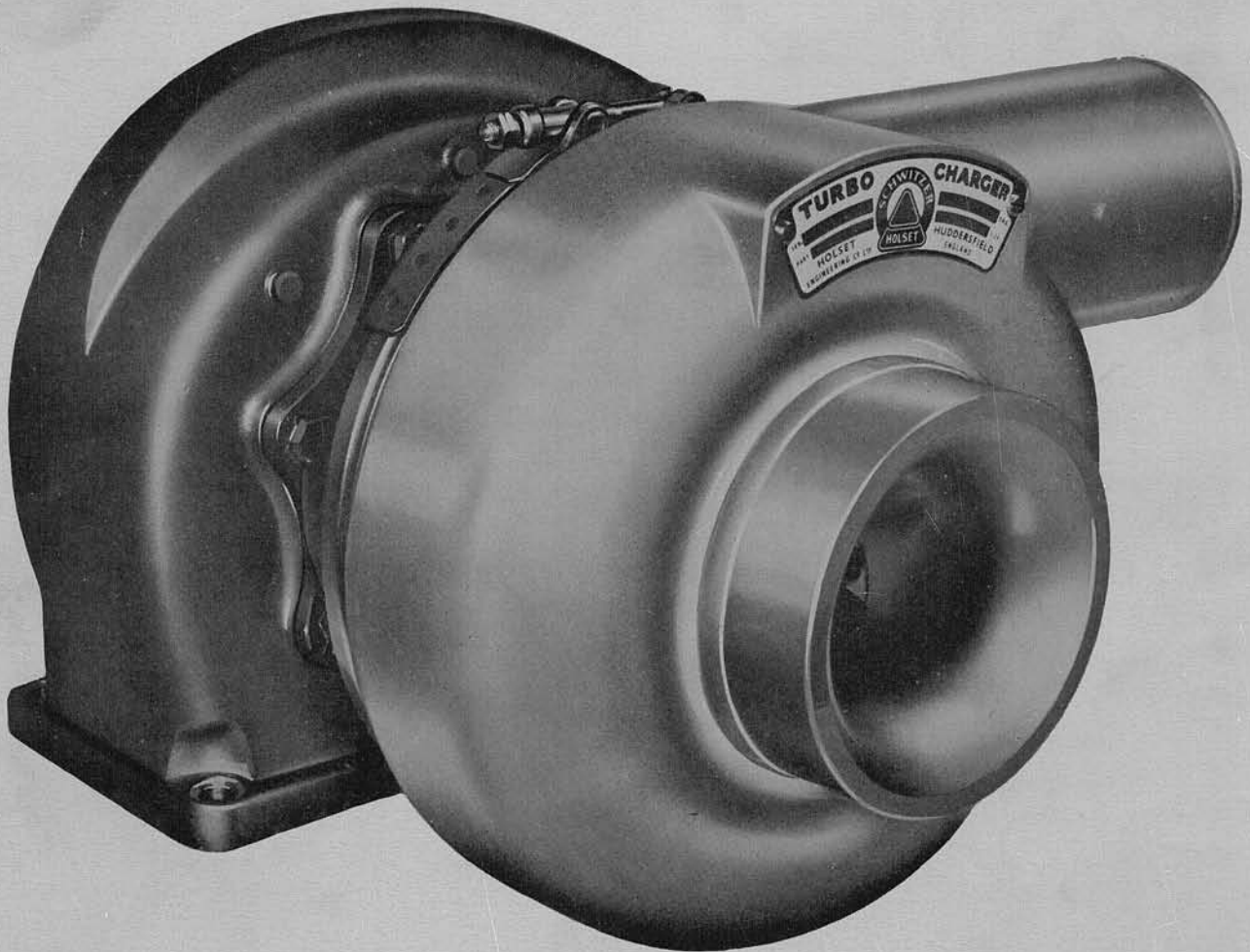
D. LOMAX BAY 9 Q.C.

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Model 4HD

TURBOCHARGER

A product of Holset Engineering Co. Ltd., Turnbridge, Huddersfield, England.



HOLSET

Introduction

This manual covers the recommended procedures for the servicing of model 4HD turbochargers. In general it is recommended that the units should be overhauled at intervals of 100,000 miles or 5,000 hours. Cleaning of the turbine and compressor may be carried out at more frequent intervals; it is not necessary to strip the turbocharger for this operation. Reference should always be made to the engine manual before carrying out any work on the turbocharger.

Installation data

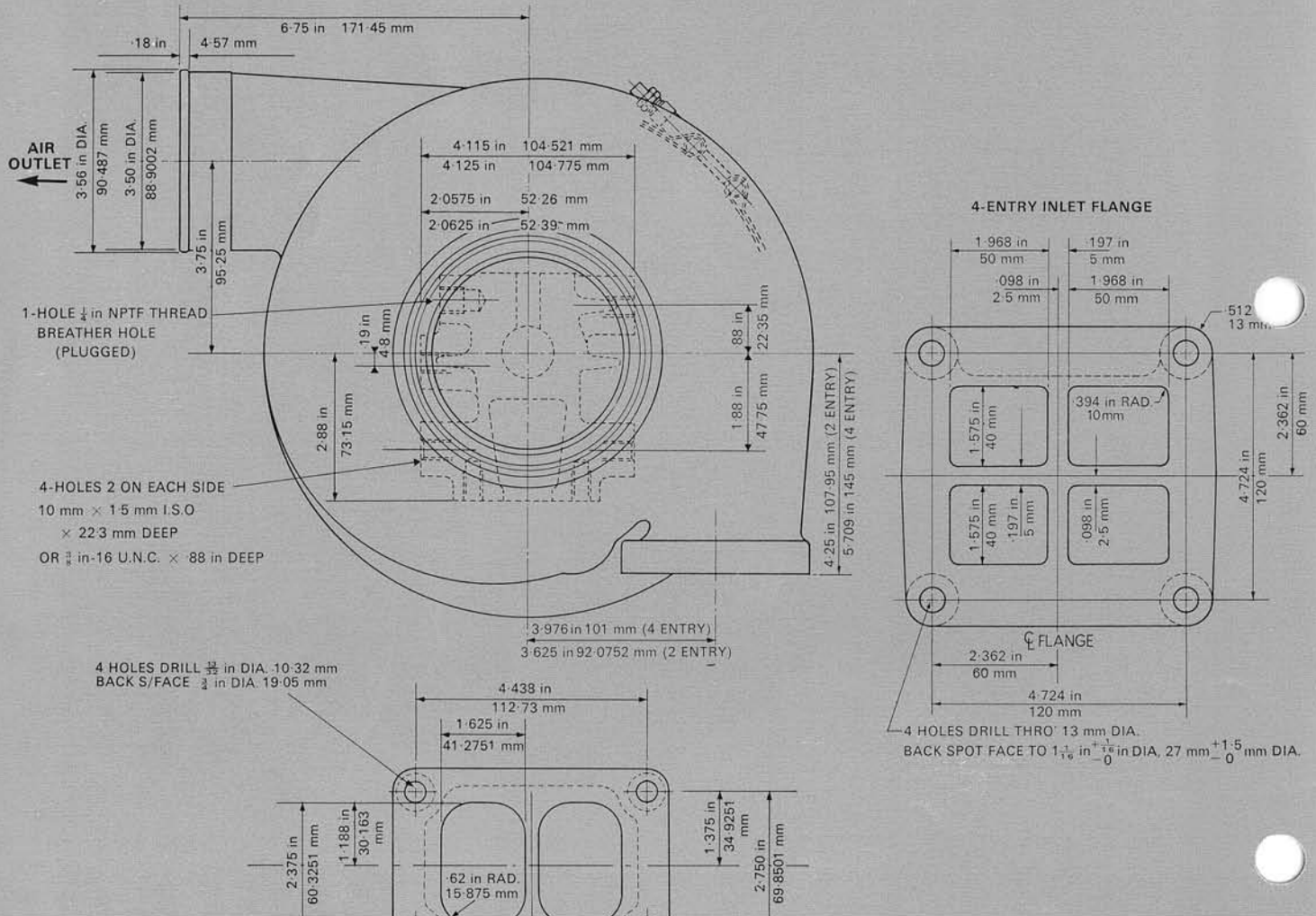
1. Mount the turbocharger on the turbine inlet flange. All other connections must be flexible and heavy pipework should be separately supported.
2. Always position the bearing housing so that the oil drain is at the bottom.
3. Oil should be filtered below 15 microns. The oil quality must be as specified by the engine manufacturer.
4. The minimum oil pressure, when the engine is on load must be 30 lb./in.² (2.0 kg./cm.²) and pressures up to 60 lb./in.² (4.0 kg./cm.²) are satisfactory. Under

idling conditions the pressure should not fall below 10 lb./in.² (0.703 kg./cm.²).

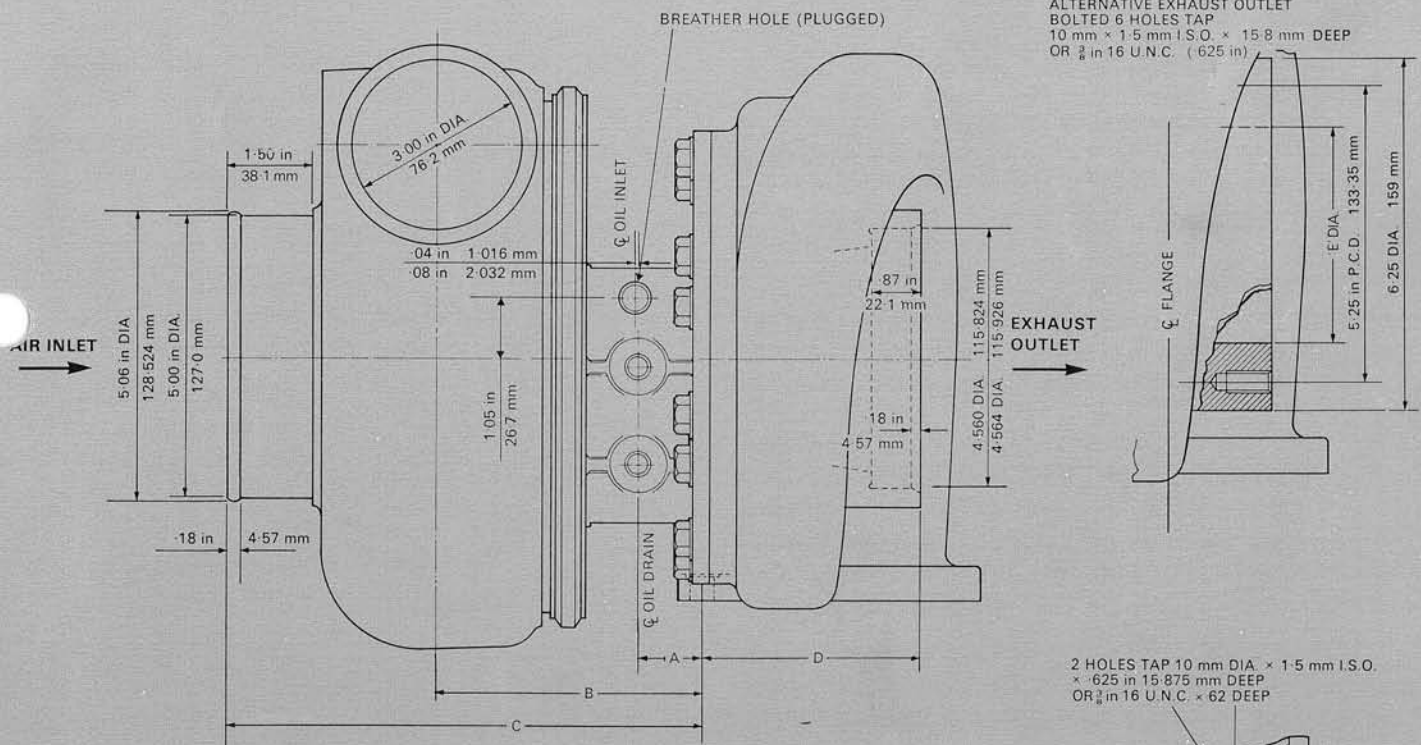
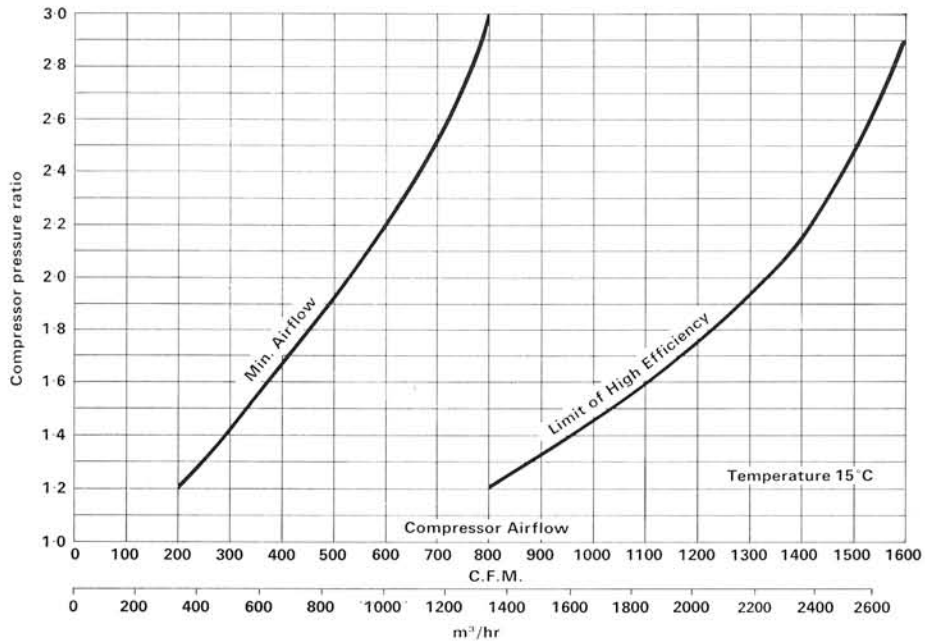
Oil pressure must show at the turbocharger inlet within 3-4 seconds of the engine firing.

5. Air cleaner pressure drop should not exceed 20 in. (500 mm) of water.

6. The exhaust back pressure after the turbocharger should not exceed 20 in. (500 mm) of water.



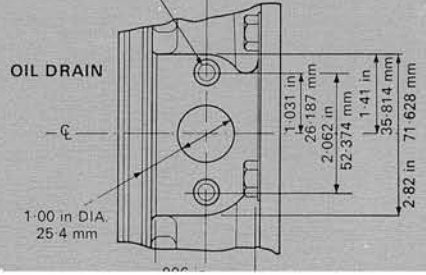
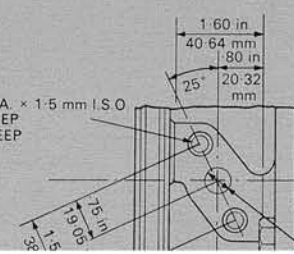
Model 4 HD Air Flow Range



	2 ENTRY TURBINE HOUSING		4 ENTRY TURBINE HOUSING	
	ins	mm	ins	mm
A	1.117	28.372	858	21.79
	1.185	30.099	810	20.57
B	4.677	118.796	4.370	111.00
	4.745	120.523	4.418	112.22
C	8.375	212.725	8.000	203.2

2 HOLES TAP 10 mm DIA. x 1.5 mm I.S.O. x .625 in 15.875 mm DEEP OR 1/8 in 16 U.N.C. x .62 DEEP

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Instructions for dismantling Turbochargers

Refer to sectional views for itemised parts.

1. With unit upright and the turbine inlet flange clamped in a vice or similar fixture, mark the relative positions of the turbine housing (22), bearing housing (28), compressor cover (1) and the 'V' clamp (14).

2. After removing the 'V' clamp locknut, spring the 'V' clamp (14) over the bearing housing (28) and remove the compressor cover (1) taking care not to catch the compressor wheel tips.

Remove the 'V' clamp (14) and 'O' ring (29).

3. Remove the eight set screws (17) with the associated lockplates (18) from the turbine housing (22).

Lift the core assembly clear of the turbine housing (22) and nozzle ring (19).

4. Holding the turbine wheel extension, remove the compressor locknut (2) with a torque spanner and $\frac{3}{4}$ " A/F drive socket.

5. Place the unit in a press supporting the bearing housing flange on a support ring. Press out the shaft and turbine wheel assembly (23) using pressing pin J.11306. If no press is available it is permissible to gently heat the compressor wheel with a 'calor gas' type flame.

Remove the compressor wheel (3) and shims (4).

Lift the unit clear of the press and remove the shaft and turbine wheel assembly (23) together with its piston rings (5).

6. Using circlip pliers Seeger J/31 remove the retaining ring (8). Install two No. 10-24 NC screws in the tapped holes provided in the insert (9) and lift out the insert.

Push the flinger sleeve (6) together with its piston rings (5) clear of the insert.

Remove the 'O' ring (10).

7. Remove the thrust bearing components in the following sequence:—

Remove the three screws (11), lockplates (12) or spring washers, oil deflector (7) thrust ring (30), thrust bearing (13), spacer sleeve (31) thrust ring (30) and spacer (15).

8. Remove the bearings and associated components in the following sequence from the compressor end of the bearing housing:—

Remove bearing (26), two snap rings (16) using circlip pliers Seeger J/31, bearing (25), oil control sleeve (24) and snap ring (16).

NOTE: Take care when using the circlip pliers, that the bore of the bearing housing is not scratched or otherwise damaged.

9. After removing the retaining ring (21), using circlip pliers Seeger A/1 remove the turbine back plate (20).

Remove the plug from the bearing housing (28) and the nozzle ring (19) from the turbine housing (22).

Cleaning procedure

1. Use a commercially approved cleaner only. Caustic solutions will damage certain parts and should not be used.

2. Soak parts in cleaner until all deposits have been loosened.

3. Use a plastic scraper or bristle-type brush on aluminium parts. Vapour blast may also be used providing the shaft and other bearing surfaces are protected.

NOTE: Do not vapour blast bearing housing.

4. Clean all drilled passages with compressed air jet.

5. Make certain surfaces adjacent to wheels on stationary housings are free of deposits and are clean and smooth

Internal parts inspection and specifications

1. Shaft and turbine wheel assembly (23).
 - a. Inspect bearing journals for excessive scratches and wear. Minor scratches may be tolerated.
 - b. Inspect piston ring groove walls for scoring. Minor scratches are acceptable.
 - c. Check carefully for cracked, bent or damaged blades. **DO NOT ATTEMPT TO STRAIGHTEN BLADES.**
2. Bearings (25 and 26).

Replace bearings if tin plate is worn off inside or outside diameters.
3. Bearing Housing (28).

Replace housing if bearing bores are excessively scratched or worn.
4. Flinger Sleeve (6).

Replace if piston ring grooves or flinger are damaged.
5. Thrust ring (30), thrust bearing (13) and oil control sleeve (24).
 - a. Replace if thrust faces are mutilated. Minor scratches are acceptable.
 - b. Replace thrust bearing (13) if scratched or worn.
 - c. The small drilled oil hole in the thrust bearing (13) must be clean and free of obstruction.
6. Spacer (15).

Replace if back face is scored by bearing. Smooth wear is permissible.
7. Compressor Wheel (3).

Check carefully for cracked, bent or damaged blades. **DO NOT ATTEMPT TO STRAIGHTEN BLADES.**
8. Insert (9).

Replace if bore is scored.
9. Snap Ring (21).

Replace if ring has not retained its temper.
10. 'O' Rings (10 and 29).

Replace if section through ring has taken a permanent set indicated by flats on the sides of the ring.
11. Nozzle Ring (19).

Check for cracked, bent, damaged or eroded vanes. A very slight bent vane is permissible. **DO NOT ATTEMPT TO STRAIGHTEN VANES.**
12. It is considered advisable when overhauling the unit to use the recommended overhaul kit.

Instructions for assembling Turbochargers

When the turbocharger has been thoroughly cleaned, inspected and any damaged parts replaced, assembly can commence. Assembly of the unit is the reverse of dismantling, but it is advised that the following points be noted, if a satisfactory re-build is to be obtained.

1. Replace the plug and the turbine back plate (20). Replace the retaining ring (21) with the bevel side of the ring uppermost using circlip pliers Seeger A/1.
2. Replace the bearings and associated components in the following sequence from the compressor end of the bearing housing ensuring that the snap rings are secure in their grooves:—

Snap ring (16), oil control sleeve (24)—flat side uppermost, bearing (25), two snap rings.

NOTE: On some models, bearings (25 and 26) are identical, on certain other models the turbine end bearing (25) may be identified by the absence of the axial oil grooves. When replacing bearings ensure that the grooveless bearing is assembled at the turbine end of the bearing housing.

Take care not to scratch or damage the bearing housing bores when using circlip pliers.
3. With the turbine housing inlet flange clamped in a vice or suitable fixture install nozzle ring (19). Fit the two piston rings (5) to the shaft and turbine wheel assembly (23), using tools J17392 and J17393 on later models and taking care not to distort the rings by over expanding them. Rotate until their gaps are 180° apart. Position o.d. of rings concentric with the shaft.
4. Stand the shaft and turbine wheel assembly (23) upright in the turbine housing (22) as shown. Lubricate shaft and piston rings.
5. Install bearing housing sub-assembly over shaft and lower into assembled position using pliers J17394 to compress the piston rings. **DO NOT FORCE.** If rings do not enter bore easily, remove housing and re-position rings on shaft.

Align assembly marks on bearing housing and turbine housing.

Coat threads of the eight set screws (17) with anti-seize compound and assemble to turbine (22) together with lockplates (18). Torque setscrews to 17 lb.ft. and lock lockplates.
6. Lubricate and install bearing (26) in the compressor end of the bearing housing bore. Assemble the thrust bearing components, aligning bolt holes as each part is assembled, in the following order:— Place spacer (15) against bearing housing, install thrust ring (30) and spacer sleeve (31). Lubricate thrust ring face only. Install thrust bearing (13) with oil passage hole facing spacer (15). Lubricate thrust bearing thrust faces only. Install thrust ring (30).

Place oil deflector (7) over thrust bearing.

Install three lockplates (12) and three capscrews (11), torque screws to 5 lb ft. and securely lock the lockplates

against o.d. of oil deflector and heads of screws, if used. On later models spring washers are used in place of lock plates.

NOTE: On some models an additional thrust washer (27) is fitted between bearing (26) and spacer (15).

7. Lubricate 'O' ring (10) with a light film of grease and install in groove in bearing housing (28).

Install piston rings (5) in groove in flinger sleeve (6), rotate gaps in rings 180° apart.

Using finger pressure only install flinger sleeve (6) together with piston rings (5) into bore of insert (9).

DO NOT FORCE. If rings do not enter bore easily remove flinger sleeve and re-centre rings.

Assemble insert (9) over shaft. Using circlip pliers Seeger J/31 install retaining ring (8) in groove with its flat side towards insert.

8. Install shim(s) (4) and checking block J.10180 onto the shaft. Grease threads and face of locknut (2) and, holding turbine wheel extension, tighten locknut to 30 lb.ft. torque using a torque spanner and $\frac{3}{4}$ " A/F drive socket.

Check with feeler gauges that the total clearance between checking block and housing lies between 0.020" and 0.022" with wheel pushed to the turbine end to take up end thrust. Adjust thickness of shims to correct clearance if required—0.003", 0.005" and 0.010" shim thicknesses are available.

NOTE: Torque locknut to 30 lb.ft. each time clearance is checked.

9. Apply a film of grease to bore of compressor wheel (3) remove all grease from back of compressor wheel.

Place unit in press with turbine wheel extension supported. Place compressor wheel (3) over shaft and, using tool J.10370, press until wheel bottoms—take care that wheel starts squarely on the shaft. Remove unit from press and replace in vice.

Apply a film of grease to threads and face of locknut (2). Holding turbine wheel extension tighten locknut on shaft to 30 lb.ft. torque using torque spanner and $\frac{3}{4}$ " A/F drive socket.

Re-check 0.020" to 0.022" compressor back clearance using feeler gauges.

10. Mount dial indicator clock on end of shaft and check vertical travel of shaft between extreme up and down positions.

Total travel should be within 0.004" to 0.006" (this reading may be less if a great deal of oil was smeared on the thrust assembly components during assembly).

Mount dial indicator clock horizontal on compressor wheel boss and check extreme radial travel of the shaft by pushing the wheel towards and away from the dial indicator. Total travel should be within 0.015" to 0.026".

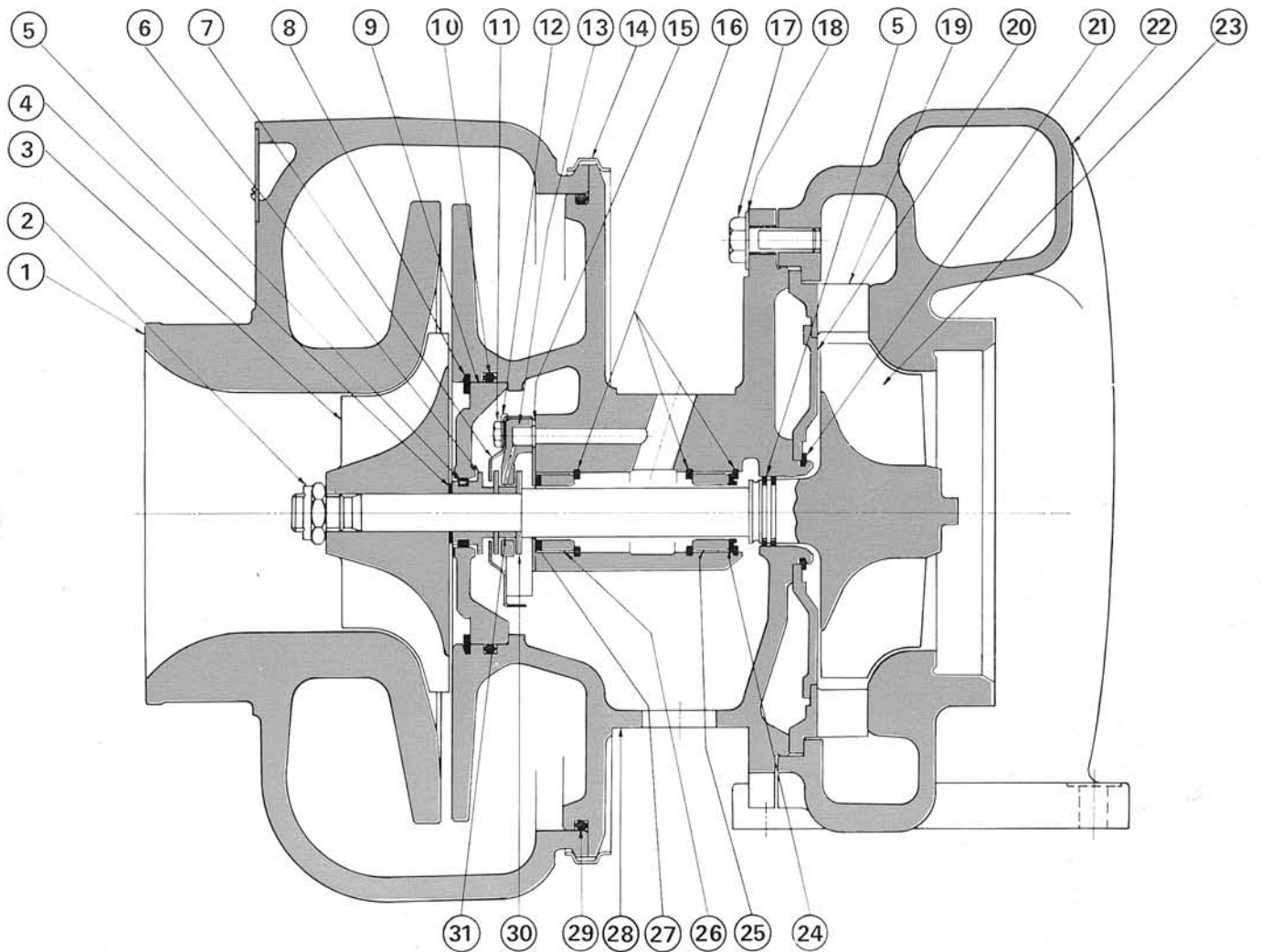
11. Place 'V' clamp (14) over bearing housing (28), install 'O' ring (29) onto bearing housing. Align assembly marks on both bearing housing (28) and compressor cover (1) and position 'V' clamp on both flanges. Grease 'V' clamp thread and face of locknut, assemble locknut and torque to 10 lb.ft.

Installation check list

1. Inspect air intake system for cleanliness and foreign material.
2. Inspect exhaust manifold for foreign material.
3. Inspect oil drain line. Make certain that line is not clogged.
4. Inspect oil supply line for clogging, deterioration or possibility of leaking under pressure.
5. Inspect the turbocharger mounting pad on the manifold to make certain that all of the old gasket has been removed.
6. Install new gasket between turbo and manifold. Make certain gasket does not protrude into opening of manifold. Opening in gasket should be preferably $\frac{1}{16}$ in. away from edge of opening in manifold.
7. Install and tighten mounting bolts.
8. Connect oil supply line but leave oil drain line disconnected at this time.
9. Connect compressor inlet and outlet piping. Check all joints for possible leaks. Make certain that piping is not producing strain on compressor cover.
10. Crank engine without firing until a steady flow of oil is noted coming from oil drain line.
11. Stop cranking, connect oil drain to crankcase.

Turbocharger service tools

J.10180	Checking block
J.10370-1	Pressing piece
J.11306	Pressing pin
J.15176	Piston ring groove width gauge (turbine end)
J.15394	Piston ring groove width gauge (comp. end)
	Seeger J/31 circlip pliers.
	Seeger J/1 circlip pliers.
	Seeger A/1 circlip pliers.
	MHH A360 torque spanner.
	Britool 2RB 5662 $\frac{9}{16}$ " x $\frac{5}{8}$ " A/F ring spanner
	Britool AB 750 $\frac{3}{8}$ " x $\frac{3}{4}$ " A/F socket
	Britool AD 437 $\frac{3}{8}$ " x $\frac{7}{16}$ " A/F long reach socket.
	Britool AB 312 $\frac{3}{8}$ " x $\frac{5}{16}$ " A/F drive socket.
15180	Two machine screws no. 10-24 NC-2A thread
52845	Toolbox complete with nameplate.
53382	Complete kit as above.



Parts list

Item No.	Name of Part	Quantity Per Turbo		Quantity
1	Compressor Cover	1		3
2	Locknut	1		8
3	Compressor wheel	1		8
4	Shims	as reqd.		1
5	Piston ring	4		1
6	Flinger sleeve	1		1
7	Oil deflector	1		1
8	Retaining ring (insert)	1		1
9	Insert	1		1
10	'O' ring (insert)	1		1
11	Capscrew	3		1
12	Lockplate or spring washer	3		1
13	Thrust bearing	1		1
14	'V' clamp (compressor)	1		1
15	Spacer	1		1
16	Snap ring (bearing)			3
17	Set screw			8
18	Lockplate			8
19	Nozzle ring			1
20	Turbine back plate			1
21	Retaining ring (turbine)			1
22	Turbine housing			1
23	Shaft and turbine wheel assy.			1
24	Oil control sleeve			1
25	Bearing (turbine end)			1
26	Bearing (comp. end)			1
27	Thrust washer (on certain models)			1
28	Bearing housing			1
29	'O' ring (cover)			1
30	Thrust ring			2
31	Spacer sleeve			1

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