CAV

HOLSET

Turbochargers

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

Models 6D, 6LD, 6MD

CAV and SIMMS PARTS AND SERVICE LONDON W3

153/A/99/3 Holset

IN GENERAL 6 MD
SUPERSEDES 6 D

6MD

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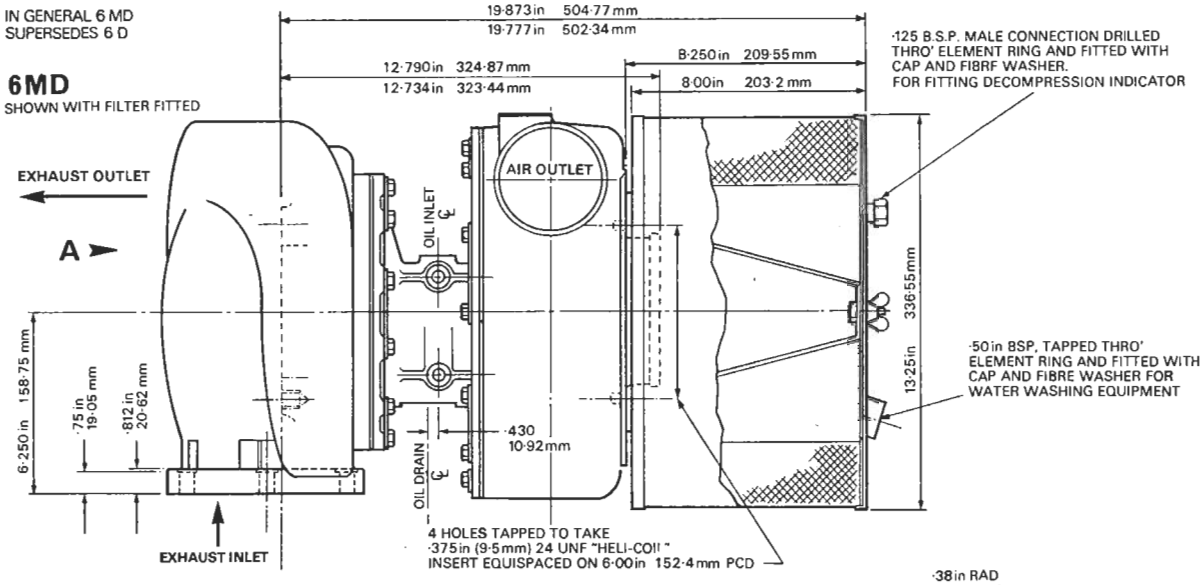

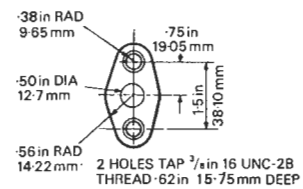

6D

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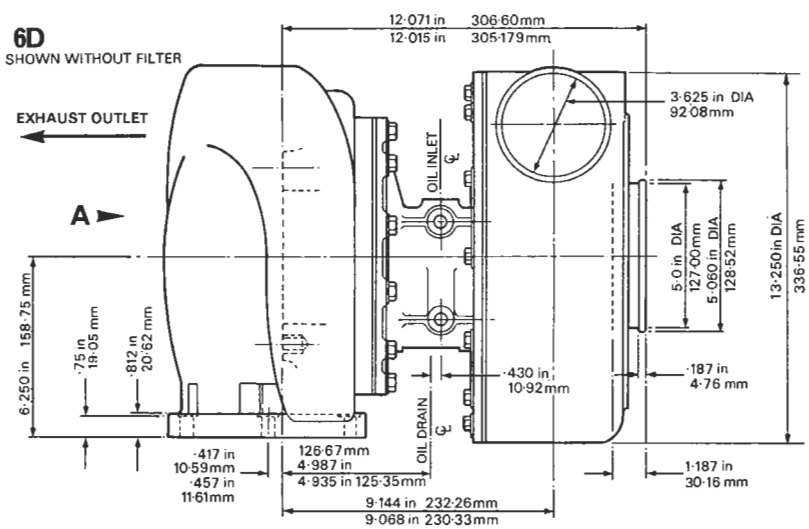
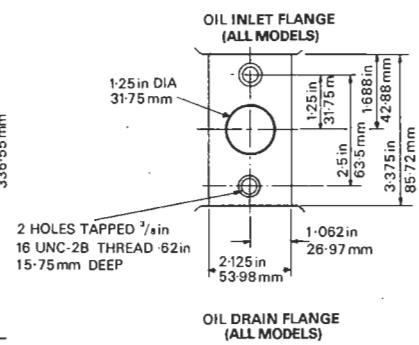
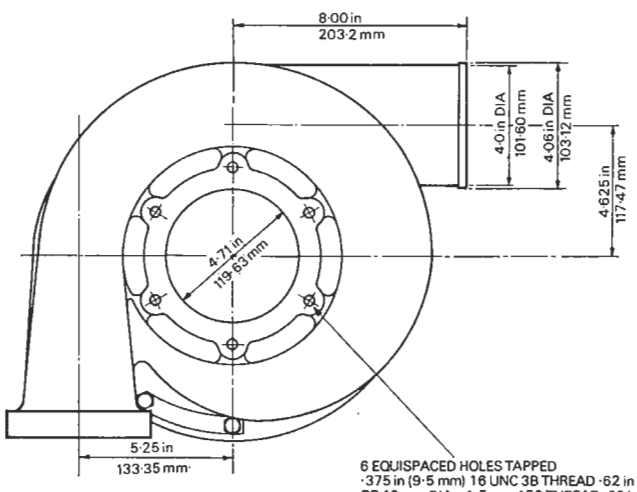
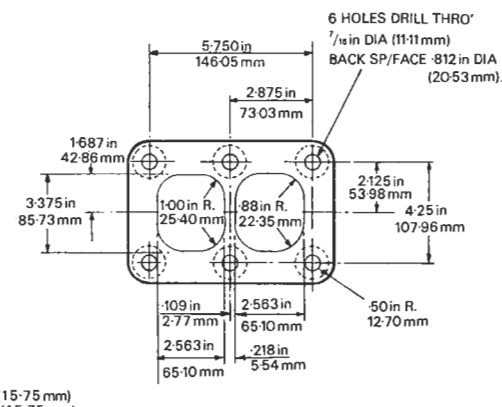




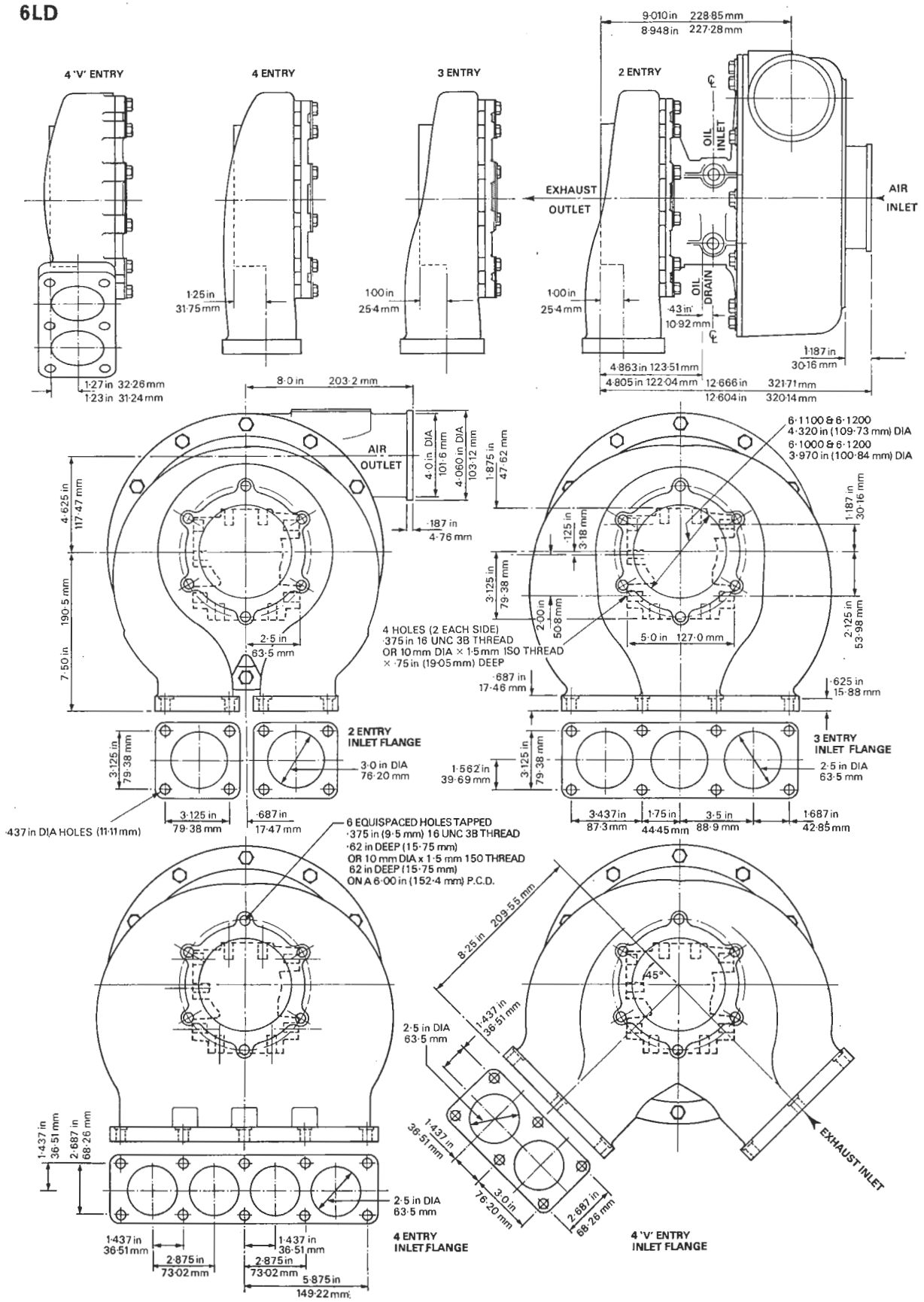


VIEW ON **A**



EXHAUST INLET FLANGE

6LD


4 'V' ENTRY
4 ENTRY
3 ENTRY
2 ENTRY
9·010 in 228·85 mm
8·948 in 227·28 mm
OIL INLET
EXHAUST OUTLET
AIR INLET
OIL DRAIN
·43 in 10·92 mm
1·00 in 25·4 mm
1·25 in 31·75 mm
1·187 in 30·16 mm
4·863 in 123·51 mm
4·805 in 122·04 mm
12·666 in 12·604 in
321·71 mm 320·14 mm
1·27 in 32·26 mm
1·23 in 31·24 mm
8·0 in 203·2 mm
AIR OUTLET
4·0 in DIA 101·6 mm
4·060 in DIA 103·12 mm
·187 in 4·76 mm
4·625 in 117·47 mm
190·5 mm
7·50 in
2·5 in 63·5 mm
2 ENTRY INLET FLANGE
3·0 in DIA 76·20 mm
3·125 in 79·38 mm
·437 in DIA HOLES (11·11 mm)
·687 in 17·47 mm
6·1100 & 6·1200 4·320 in (109·73 mm) DIA
6·1000 & 6·1200 3·970 in (100·84 mm) DIA
1·875 in 47·62 mm
1·187 in 30·16 mm
·125 in 3·18 mm
3·125 in 79·38 mm
2·00 in 50·8 mm
2·125 in 53·98 mm
4 HOLES (2 EACH SIDE)
·375 in 16 UNC 3B THREAD
OR 10 mm DIA × 1·5 mm ISO THREAD
× ·75 in (19·05 mm) DEEP
5·0 in 127·0 mm
·687 in 17·46 mm
·625 in 15·88 mm
3 ENTRY INLET FLANGE
2·5 in DIA 63·5 mm
1·562 in 39·69 mm
3·437 in 87·3 mm
1·75 in 44·45 mm
3·5 in 88·9 mm
1·687 in 42·85 mm
6 EQUISPACED HOLES TAPPED
·375 in (9·5 mm) 16 UNC 3B THREAD
·62 in DEEP (15·75 mm)
OR 10 mm DIA x 1·5 mm ISO THREAD
62 in DEEP (15·75 mm)
ON A 6·00 in (152·4 mm) P.C.D.
1·437 in 36·51 mm
2·687 in 68·26 mm
2·5 in DIA 63·5 mm
4 ENTRY INLET FLANGE
1·437 in 36·51 mm
2·875 in 73·02 mm
5·875 in 149·22 mm
8·25 in 209·55 mm
45°
2·5 in DIA 63·5 mm
1·437 in 36·51 mm
3·0 in 76·20 mm
2·687 in 68·26 mm
EXHAUST INLET
4 'V' ENTRY INLET FLANGE

Introduction

This manual covers the recommended procedures for servicing model 6D, 6LD, 6MD, turbochargers. In general it is recommended that the units should be overhauled at intervals of 5000 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.

Close adherence to engine maintenance schedules for lubricating oil and filter changes is necessary to ensure the normal working life of turbocharger bearings.

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/in² (2·0 kg/cm²) and pressures up to 60 lb/in² (4·0 kg/cm²) are satisfactory. Under idling conditions the pressure should not fall below 10 lb/in² (0·703 kg/cm²).
   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.

Instructions for dismantling Turbochargers

Refer to sectional view for itemised parts.

1. With the unit upright and the turbine inlet flange clamped in a vice or similar fixture, mark the relative positions of the turbine housing (21), bearing housing (28), and compressor cover (1).
2. Remove the 12 bolts (17) together with the associated lock plates (16). The compressor cover may then be sufficiently raised to permit taper nose pliers (Seeger J/31) to be inserted in the two plain holes at the ends of the lockring (14).
   Compress the lockring to release it from the groove in the cover, and remove the cover.
3. Remove the 12 setscrews (18) together with the associated lockplates (19) from the turbine housing (21).
   Lift the core assembly clear of the turbine housing (21) and nozzle ring (20).
4. Holding the turbine wheel extension, remove the compressor locknut (2) with a torque spanner and $1\frac{1}{8}$ in 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 (24) using pressing pin 57096.
   Remove the compressor wheel (3) and shims (4). Lift the unit clear of the press and remove the shaft and turbine wheel assembly (24) 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 (part No. 15180) 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:—
   straighten the lockwashers (12) and remove the three screws (11), lockwashers (12), oil deflector (7), thrust ring (30), thrust bearing (13), spacer sleeve (31) and second thrust ring (30). Lift off oil retainer (29).
8. Remove the bearings and associated components in the following sequence from the compressor end of the bearing housing:—
   Remove compressor end bearing (26) and two snap rings (27) using circlip pliers (Seeger J1), turbine end bearing (26), thrust washer (25), and snap ring (27).

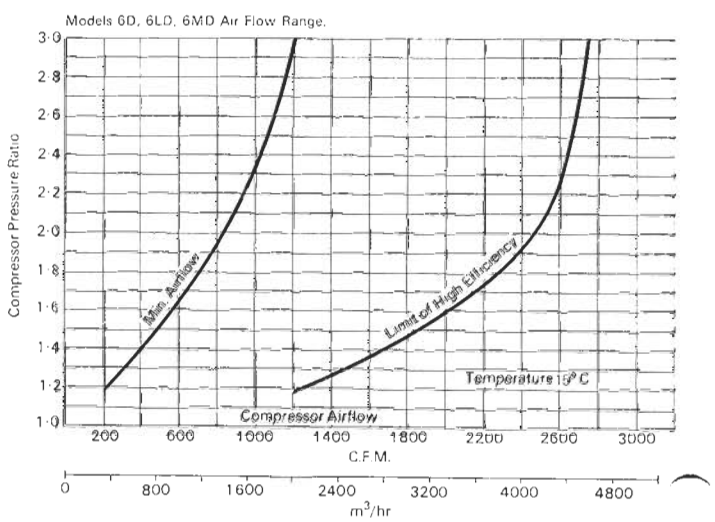
Note:

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

9. To remove the turbine backplate (22) from the bearing housing (28). Remove the retaining ring (23) using circlip pliers (Seeger A/1), remove the turbine backplate (22).
   Remove the plug from the bearing housing (28) and the nozzle ring (20) from the turbine housing (21).

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.
4. Clean all drilled passages with compressed air jet.
5. Make certain that 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 (24).
   (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. Check width using piston ring width gauge 56678.
   (c) Check carefully for cracked, bent or damaged blades. DO NOT ATTEMPT TO STRAIGHTEN BLADES.
2. Bearings (26).
   (a) 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. Minor scratches are permissible.
4. Flinger Sleeve (6).
   Replace if piston ring groove or flinger is damaged. Check width using piston ring width gauge 57097.
5. Thrust Rings (30), Thrust Bearing (13) and Thrust Washer (25).
   (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. Oil Retainer (29).
   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 or worn.
9. Retaining Ring (23).
   Replace if ring has not retained its temper.
10. 'O' Ring (10).
    Replace if section through ring has taken a permanent set indicated by flats on the sides of the ring.
11. Nozzle Ring (20).
    Check for cracked, bent, damaged or eroded vanes. A very slightly 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 rebuild is to be obtained.

1. Replace the plug and the turbine backplate (22). Replace the retaining ring (23) 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 (27), thrust washer (25), bearing (26), two snap rings (27).
   Take care not to scratch or damage the bearing housing bores when using circlip pliers.
3. With the turbine housing inlet flange clamped into a vice or suitable fixture, install nozzle ring (20). Fit the two piston rings (5) to the shaft and turbine wheel assembly (24) 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 (24) upright in the turbine housing (21). Lubricate shaft and piston rings.
5. Install bearing housing sub-assembly over shaft, and lower into assembled position. 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 twelve setscrews (18) with anti-seize compound and assemble to turbine housing (21) together with lockplates (19). Torque setscrews to 12 lb/ft and lock lockplates.
6. Lubricate and install bearing (26) in compressor end of bearing housing bore. Assemble the thrust bearing components, aligning bolt holes as each part is assembled in the following order:—
   Place oil retainer (29) 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 oil retainer (29). Lubricate thrust bearing faces only.
   Install thrust ring (30).
   Place oil deflector (7) over thrust bearing.
   Install three lockwashers (12) and three capscrews (11), torque screws to 5 lb/ft and securely lock the lockwashers against o.d. of oil deflector and heads of screws.
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 the 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 and, using circlip pliers Seeger J31, install retaining ring (8) in groove with its flat side towards insert.
8. Install shim(s) (4) and checking block 56687 on to shaft. Grease threads and face of locknut (2) and, holding turbine wheel extension, tighten locknut to

60 lb/ft torque using a torque spanner and 1⅛in A/F drive socket.
Check with feeler gauges that the total clearance between checking block and housing lies between 0·016in and 0·018in with rotor pushed to turbine end. Adjust thickness of shims to correct clearance if required—0·003in, 0·005in and 0·010in shim thicknesses are available.

Note: Torque locknut to 60 lb/ft each time clearance is checked.

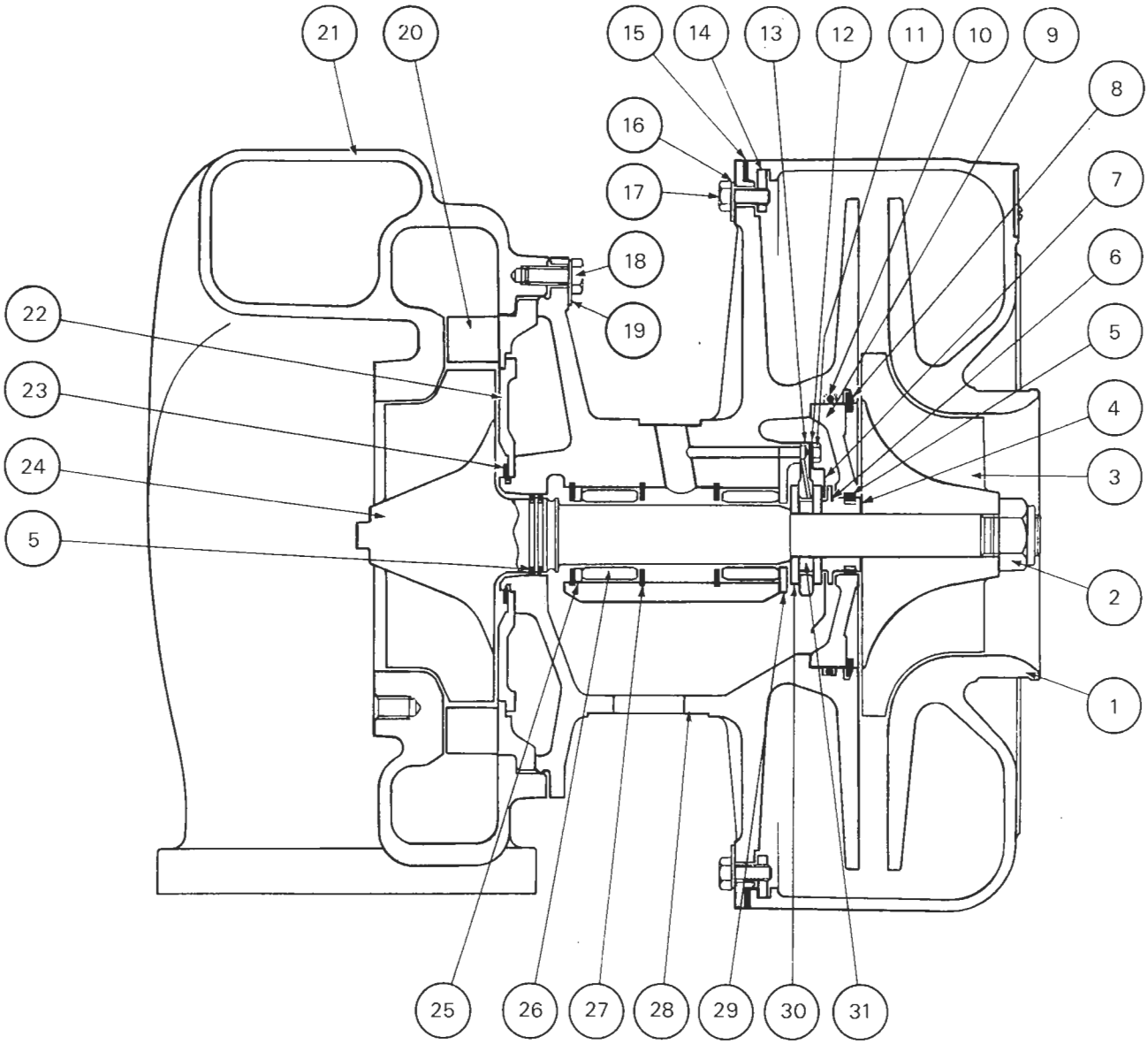
9. Apply a film of grease to bore of compressor wheel (3), remove all grease from back of compressor wheel. Place unit in press with turbine wheel extension supported. Place compressor wheel (3) over shaft and, using tool 57095, press until wheel bottoms—take care that the wheel starts squarely on the 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 60 lb/ft torque using a torque spanner and 1⅛in A/F drive socket.
   Recheck 0·016in to 0·018in 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 0·004in– 0·006in (this reading may be less if a great deal of oil was smeared on the thrust assembly components during assembly).
    Mount dial indicator clock on compressor wheel boss and check extreme radial travel of the shaft by pushing the wheel towards and from the dial indicator. Total travel should be within 0·019in–0·0265in.
11. Place the lockring over the housing. Position the compressor cover on the housing and at the same time compress the lockring into the internal groove in the cover by means of circlip pliers J31 in two holes adjacent to the ends of the lockring.
    Fit twelve bolts (17) together with lockplates (16), re-align assembly marks, torque bolts to 8 lb/ft and lock lockplates.
    Check that the rotor spins freely.

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 blocked.
4. Inspect oil supply line for blockages, deterioration or possibility of leakage 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 that gasket does not protrude into opening of manifold. Opening in gasket should preferably be $\frac{1}{16}$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 o is noted coming from oil drain line.
11. Stop cranking, connect oil drain to crank case.

Turbocharger service tools

Holset Part No.	Description
56687	Checking block
57095	Pressing piece
57096	Pressing pin
56678	Piston ring groove width gauge (turbine end)
57097	Piston ring groove width gauge (comp. end)
56662	Seeger J/31 Circlip pliers
56663	Seeger A/1 Circlip pliers
56664	Seeger J/1 Circlip pliers
56685	Torque spanner MHH/360
56676	Torque spanner MHH/B60
57098	Drive socket ½in sq. drive x 1⅛in A/F Britool EB1125
57099	Drive socket ⅜in sq. drive x $\frac{5}{16}$in A/F Britool AB312
56659	Britool 2RB4350 $\frac{7}{16}$in x 1½in A/F ring spanner
15180	Two machine screws No. 10.24 N.C.—2A thread



Parts List

Item No.	Name of Part	Quantity Per Turbo'	Item No.	Name of Part	Quantity Per Turbo'
1	Compressor Cover	1	20	Nozzle Ring	1
2	Locknut	1	21	Turbine Housing	1
3	Compressor Wheel	1	22	Turbine Back Plate	1
4	Shims	as required	23	Retaining Ring (Turbine)	1
5	Piston Rings	4	24	Shaft and Turbine Wheel Assembly	1
6	Flinger Sleeve	1	25	Thrust Washer	1
7	Oil Deflector	1	26	Bearings	2
8	Retaining Ring (Insert)	1	27	Snap Ring (Bearing)	3
9	Insert	1	28	Bearing Housing	1
10	'O' Ring (Insert)	1	29	Oil Retainer	1
11	Capscrew	3	30	Thrust Ring	2
12	Lockwashers	3	31	Spacer Sleeve	1
13	Thrust Bearing	1	32	Breather Plug	1
14	Cover Lock Ring	1	33	Gasket—Oil Inlet	1
15	Gasket (Compressor)	1	34	Gasket—Oil Drain	1
16	Lockplates (Compressor)	6	35	Serial Nameplate	1
17	Bolts	12	36	Nameplate Screws	3
18	Setscrew	12	37	Nameplate	1
19	Lockplates (Turbine)	1	38	Gasket—Turbine Inlet	1

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