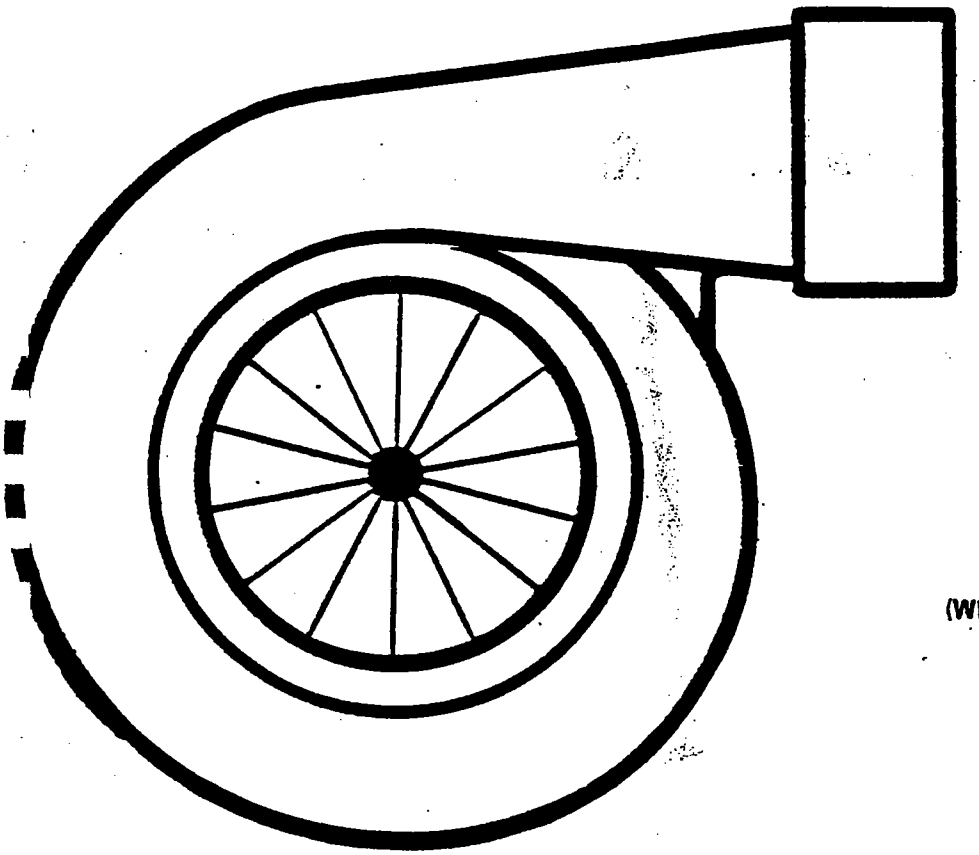
ROTO-MASTER

MAINTENANCE & OVERHAUL MANUAL



ROTO-MASTER®

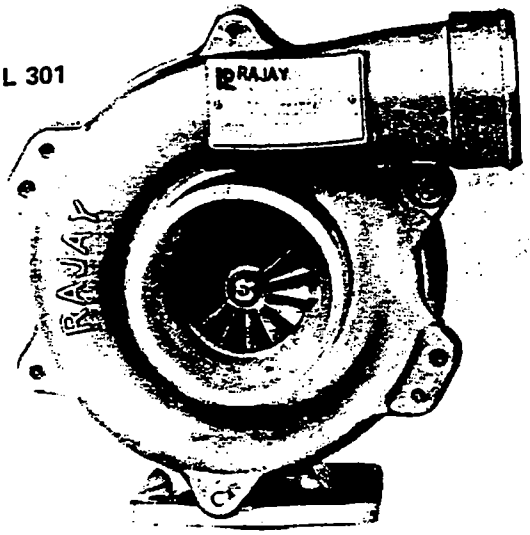
RAJAY
PRODUCT

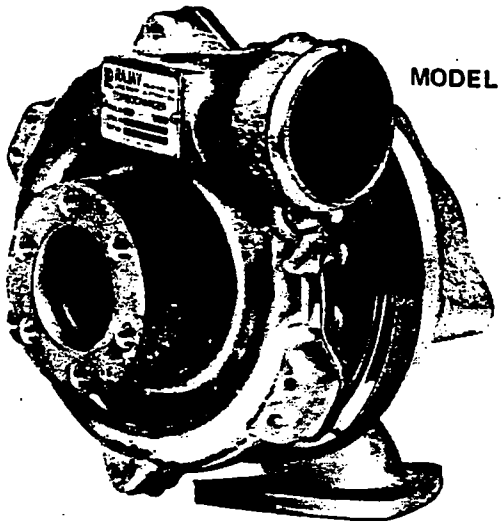
300 SERIES TURBOCHARGERS
(WITH DIE-CAST BEARING HOUSING)

 Printed in U.S.A.

BULLETIN NO.001383

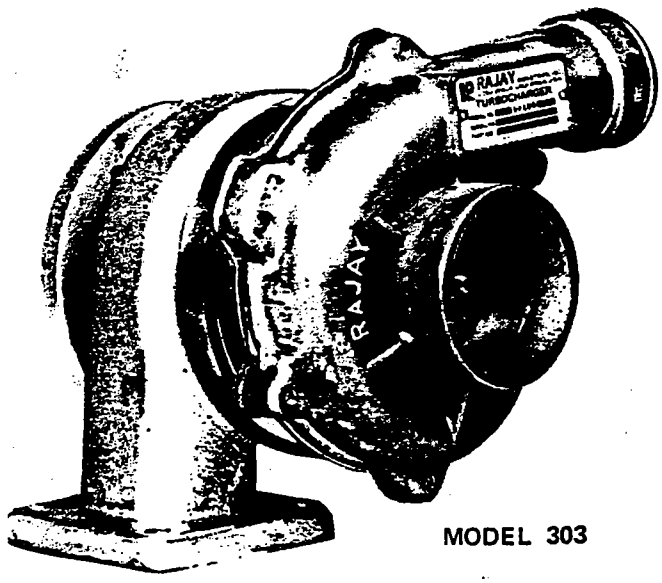
MODEL 301



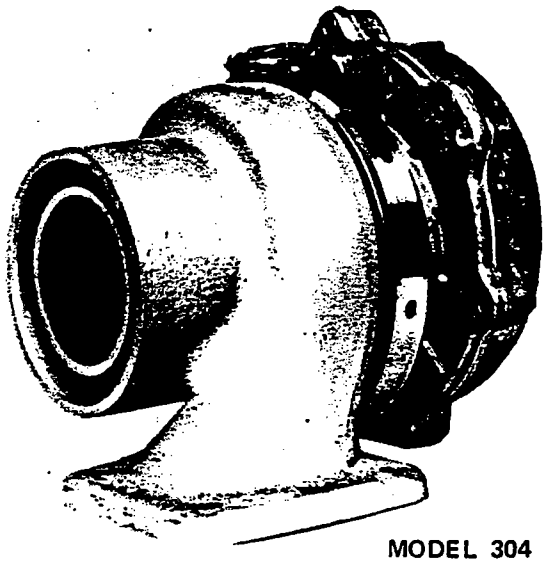


MODEL 302

RAJAY 300 SERIES TURBOCHARGERS



MODEL 303



MODEL 304

Figure 1

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TROUBLESHOOTING

With the design simplicity and precision construction of the Rajay Turbocharger, any difficulty experienced is usually traced to other engine systems rather than the turbocharger itself. The following troubleshooting table is useful in diagnosing and correcting unsatisfactory operation. Each trouble symptom is followed by a list of possible causes and the recommended remedy. Correct these probable trouble areas before assuming that the turbocharger is at fault.

TROUBLE	PROBABLE CAUSE	REMEDY
Smoking engine exhaust, loss of engine power, low boost pressure	Dirty air cleaner; undersize air cleaner.	Clean or replace air cleaner as required.
	Restricted intake manifold or piping.	Remove restriction.
	Foreign matter or dirt accumulation on impeller.	Clean impeller (see par. F, pg. 13).
	Damaged impeller or turbine wheel.	Rebuild unit.
	Excessive oil leakage from seals.	Rebuild unit.
	Leaking intake or exhaust manifold connections.	Tighten all connections and replace gaskets where required.
	Excess back pressure on turbine outlet.	Reduce restrictions in exhaust ducting.
Noisy rotating assembly	Damaged bearing or other component, causing rotating assembly to rub against housing.	Rebuild unit.
	Insufficient or complete lack of oil.	Rebuild unit. Determine and correct cause of lack of oil.
Excess oil in intake manifold or exhaust stack.	Oil carryover from air cleaner.	Service or replace air cleaner.
	Excessive oil leakage from seals.	Rebuild unit.
Boost pressure low, power low, clean exhaust.	Insufficient fuel supply to engine.	Check fuel system.
Engine knock (gasoline).	Improper fuel.	Use recommended fuel.
	Excessive boost due to incorrect turbocharger, carburetor, or other component.	Check engine manual and install correct components.
	Ignition timing incorrect.	Reset timing to specifications.

SERVICE MANUAL
Rajay 300 Series Turbocharger

I. INTRODUCTION

The 300 Series turbochargers, designed and built by Rajay Industries, represent the most advanced state of the art. Recognized as the standard for high performance power boosters, these units combine lightweight, compact design and ease of installation with rugged construction for reliable service under the most rigorous operating conditions. When following prescribed, simple maintenance practices, long turbocharger life and maximum operating efficiency can be expected.

This manual provides general installation, troubleshooting and routine maintenance information together with detailed disassembly, repair and assembly data on 300 Series turbochargers.

II. DESCRIPTION

All models in the series feature a 3 inch diameter precision-balanced rotating group which consists of a radial inflow turbine wheel on one end and a centrifugal impeller on the opposite end, each encased in its own suitable housing. The precision-balanced shaft assembly is supported by a die-cast aluminum, two piece center housing which features a patented, one-piece aluminum bearing of semi-floating design, lubricated with engine oil under pressure. (See Fig. 23). Both ends of the bearing serve as thrust surfaces, with bearing rotation being restrained by the bearing flange at the compressor end.

Oil leakage at the compressor end is prevented by a carbon face-type seal. A piston ring-type seal is used at the turbine end.

III. HOW THE TURBOCHARGER OPERATES

The turbocharger is not mechanically coupled to the engine. It is driven by the exhaust gas energy which is wasted in naturally-aspirated engines. No engine power is consumed by the turbocharger.

As illustrated in Fig. 2, hot engine exhaust gas is routed into the turbocharger turbine inlet and directed against the turbine wheel, causing it to rotate at high speed. An impeller wheel on the opposite end of the rotating assembly draws air into the compressor where it is forced radially outward under pressure into the engine's intake manifold. Thus, the amount of air available to the engine is increased, allowing more efficient burning of increased amounts of fuel. The result: greater horsepower output than is possible with a naturally-aspirated engine.

Furthermore, the added air improves cylinder scavenging, resulting in better fuel economy and

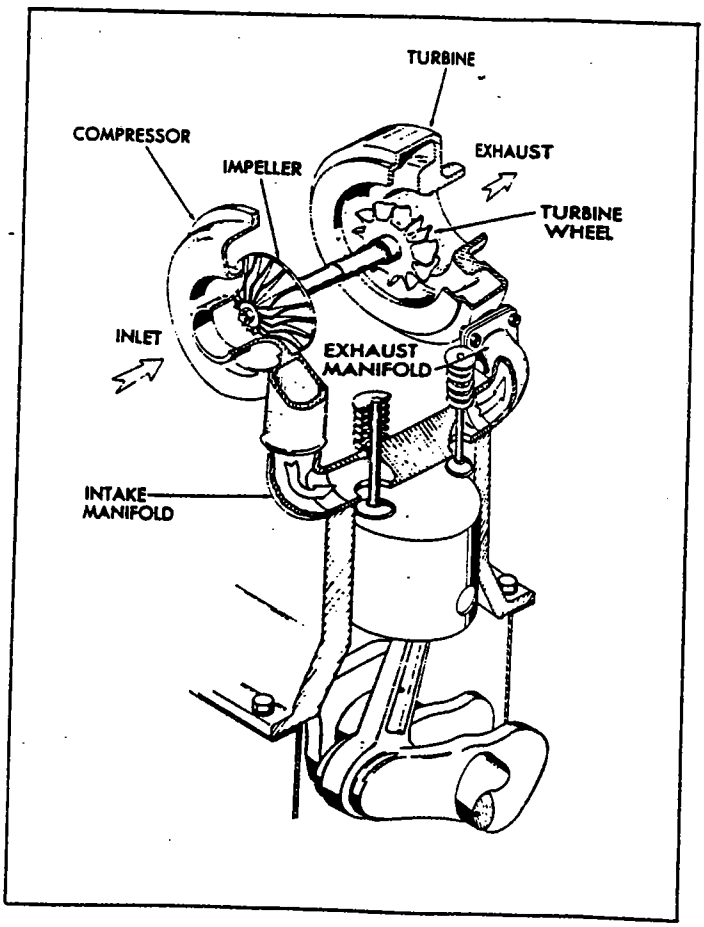

Figure 2. TURBOCHARGER OPERATION DIAGRAM

lower exhaust temperature. The slight effect of the exhaust manifold back pressure is more than offset by the much greater discharge of air from the compressor.

Under heavy loads or lugging operation, the increased volume of exhaust gas increases turbocharger speed, thus providing more air to meet the engine's increased demand.

Conversely, when engine loads are light, the lesser volume of exhaust gas causes the turbocharger to decrease speed and consequently, the air volume output of the turbocharger.

IV. HOW TO INSTALL A NEW TURBOCHARGER

A. When the turbocharger unit is unpacked, make certain that no foreign material is lodged in any of its ports.

B. Place an asbestos-packed, steel-wrapped gasket on the exhaust manifold pad of the engine where the turbocharger is to be mounted. Then place the turbocharger on the engine with the turbine housing flange over the gasket. (Do not coat the gasket with any sealant.) Coat the threads of the mounting bolts or studs with a high-temperature thread lubricant, and then secure the turbocharger to the manifold.

C. Loosen the nut on the turbine housing clamp and rotate the compressor outlet to the required angular position for connecting the compressor outlet to the intake manifold. (NOTE: With the compressor in position, the oil outlet port should be within 45° of bottom center for proper oil flow through the turbocharger. If it is not, the compressor flange must be repositioned on the bearing housing, as shown in Fig. 24, Page 18.)

D. Since the turbocharger requires engine oil under pressure an oil supply line from some pressure point in the engine oil system must be installed. Check the line for dirt, clogging or other conditions that could cause leakage under pressure or damage to the turbocharger. The oil supply line must be at least ¼ inch flexible woven hose or ¼ inch tubing with fittings (No. 4 Aeroquip or equivalent).

Connect the oil supply line to the oil inlet port.

E. An oil return line is required to route oil from the turbocharger back to the engine sump. A special turbocharger adapter is required. Do not connect this line until free flow of oil through the turbocharger is observed. Crank the engine without firing, or with fuel shut off, until there is a free flow of oil from the oil drain port. This will assure a supply of oil to the turbocharger during engine operation.

NOTE!
Lubricating oil to the turbocharger must be filtered through a 25 to 35-micron filter. If an auxiliary filter is used, it must be the by-pass type.

F. The oil drain line must slope continuously downward from the turbocharger oil outlet to the return point at the engine sump. This point of return must not be below the engine oil level in order to assure free flow through the drain line. An oil drain line of 7/16 I.D. min. tubing, or 1/2-inch I.D. woven flexible hose is recommended (No. 8 Aeroquip or equivalent).

G. Tighten the turbine housing clamp to 15-20 inch-pounds.

H. Connect the compressor outlet to the intake manifold.

I. Connect the air cleaner-to-compressor inlet piping. Carry the air cleaner outlet diameter as close to the turbocharger as possible before making any necessary reduction. Piping must be free from sharp bends and restrictions.

J. Connect the exhaust piping to the turbine discharge port. The exhaust piping must be at least as large as the discharge opening.

V. REINSTALLING A USED TURBOCHARGER AFTER SERVICING

A. When a turbocharger is removed from an engine for servicing, it may be disconnected at the turbine housing clamp, thus allowing the turbine housing to remain installed on the exhaust manifold. Before reinstalling, clean the two pilot diameters and the gasket surfaces of both the turbine housing and bearing housing assembly.

B. Using a new turbine housing gasket, position the turbocharger on the turbine housing. Reinstall the turbine housing clamp, but do not tighten. Carefully rotate the compressor section to the correct angular position for making the connections to the intake manifold.

C. Refer to steps (D) through (J) above under INSTALLING A NEW TURBOCHARGER to complete the installation.

VI. ROUTINE TURBOCHARGER PREVENTATIVE MAINTENANCE

A. PERIODIC INSPECTION. Whenever routine service of the engine is performed, inspect the turbocharger as follows:

1. Inspect the hoses and tubing of the air intake system between the air cleaner and turbocharger, and from the turbocharger to the intake manifold. Check for leakage due to cracks, damaged gaskets, loose clamps or connections, and restrictions due to kinks, collapsed hoses, or dented tubing.

2. Inspect for exhaust leakage from a cracked exhaust manifold, damaged gaskets or loose turbocharger mounting.

3. Inspect the oil lines and fittings for kinks, damage and leakage.

4. Note any unusual noises or vibration which would warrant further inspection of the turbocharger.

5. Observe engine exhaust. Excessive smoke may indicate a restricted air cleaner or intake piping, overfueling, or faulty turbocharger operation. (See "Troubleshooting Chart").

B. MAJOR INSPECTION AND CLEANING. Every 50,000 miles or after every 2,000 hours of operation. If trouble is suspected in the turbocharger, a major inspection should be performed. This requires removal of the turbocharger from the engine.

CAUTION !!

Before removing, clean the entire turbocharger, air piping, and oil line connections with a stiff brush or whisk broom. Then wipe with a cloth dampened with solvent. This precaution is necessary to prevent foreign matter from entering the engine and turbocharger system during removal.

PROCEED WITH INSPECTION AS FOLLOWS:

1. Remove the air cleaner piping from the turbocharger compressor inlet. Observe the condition of the impeller and housing. Carefully check the leading edges of the impeller blades for damage and for evidence of interference with the compressor housing.

2. Disconnect the oil lines and the intake manifold piping from the turbocharger. The entire turbocharger can be removed by removing the bolts or stud nuts securing the unit to the exhaust manifold. Or if desired, only the compressor section and rotating assembly can be removed, allowing the turbine housing to remain mounted to the engine. This is accomplished by first supporting the turbocharger, then removing the turbine housing clamp that secures the turbine housing to the bearing housing assembly. Cover all openings to prevent the entry of foreign materials.

3. Inspect the turbine wheel for cracks, erosion and nicked blade tips. Inspect the turbine shield for warpage, rubbing, scoring and erosion. Check for accumulations of carbon behind the turbine wheel and check for other defects that could interfere with proper turbocharger operation.

NOTE!!

The shield must be depressed against the tension of the spring ring to check for free rotation.

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4. If the turbine and impeller do not rotate freely when the turbine shield is depressed away from the turbine wheel, the parts may be damaged or there may be interference due to foreign material. These conditions will necessitate the disassembly of the turbocharger for inspection. If there is no apparent damage, clean the unit and check for excessive end play as directed below.

5. Using a 5/32 Allen wrench, remove the six (6) countersunk cap screws that secure the compressor housing to the bearing housing assembly. Separate these two components and remove the gasket. It may be necessary to tap the compressor housing gently with a plastic mallet while holding the bearing housing assembly as shown in Fig. 3.

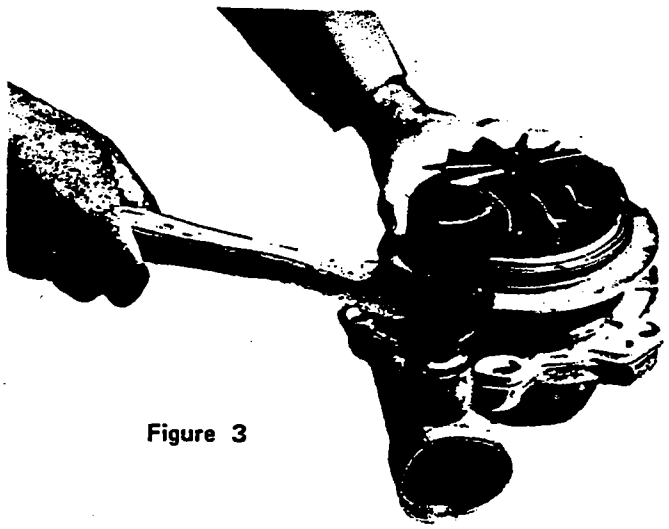

Figure 3

6. If the impeller requires cleaning, use a nylon-bristled brush and a solvent such as diesel fuel or kerosene to remove accumulated dirt. Thoroughly clean the impeller and the compressor housing. Failure to remove all dirt may result in a more severe unbalance than that which existed prior to cleaning.

CAUTION!!

Never use caustic solution or other cleaner that may attack aluminum. Never use a wire brush that could score highly-finished parts.

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7. With the gasket removed, reposition the bearing housing assembly onto the turbine housing and resecure the V-clamp as shown in Fig. 4. This will overcome the tension of the spring ring and hold the turbine shield away from the turbine wheel.

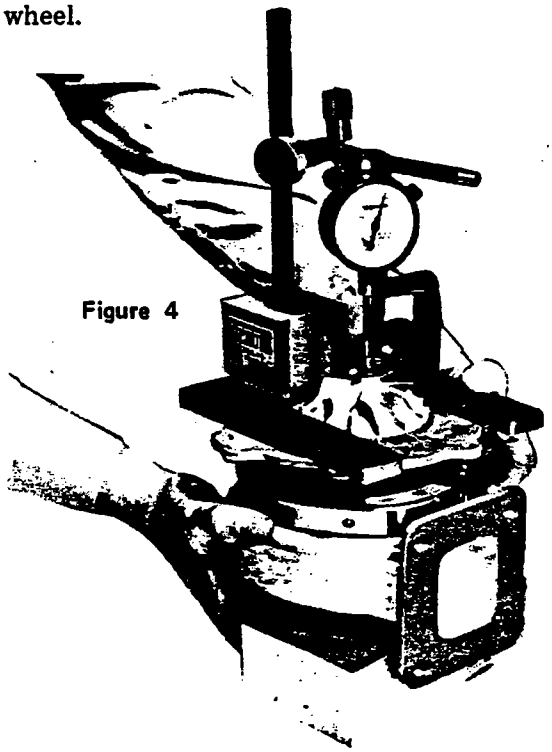


Figure 4

8. Place a flat U-plate on the bearing flange and secure it with a small C-clamp. Place a dial indicator on the plate and adjust it so that the indicator point is resting on the end of the shaft as shown in Fig. 4. Inserting your fingers into the turbine outlet, press up fully on the turbine wheel to measure shaft end play. The normal shaft end play is .005 to .009 inch. If shaft end play exceeds this limit, rebuild the turbocharger.

9. Reposition the dial indicator so that the contact point is resting on the flat side surface of the impeller nut as shown in Fig. 5, and then adjust the indicator dial to zero. Push from side to side as shown to determine the radial play of the shaft. Rotate the shaft slightly to get minimum readings on the nut flat. Maximum allowable radial play is .022 inch. If radial play exceeds this limit, parts are worn excessively and the turbocharger must be rebuilt.

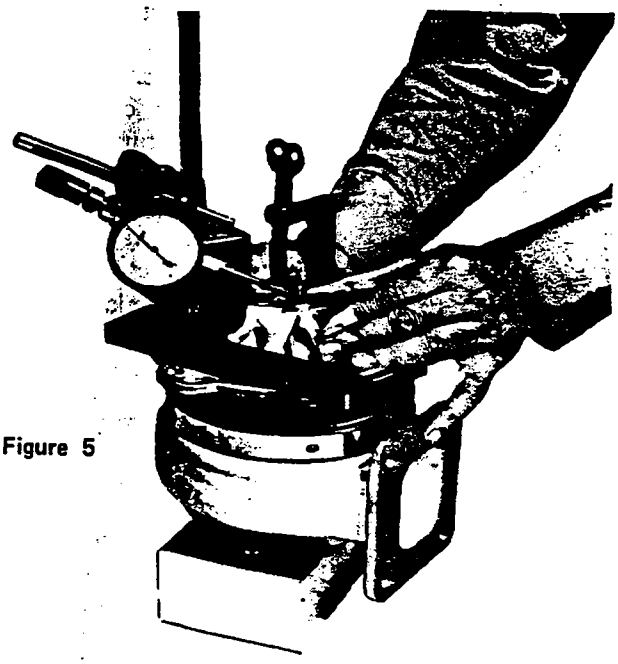


Figure 5

10. If the unit is in satisfactory condition, position a new gasket on the compressor housing, making sure that the gasket surfaces are perfectly clean. Place the bearing housing in position. Secure with six (6) cap screws, tightening evenly and alternately to 80 to 100 inch-pounds.

VII. DISASSEMBLY FOR OVERHAUL

NOTE

Disassemble the turbocharger only in a clean, dust-free location, using clean tools and equipment. Avoid contact with dust or grit which could score highly-machined parts and result in premature failure of the unit.

No special tools are required for the overhaul of Rajay Turbochargers. However, a holding fixture which can be easily fabricated in any machine shop, is helpful in performing many of the overhaul and assembly operations. A drawing of this fixture is provided in Fig. 25, page 19.

A. Position the turbocharger on a bench so that the turbine inlet flange hangs over the edge of the bench. Remove the lock nut from the housing clamp (2) and remove the clamp. Remove the turbine housing (1) and gasket (5).

NOTE

All index numbers in parentheses refer to items called out on the exploded view in Fig. 9, Page 10.

B. Using a 5/32 Allen wrench, remove the six countersunk cap screws (23) that secure the compressor housing (22) to the bearing housing assembly. If necessary, gently tap the compressor housing with a plastic hammer (see Fig. 3) to loosen it from the bearing housing assembly.

C. The impeller nut (20) has a left-hand thread! To prevent the turbine wheel from rotating while the nut is being removed, follow one of the three following recommended methods:

METHOD 1 - If the holding fixture, illustrated in Fig. 6, is available, insert the turbine wheel into the machined opening. The turbine wheel cannot rotate and the nut can easily be removed, turning it clockwise. Position the fixture in a vise for easy handling.

METHOD 2 - Grasping the blades of the turbine wheel firmly with the aid of a cloth or V-belt, loosen the nut as shown in Fig. 7.

METHOD 3 - On models with a cast hex on the turbine wheel end of the turbine shaft, place the hex in a 5/8 extended socket which has been secured in a vise (see Fig. 8) and the nut can easily be removed.

Remove the washer (19), and carefully remove the impeller (18). The shim or shims (17) may stick to the impeller or may remain on the shaft. Take care not to lose them.

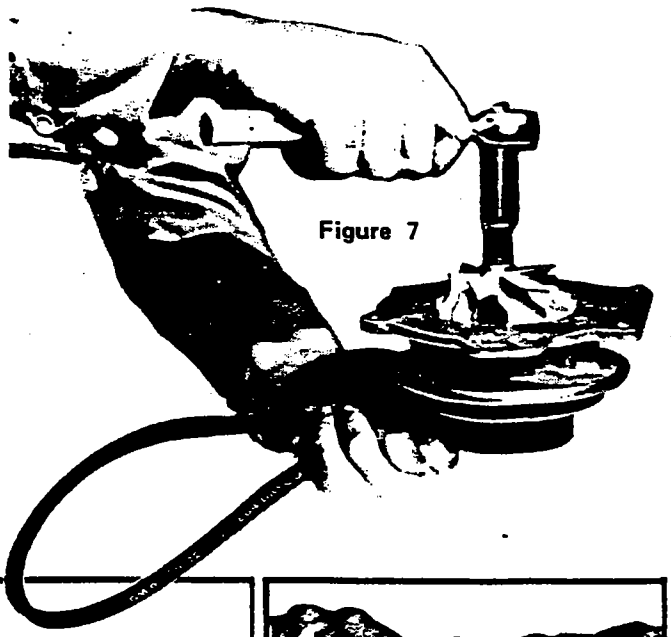


Figure 7

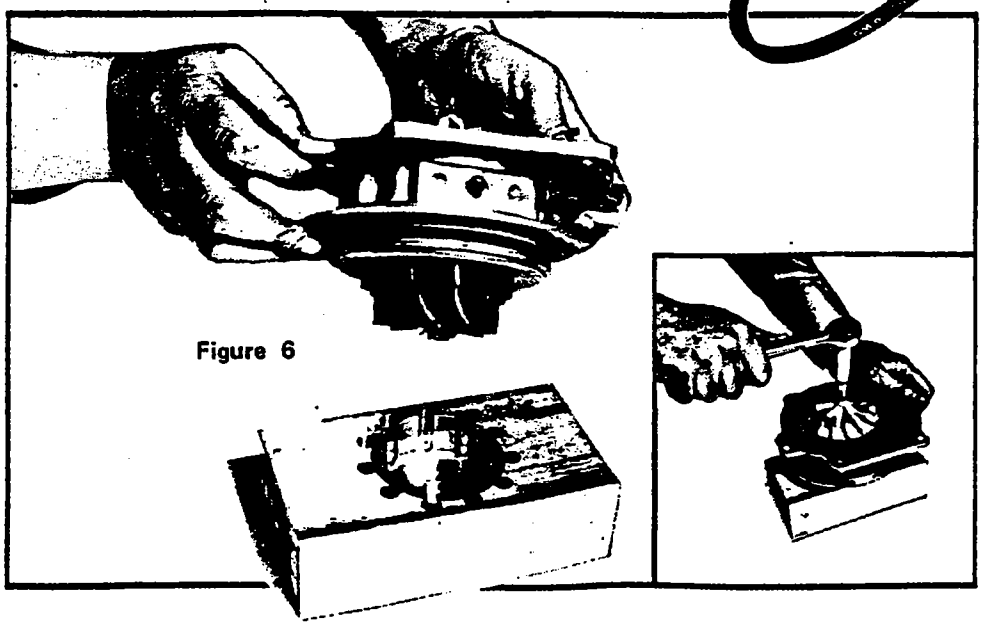


Figure 6

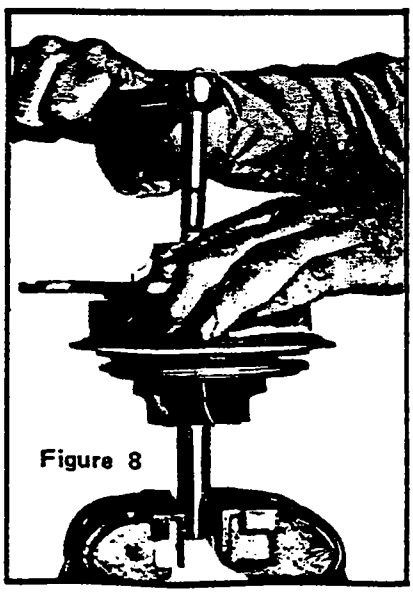
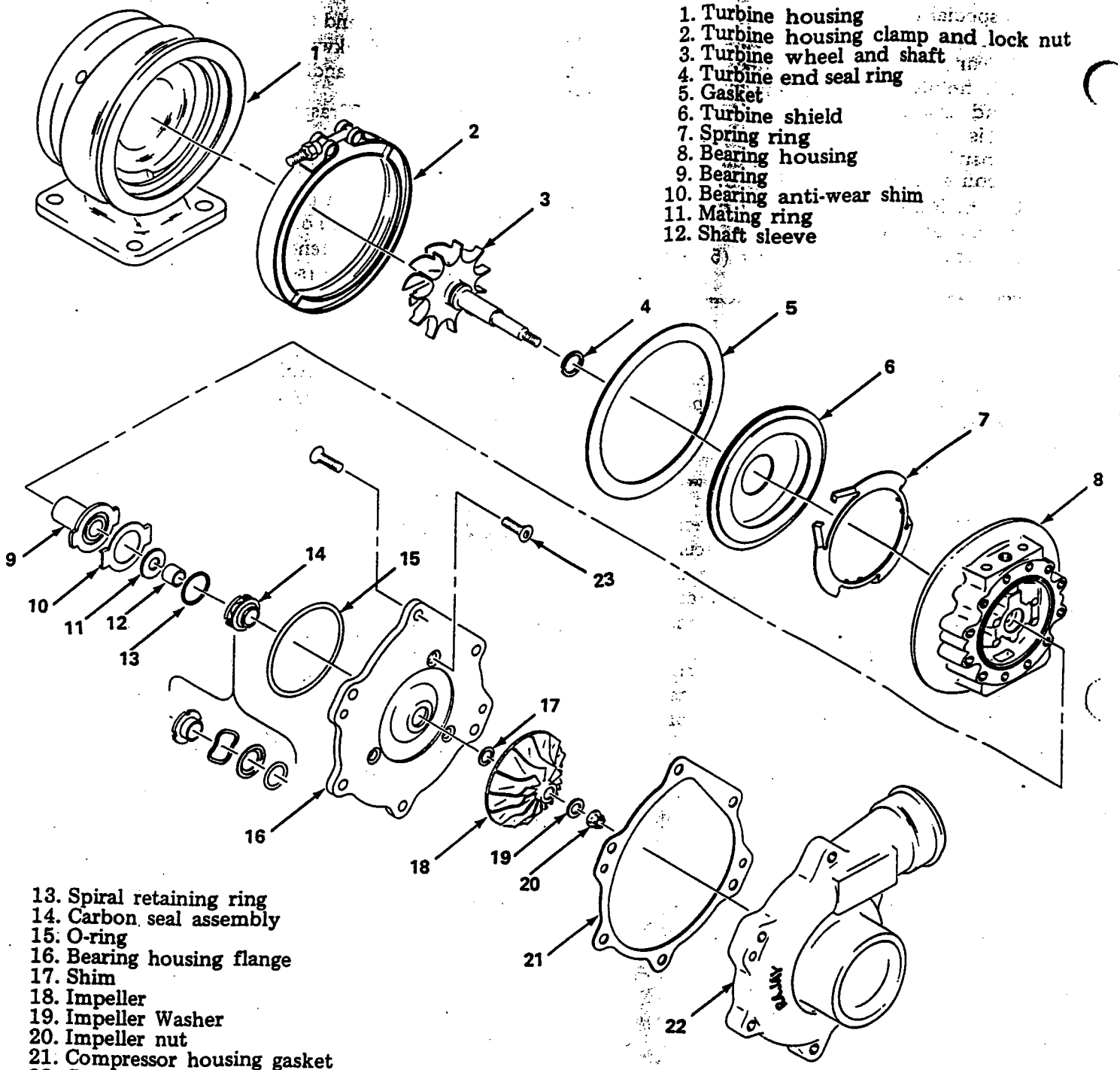


Figure 8



1. Turbine housing
2. Turbine housing clamp and lock nut
3. Turbine wheel and shaft
4. Turbine end seal ring
5. Gasket
6. Turbine shield
7. Spring ring
8. Bearing housing
9. Bearing
10. Bearing anti-wear shim
11. Mating ring
12. Shaft sleeve
13. Spiral retaining ring
14. Carbon seal assembly
15. O-ring
16. Bearing housing flange
17. Shim
18. Impeller
19. Impeller Washer
20. Impeller nut
21. Compressor housing gasket
22. Compressor housing
23. Countersunk cap screws

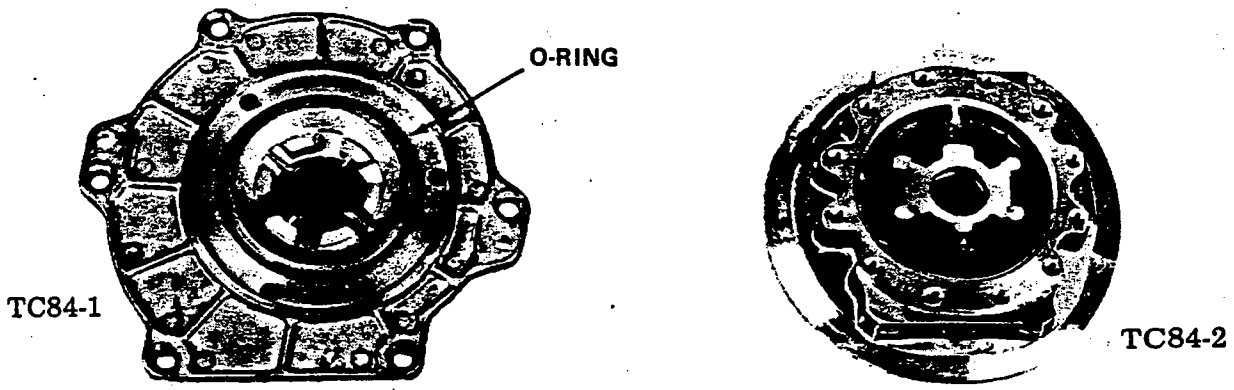
Figure 9 TURBOCHARGER, EXPLODED VIEW

CAUTION: NOTE POSITION OF BEARING HOUSING AND FLANGE!

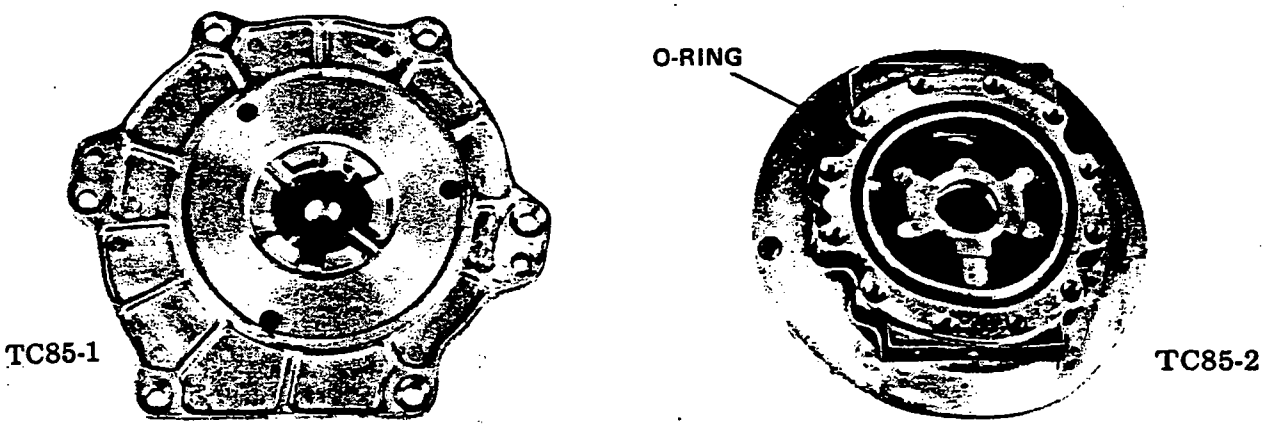
In order to position the oil outlet at the bottom of the turbocharger, the unit was designed so that the bearing flange (16) and compressor housing (22) can be mated to the bearing housing in 12 different positions. Before proceeding further with disassembly, it is important to scribe a mating index mark on both parts so they can later be reassembled in the same position.

NOTE!

Depending on the date of manufacture, the turbocharger will utilize either the TC 84-1 and TC 84-2, or the TC 85-1 and TC 85-2 bearing housing assembly, both of which are illustrated in Fig. 10. The O-ring is positioned on the bearing housing flange on units with the TC 84-1/TC 84-2 assembly. On TC 85-1/ TC 85-2 equipped turbochargers, the O-ring is positioned in a machined groove in the bearing housing. This change was effective with serial numbers shown on page 19. It is important to remember that the TC 84-1 flange must be used with the TC 84-2 bearing housing and the TC 85-1 flange must be used with the TC 85-2 bearing housing. TC 84-1 flange may be reworked into a TC 85-1 flange by removing 2.83 shoulder. Be careful not to score or otherwise damage O-ring surface.



TC84-1 BEARING HOUSING ASSEMBLY



TC85-1 BEARING HOUSING ASSEMBLY

Figure 10

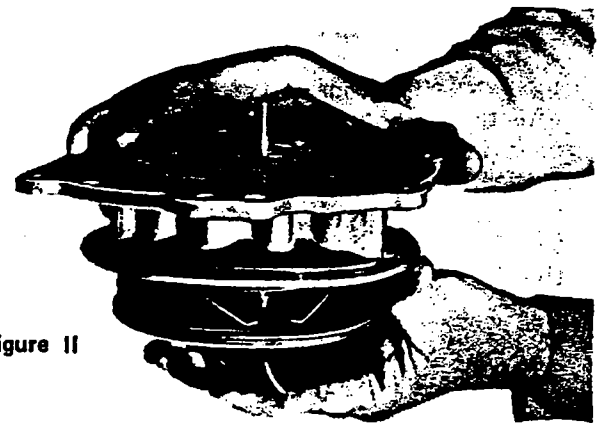


Figure 11

D. Lift the bearing housing from the assembled turbine wheel and shaft (3), spring ring (7), and turbine shield as shown in Fig. 11. Remove the spring ring and turbine shield from the turbine wheel and shaft. Remove the shaft sleeve from the bearing housing assembly.

E. Remove the turbine end seal ring (4) from the shaft, taking care not to damage the close-fitting ends of the ring.

F. Remove the three cap screws that secure the bearing housing flange to the bearing housing, and lift off the flange. It is recommended that a 5/32 hexagonal key mounted in a 3/8 drive socket be used. If difficulty is encountered the application of heat in the area of the capscrews will help.

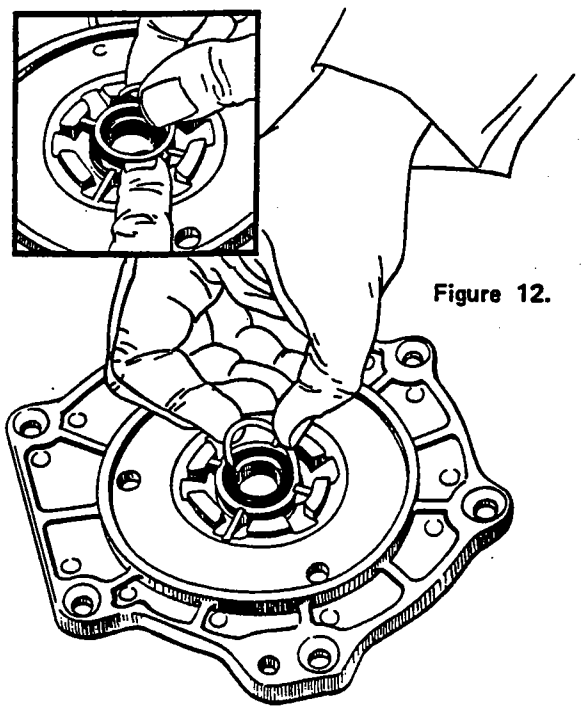


Figure 12.

Remove the mating ring (11). Slide out the bearing and shim assembly (9) from the bearing housing. Remove the O-ring.

G. The oil seal is secured in the bearing housing flange by a spiral retaining ring held in place under four retaining ears in the body of the flange. Carefully uncoil this retaining ring from beneath these ears, then lift out the carbon seal assembly. (See Fig. 12).

VIII. CLEANING AND INSPECTION AFTER TEAR-DOWN

A. Discard and replace the turbine end seal ring, gaskets, O-ring, compressor end seal (carbon seal cartridge) and mating ring.

B. Wash the remainder of the turbocharger parts with diesel fuel, trichloroethane or similar solvents, allowing the parts to soak if required to remove carbon deposits. Use a small nylon bristle brush to remove more heavy deposits.

CAUTION!

Never use caustic solution or other cleaners that may attack metal. Don't use a wire brush that could score the highly-finished parts.

C. TURBINE HOUSING – Check the turbine housing for wiping, erosion, scoring, or pit marks in the inner contour. Check the entire housing for cracks, and inspect any tapped holes for damaged threads or broken studs. Using a knife or sharp tool, remove all buildups of deposits on the face and in the internal diameter of the V-flange to which the bearing housing mates.

D. COMPRESSOR HOUSING - Check the compressor housing (22) for scoring, wiping, erosion, cracks or pit marks on the inner contour. Inspect the gasket surface for damage and old gasket material. Check fence on E-flow for loose rivets, distortion or other damage.

E. TURBINE WHEEL AND SHAFT – Inspect the turbine wheel and shaft (3) for nicked, bent, or broken blades. Inspect blade edges for burrs caused by interference with the turbine housing. Check for scoring on the back face or back hub. Inspect the turbine seal ring groove for excessive wear on the sides and for carbon buildup in the groove. Check the bearing journal for wear and scoring caused by dirty oil or inadequate lubrication. (See

Section IX for proper lubrication).

F. IMPELLER – Check the impeller (18) for nicked or badly eroded blades, indicating that dirt or other foreign material is entering the air intake system. Inspect blade edges for burrs or excessive wear caused by interference with the compressor housing.

G. BEARING HOUSING -- Inspect the bearing housing (8) for fretting or scoring of the bore, particularly at the turbine end seal ring area. Make sure the chamfer at the end is free from carbon deposits and score marks to insure ease of installation of the turbine end seal ring. Check that the O-ring seat is clean and in satisfactory condition. Check all ports for freedom from obstructions. Remove all buildups of deposits and old gasket material from the flange faces and from the pilot diameter on which the bearing housing engages the turbine housing. Check the oil inlet and outlet for damaged threads and cracks due to overtightening of fittings and adaptors.

H. BEARING HOUSING FLANGE -- Examine for warpage and cracks, particularly in the cap screw and pilot hole areas. Inspect the O-ring contact surface for pitting, erosion, scratches and foreign material. Examine the oil seal assembly seat area for pits, scratches, chips and erosion. Check the four seal retainer lugs for fretting or inadequate retaining ring grooves. Replace the flange if there is any evidence of damage.

I. BEARING AND SHIM ASSEMBLY -- Check the bearing and shim assembly (9 & 10) for wiping, scuffing, scoring, pit marks, scratches, or imbedded foreign material. Inspect for fretting, particularly on the external diameter and flange face. Note the condition of the thrust surfaces. Make sure the anti-wear shim is secured to the flange. Replace the bearing if there is any evidence of damage or wear.

NOTE!

It is generally recommended that the mating ring and oil seal cartridge be replaced at any major teardown.

J. SHAFT SLEEVE – Inspect the shaft sleeve (12) for burrs or distortion. This is a precision-ground part; any defect will distort the mating ring and result in seal leakage.

K. TURBINE SHIELD – Inspect the turbine shield (6) for flatness, excessive carbon buildup, evidence of rubbing or scoring, and for eroding or pitting of the surfaces subject to hot gases. Examine the spring ring for damage, loss of tension, and warping.

L. TURBINE HOUSING CLAMP -- Inspect the turbine housing clamp (2) for cracks, stripped thread, distortion, broken welds or other damage.

IX. REASSEMBLY

Before reassembling the turbocharger, make sure all parts are thoroughly cleaned of all grease, dirt, metal chips and other foreign particles. Parts must be free of nicks and burrs, and must be handled with care to prevent damage to machined surfaces. Keep the assembly area and tools clean at all times.

A. Before reassembly, measure bearing end - to - turbine shaft clearance as follows:

1. Place the bearing and shim assembly, the mating ring and shaft sleeve on the turbine wheel shaft.

2. Hold down on the shaft sleeve so that the mating ring is tight against the shaft shoulder as shown in Fig. 13. Use a feeler gauge as shown to check the clearance between the bottom of the bearing and the shoulder. Clearance must be .004 to .006 inch. Replace the bearing if clearance exceeds this limit.

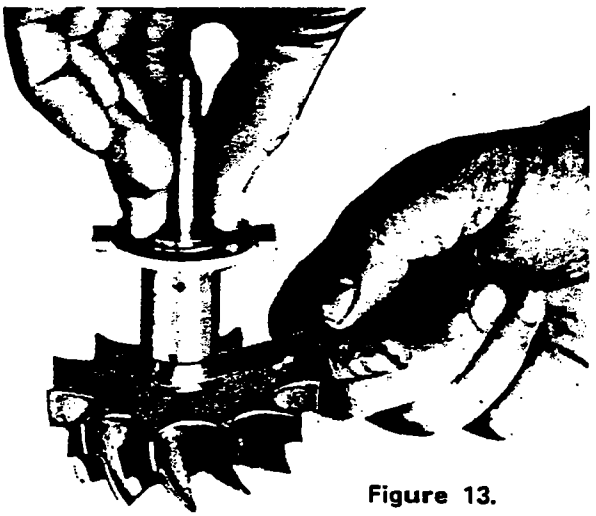


Figure 13.
MEASURING BEARING END-TO-SHAFT CLEARANCE

3. Record the clearance for later reference during reassembly.

B. Assemble the bearing housing as follows:

1. Place the oil seal cartridge (O-ring, back up washer, wave spring and carbon insert) into place

in the center of the bearing housing flange with the O-ring down against the flange mating surface. Note: If the seal cartridge becomes disassembled, this is the correct order for the parts. See Fig. 9 for detail. Open the spiral retaining ring slightly and insert the outer edge of the bottom end into one of the grooves machined into the seal retainer lugs. (See Fig. 12). Working in a counter-clockwise direction, continue to insert the retaining ring into the successive lugs until it is entirely in place. Press the carbon seal downward with both thumbs to make sure that it is not binding and that it moves freely.

2. Insert the bearing and shim assembly into the bearing housing so that the tangs on the bearing flange drop in between the bearing retainer lugs. (see Fig. 14) to prevent the bearing from rotating.

3. Add a few drops of lubricating oil to the face of the bearing. Position the mating ring on the bearing as illustrated in Fig. 14. Coat the outside face of the mating ring with a few drops of oil.

4. Lubricate the O-ring (15) with silicone O-ring lubricant or clean, medium-weight grease. If the turbocharger uses the TC 84-1/TC 84-2 bearing housing assembly, install the O-ring on the bearing housing flange. If the turbocharger uses the TC 85-1/TC 85-2 bearing housing assembly, install the O-ring in the machined groove in the bearing housing. Refer to Fig. 10, page 11.

5. Refer to the mating index marks scribed on the two parts of the bearing housing assembly during tear-down. Place the bearing housing flange on the bearing housing, making sure that these marks line up for proper positioning.

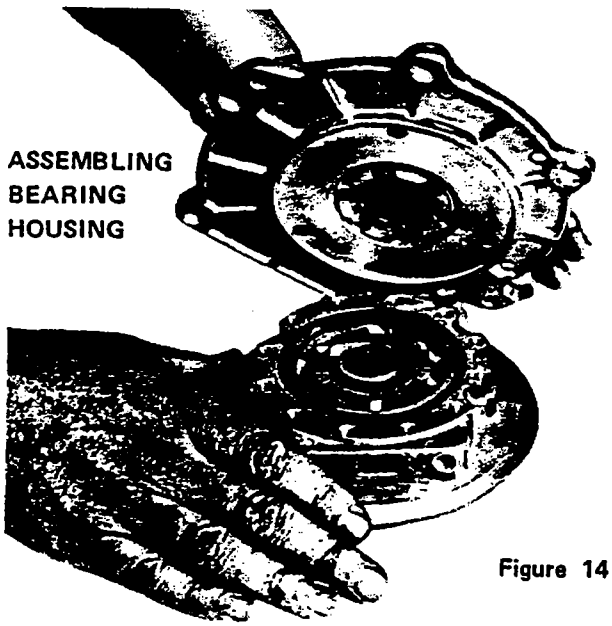


Figure 14

NOTE!

The TC 85-1 flange can be rotated on the TC 85-2 bearing housing in order to line up the cap screw holes without removing the impeller. On the TC 84-2 bearing housing assembly, the TC 84-1 flange cannot be rotated in position because of the O-ring installation. It must be completely lifted off the bearing housing, then repositioned for cap screw hole alignment.

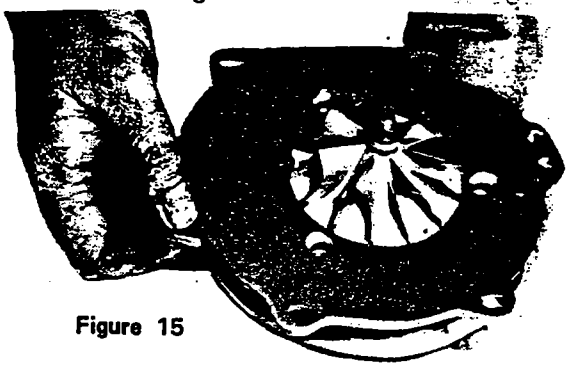


Figure 15

6. Secure the flange to the bearing housing with three cap screws and tighten evenly to 80 - 100 inch pounds.

C. Check the bearing clearance as follows:

1. Center the mating ring over the bore of the bearing housing. Install the turbine wheel and shaft without the turbine-end seal ring (4) so that the shaft extends through the bearing as shown in Fig. 16.

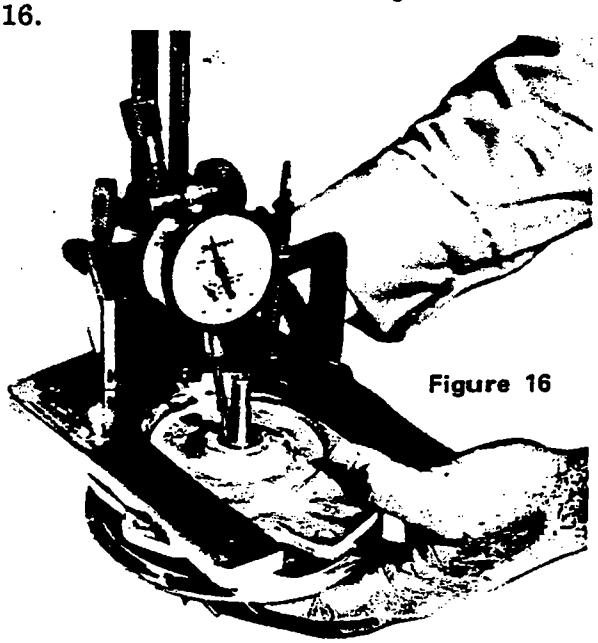


Figure 16

2. Install the shaft sleeve (12) on the shaft. Position the dial indicator on the bearing housing so that the indicator point engages the top of the shaft sleeve as shown in Fig. 16.

3. Push up on the turbine wheel to check for total end play. Note the indicator reading. Total end play with the shaft in place must be no more than .001 to .003 inch above the bearing-to-turbine shaft clearance noted in Step IX, A, above. Record this end play for later use. (If the end play is greater, it indicates that the O-ring may be crimped between the bearing housing and the bearing housing flange, permitting excessive bearing clearance.)

4. Remove the turbine wheel and shaft, and shaft sleeve.

D. Determine impeller shim requirements by the following method:

1. Temporarily place the shaft sleeve (12) in the bore of the oil seal (14). Position the impeller loosely over the oil seal, resting on the shaft sleeve. Temporarily install the compressor housing and gasket, securing them with a minimum of three capscrews. Tighten the capscrews to 80 inch-pounds torque.

2. Mount a dial indicator so that the indicator point engages the hub of the impeller as shown in Fig. 17. Use a pair of long-nosed pliers or similar tool. Grasp the impeller gently and raise as far as possible, then check the dial indicator to determine the total impeller movement.

3. Subtract the total end play determined in step C, (3) above from the total impeller movement determined in step (2) above. Select shims which will total .015 to .020 inch less than the value just determined.

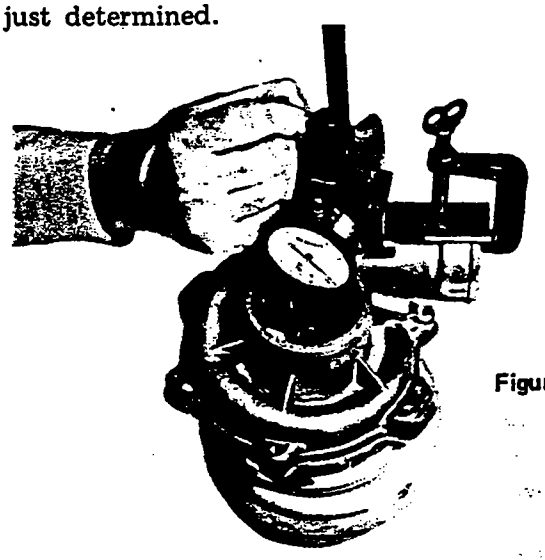


Figure 17

CHECKING TOTAL IMPELLER MOVEMENT TO DETERMINE SHIM REQUIREMENTS

EXAMPLE

If the total impeller movement is .049 inch and the total end play is .006 inch, subtract as follows:

Total impeller movement	.049
Bearing-to-turbine shaft clearance	− .006
Difference	.043

Select a combination of .010 and .015 inch shims which will provide the .015 to .020 inch clearance required as follows:

Calculated difference	.043	.043
Desired clearance	− .020	− .015
Shim thickness required	.023	.028

A combination of one .010 inch shim and one .015 shim for a total of .025 inch will fall in the required range. These will be needed during reassembly of the impeller on the shaft.

4. Remove the bolts that secure the compressor housing to the bearing housing and remove the compressor housing, impeller, and shaft sleeve.

E. Place the bearing housing on level blocks (or support on turbine housing) with the turbine end upward. Position the spring ring in the recess provided as shown in Fig. 18. Position the turbine heat shield on the spring ring with the larger opening downward.

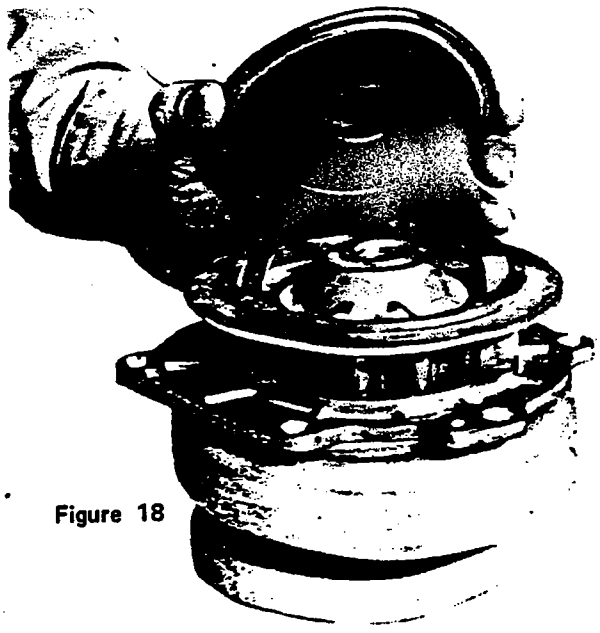


Figure 18

INSTALLING SPRING RING AND TURBINE SHIELD

F. Lubricate the groove on the turbine shaft with oil. Install the turbine end seal ring. Lubricate the turbine shaft bearing journal area.

G. Check that the mating ring is centered in the bearing housing and insert the turbine shaft into the assembled housing. Make sure the turbine shaft seal ring is evenly centered in the shaft groove as shown in Fig. 19. With a slight rotation push the shaft into the housing to compress the ring. A plastic ring suppressor TCI-39, may be used if difficulty is encountered.

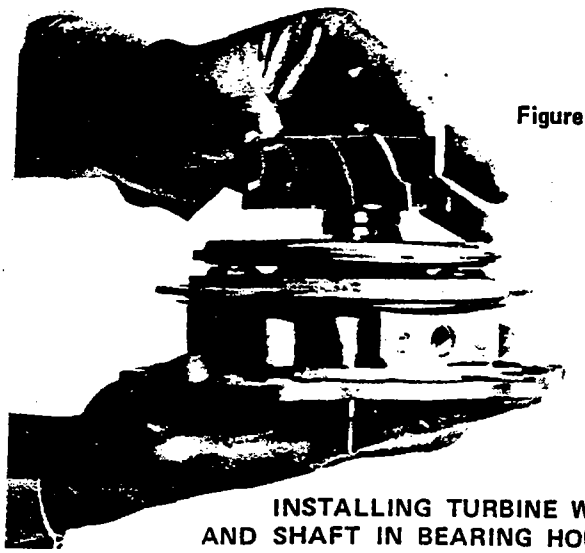


Figure 19
INSTALLING TURBINE WHEEL AND SHAFT IN BEARING HOUSING

H. Hold the turbine wheel and shaft in place and invert the bearing housing assembly, taking care to prevent the shaft from falling out of the housing. Install the shaft sleeve and the thickness of shims determined in Step D (3) above as shown in Fig. 19.

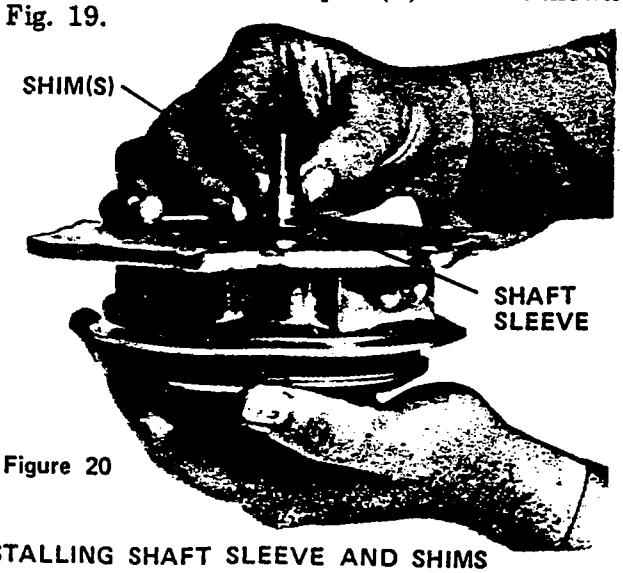


Figure 20
INSTALLING SHAFT SLEEVE AND SHIMS

I. Install the impeller on the end of the shaft. Install the impeller washer and impeller nut. Hold the turbine wheel with a cloth or V-belt (or use special holding fixture, Fig. 6, page 9), and turn the nut counterclockwise to tighten. Note that the nut has a left-hand thread. Tighten the nut to 80 to 100 inch-pounds.

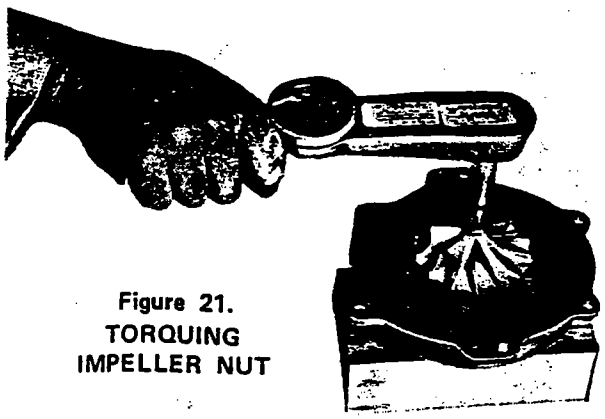


Figure 21.
TORQUING IMPELLER NUT

J. Install the assembled cartridge on the compressor housing and gasket. Secure with six capscrews and tighten evenly and alternately to 80 to 100 inch-pounds.

K. Position the gasket on the turbine housing. Install the turbocharger on the turbine housing

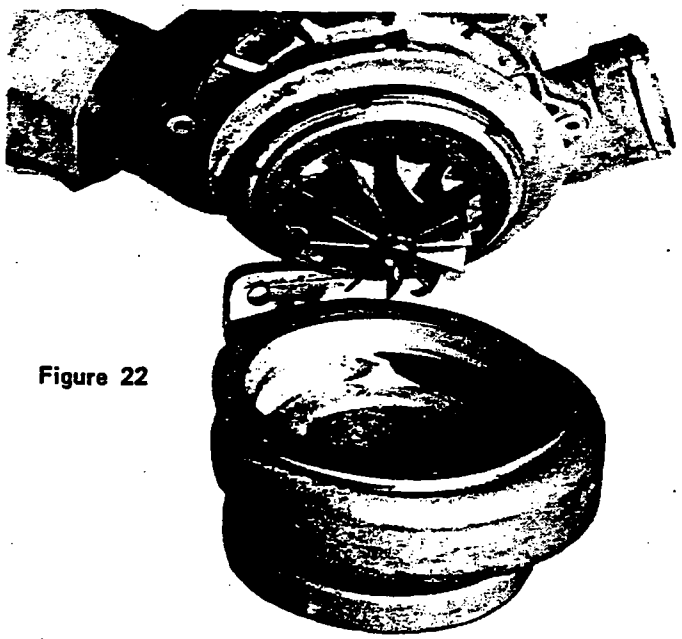


Figure 22

as shown in Fig. 22. Install the turbine housing clamp (2) and tighten the nut (2) to 15 to 20 inch-pounds. Check for freedom of rotation with no indications of interference.

L. Cover all openings to prevent the entry of foreign particles, and keep them covered until the turbocharger is installed.

M. Install the turbocharger as directed on page 6.

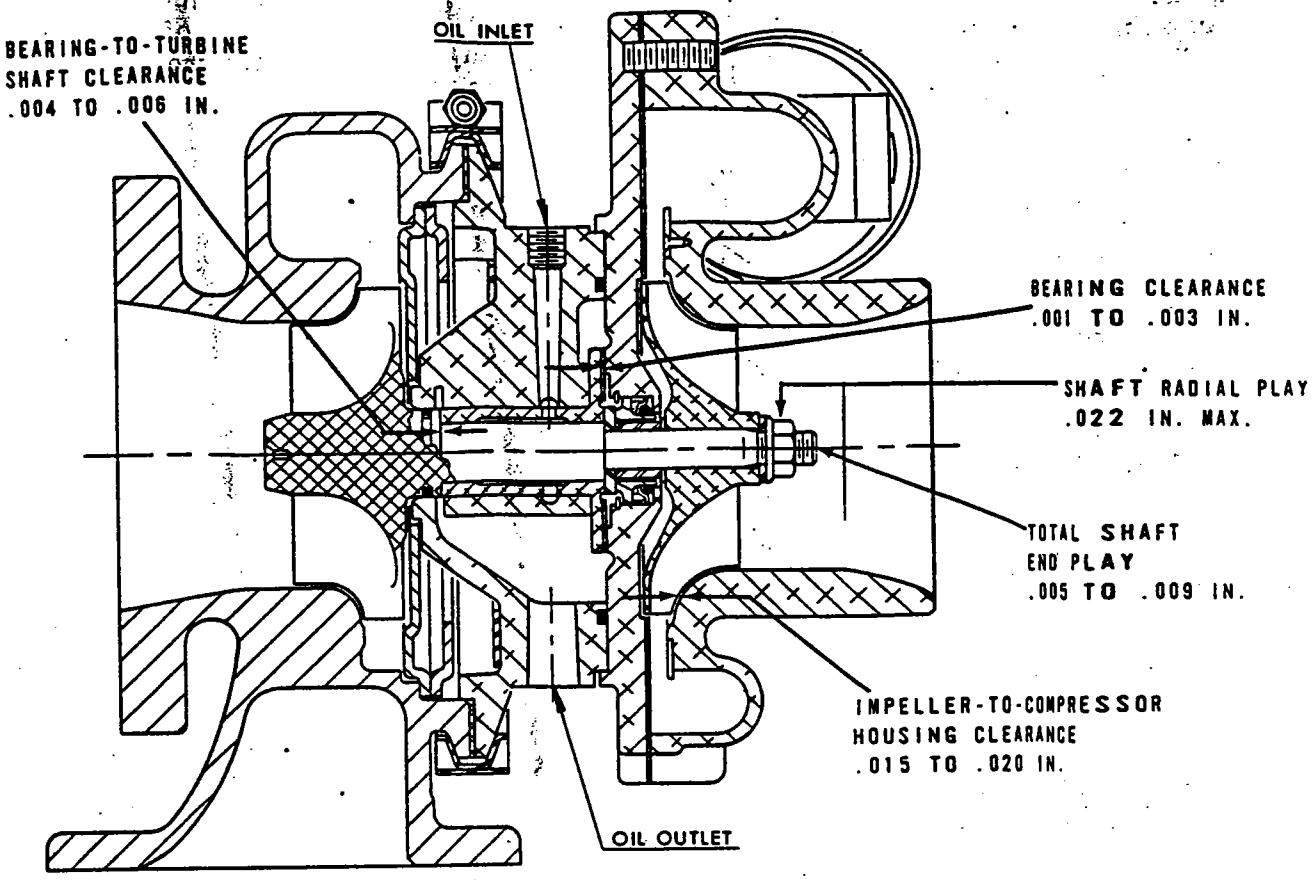


Figure 23. CROSS SECTION OF TURBOCHARGER

TORQUE VALUES AND CLEARANCES

A. Torque Values.

Turbine housing V-clamp nut	15 to 20 in.-lbs.
Compressor housing-to-bearing housing capscrews	80 to 100 in.-lbs.
Impeller nut	80 to 100 in.-lbs.
Bearing housing assembly capscrews	80 to 100 in.-lbs.

B. Clearances.

Bearing-to-turbine shaft clearance	.004 to .006 in.
Assembled bearing clearance	.001 to .003 in. greater than disassembled bearing-to-shaft clearance.
Total shaft end play	.005 to .009 in.
Impeller to compressor housing clearance	.015 to .020 in.
Maximum shaft radial play (impeller end)	.022 in.

The bearing flange can be attached to the bearing housing in 12 possible positions as illustrated in Fig. 24. This in turn provides 12 options for positioning the compressor housing to facilitate installation, while retaining the oil outlet near the lower vertical position. The oil outlet in final installation on the engine can be up to 45° from the vertical centerline. (See Section IV, Paragraph C.) Final adjustments of the compressor outlet can be made through the V-clamp attachment to the turbine housing.

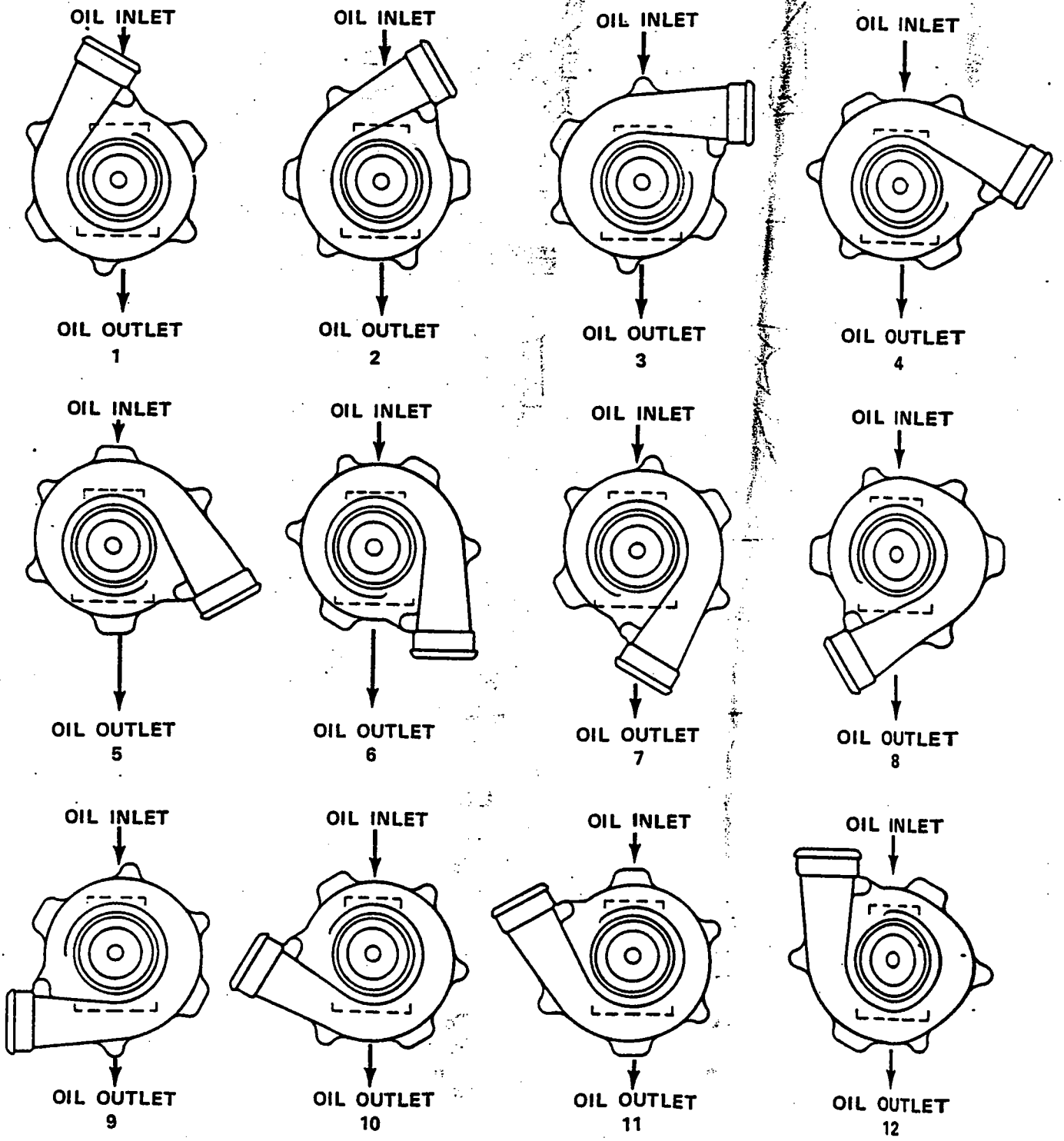


Figure 24

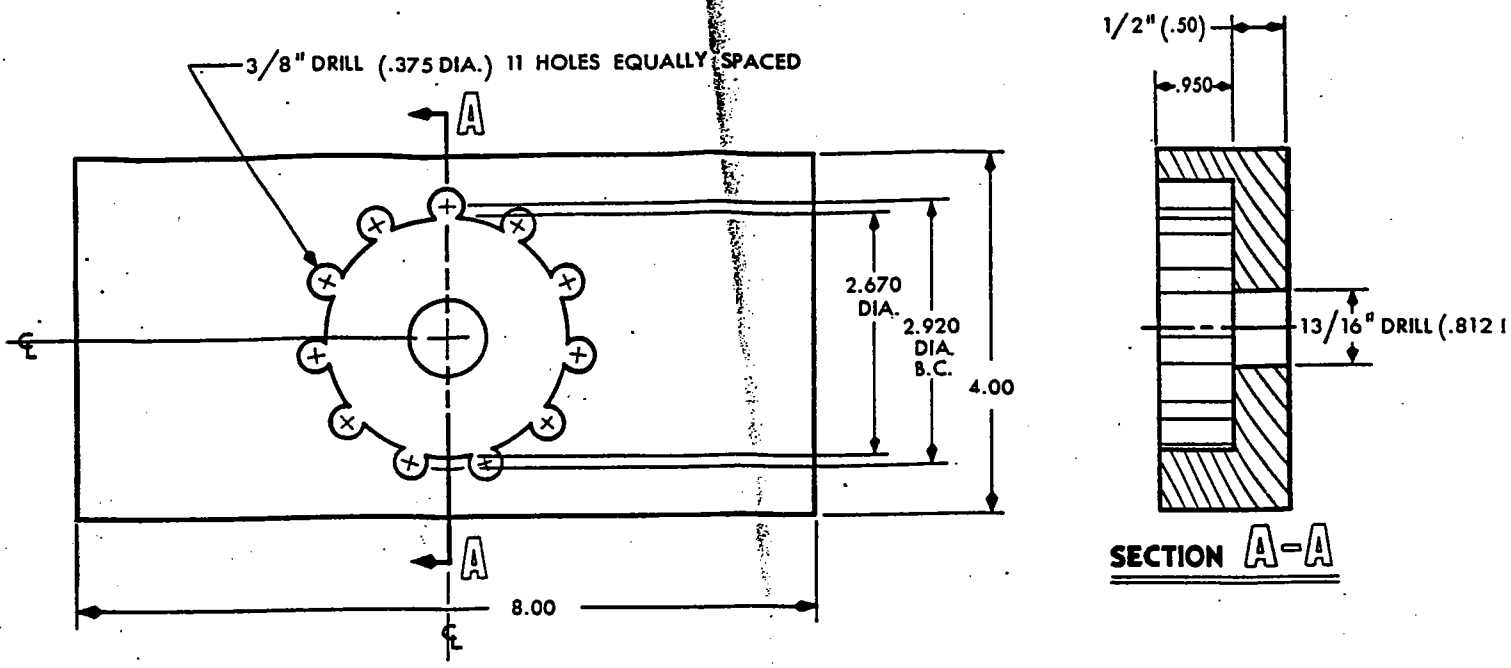


Figure 25

The turbine wheel holding fixture can be made of either hard wood or aluminum bar stock. Drill the 3/8" holes prior to cutting the 2.670 diameter.

SERIAL NUMBER RECORD

Serial Nos. 101 through 1000 use the TC84-2 (Old Style) Bearing Housing. To reposition these units it will be necessary to remove the impeller, then remove the bearing housing flange, reposition the flange as desired, then reassemble.

Serial Nos. 2731 and up use the TC85-2 (New Style) Bearing Housing. Repositioning may be accomplished by removing the three countersunk-head screws that attach the flange to the bearing housing, rotating the flange to the desired position and re-installing the screws.

Serial Nos. 1001 through 2730 may have either the TC84-2 or the TC85-2 Bearing Housing. It will be necessary therefore, to treat this entire block of units as being equipped with the TC84-2 Bearing Housing and proceed as indicated above.

RAJAY PRODUCT LINE DESIGN OPTION GUIDE

Introduction. Roto-Master's Rajay product line features a wide variety of design options. Rajay product line turbos are available in two frame sizes with three compressor flow options, three turbine flow options and numerous turbine housing A/R ratios. In addition, several options in the configuration of compressor housings, bearing housings and turbine housings are available. As a result, you will probably be able to select a Rajay product turbo with both the performance characteristics and the outside dimensions you need for your particular application.

Frame size options. Rajay product line turbos are currently available in two frame sizes: 300 Series and 370/375 Series turbos. These differ mainly in bearing housing configuration (there are also some internal design differences). 300 Series turbos have die-cast bearing housings, while 370 and 375 Series bearing housings are sand-cast (370 and 375 Series bearing housings are the same dimensionally but differ in the placement of oil inlet and outlet connections). Both series accept any of the available compressor housing and turbine housing options.

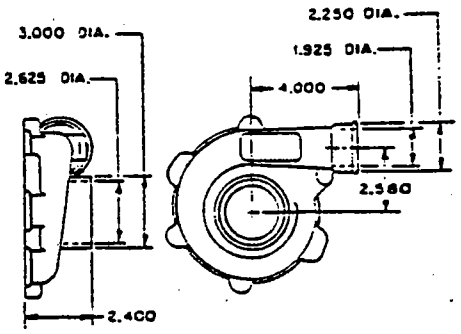
Flow options. Three compressor flow options are currently available: B-flow, F-flow and E-flow. Airflow ranges can be compared by studying their respective compressor maps. In addition, three turbine flow options (also designated B-flow, F-flow and E-flow) are currently offered. In most cases, compressor and turbine should match (B-flow with B-flow, F with F, etc.). However, combining a larger compressor with a smaller turbine is possible for special applications. Ask your Distributor or Dealer for details. You can select the optimum flow options for your application by using the Turbocharger Selection Charts or by following the directions in the Custom Selection Guide.

Component configuration options. Currently available compressor housing, bearing housing and turbine housing options are listed and illustrated below. The dimensions provided here and in the installation drawings for 300 Series and 370/375 Series turbos (see Installation Drawings section) will help you match a turbo to the space limitations of your particular installation.

RAJAY PRODUCT LINE COMPRESSOR HOUSING OPTIONS

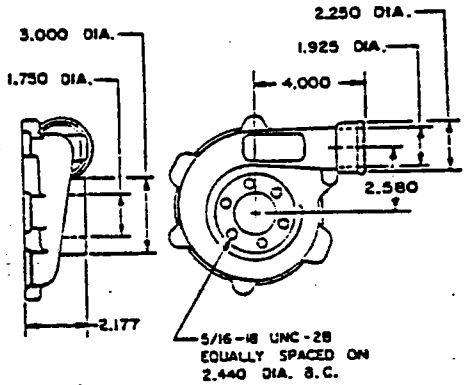
DESIGN A HOSE CONNECTION

B-Flow	500112-00
F-Flow	600098-00
E-Flow	500227-00



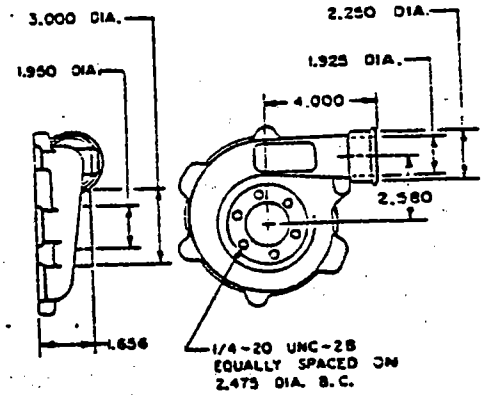
DESIGN B THREADED INLET — LONG

B-Flow	600240-00
F-Flow	———
E-Flow	600589-00



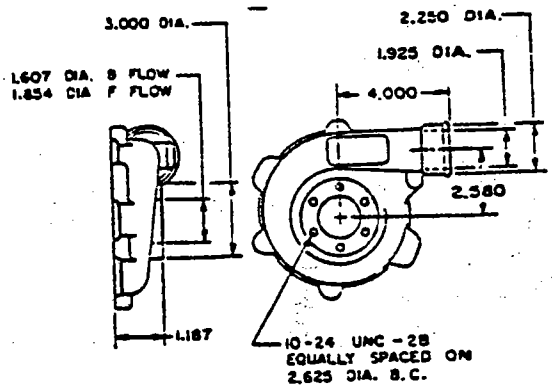
DESIGN B THREADED INLET — LONG

B-Flow	———
F-Flow	600218-00
E-Flow	———



DESIGN C THREADED INLET — SHORT

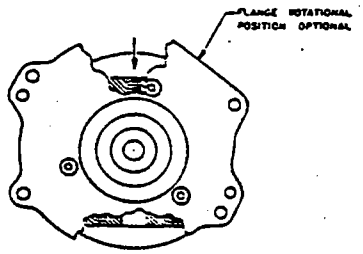
B-Flow	600493-00
F-Flow	600494-00
E-Flow	———



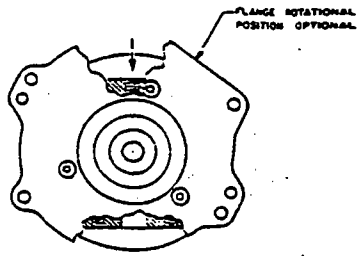
RAJAY PRODUCT LINE BEARING HOUSING DESIGN OPTIONS

300 SERIES (DIE CAST)

DESIGN NO. 1
SINGLE FEED BEARING VERSION
600460-00

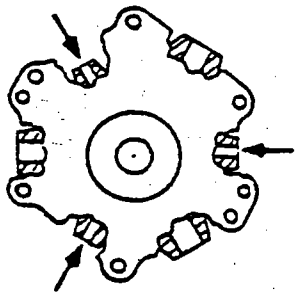


DESIGN NO. 7
DUAL FEED BEARING VERSION
600535-00

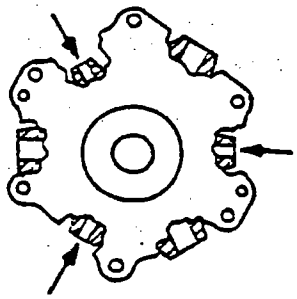


370 SERIES (SAND CAST)

DESIGN NO. 3 — 3 INLET
SINGLE FEED BEARING VERSION
600736-00

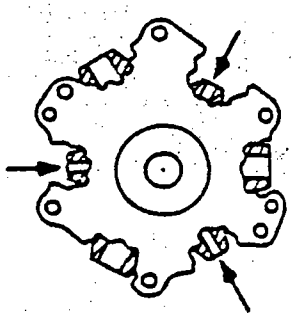


DESIGN NO. 6 — 3 INLET
DUAL FEED BEARING VERSION
600734-00

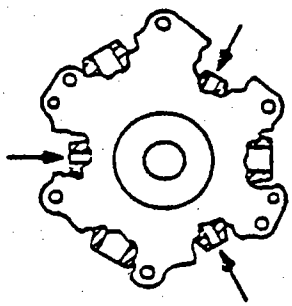


375 SERIES (SAND CAST)

DESIGN NO. 2 — 3 INLET
SINGLE FEED BEARING VERSION
600735-00



DESIGN NO. 5 — 3 INLET
DUAL FEED BEARING VERSION
600733-00

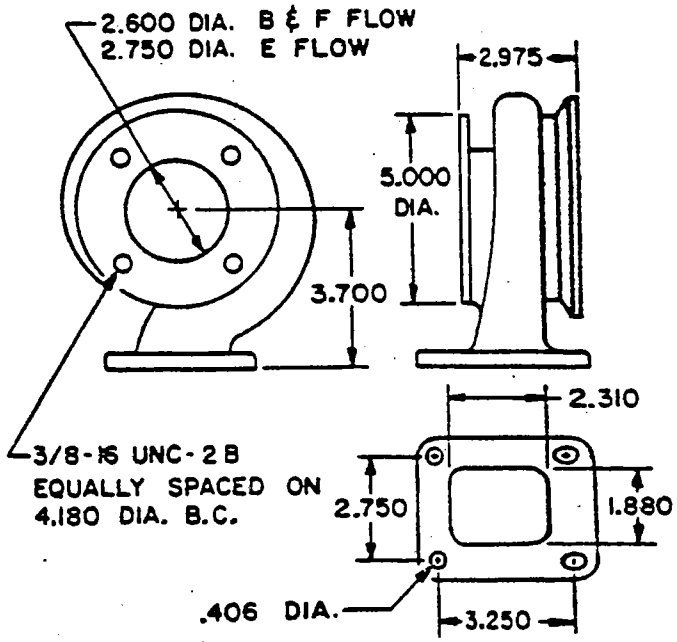


RAJAY PRODUCT LINE TURBINE HOUSING DESIGN OPTIONS

DESIGN A — RECTANGULAR INLET FLANGE

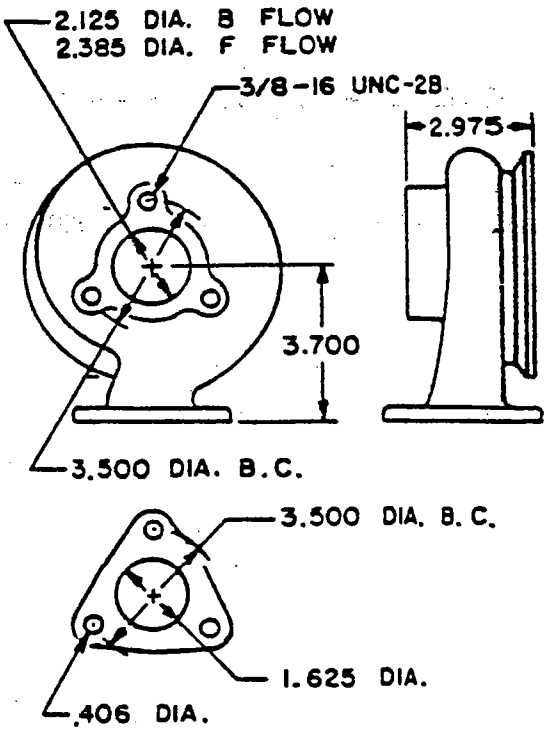
	TURBINE WHEEL SIZE		
A/R	B	F	E
.60	600527-02	600528-03	600529-02
.60	---------	600521-01[1]	---------
.70	600527-01	600528-05	600529-04
.70	---------	600528-04[2]	---------
.76	---------	---------	600529-08
.80	---------	600528-01	600529-03
.90	---------	600528-06	600529-01
1.00	---------	600528-02	600529-05
1.00	---------	---------	600529-06[2]

[1]Extended tongue style [2]NI-RESIST



DESIGN B — TRIANGULAR INLET FLANGE — LONG OUTLET

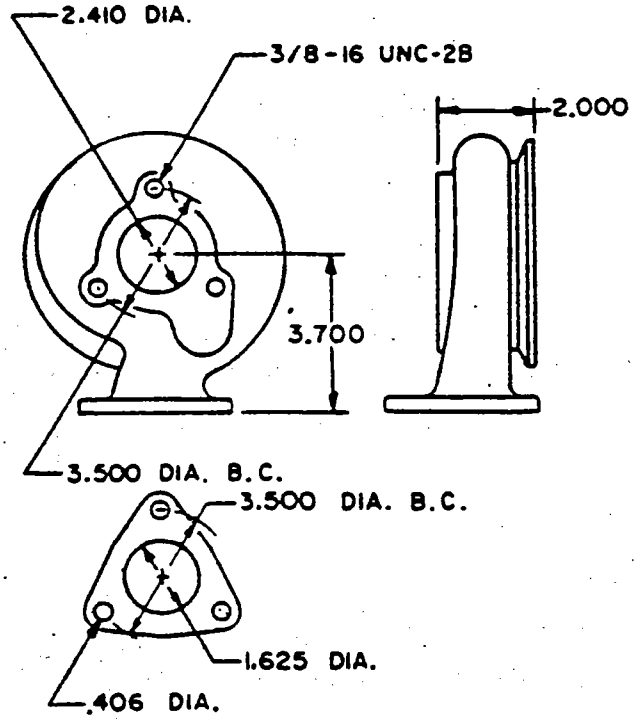
	TURBINE WHEEL SIZE		
A/R	B	F	E
.25	600517-01	600518-02	---------
.40	600517-02	600518-01	---------



RAJAY PRODUCT LINE TURBINE HOUSING DESIGN OPTIONS

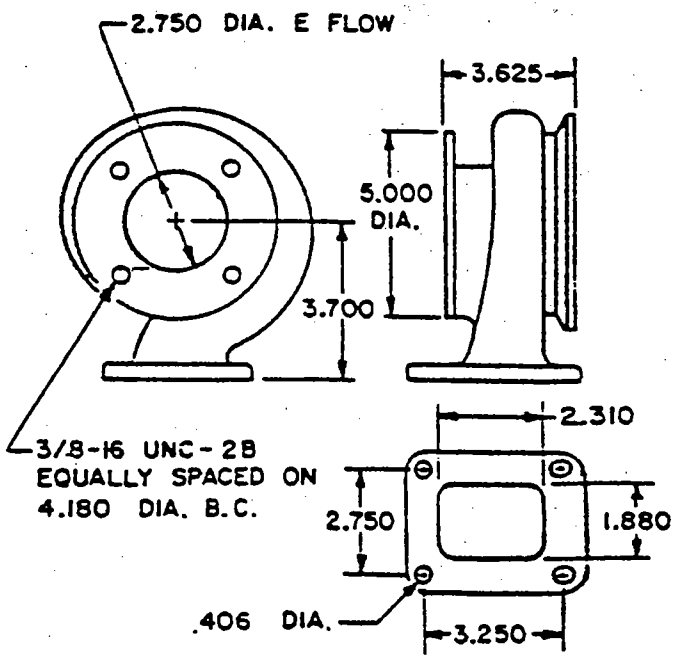
DESIGN C — TRIANGULAR INLET FLANGE — SHORT OUTLET

A/R	TURBINE WHEEL SIZE B	F	E
.22	600537-01	600538-01	---------
.25	600537-02	600538-02	---------
.40	600537-03	600538-03	---------



DESIGN J — RECTANGULAR INLET FLANGE — EXTENDED OUTLET

A/R	TURBINE WHEEL SIZE B	F	E
1.30	---------	---------	600530-01



RAJAY PRODUCT LINE TURBOCHARGER MODEL NUMBER GUIDE

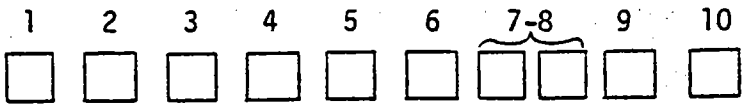
Introduction. Rajay product line turbochargers are designated by 10-digit model numbers. Each digit in a Rajay turbo model number indicates a specific design feature incorporated in that turbo. In addition to this model designation, each Rajay turbo also has a Roto-Master part number.

Rajay model number key. The key provided below explains the meaning of each digit in Rajay model numbers. After selecting the design options you want for your particular application, use this key to determine the model number for the turbo incorporating those options. For example, suppose you want a very compact turbo for a small-displacement automotive application. You may select a 300 Series turbo with a Design C compressor housing, Design C turbine housing, B-flow compressor and turbine, .25 turbine housing A/R ratio and standard internal design features. The model number for this particular turbo would be 3CC1BB25B1.

Roto-Master part number. In addition to a model number, each Rajay product turbo has a Roto-Master part

number. This number consists of six digits followed by a 2-digit suffix. For example, 600584-23 is the Roto-Master part number for model 3CC1BB25B1, the turbo specified in the previous paragraph. You don't have to know the Roto-Master part number because you can order Rajay product turbos by model.

MODEL NUMBER KEY FOR RAJAY PRODUCT LINE TURBOCHARGERS



1. Turbocharger Family - indicates compressor wheel diameter. For all current production this will be a three.

2. Compressor Housing Design Options - indicates compressor housing features:

   A. Hose connection to compressor inlet (3.00").
   B. Threaded inlet - long.
   C. Threaded inlet - short.

3. Turbine Housing Design Options - indicates turbine housing features:

   A. Rectangular inlet flange.
   B. Triangular inlet flange (long outlet).
   C. Triangular inlet flange (short outlet).
   J. Rectangular inlet flange (extended outlet).

4. Bearing Housing Design Options - indicates bearing housing features:

   1. Die cast/single feed (300 Series).
   2. Sand cast/single feed (375 Series).
   3. Sand cast/single feed (370 Series).
   5. Sand cast/dual feed (375 Series). (1)
   6. Sand cast/dual feed (370 Series). (1)
   7. Die cast/dual feed (300 Series). (1)

5. Compressor Flow Options - specifies B, F or E-flow compressor.

6. Turbine Flow Options - specifies B, F or E-flow turbine.

7. Turbine Housing A/R Ratio Options - specifies turbine housing A/R ratio.

8. Internal Design Options - indicates certain internal design features:

   A. Dual feed bearing. (1)
   B. Single feed bearing. (2)
   C. Single feed bearing without compressor housing flow fence (E-flow only). (3)
   G. Dual feed bearing without compressor housing flow fence (E-flow only). (3)

Model Number Key for Rajay Product Line Turbochargers (Cont'd.)

9. Heat Shield Design Options - indicates type of heat shield:

   1. Stamped. (2)
   2. Cast. (4)

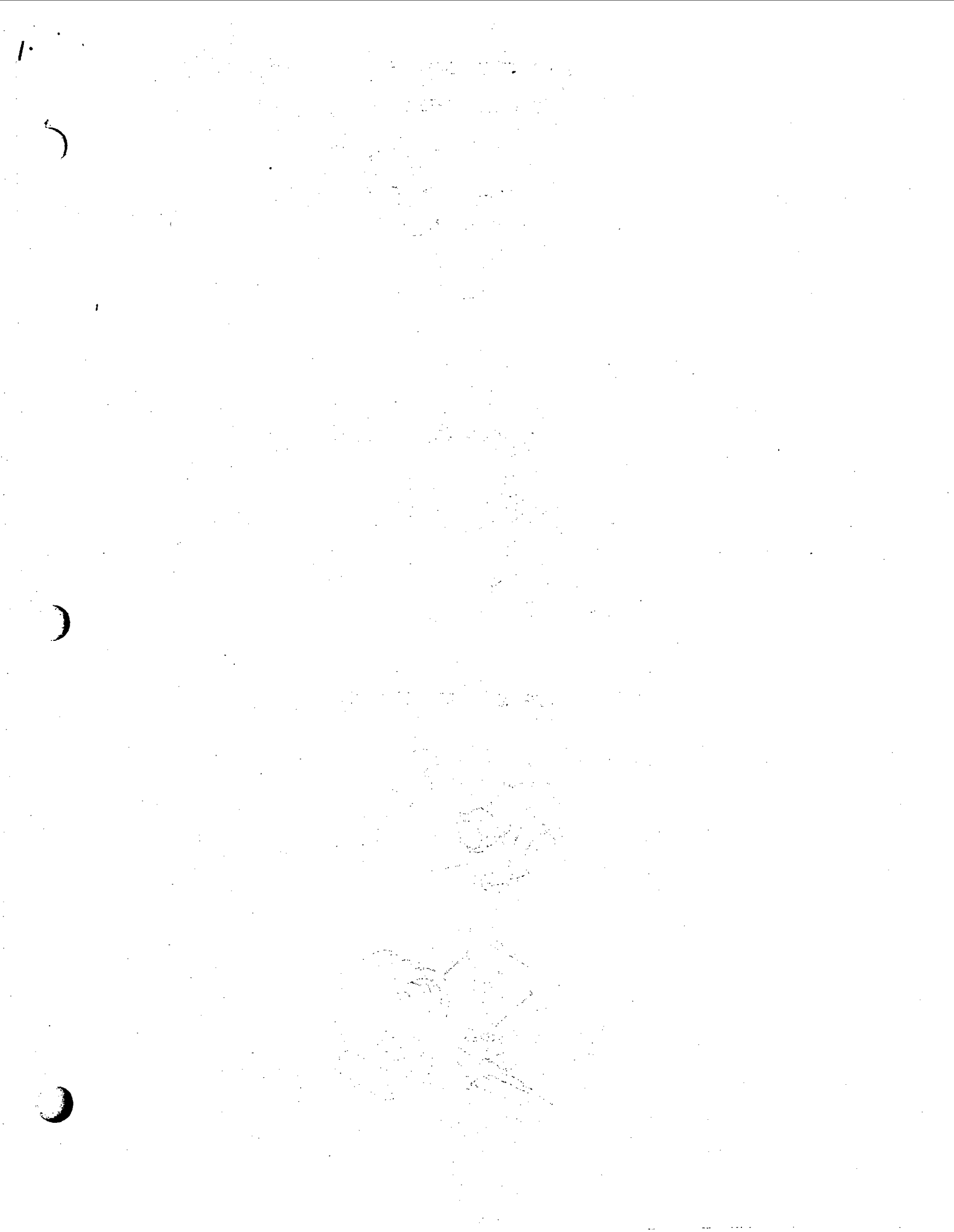
NOTES

(1) Dual feed design option is for smaller engines with a limited exhaust gas flow. It reduces oil flow and rotational friction, allowing the rotating assembly to spin up faster so boost comes in at a lower RPM for a given exhaust flow. See your Distributor or Dealer for recommended applications.

(2) Standard design option.

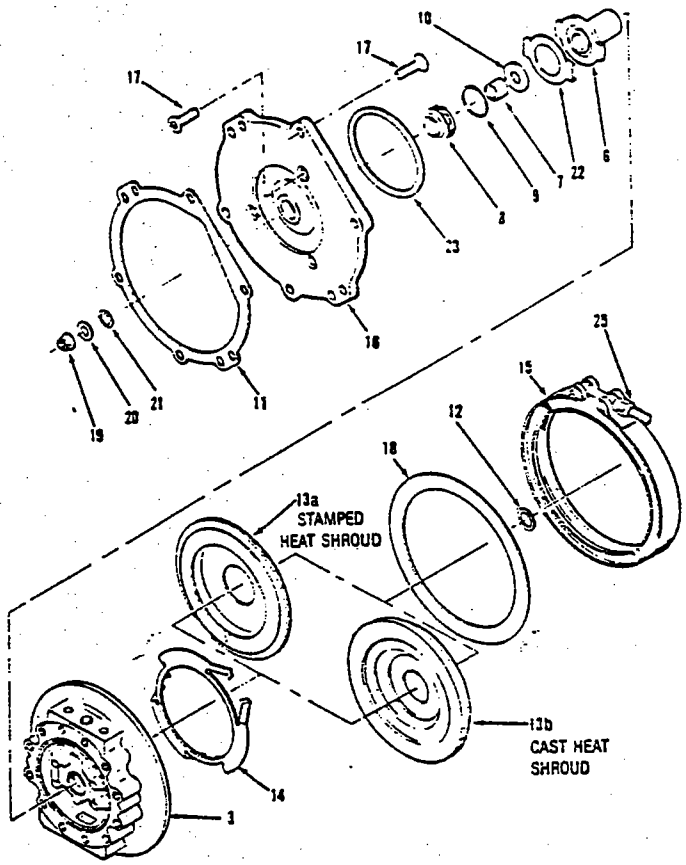
(3) For RV's and other applications prone to backfiring. See your Distributor or Dealer for recommended applications.

(4) Additional-cost option for applications with high exhaust temperatures (over 1500° F). See your Distributor or Dealer for recommended applications.

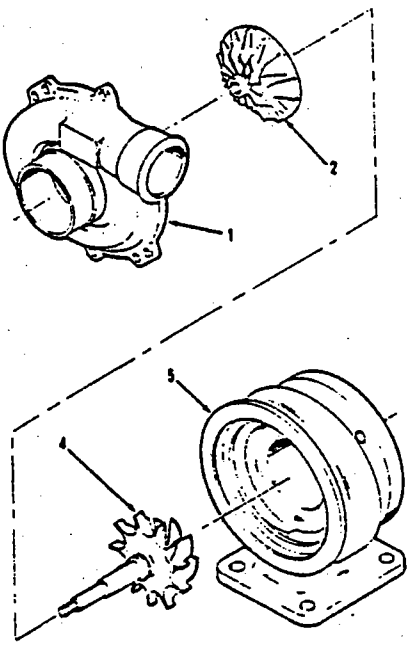


RAJAY PRODUCT LINE 300 SERIES (GASOLINE AND DIESEL APPLICATIONS)

COMPONENT PARTS COMMON



COMPONENT PARTS NOT COMMON



COMPONENT PARTS COMMON AND KIT CONTENTS

KEY	DESCRIPTION	ROTO-MASTER PART NUMBER	QTY PER TURBO	SINGLE FEED MAINT. KIT 600800-00	DUAL FEED MAINT. KIT 600810-00	SINGLE FEED OVERHAUL KIT 600801-00	DUAL FEED OVERHAUL KIT 600811-00	CART. MOUNTING KIT 600802-00
3	Bearing Hsg. 1, SF	600460-00	1			1		
3	Bearing Hsg. 1, DF	600535-00 (2)	1				1	
6	Bearing Kit, SF	600270-00 (3)	1	1		1		
6	Bearing Kit, DF	600625-00 (3)	1		1		1	
7	Thrust Spacer	600338-00	1	1	1	1	1	
8	Carbon Seal Assy.	600453-00	1	1	1	1	1	
9	Retaining Ring	600454-00	1	1	1	1	1	
10	Mating Ring	600041-00	1	1	1	1	1	1
11	Gasket, Comp. Hsg.	600017-00	1	1	1	1	1	
12	Piston Ring .300	600238-00	1			1	1	
13a	Heat Shield, Stamped	600291-00	1					
13b	Heat Shield, Cast	600465-00	1					
14	Ring-Spring	600001-00	1	1	1	1	1	1
15	Band Clamp, Turb. Hsg.	600181-00 (1)	1			1	1	
16	Flange, Bearing Hsg.	600459-00	1			1	1	
17	Flathead Screw	600455-00	9	9	9	9	9	6
18	Gasket, Turbine Hsg.	600010-00	1	1	1	1	1	1
19	Shaft Nut	600435-00	1	1	1	1	1	
20	Washer, Comp. Wheel	600434-00	1	1	1	1	1	
21	Shim, Comp. Wheel .010	600005-01	1	1	1	1	1	
21	Shim, Comp. Wheel .015	600005-02	1	1	1	1	1	
22	Shim, Bearing	600268-00 (3)	1	(3)	(3)	(3)	(3)	
23	'O' Ring	600263-00	1	1	1	1	1	
25	Nut, Band Clamp	600015-00 (1)	1	1	1			
	Pin, Comp. Hsg.	600011-00	2					
	Pin, Brg. Hsg., DF	600091-00 (2)	2		(2)		(2)	

NOT ILLUSTRATED	ROTO-MASTER PART NUMBER	TURBINE HOUSING MOUNTING GASKETS A	B	C	J
Gasket, Turbine Inlet, 4 Bolt	600150-00	1			1
Gasket, Turbine Inlet, 3 Bolt	600483-00		1	1	
Gasket, Turbine Outlet, 4 Bolt	600481-00	1			1
Gasket, Turbine Outlet, 3 Bolt	600482-00		1	1	
Adapter, Oil Drain, Aluminum	600486-00	1	1	1	1
Gasket, Oil Drain	600764-00	1	1	1	1
Flange, Oil Drain	600768-00	Optional Oil Drain			
Oil Drain Assy., 12-1/2", Flex Steel	600769-00	Optional Oil Drain			
Oil Drain Assy., 25", Flex Steel	600770-00	Optional Oil Drain			

		COMPRESSOR HOUSING MOUNTING GASKETS/HOSES A	B	C
Gasket, Compressor Inlet, 6 Bolt	600762-00		1	1
Hose, Comp. Inlet, 3" x 2-1/2"	210378	1		
Hose, Comp. Discharge, 2-1/4" x 3"	600763-00	1	1	1

(1) Band Clamp Nut #600015-00 is included with Band Clamp #600181-00. Also available as a separate line item.
(2) Pin #600091-00 is included with Dual Feed Bearing Housing #600535-00 only. Also available as a separate line item.
(3) Bearing Shim #600268-00 is included with Bearing Kit #600270-00 and #600625-00. Also available as a separate line item.

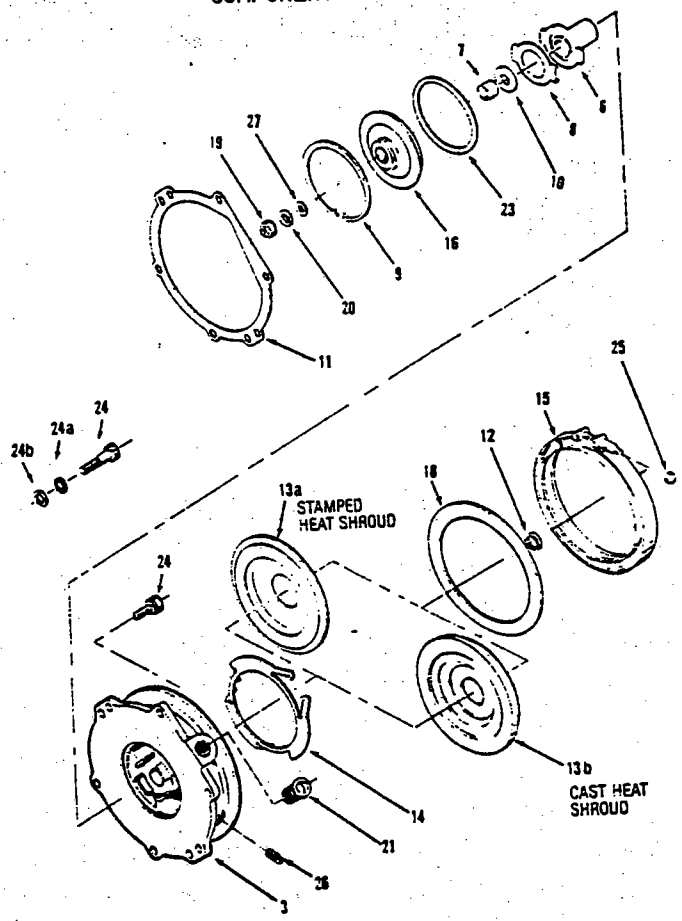
COMPONENT PARTS NOT COMMON

MODEL NUMBER	ROTO-MASTER PART NUMBER	COMPRESSOR WHEEL (Key 2)	TURBINE WHEEL & SHAFT (Key 4)	CARTRIDGE	COMPRESSOR HOUSING (Key 1)	TURBINE HOUSING (Key 5)	TURBINE HSG. A/R RATIO
B-FLOW (Single Feed)							
(1)	(1)	600021-00	600018-00	600024-00	(2)	(2)	(2)
(1)	(1)	600021-00	600018-00	600024-01 (3)	(2)	(2)	(2)
B-FLOW (Dual Feed)							
(1)	(1)	600021-00	600018-00	600793-01	(2)	(2)	(2)
(1)	(1)	600021-00	600018-00	600793-02 (3)	(2)	(2)	(2)
F-FLOW (Single Feed)							
(1)	(1)	600203-00	600546-00	600204-00	(2)	(2)	(2)
(1)	(1)	600203-00	600546-00	600204-01 (3)	(2)	(2)	(2)
F-FLOW (Dual Feed)							
(1)	(1)	600203-00	600546-00	600732-01	(2)	(2)	(2)
(1)	(1)	600203-00	600546-00	600732-02 (3)	(2)	(2)	(2)
E-FLOW (Single Feed)							
(1)	(1)	600058-00	600355-00	600319-00	(2)	(2)	(2)
(1)	(1)	600058-00	600355-00	600319-01 (3)	(2)	(2)	(2)
E-FLOW (Dual Feed)							
(1)	(1)	600058-00	600355-00	600795-01	(2)	(2)	(2)
(1)	(1)	600058-00	600355-00	600795-02 (3)	(2)	(2)	(2)

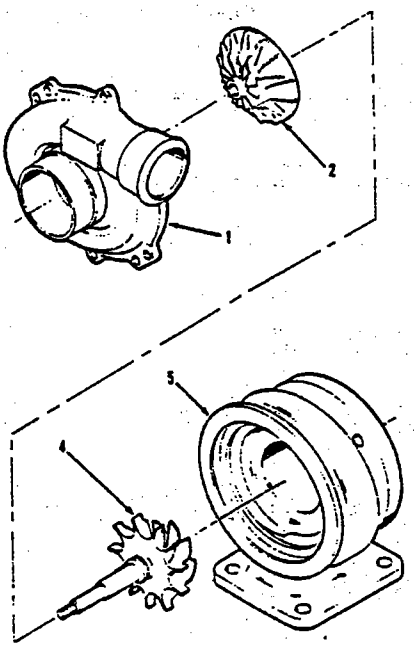
(1) See Rajay Product Line Turbocharger Model Number Guide.
(2) See Rajay Product Line Design Option Guide.
(3) Incorporates optional cast heat shield.

RAJAY PRODUCT LINE 370 SERIES (GASOLINE AND DIESEL APPLICATIONS)

COMPONENT PARTS COMMON



COMPONENT PARTS NOT COMMON



COMPONENT PARTS COMMON AND KIT CONTENTS

KEY	DESCRIPTION	ROTO-MASTER PART NUMBER	QTY PER TURBO	SINGLE FEED MAINT. KIT 600870-00	DUAL FEED MAINT. KIT 600890-00	SINGLE FEED OVERHAUL KIT 600871-00	DUAL FEED OVERHAUL KIT 600891-00	CART. MOUNTING KIT 600872-00
3	Bearing Hsg. 1, SF	600736-00	1			1		
3	Bearing Hsg. 5, DF	600734-00 (2)	1				1	
6	Bearing Kit, SF	600270-00 (3)	1	1		1		
6	Bearing Kit, DF	600625-00 (3)	1		1		1	
7	Thrust Spacer	600338-00	1	1	1	1	1	
8	Shim, Bearing	600268-00 (3)	1	(3)	(3)	(3)	(3)	
9	Retaining Ring	600016-00	1			1	1	
10	Mating Ring	500041-00	1	1	1	1	1	
11	Gasket, Comp. Hsg.	600017-00	1	1	1	1	1	1
12	Piston Ring .300	600238-00	1	1	1	1	1	
13a	Heat Shield, Stamped	600291-00	1			1	1	
13b	Heat Shield, Cast	600465-00	1					
14	Ring-Spring	600001-00	1	1	1	1	1	
15	Band Clamp, Turb. Hsg.	600181-00 (1)	1			1	1	1
16	Insert Plate Assy.	600109-00	1	1	1	1	1	
18	Gasket, Turb. Hsg.	600010-00	1	1	1	1	1	1
19	Shaft Nut	600435-00	1	1	1	1	1	
20	Washer, Comp. Wheel	600434-00	1	1	1	1	1	
21	Pipe Plug, 1/2" NPT	600063-00	1			1	1	
23	'O' Ring	600263-00	1	1	1	1	1	
24	Bolt, with Lockwasher	600314-00	6			6	6	6
25	Nut, Band Clamp	600015-00 (1)	1	1	1			
26	Pipe Plug 1/8" NPT	210082	2			2	2	
27	Shim, Comp. Wheel .010	600005-01	1	1	1	1	1	
27	Shim, Comp. Wheel .015	600005-02	1	1	1	1	1	
	Pin, Comp. Hsg.	600011-00	2					
	Pin, Bearing Hsg., DF	600091-00 (2)	2		(2)		(2)	

NOT ILLUSTRATED	ROTO-MASTER PART NUMBER	TURBINE HOUSING MOUNTING GASKETS A	B	C	J
Gasket, Turbine Inlet, 4 Bolt	600150-00	1			1
Gasket, Turbine Inlet, 3 Bolt	600483-00		1	1	
Gasket, Turbine Outlet, 4 Bolt	600481-00	1			1
Gasket, Turbine Outlet, 3 Bolt	600482-00		1	1	

		COMPRESSOR HOUSING MOUNTING GASKETS/HOSES A	B	C
Gasket, Compressor Inlet, 6 Bolt	600762-00		1	1
Hose, Comp. Inlet, 3" x 2-1/2"	210378	1		
Hose, Comp. Discharge, 2-1/4" x 3"	600763-00	1	1	1

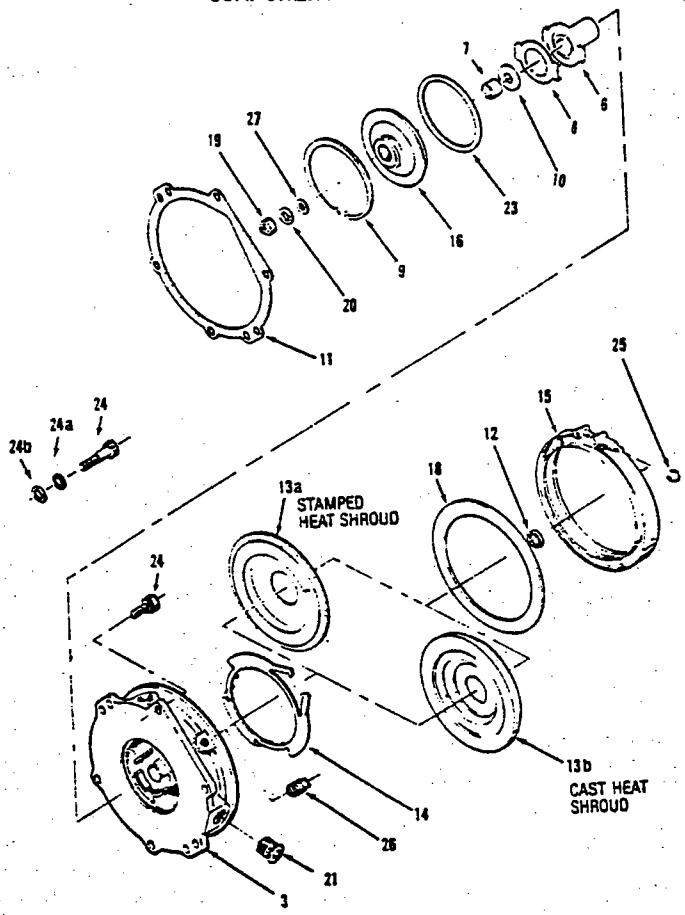
(1) Band Clamp Nut #600015-00 is included with Band Clamp #600181-00. Also available as a separate line item.
(2) Pin #600091-00 is included with Dual Feed Bearing Housing #600734-00 only. Also available as a separate line item.
(3) Bearing Shim #600268-00 is included with Bearing Kit #600270-00 and #600625-00. Also available as a separate line item.

COMPONENT PARTS NOT COMMON

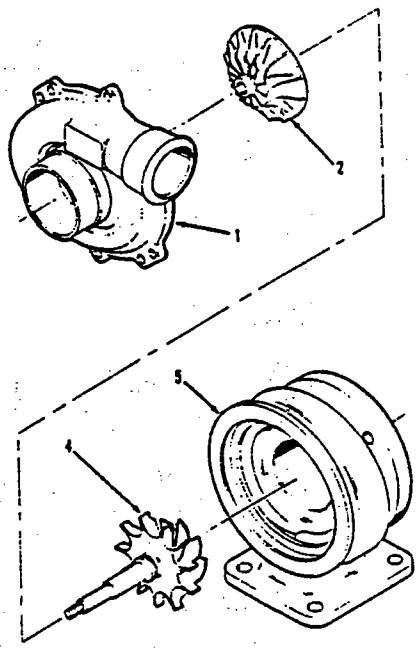
MODEL NUMBER	ROTO-MASTER PART NUMBER	COMPRESSOR WHEEL (Key 2)	TURBINE WHEEL & SHAFT (Key 4)	CARTRIDGE	COMPRESSOR HOUSING (Key 1)	TURBINE HOUSING (Key 5)	TURBINE HSG. A/R RATIO
B-FLOW (Single Feed)							
(1)	(1)	600021-00	600018-00	600725-01	(2)	(2)	(2)
(1)	(1)	600021-00	600018-00	600725-02 (3)	(2)	(2)	(2)
B-FLOW (Dual Feed)							
(1)	(1)	600021-00	600018-00	600641-01	(2)	(2)	(2)
(1)	(1)	600021-00	600018-00	600641-02 (3)	(2)	(2)	(2)
F-FLOW (Single Feed)							
(1)	(1)	600203-00	600546-00	600742-01	(2)	(2)	(2)
(1)	(1)	600203-00	600546-00	600724-02 (3)	(2)	(2)	(2)
F-FLOW (Dual Feed)							
(1)	(1)	600203-00	600546-00	600642-01	(2)	(2)	(2)
(1)	(1)	600203-00	600546-00	600642-02 (3)	(2)	(2)	(2)
E-FLOW (Single Feed)							
(1)	(1)	600058-00	600355-00	600321-00	(2)	(2)	(2)
(1)	(1)	600058-00	600355-00	600321-01 (3)	(2)	(2)	(2)
E-FLOW (Dual Feed)							
(1)	(1)	600058-00	600355-00	600643-01	(2)	(2)	(2)
(1)	(1)	600058-00	600355-00	600643-02 (3)	(2)	(2)	(2)

(1) See Rajay Product Line Turbocharger Model Number Guide.
(2) See Rajay Product Line Design Option Guide.
(3) Incorporates optional cast heat shield.

COMPONENT PARTS COMMON



COMPONENT PARTS NOT COMMON



COMPONENT PARTS COMMON AND KIT CONTENTS

KEY	DESCRIPTION	ROTO-MASTER PART NUMBER	QTY PER TURBO	SINGLE FEED MAINT. KIT 600870-00	DUAL FEED MAINT. KIT 600890-00	SINGLE FEED OVERHAUL KIT 600875-00	DUAL FEED OVERHAUL KIT 600895-00	CART. MOUNTING KIT 600872-00
1	Bearing Hsg. 2, SF	600735-00	1			1		
1	Bearing Hsg. 5, DF	600733-00 (2)	1				1	
6	Bearing Kit, SF	600270-00 (3)	1	1		1		
6	Bearing Kit, DF	600625-00 (3)	1		1		1	
7	Thrust Spacer	600338-00	1	1	1	1	1	
8	Shim, Bearing	600263-00 (3)	1	(3)	(3)	(3)	(3)	
9	Retaining Ring	600016-00	1			1	1	
10	Mating Ring	600041-00	1	1	1	1	1	1
11	Gasket, Comp. Hsg.	600017-00	1	1	1	1	1	
12	Piston Ring .300	600239-00	1	1	1	1	1	
13a	Heat Shield, Stamped	600291-00	1			1	1	
12b	Heat Shield, Cast	600465-00	1					
14	Ring-Spring	600001-00	1	1	1	1	1	1
15	Band Clamp, Turb. Hsg.	600181-00 (1)	1			1	1	
16	Insert Plate Assy.	600109-00	1	1	1	1	1	1
18	Gasket, Turb. Hsg.	600010-00	1	1	1	1	1	
19	Shaft Nut	600435-00	1	1	1	1	1	
20	Washer, Comp. Wheel	600434-00	1			1	1	
21	Pipe Plug, 1/2" NPT	600063-00	1	1	1	1	1	
23	'O' Ring	600263-00	1			6	6	6
24	Bolt, W/Lockwasher	600314-00	6	1	1			
25	Nut, Band Clamp	600015-00 (1)	1			2	2	
26	Pipe Plug 1/8" NPT	210082	2	1	1	1	1	
27	Shim, Comp. Wheel .010	600005-01	1	1	1	1	1	
27	Shim, Comp. Wheel .015	600005-02	1					
	Pin, Comp. Hsg.	600011-00	2					
	Pin, Brg. Hsg., DF	600091-00 (2)	2		(2)		(2)	

NOT ILLUSTRATED	ROTO-MASTER PART NUMBER	TURBINE HOUSING MOUNTING GASKETS A	B	C	J
Gasket, Turbine Inlet, 4 Bolt	600150-00	1			1
Gasket, Turbine Inlet, 3 Bolt	600483-00		1	1	
Gasket, Turbine Outlet, 4 Bolt	600481-00	1			1
Gasket, Turbine Outlet, 3 Bolt	600482-00		1	1	

		COMPRESSOR HOUSING MOUNTING GASKETS/HOSES A	B	C
Gasket, Compressor Inlet, 6 Bolt	600762-00		1	1
Hose, Comp. Inlet, 3" x 2-1/2"	210378	1		
Hose, Comp. Discharge, 2-1/4" x 3"	600763-00	1	1	1

(1) Band Clamp Nut #600015-00 is included with Band Clamp #600181-00. Also available as a separate line item.
(2) Pin #600091-00 is included with Dual Feed Bearing Housing #600723-00 only. Also available as a separate line item.
(3) Bearing Shim #600268-00 is included with Bearing Kit #600270-00 and #600625-00. Also available as a separate line item.

COMPONENT PARTS NOT COMMON

MODEL NUMBER	ROTO-MASTER PART NUMBER	COMPRESSOR WHEEL (Key 2)	TURBINE WHEEL & SHAFT (Key 4)	CARTRIDGE	COMPRESSOR HOUSING (Key 1)	TURBINE HOUSING (Key 5)	TURBINE HSG. A/R RATIO
B-FLOW (Single Feed)							
(1)	(1)	600021-00	600018-00	600025-00	(2)	(2)	(2)
(1)	(1)	600021-00	600018-00	600025-01 (3)	(2)	(2)	(2)
B-FLOW (Dual Feed)							
(1)	(1)	600021-00	600018-00	600638-01	(2)	(2)	(2)
(1)	(1)	600021-00	600018-00	600638-02 (3)	(2)	(2)	(2)
F-FLOW (Single Feed)							
(1)	(1)	600203-00	600546-00	600205-00	(2)	(2)	(2)
(1)	(1)	600203-00	600546-00	600205-01 (3)	(2)	(2)	(2)
F-FLOW (Dual Feed)							
(1)	(1)	600203-00	600546-00	600639-01	(2)	(2)	(2)
(1)	(1)	600203-00	600546-00	600639-02 (3)	(2)	(2)	(2)
E-FLOW (Single Feed)							
(1)	(1)	600058-00	600355-00	600320-00	(2)	(2)	(2)
(1)	(1)	600058-00	600355-00	600320-01 (3)	(2)	(2)	(2)
E-FLOW (Dual Feed)							
(1)	(1)	600058-00	600355-00	600640-01	(2)	(2)	(2)
(1)	(1)	600058-00	600355-00	600640-02 (3)	(2)	(2)	(2)

(1) See Rajay Product Line Turbocharger Model Number Guide.
(2) See Rajay Product Line Design Option Guide.
(3) Incorporates optional cast heat shield.

RAJAY PRODUCT LINE
300 AND 370/375 SERIES
ASSEMBLY SPECIFICATIONS AND TOLERANCES
(SERVICE LIMITS)

TORQUE SPECIFICATIONS	POUNDS INCH (lb. in.) MIN.	MAX.	NEWTON METERS (N m) MIN.	MAX.
Turbine Housing V-Band Clamp Nut	15	20	1.69	2.26
Flange-to-Bearing Housing Bolts	80	100	9.04	11.30
Compressor Housing-to-Bearing Housing Flange Bolts	80	100	9.04	11.30
Shaft Nut	80	100	9.04	11.30
Pipe Plug (370/375 Series)				
1/2" NPTF	140	200	15.82	22.60
3/8" NPTF	120	160	13.56	18.07

TOLERANCE SPECIFICATIONS	INCHES (in.) MIN.	MAX.	MILLIMETERS (mm) MIN.	MAX.
Bearing-to-Turbine Shaft End Play	.004	.006	.102	.152
Bearing End Play	.001	.003	.025	.076
Total Shaft End Play (Assembled)	.005	.009	.127	.229
Compressor Wheel-to-Compressor Housing	.015	.020	.381	.508
Turbine Shaft Radial Play (Compressor End)		.022		.558