

M-D Pneumatics™

EQUALIZER™

Rotary Positive Displacement Air Blower

Models

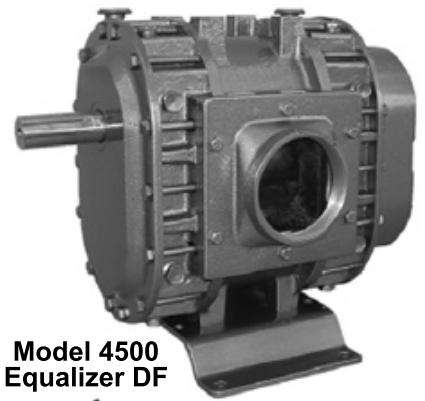
EQUALIZER DF™
4504 4506 4509 4512

EQUALIZER RM™
4604 4606 4609 4612
6012 6016 6024

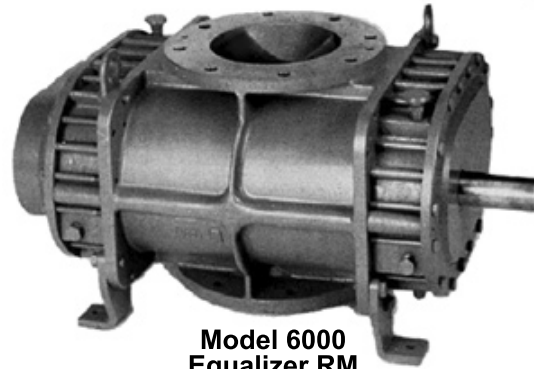
INSTALLATION
OPERATION
MAINTENANCE
REPAIR
MANUAL



Model 4600
Equalizer RM



Model 4500
Equalizer DF



Model 6000
Equalizer RM

WARNING

DO NOT OPERATE
BEFORE READING MANUAL



8/2008

LEADING THE SEARCH FOR NEW SOLUTIONS



TUTHILL
Vacuum & Blower Systems

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SAFETY INSTRUCTIONS

1. Do not operate before reading the enclosed instruction manual.
2. Use adequate protection, warning, and safety equipment necessary to protect against hazards involved in installation and operation of this equipment.

NOTICE

1. The safety instruction tags shown below were attached to your unit prior to shipment. Do not remove, paint over, or obscure in any manner.
2. Failure to heed these warnings could result in serious bodily injury to the personnel operating and maintaining this equipment.



SAFETY WARNINGS

- Keep hands and clothing away from rotating machinery, inlet and discharge openings.
- Blower and drive mounting bolts must be secured.
- Drive belts and coupling guards must be in place.
- Noise level may require ear protection.
- Blower heat can cause burns if touched.

TUTHILL VACUUM AND BLOWER SYSTEMS — SPRINGFIELD, MO USA

IMPORTANT

In order to assure you of the full benefits of our product warranty, please complete, tear out and return the warranty registration card located on the back cover of this manual, or you can register your product online at:

http://vacuum.tuthill.com/product_registration

SAFETY PRECAUTIONS

For equipment covered specifically or indirectly in this instruction book, it is important that all personnel observe safety precautions to minimize the chances of injury. Among many considerations, the following should particularly be noted:

- Blower casing and associated piping or accessories may become hot enough to cause major skin burns on contact.
- Internal and external rotating parts of the blower and driving equipment can produce serious physical injuries. Do not reach into any opening in the blower while it is operating, or while subject to accidental starting. Cover external moving parts with adequate guards.
- Disconnect power before doing any work, and avoid bypassing or rendering inoperative any safety or protective devices.
- If blower is operated with piping disconnected, place a strong, coarse screen over the inlet and avoid standing in discharge air stream.
- Avoid extended exposure in close proximity to machinery with high intensity noise levels.
- Use proper care and good procedures in handling, lifting, installing, operating, and maintaining the equipment.
- There are other potential safety hazards associated with the use of this equipment. All personnel working in or passing through the area should be warned by signs and trained to exercise adequate general safety precautions.
- Hearing protection may be required depending on silencing capabilities.

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INTRODUCTION

CONGRATULATIONS on your purchase of a new **EQUALIZER® Rotary Positive Displacement Air Blower** from Tuthill Vacuum & Blower Systems. Please examine the blower for shipping damage, and if any damage is found, report it immediately to the carrier. If the blower is to be installed at a later date make sure it is stored in a clean, dry location and rotated regularly. Make sure covers are kept on all openings. If blower is stored outdoors be sure to protect it from weather and corrosion.

EQUALIZER blowers are built to exacting standards and if properly installed and maintained will provide many years of reliable service. We urge you to take time to read and follow every step of these instructions when installing and maintaining your blower. We have tried to make these instructions as straightforward as possible. We realize getting any new piece of equipment up and running in as little time as possible is imperative to production.



WARNING: *Serious injury can result from operating or repairing this machine without first reading the service manual and taking adequate safety precautions.*

IMPORTANT: Record the blower model and serial numbers of your machine in the OPERATING DATA form on page 23. You will save time and expense by including this reference identification on any replacement part orders, or if you require service or application assistance.

INSTALLATION



WARNING: *Customers are cautioned to provide adequate protection, warning and safety equipment necessary to protect personnel against hazards involved in the installation and operation of this equipment in the system or facility.*



WARNING: *Do not use air blowers on explosive or hazardous gases. Each size blower has limits on pressure differential, running speed, and discharge temperature, which must not be exceeded. Consult "Maximum Operating Limits Table."*

PROTECTIVE MATERIALS

- Remove protective materials from the shaft.
- Remove the protective covers from the inlet and outlet ports and inspect the interior for dirt and foreign material.



WARNING: *Keep hands, feet, foreign objects, and loose clothes from inlet and outlet openings to avoid injury or damage if lobes are to be rotated at this point.*

FOUNDATION

We recommend a solid foundation be provided for permanent installation. It is necessary that a suitable base be used, such as a steel combination base under blower and motor, or a separate sole plate under each. Where a solid foundation is not feasible, care must be taken to insure that equipment is firmly anchored to adequate structural members.

Mount in a level position. Before tightening the bolts, check to see that both mounting feet are resting evenly on the foundation, shim as necessary to eliminate stress on the base when the bolts are tightened. Twisting or cramping the blower in mounting will cause rotor contact and binding during operation.

LOCATION

Install the unit in a protected indoor location, if possible. However, an unprotected outdoor installation will be satisfactory if correct lubrication for expected temperatures is provided (see recommended lubrication section). Just before starting the installation, remove plugs or covers from inlet and discharge connections. Inspect for dirt or foreign objects inside machine, then turn drive shaft by hand to make sure it rotates freely. Mount in a level position. Use of a rigid, solidly supported, structurally sound baseplate is recommended. Make sure feet rest evenly on the plate before fastening down. Twisting or cramping the blower in mounting will cause rotor contact and binding during operation.

A unit that is factory mounted on a base, should not require the above adjustments. However, since the assembly can become twisted in shipping or installation, checking for soft foot should be done after installation of the base. Shims may be needed for alignment. Loosen the foot hold-down screws to check foot contact with the mounting surface. The base should be mounted on a solid foundation or heavy flooring, using shims as necessary at bolting points to prevent warping the assembly.

Transmission of small operating vibrations to a support structure may be objectionable in some cases. Use of vibration isolators or vibration absorbing materials can be effective in overcoming this problem. To avoid casing distortion, the treatment used should be applied under the motor-blower common mounting plate or base, rather than directly under the feet alone. Piping should be accurately squared with the blower and supported independently. Use only clean new pipe and make certain it is free of scale, cuttings, weld beads, dirt, or any other foreign material. To guard against damage to the blower, insure that an inlet filter is used. Make provisions to clean the filter of collected debris after a few hours of operation and periodically thereafter.

DRIVE

When the blower is V-belt driven the sheaves must be positioned so that the hub face of the blower sheave is not more than 1/4" (6.5 mm) from the blower drive end plate and the driver sheave is as close to the driver bearing as possible. Care should be taken when installing sheave onto shaft. The faces of the sheaves should be accurately in line to minimize belt wear.

Adjust the belt tension to the belt manufacturer's specifications.

For installations where the blower is to be operated by direct drive, selection of the driver should be such as not to exceed the maximum speed ratings of the blower. (See "Maximum Operating Limits" table on page 15).

A flexible type coupling should be used to connect driver and blower shafts. The two shafts must be aligned within .005" (.13 mm) T.I.R. (Total Indicated Runout) .002 (.07mm) T I R face run out on coupling.

LUBRICATION

Do not start up the blower until you are positive that it has been properly and fully lubricated. (See Lubrication Section on page 6).

Every M-D Pneumatics™ blower from Tuthill Vacuum & Blower Systems is factory tested, oil drained and shipped dry to its installation point. Both independent oil reservoirs must be filled to the proper level before operation.

Shaft bearings at the gear end of the blower are splash lubricated by one or both gears dipping into an oil reservoir formed in the gear end plate and cover. Shaft bearings at the drive end of the blower are lubricated by a slinger assembly dipping into an oil reservoir. Before starting the blower, fill oil sumps as shown below under "Filling Procedure." Tuthill Vacuum & Blower Systems approved mineral-based, synthetic, and food grade lubricants are listed on page 15.

FILLING PROCEDURE

1. Shut off and lock out power to the blower drive motor.
2. Remove fill plugs or breathers from both gear end and drive end plates.
3. SLOWLY pour oil through fill until oil appears in the oil sight glass. Bring oil level to center of sight glass.
4. Verify oil level is at proper level in BOTH gear end and drive end sight glasses.
5. Replace fill plugs or breathers that were removed in step 2.



CAUTION: Do not start the blower until you are sure oil has been put in the gear housing. Operation of the blower without proper lubrication will cause the blower to fail and void its warranty.



WARNING: Never attempt to change oil while the blower is in operation. Failure to heed this warning could result in damage to the equipment and/or serious personal injury. Oil level must ONLY be checked while the blower is not running, and the power locked out.

BLOWER MODEL	HORIZONTAL AIR FLOW OUNCES / LITERS		VERTICAL AIR FLOW OUNCES / LITERS	
	GEAR END	DRIVE END	GEAR END	DRIVE END
4504, 4506, 4509, 4512	16 / 0.47	13 / 0.38	32 / 0.95	23 / 0.68
4604, 4606, 4609, 4612	16 / 0.47	11 / 0.33	32 / 0.95	17 / 0.50
6012, 6016, 6024	34 / 1.00	22 / 0.65	57 / 1.69	41 / 1.21

Oil capacities are based on filling from dry condition. Less oil may be needed depending on emptiness of oil reservoirs after draining. Always fill the oil sumps until oil level is in the center of the sight glass in EACH END of the blower. Following this procedure will insure proper oil level.

FREQUENTLY ASKED QUESTIONS REGARDING LUBRICATION

What are the perceived modes of failure when units are run beyond the specified duty cycles?

Several things are happening as the lubricant goes through the unit. First, it is absorbing frictional energy in the form of heat. This heat has to be dissipated through either surface contact with cooler materials, or in a rest volume of lubricant. While reducing the friction, the lubricant is also going through a shearing process and the molecular structure is broken down.

The result is that the lubricant will begin to thicken. Because of the shorter molecular chains and the drop out of additive packages. The thickened lubricant will cause more drag, increasing the friction and heat, and further degrading the lubricant.

Operation of the blower (environment, run time, speed, and pressure) has a direct effect on duty cycles. Our published cycles are based on worst-case conditions.

What is the functional detriment if the "wrong oil" is used?

The lubricant is selected based on bearing and gear speed, and operating temperature. Too light of a lubricant increases wear by not separating the sliding surfaces and it will not remove the heat adequately. If the lubricant is too thick, the drag in the bearings is increased causing them to run hotter. Since it is thicker, it will not flow as readily into the gears, reducing the available backlash. Lubricants at our conditions are incompressible.

What is the functional detriment if the oil is not serviced?

If the lubricant is not serviced at the proper interval the shearing action in the bearing and the gears will begin to take their toll and the lubricant will thicken, making matters worse. The unit will run hotter and the wear on running surfaces will increase. Generally the lubricant will appear dirtier, this is actually material rubbed off the unit's components. The discoloration comes from overheating the additive package. An indicator of the breakdown of a lubricant is the increase in the TAN (Total Acid Number) and a change in the base viscosity of ten percent.

FLOW CONFIGURATIONS

FLOW CONFIGURATIONS

- 17 series EQUALIZER blowers are shipped from the factory in a horizontal flow configuration. Bottom drive with horizontal flow is now available on 4500 EQUALIZER DF and 6000 Equalizer RM models.
- 46 series EQUALIZER blowers are shipped from the factory in either left drive or right drive, vertical flow configuration.
- If flow direction is changed, the oil level sight glasses and breathers must be relocated to proper positions, as shown to the right.
- Failure to change plug location will result in blower failure and void the product warranty.

SPECIAL NOTE REGARDING 4600 & 6000 EQUALIZER RM MODELS

- Vertical flow 4600 & 6000 EQUALIZER RM models with either left or right drive can be converted to top drive. However, a left drive blower cannot be converted to right drive, and vice versa.
- Top drive 4600 & 6000 EQUALIZER RM models can be converted to left drive only. Either left or right drive blowers can be converted to top drive. Unless specifically stated by factory, never arrange the blower so that the flow direction is horizontal with bottom drive. This will result in blower failure and void the product warranty.
- Bottom drive can be changed into right drive only.
- Top drive can be changed into left drive only.

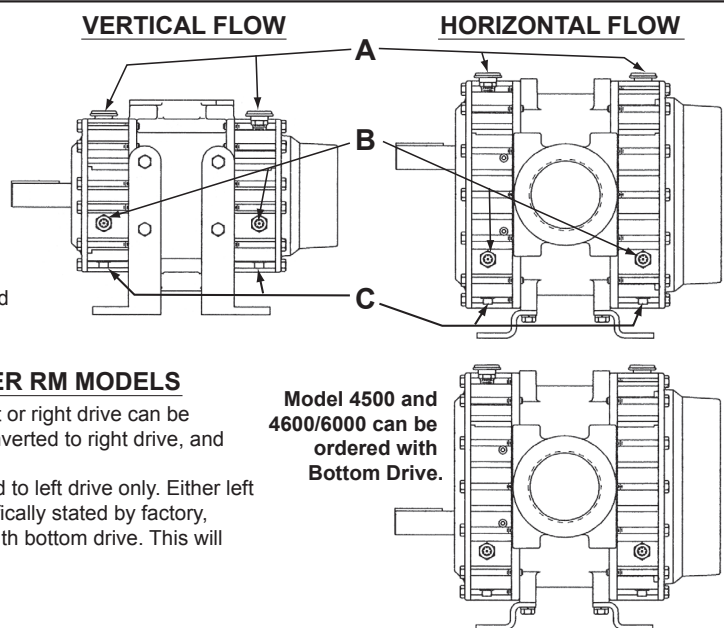


Figure 1. Flow Configurations

RELIEF VALVES

We recommend the use of relief valves to protect against excessive pressure or vacuum conditions. These valves should be tested at initial start-up to be sure they are properly adjusted to relieve at or below the maximum pressure differential rating of the blower.



CAUTION: Upon completion of the installation, and before applying power, rotate the drive shaft by hand. It must move freely. If it does not, look for uneven mounting, piping strain, excessive belt tension or coupling misalignment or any other cause for binding. If blower is removed and still does not rotate freely, check inside the blower housing for foreign material.

PIPING

Inlet and outlet connections on all blowers are large enough to handle maximum volume with minimum friction loss. Be sure to maintain same diameter piping and avoid stress loads. Do not support silencers with the blower.

Be certain all piping is clean internally before connecting to the blower. We recommend placing a 16-mesh wire screen backed with hardware cloth at or near the inlet connections for the first 50 hours of use until the system is clean. Make provisions to clean the screen after a few hours of operation and completely discard it once the system is clean, as it will eventually deteriorate and small pieces going into the blower can cause serious damage. A horizontal or vertical air flow piping configuration is easily achieved by rearranging the mounting feet position.



WARNING: Do not operate equipment without adequate silencing devices since high noise level may cause hearing damage. (Reference OSHA Standards).

OPERATION

RECOMMENDED SHUTDOWN PROCEDURE TO MINIMIZE RISK OF FREEZING OR CORROSION

When a blower is taken out of service, it may require internal protection against rusting or corrosion. The need for such protection must be a matter of judgment based on existing conditions as well as length of down time. Under atmospheric conditions producing rapid corrosion, the blower should be protected immediately. When high humidity or moisture is present in an air piping system, condensation of water can occur after the blower is shut down and the blower begins to cool. This creates an environment favorable to corrosion of the iron internal surfaces, or in cold weather, the formation of ice. Either of these conditions can close the operating clearances, causing the blower to fail upon future start-up.

The shutdown procedure outlined below minimizes the risk of moisture condensation, corrosion, and freezing. Care must be taken to avoid overloading or overheating.

1. Isolate the blower from the moist system piping, allowing the blower to intake atmospheric air.
2. Operate the blower under a slight load allowing the blower to heat within safe limits. The heat generated by the blower will quickly evaporate residual moisture.
3. For carpet cleaning applications, after the work is completed, simply allow the blower to run a few (3-5) minutes with the suction hose and wand attached. The suction hose and wand will provide enough load to the blower to evaporate the moisture quickly.
4. For extended shutdown, inject a small amount of a light lubricating oil such as 3-in-One®* or a spray lubricant such as WD-40®* into the inlet of the blower just prior to shutdown. The lubricant will provide an excellent protective coating on the internal surfaces. If using a spray lubricant, exercise care to prevent the applicator tube from getting sucked into the blower. The applicator tube will damage the blower, most likely to the point that repair would be required.

* 3-in-One and WD-40 are registered trademarks of WD-40 Company.

LONG TERM STORAGE

1. Spray the interior (lobes, housing, and end plates) with rust preventative.
2. Apply a rust preventative grease to the drive shaft.
3. Attach a dessiccant bag to either of the covers to prevent condensation from occurring inside the blower. Make sure any dessiccant bag (or bags) is attached to the covers so that they will be removed when the dust cover is removed. It is imperative that these be removed before startup of the blower.
4. Store the blower in an air conditioned and heated building if at all possible. At least insure as dry conditions as possible.
5. If possible, rotate the drive shaft by hand at least monthly in order to prevent the seals from setting in one position.

FLOW DIRECTION BY ROTATION

Refer to the illustrations at the right before installing inlet and discharge piping.

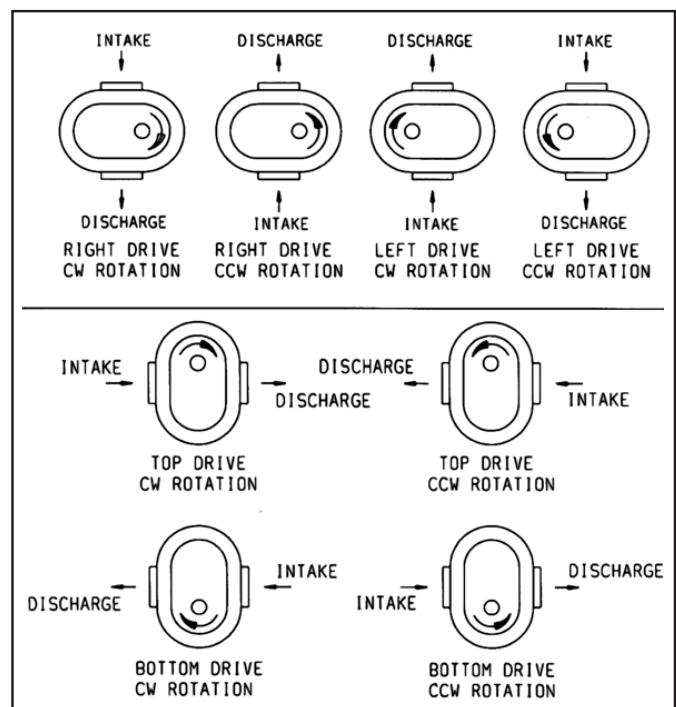


Figure 2 - Flow Direction by Rotation

MAINTENANCE

A good maintenance program will add years of service to your blower. A newly installed blower should be checked frequently during the first month of operation, especially lubrication. Check oil level in both the drive end and gear end of the blower and add oil as needed. Complete oil changes are recommended every 1000 operating hours, or more frequently depending on the type of oil and oil operating temperature.

PREVENTATIVE MAINTENANCE

The following is recommended as a minimum maintenance program.

DAILY	WEEKLY	MONTHLY
1. Check and maintain oil level, and add oil as necessary. 2. Check for unusual noise or vibration (See <i>Troubleshooting</i>)	1. Clean all air filters. A clogged air filter can seriously affect the efficiency of the blower and cause overheating and increased oil usage. Replace if necessary.	1. Inspect the entire system for leaks. 2. Inspect condition of oil and change if necessary. 3. Check drive belt tension and tighten if necessary.

START-UP CHECKLIST

We recommend that these startup procedures be followed in sequence and checked off (☑) in the boxes provided in any of the following cases:

- During initial installation
- After any shutdown period
- After maintenance work has been performed
- After blower has been moved to a new location

DATES CHECKED:

Check the unit for proper lubrication. Proper oil level cannot be over-emphasized. Refer to the *Lubrication* section. Please see *Recommended Lubricants* for information on acceptable lubricants for your product.

Check V-belt drive for proper belt alignment and tension.

Carefully turn the rotors by hand to be certain they do not bind.



WARNING: Disconnect power. Make certain power is off and locked out before touching any rotating element of the blower, motor, or drive components.

"Bump" the unit with the motor to check rotation (counter-clockwise [CCW] when facing shaft) and to be certain it turns freely and smoothly.

Start the unit and operate it for 30 minutes at no load. During this time, feel the cylinder for hot spots. If minor hot spots occur, refer to the *Troubleshooting* chart.



WARNING: When touching the blower or motor during operation, make certain that loose clothing, long hair, neckties, loose shoelaces, rags, etc. are secured snugly and cannot accidentally dangle into rotating elements such as shafts, belts, and sheaves.

Apply the load and observe the operation of the unit for one hour.

If minor malfunctions occur, discontinue operation and refer to the *Troubleshooting* chart.

TROUBLESHOOTING

Although Tuthill Vacuum & Blower Systems blowers are well designed and manufactured, problems may occur due to normal wear and the need for readjustment. The chart below lists symptoms that may occur along with probable causes and remedies.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Loss of oil	Gear housing not tightened properly.	Tighten gear housing bolts.
	Lip seal failure.	Disassemble and replace lip seal.
	Insufficient sealant.	Remove gear housing and replace sealant. (See <i>Disassembly</i> section on page 10)
	Loose drain plug.	Tighten drain plug.
Excessive bearing or gear wear	Improper lubrication.	Correct oil level. Replace dirty oil. (See <i>Lubrication</i> section on page 8)
	Excessive belt tension.	Check belt manufacturer's specifications for tension and adjust accordingly.
	Coupling misalignment.	Check carefully, realign if necessary.
Lack of volume	Slipping belts.	Check belt manufacturer's specifications for tension and adjust accordingly.
	Worn lobe clearances.	Check for proper clearances. (See <i>Assembly Clearances</i> on pages 17-21)
	Speed too low.	Increase blower speed within limits.
	Obstruction in piping.	Check system to assure an open flow path.
Knocking	Unit out of time.	Re-time.
	Distortion due to improper mounting or pipe strains.	Check mounting alignment and relieve pipe strains.
	Excessive pressure differential.	Reduce to manufacturer's recommended pressure. Examine relief valve and reset if necessary.
	Worn gears.	Replace timing gears. (See <i>Disassembly</i> section on page 10)
Excessive blower temperature	Too much or too little oil in gear reservoir.	Check oil level. (See <i>Lubrication</i> section on page 5)
	Too low operating speed.	Increase blower speed within limits.
	Clogged filter or silencer.	Remove cause of obstruction.
	Excessive pressure differential.	Reduce pressure differential across the blower.
	Elevated inlet temperature.	Reduce inlet temperature.
	Worn lobe clearances.	Check for proper clearances. (See <i>Assembly Clearances</i> on pages 17-21)
Rotor end or tip drag	Insufficient assembled clearances.	Correct clearances (See <i>Assembly Clearances</i> on pages 17-21)
	Case or frame distortion.	Check mounting and pipe strain.
	Excessive operating pressure.	Reduce pressure differential.
	Excessive operating temperature.	Reduce pressure differential or reduce inlet temperature.
Vibration	Belt or coupling misalignment.	Check carefully, realign if necessary.
	Lobes rubbing.	Check cylinder for hot spots, then check for lobe contact at these points. Correct clearances. (See <i>Assembly Clearances</i> on pages 17-21)
	Worn bearings or gears.	Check condition of gears and bearings; replace if necessary.
	Unbalanced or rubbing lobes.	Possible buildup on casing or lobes, or inside lobes. Remove buildup and restore clearances.
	Driver or blower loose.	Check mounting and tighten if necessary.
	Piping resonance.	Check pipe supports, check resonance of nearby equipment, check foundation.

DISASSEMBLY & REASSEMBLY

DISASSEMBLY & INSPECTION

With proper maintenance and lubrication, normal life expectancy for gears, bearings, and seals can be achieved. However, over a period of time these parts must be repaired or replaced to maintain the efficiency of your blower. This section is written in a way that will allow you to completely disassemble your blower. The inspection of certain repairable or replaceable parts is referred to at the point of disassembly where these parts are exposed. If at any point of inspection, repair or replacement is deemed necessary, appropriate instruction will be given to achieve these repairs or replacements.

Remove the oil drain plugs [18] in the bottom of the end covers [Items 5 & 10] and drain the oil. Take out eight cap screws [16] and remove the gear cover. It may be necessary to tap the sides with a mallet or wooden block to break the seal joint.

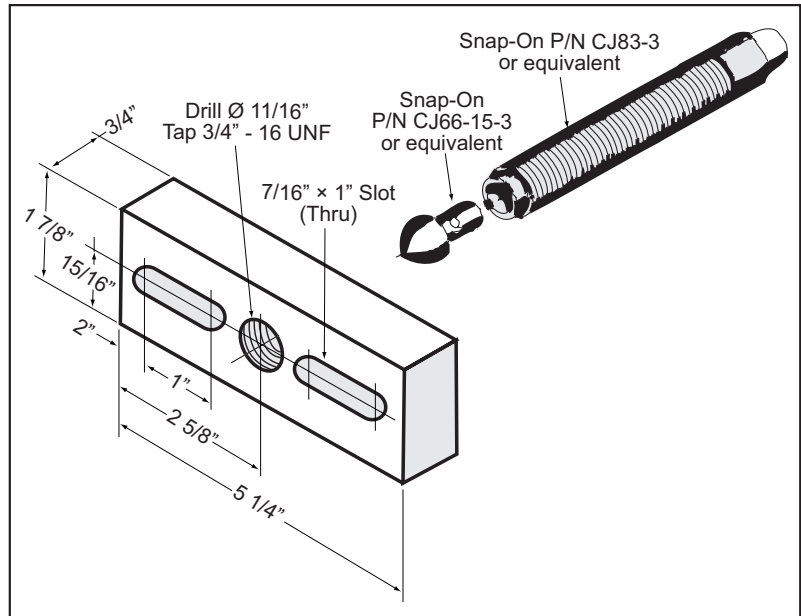


Figure 3. Bar Puller Illustration

Gears are not exposed for visual inspection. Items in brackets [] are referenced to item numbers on pages 16, 18, or 20 as applicable to the blower model.

Inspect the gears for the following:

- Broken Teeth
- Chipped Teeth
- Uneven Wear
- Excessive Wear
- Any Other Abnormalities

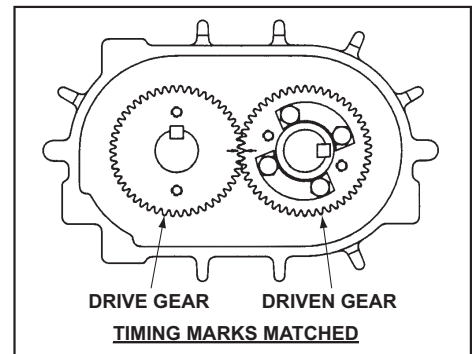


Figure 4A. Timing Marks

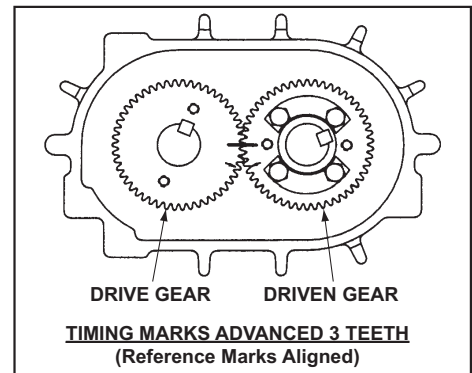


Figure 4B. Timing Marks



WARNING: Before performing any repair or replacement, disconnect and lock out power.

DISASSEMBLY OF BLOWER

1. Remove unit from installation and drain lubricant from both ends by removing magnetic drain plugs [31]. Mark end plates, covers and housing so they can be reassembled in their original position.
2. Remove cap screws [26] from drive end cover [6]. Using a beveled chisel and hammer, remove cover,
3. Remove cap screw [307 or 29], washer [27] and oil slinger [20]
4. Remove cap screw [62] and bearing retainer plates [14]. Note location and sequence of wave springs [282] and spacers [281] as they are removed.
5. Attach bar pullers as shown in Figure 3 to each bearing bore and pull end plate [4].
6. Remove cap screws [26] and gear end cover [7].
7. Remove gear lock bolts [29], and washers [25].
8. Align timing marks on gears (Figure 4A). Rotate drive gear clockwise approximately three teeth and mark a matching reference line on each gear as shown in Figure 4B. This gear position is necessary so rotors will clear and not jam. Do not allow the gears to move from the matched reference line while pulling. Use a light rocking motion to insure that the lobes have not jammed. Remove driven gear first, and then drive gear.



CAUTION: Failure to properly pull this gear could result in damage to rotor keyway or a bent rotor shaft. Never use excessive force.

9. Remove cap screws [62] and bearing retainer plates [14].
10. Using bar puller attached to bearing bore, push one rotor [1 & 2] at a time from end plate. Keep rotor lobes in vertical position while removing.
11. Using a mallet, tap end plate from housing.

12. Tap out bearings [9 & 10] or [50], and seals [12 & 13].
13. Remove seal rings [58] from rotor shaft sleeves [239].
14. Inspect all parts for wear.

ASSEMBLY OF BLOWER

The assembly procedure is generally the same for all series, but where there are differences, notations are made.

Dowel pins are used to locate end plates, housing, and end covers in their proper location relative to each other. Be sure they are in place.

It is recommended that the gear end rotor shaft bearings be purchased from Tuthill Vacuum & Blower Systems, as they are specially ground to locate the rotors with correct end clearance relative to the gear end plate.

Make sure all parts are clean and free of any nicks or burrs caused by disassembly. Refer to page 14 for seal pressing tools as well as other assembly tools required.

It is suggested that long feeler gauges (12" [250 mm]) be used to check the interlobe timing, preferably (2) .006" (.15 mm), (1) .005" (.13 mm), (1) .004" (.10 mm), and (1) .003" (.08 mm). This will give you all the combinations from .003" (.08 mm) to .021" (.53 mm) and also .024" (.61 mm), which is the total.



CAUTION: All cap screws used on EQUALIZER™ models are metric. The use of anything other than metric cap screws will result in thread damage. All pipe plug and oil breather holes are National Pipe Thread (NPT).

PREPARATION OF END PLATES AND ROTORS FOR ASSEMBLY

1. Apply a thin coat of sealer to O.D. of lip seal [12] and press into seal bores of both end plates [4]. Make sure seals are fully seated without deforming. Seal lip should face up towards the bearing. Lubricate lip with grease.

All models except 6000:

If the rotor shaft sleeves [239] are being replaced, lubricate shaft and press on new sleeves with inside chamfer facing lobes (O.D. chamfer faces outward). Install seal rings [58] into grooves of rotor shaft sleeves on gear end only and lock in place by compressing ring. Center rings on sleeves. Seal rings for drive end of shafts will be installed later in the assembly.

Model 6000:

Sleeves are installed in the same manner as above except a silicone sealer must be applied to the two milled indentations in the shafts on the gear side of each rotor. After the sleeve is pressed on, remove any excess sealer that has squeezed out between sleeve and lobe. It is not necessary to seal the shafts on the other end.

ATTENTION: All rotor sleeves or seal journals MUST be polished to remove any scratches or nicks. Failure to polish seal journals could result in seal leakage.

GEAR END ASSEMBLY

2. Stand rotors on press with drive rotor [1] on the left, making sure keyways are properly positioned as shown in Figure 5. You may use the drive end plate as a temporary fixture to support the rotor lobes while pressing on the bearings and gears.

3. Install gear end plate [4] over the rotor shafts making sure the oil feed holes for the bearing bores are properly located in relation to the drive rotor.

NOTE: Two oil feed holes for each bearing bore must always be at the top when the assembled unit is standing on its feet. Units can only be assembled for top drive, left drive, or right drive.

The seal rings should glide into their respective bores with ease.

4. Lubricate shafts and press double row ball bearings [9] onto shafts and into end plate bores. Use bearing pressing tool shown on page 14.

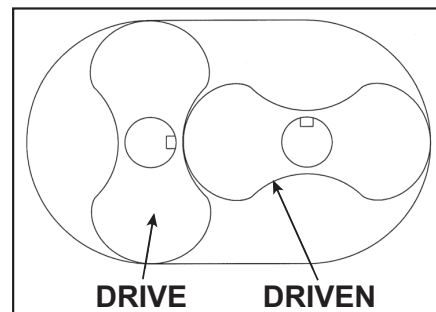


Figure 5. Keyway Position



CAUTION: These bearings have flush ground faces and should be installed with manufacturer numbers up (toward gear). If no numbers appear on either side, look for a black dot (acid mark) on the inner race. Install with dot up. Do not use bearings that have not been flush ground within .001" tolerance.

5. Install bearing retainer rings [14] and secure with cap screws [62]. At this time, using feeler gauges, check the clearance between the face of the end plate and rotor lobes. Refer to assembly drawings for gear end clearance. If clearances are not within specifications, recheck parts to find cause of incorrect clearances before proceeding.
 6. Install keys [24] in rotor shaft keyways. Tight fits are required.
 7. Lubricate shafts and keys and press drive gear (right hand helix) on drive rotor. To install driven gear, align reference marks as shown in Fig. 4B. Tap gear with mallet to start, then press the gear until seated.
- NOTE:** All timing gears must be used in sets as they are matched and serially numbered.
8. Install gear washers [25] and secure with cap screws [29] using a few drops of Loctite® #242 (Removable Thread Locker) on each screw.
 9. Remove assembly from press and stand it on workbench with gears down. Place blocks under end plate to prevent assembly from falling over. Drive gear should remain on left side.
 10. Install rotor housing [3] and secure temporarily with two cap screws evenly spaced.
 11. Check clearances between end of lobes and housing using a flat bar and feeler gauges or a depth micrometer. Refer to assembly drawings for drive end clearances.

DRIVE END ASSEMBLY

12. Repeat instructions given in steps 3 and 4 to assemble drive end plate and temporarily secure with two cap screws evenly spaced.

NOTE: 4500 Models Install Free End Spacers on Shaft (Item 123)

13. Lubricate shafts and install roller bearings [10] on 4600 models. On 6000 models the drive rotor bearing [50] is a larger bearing than the driven rotor bearing [10].

NOTE: The inner races of all roller bearings have a flange on one side only. This flange must face inward, See Fig. 6. For 4500 Models the inner race flange must face outward.

14. **4600 Models:** Install one wave spring [282] on drive rotor and two wave springs with spacer [281] between, on the driven rotor.

NOTE: 4500 Models have no wave springs to install.

Model 6000: Install two wave springs [282] with spacer [281] between, on both rotors.

Secure with retainer plate [14] and cap screws [62].

15. Install spring pin [68] in driven rotor, oil slinger [20] washer [27] and secure with cap screw [29] or [307].

16. Apply thin coat of sealer to O.D. of drive shaft seal [13] and press into end cover [6] bore. Lip must face inward.

17. Remove temporary screws, then place a bead of silicone sealer around the perimeter of the end plate. Carefully slide cover over drive shaft. Make sure dowels [126] are in place. Secure with cap screws [26]. Lay assembly down with drive gear on the left for timing.

ADJUSTING ROTOR INTERLOBE CLEARANCE

18. The driven gear is made of two pieces. The outer gear shell is fastened to the inner hub with four cap screws and located with two dowel pins. A laminated shim, made up of .003" (.076 mm) laminations, separates the hub and the shell. Removing or adding shim laminations moves the gear shell axially relative to the inner hub. Being a helical gear, it rotates as it is moved in or out and the driven rotor turns with it, thus changing the clearance between rotor lobes. Changing the shim thickness .014" (.36 mm) on a 6000 model will change the interlobe clearance approximately .005" (.13 mm). On a 4600 model it would take approximately .012" (.30 mm) shims to effect the same change.

EXAMPLE: Referring to Figure 7, check the clearance on a 6000 model at AA (right-hand reading) and BB (left-hand reading). If AA reading is .017" (.43 mm) and BB reading is .004" (.10 mm), by removing .018" (.46 mm) of shims, the readings should then read: AA .011" (.28 mm) and BB .010" (.25 mm).

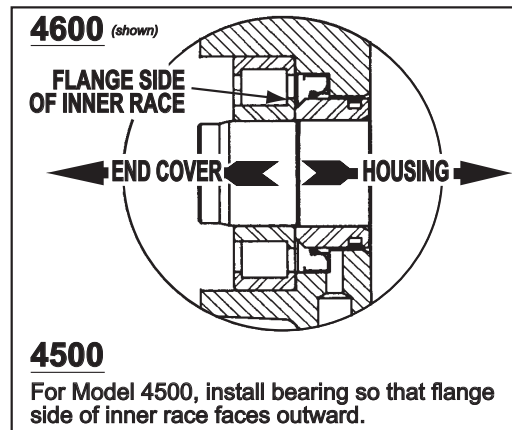


Figure 6. Bearing Race Illustration

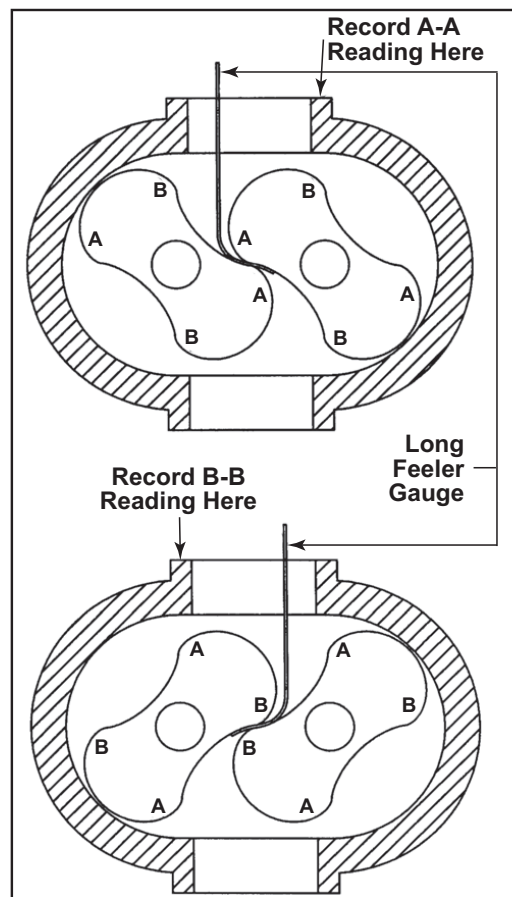
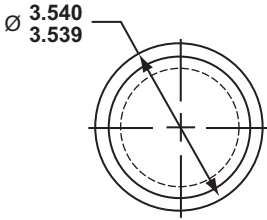
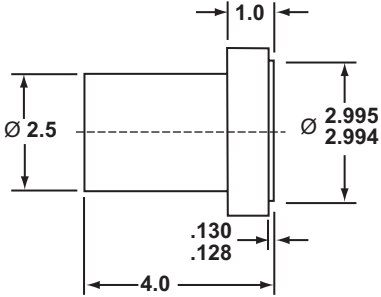


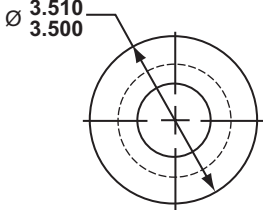
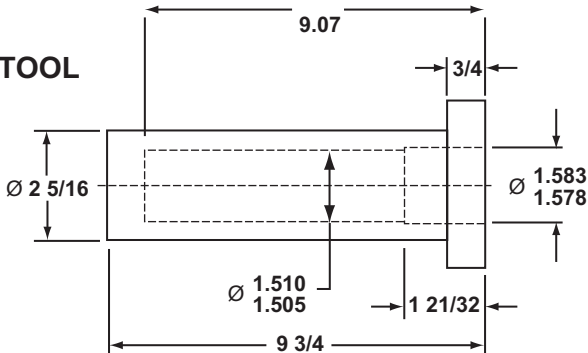
Figure 7. Rotor Interlobe Clearance

SPECIAL TOOL DRAWINGS

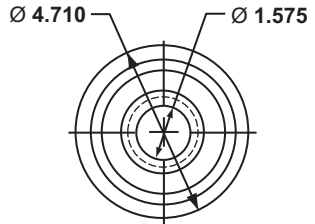
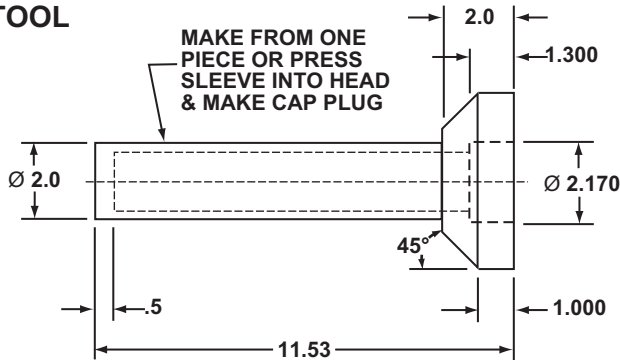
**MODEL 4500/4600
LIP SEAL PRESSING TOOL**



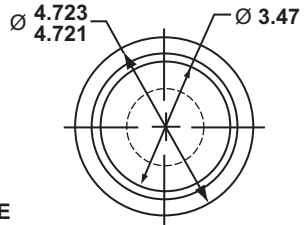
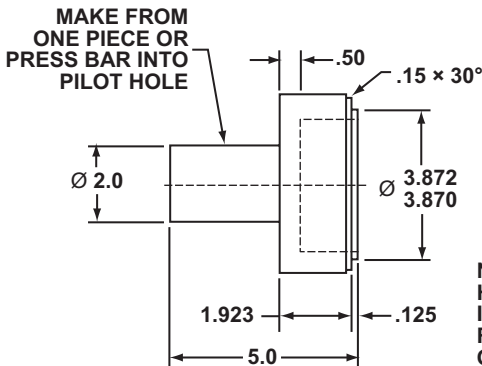
**MODEL 4500/4600
BEARING INSTALLATION TOOL**



**MODEL 6000
BEARING PRESSING TOOL**

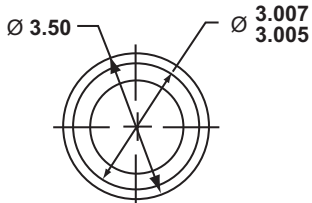
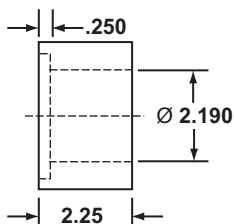


**MODEL 6000
SEAL PRESSING TOOL**



NOTE: THE HOLLOW CAVITY IS FOR WEIGHT REDUCTION ONLY ON SEAL PRESSING TOOL

**MODEL 6000
SLEEVE PRESSING RING
(USE WITH BEARING PRESSING TOOL)**



RECOMMENDED LUBRICANTS FOR ROTARY BLOWERS

RECOMMENDED MINERAL BASED LUBRICANTS				
AMBIENT TEMPERATURE	SHELL	CITGO	CHEVRON TEXACO	EXXONMOBIL
0° to 32° F (-18° to 0° C)	TELLUS® 68 (ISO 68)	A/W 68 (ISO 68)	RANDO HD 68 (ISO 68)	DTE HEAVY MEDIUM (ISO 68)
32° to 90° F (0° to 32° C)	TELLUS® 100 (ISO 100)	A/W 100 (ISO 100)	RANDO HD 100 (ISO 100)	DTE HEAVY (ISO 100)
90° to 120° F (32° to 50° C)	TELLUS® 150 (ISO 150)	A/W 150 (ISO 150)	RANDO HD 150 (ISO 150)	DTE EXTRA HEAVY (ISO 150)

RECOMMENDED SYNTHETIC BASED LUBRICANTS*			
AMBIENT TEMPERATURE	TUTHILL	EXXONMOBIL	SHELL
0° to 32° F (-18° to 0° C)	PneuLube™ (ISO 100)	SHC 626 (ISO 68)	OMALA® RL 68 (ISO 68)
32° to 90° F (0° to 32° C)		SHC 627 (ISO 100)	OMALA® RL 100 (ISO 100)
90° to 120° F (32° to 50° C)		SHC 629 (ISO 150)	OMALA® RL 150 (ISO 150)

* Blowers used in oxygen-enriched service should use only Castrol Brayco 1726 Plus non-flammable, PFPE synthetic lubricant. Blowers used in hydrogen service should use only PneuLube synthetic oil. Tuthill Vacuum & Blower Systems cannot accept responsibility for damage to seals, O-rings and gaskets caused by use of synthetic lubricants not recommended by Tuthill Vacuum and Blower Systems.

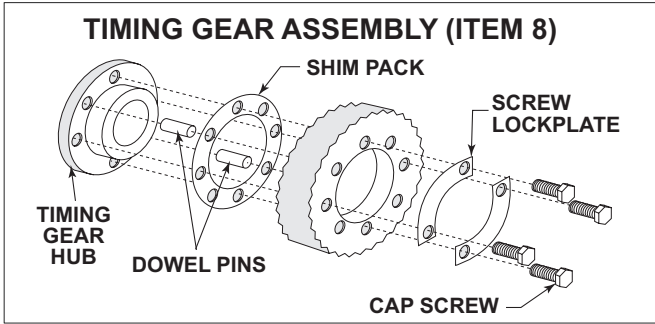
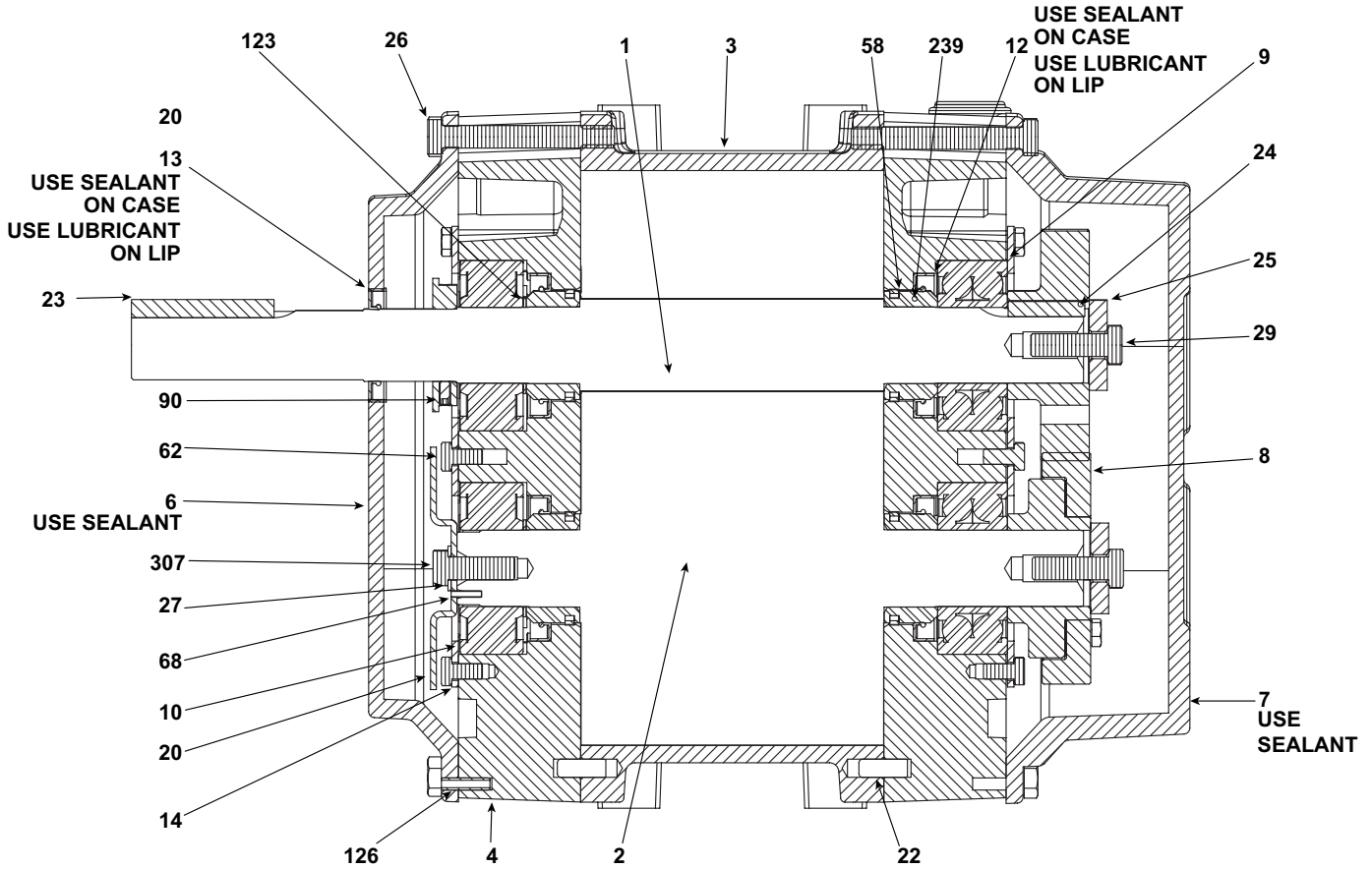
RECOMMENDED MINERAL BASED, FOOD GRADE LUBRICANTS		
AMBIENT TEMPERATURE	Lubricant meeting U. S. FDA regulation 21 CFR 178.3570 governing petroleum products which may have incidental contact with food, and USDA H1 requirements	Lubricant meeting U.S. FDA regulations 21 CFR 172.878 and 178.3620(a) for direct and indirect food contact
0° to 32° F (-18° to 0° C)	CITGO CLARION® A/W 68 (ISO 68)	CITGO CLARION® 350 FOOD GRADE (ISO 68)
32° to 90° F (0° to 32° C)	CITGO CLARION® A/W 100 (ISO 100)	CONSULT FACTORY
90° to 120° F (32° to 50° C)	CONSULT FACTORY	CONSULT FACTORY

MAXIMUM OPERATING LIMITS

MODEL	RPM	PRESSURE PSI / mbar	VACUUM in. Hg / mbar	TEMPERATURE RISE F° / C°
4504	4000	18 / 1240	16 / 540	290 / 161
4506	4000	18 / 1240	16 / 540	265 / 147
4509	4000	18 / 1240	16 / 540	260 / 144
4512	4000	15 / 1035	16 / 540	255 / 141
4604	4000	18 / 1240	16 / 540	290 / 161
4606	4000	18 / 1240	16 / 540	265 / 147
4609	4000	18 / 1240	16 / 540	260 / 144
4612	4000	15 / 1035	16 / 540	255 / 141
6012	3000	15 / 1035	16 / 540	280 / 155
6016	3000	15 / 1035	16 / 540	280 / 155
6024	3000	10 / 690	16 / 540	230 / 127

EQUALIZER CUTAWAY VIEW — MODELS 4504, 4506, 4509, 4512

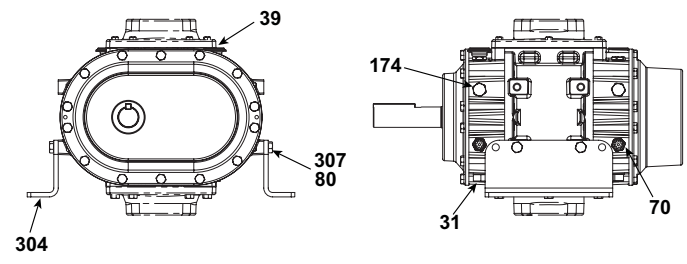
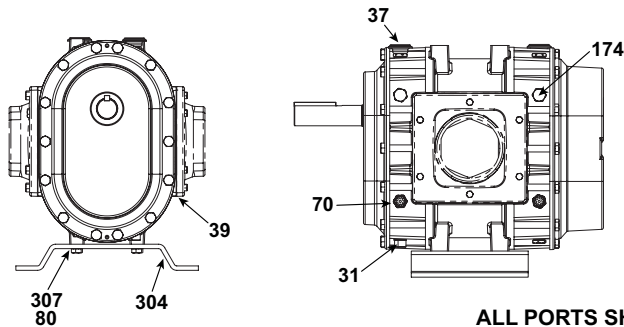
(When ordering parts, please include the item number shown, as well as your model and serial number.)



4500 TORQUE CHART			
ITEM	PART	lbf-ft	(N-m)
26	Cap Screw M10 x 1.5	20-29	(27-39)
29	Cap Screw M14 x 2	57-85	(77-115)
62	Cap Screw M8 x 1.25	9-14	(12-19)
307	Cap Screw M12 x 1.75	35-53	(47-72)

HORIZONTAL FLOW (17 SERIES) — TOP DRIVE SHOWN

VERTICAL FLOW (46 SERIES) — LEFT DRIVE SHOWN



ALL PORTS SHOWN ARE OPTIONAL

EQUALIZER PARTS LIST — MODELS 4504, 4506, 4509, 4512

(When ordering parts, please include the item number shown, as well as your model and serial number.)

ITEM NO.	DESCRIPTION	QTY
1	ROTOR, DRIVE	1
2	ROTOR, DRIVEN	1
3	HOUSING	1
4	END PLATE	2
6	END COVER, DRIVE END	1
7	END COVER, GEAR END	1
8	TIMING GEAR SET	1
9	BEARING, DOUBLE ROW BALL	2
10	BEARING, CYLINDRICAL ROLLER	1
12	LIP SEAL, ROTOR SHAFT	4
13	LIP SEAL, DRIVE SHAFT	1
14	RETAINER PLATE	4
20	OIL SLINGER	1
22	DOWEL PIN	4
23	KEY, DRIVE SHAFT	1
24	KEY, GEAR	2
25	WASHER	2
26	CAP SCREW	28
27	WASHER	1
29	CAP SCREW	2
31	DRAIN PLUG, MAGNETIC	2
37	BREATHER	2
39	GASKET, PORT	2
58	SEAL RING	4
62	CAP SCREW	16
68	SPRING PIN	1
70	OIL SIGHT GAUGE	2
80	LOCKWASHER	AR
123	SHIM SEAL	2
126	SPRING PIN	4
174	PIPE PLUG	2
239	SLEEVE	4
304	MOUNTING FOOT	2
307	CAP SCREW	AR

Port connectors and associated mounting hardware for Model 4500 Equalizer DF blowers are sold separately.

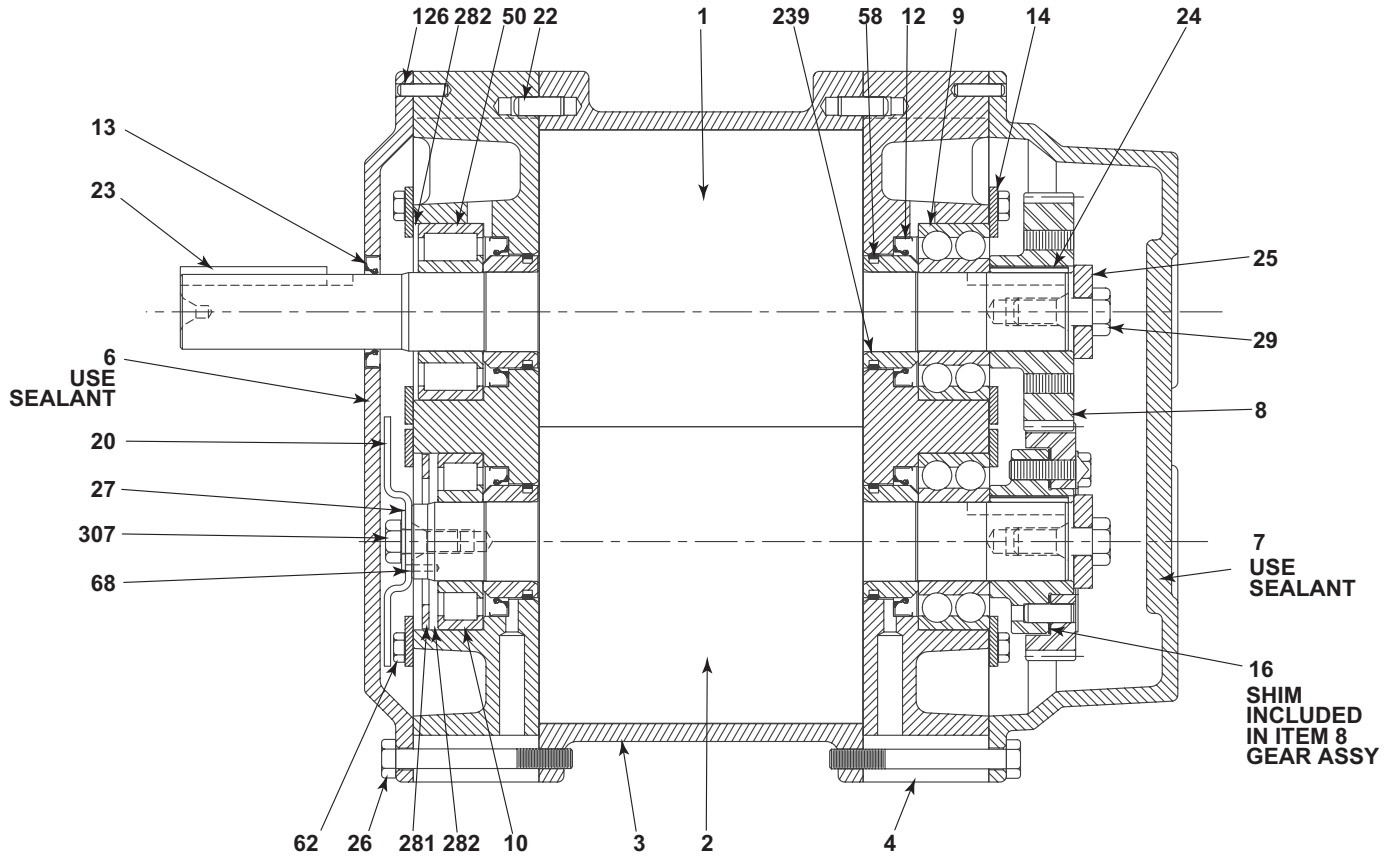
ASSEMBLY CLEARANCES FOR EQUALIZER MODELS 4504, 4506, 4509, 4512

Clearances are shown in inches and *millimeters*

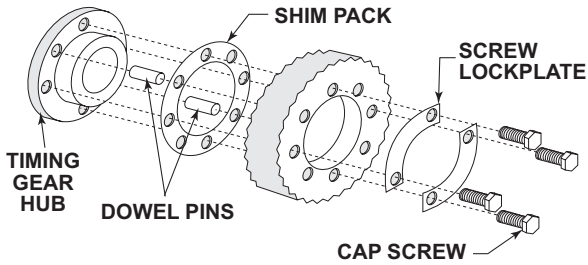
MODEL	LOBE TO END PLATES		LOBE TO CASING		INTERLOBE
	GEAR END	DRIVE END	TIP-DOWEL	TIP-PORT	MINIMUM
4504	.004" - .008" .10 - .20	.005" - .009" .13 - .23	.007" - .011" .18 - .28	.009" - .013" .23 - .33	.008" - .012 .20 - .30
4506	.004" - .008" .10 - .20	.006" - .010" .10 - .25	.007" - .011" .18 - .28	.009" - .013" .23 - .33	.008" - .012 .20 - .30
4509	.004" - .008" .10 - .20	.009" - .013" .23 - .33	.007" - .011" .18 - .28	.009" - .013" .23 - .33	.008" - .012 .20 - .30
4512	.004" - .008" .10 - .20	.012" - .016" .30 - .41	.007" - .011" .18 - .28	.009" - .013" .23 - .33	.008" - .012 .20 - .30

EQUALIZER CUTAWAY VIEW — MODELS 4604, 4606, 4609, 4612

(When ordering parts, please include the item number shown, as well as your model and serial number.)



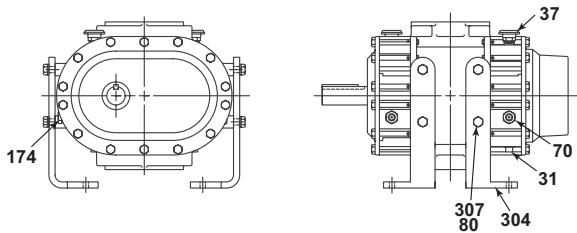
TIMING GEAR ASSEMBLY (ITEM 8)



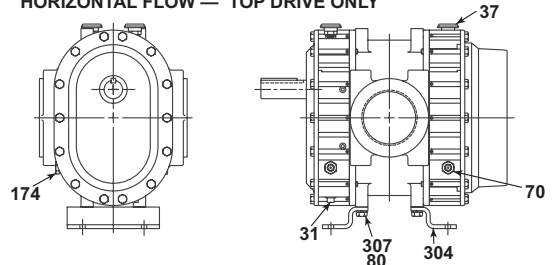
TORQUE CHART

ITEM	PART	lbf-ft	(N-m)
26	Cap Screw M10 x 1.5	20-29	(27-39)
29	Cap Screw M14 x 2	57-85	(77-115)
40	Cap Screw 5/8"-11 UNC	90-120	(122-163)
62	Cap Screw M8 x 1.25	9-14	(12-19)
307	Cap Screw M12 x 1.75	35-53	(47-72)

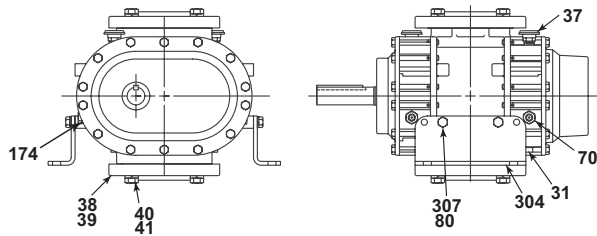
VERTICAL FLOW — LEFT DRIVE SHOWN



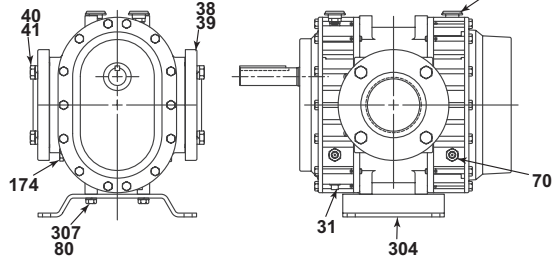
HORIZONTAL FLOW — TOP DRIVE ONLY



VERTICAL FLOW — LEFT DRIVE SHOWN



HORIZONTAL FLOW — TOP DRIVE ONLY



EQUALIZER PARTS LIST — MODELS 4604, 4606, 4609, 4612

(When ordering parts, please include the item number shown, as well as your model and serial number.)

ITEM NO.	DESCRIPTION	QTY
1	ROTOR, DRIVE	1
2	ROTOR, DRIVEN	1
3	HOUSING	1
4	END PLATE	2
6	END COVER, DRIVE END	1
7	END COVER, GEAR END	1
8	TIMING GEAR SET	1
9	BEARING, DOUBLE ROW BALL	2
10	BEARING, CYLINDRICAL ROLLER	1
12	LIP SEAL, ROTOR SHAFT	4
13	LIP SEAL, DRIVE SHAFT	1
14	RETAINER PLATE	4
20	OIL SLINGER	1
22	DOWEL PIN	4
23	KEY, DRIVE SHAFT	1
24	KEY, GEAR	2
25	WASHER	2
26	CAP SCREW	28
27	WASHER	1
29	CAP SCREW	2
31	DRAIN PLUG, MAGNETIC	2
37	BREATHER	2
38	PORT FLANGE ("D" SUFFIX UNITS ONLY)	2
39	GASKET ("D" SUFFIX UNITS ONLY)	2
40	CAP SCREW ("D" SUFFIX UNITS ONLY, NOT USED ON MODEL 4606D.	AR
41	LOCKWASHER ("D" SUFFIX UNITS ONLY)	8
50	BEARING, CYLINDRICAL ROLLER	1
58	SEAL RING	4
62	CAP SCREW	16
68	SPRING PIN	1
70	OIL SIGHT GAUGE	2
80	LOCKWASHER	4
123	BEARING SPACER	2
126	SPRING PIN	4
174	PIPE PLUG	2
239	SLEEVE	4
281	SPACER	1
282	WAVE SPRING	3
304	MOUNTING FOOT	AR
307	CAP SCREW	5

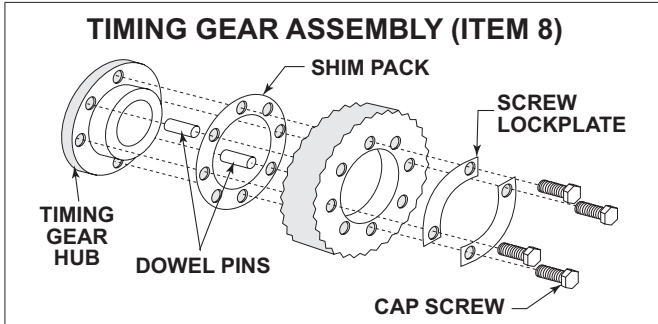
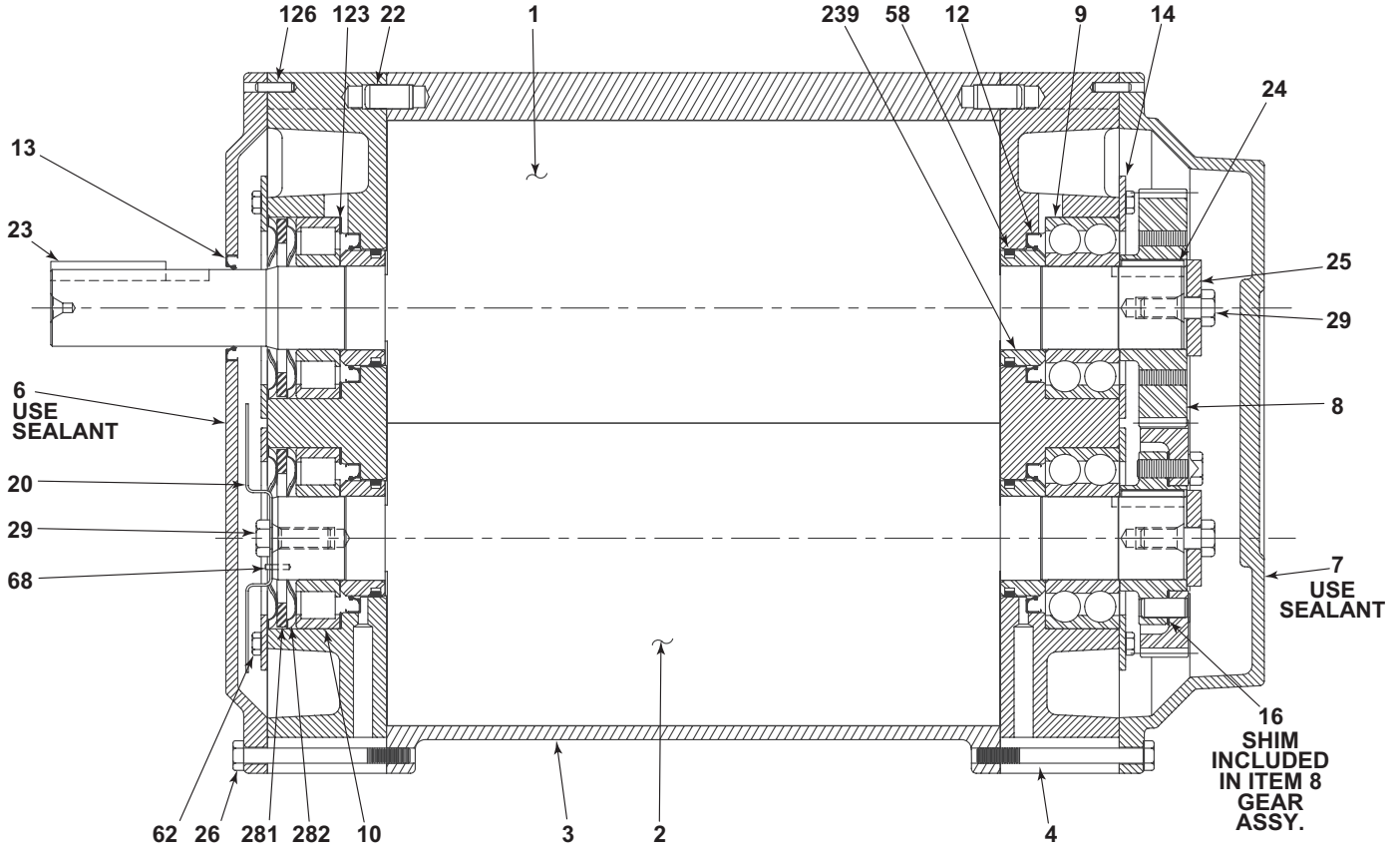
ASSEMBLY CLEARANCES FOR EQUALIZER MODELS 4604, 4606, 4609, 4612

Clearances are shown in inches and *millimeters*

MODEL	LOBE TO END PLATES		LOBE TO CASING		INTERLOBE
	GEAR END	DRIVE END	TIP-DOWEL	TIP-PORT	MINIMUM
4604	.004" - .008" .10 - .20	.005" - .009" .13 - .23	.007" - .011" .18 - .28	.009" - .013" .23 - .33	.008" - .012 .20 - .30
4606	.004" - .008" .10 - .20	.006" - .010" .10 - .25	.007" - .011" .18 - .28	.009" - .013" .23 - .33	.008" - .012 .20 - .30
4609	.004" - .008" .10 - .20	.009" - .013" .23 - .33	.007" - .011" .18 - .28	.009" - .013" .23 - .33	.008" - .012 .20 - .30
4612	.004" - .008" .10 - .20	.012" - .016" .30 - .41	.007" - .011" .18 - .28	.009" - .013" .23 - .33	.008" - .012 .20 - .30

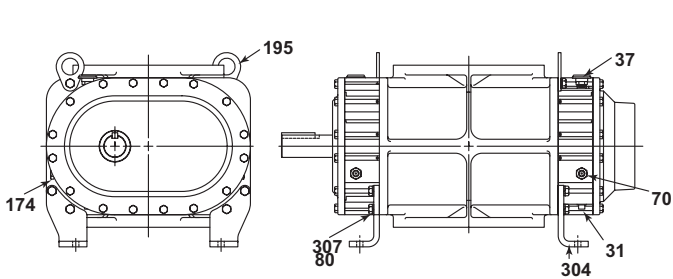
EQUALIZER CUTAWAY VIEW — MODELS 6012, 6016, 6024

(When ordering parts, please include the item number shown, as well as your model and serial number.)

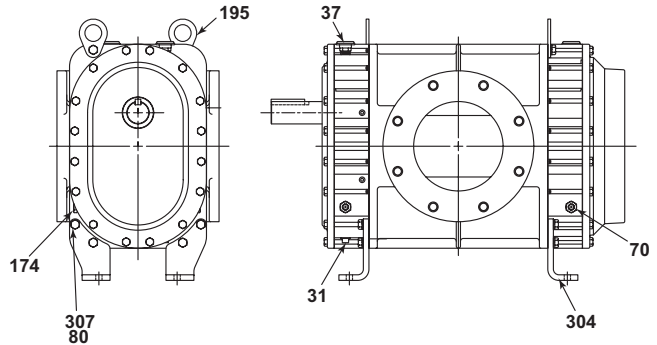


TORQUE CHART			
ITEM	PART	lbf-ft	(N-m)
26	Cap Screw M10 x 1.5	20-29	(27-39)
29	Cap Screw M14 x 2	57-85	(77-115)
62	Cap Screw M8 x 1.25	9-14	(12-19)
307	Cap Screw M12 x 1.75	35-53	(47-72)

VERTICAL FLOW



HORIZONTAL FLOW - TOP DRIVE ONLY



EQUALIZER PARTS LIST — MODELS 6012, 6016, 6024

(When ordering parts, please include the item number shown, as well as your model and serial number.)

ITEM	DESCRIPTION	QTY
1	ROTOR, DRIVE	1
2	ROTOR, DRIVEN	1
3	HOUSING	1
4	END PLATE	2
6	END COVER, DRIVE END	1
7	END COVER, GEAR END	1
8	TIMING GEAR SET	1
9	BEARING, DOUBLE ROW BALL	2
10	BEARING, CYLINDRICAL ROLLER	2
12	LIP SEAL, ROTOR SHAFT	4
13	LIP SEAL, DRIVE SHAFT	1
14	RETAINER PLATE	4
20	OIL SLINGER	1
22	DOWEL PIN	4
23	KEY, DRIVE SHAFT	1
24	KEY, GEAR	2
25	WASHER	2
26	CAP SCREW	32
27	WASHER	1
29	CAP SCREW	3
31	DRAIN PLUG, MAGNETIC	2
37	BREATHER	2
58	SEAL RING	4
62	CAP SCREW	16
68	SPRING PIN	1
70	OIL SIGHT GAUGE	2
80	LOCKWASHER	10
126	SPRING PIN	4
174	PIPE PLUG	2
195	LIFTING LUG	2
239	SLEEVE	4
281	SPACER	2
282	WAVE SPRING	4
304	MOUNTING FOOT	4*
307	CAP SCREW	10

* Requires 2 lefts (304A) and 2 rights (304B)

ASSEMBLY CLEARANCES FOR EQUALIZER MODELS 6012, 6016, 6024

Clearances are shown in inches and *millimeters*

MODEL	LOBE TO END PLATES		LOBE TO CASING		INTERLOBE
	GEAR END	DRIVE END	TIP-DOWEL	TIP-PORT	MINIMUM
6012	.005" - .009" .13 - 23	.014" - .020" .36 - .51	.008" - .013" .20 - .33	.011" - .016" .28 - .41	.012" - .016" .30 - .41
6016	.005" - .009" .13 - 23	.018" - .024" .46 - .61	.008" - .013" .20 - .33	.011" - .016" .28 - .41	.012" - .016" .30 - .41
6024	.005" - .009" .13 - 23	.018" - .024" .46 - .61	.011" - .016" .28 - .41	.014" - .019" .36 - .48	.012" - .016" .30 - .41

WARRANTY – BLOWER PRODUCTS

Subject to the terms and conditions hereinafter set forth and set forth in General Terms of Sale, Tuthill Vacuum & Blower Systems (the Seller) warrants products and parts of its manufacture, when shipped, and its work (including installation and start-up) when performed, will be of good quality and will be free from defects in material and workmanship. This warranty applies only to Seller's equipment, under use and service in accordance with seller's written instructions, recommendations and ratings for installation, operating, maintenance and service of products, for a period as stated in the table below. Because of varying conditions of installation and operation, all guarantees of performance are subject to plus or minus 5% variation. (Non-standard materials are subject to a plus or minus 10% variation)

PRODUCT TYPE	TYPE OF APPLICATION	
	ATMOSPHERIC AIR OR PROCESS AIR WITHOUT LIQUIDS PRESENT	PROCESS GASES OTHER THAN AIR, OR ANY LIQUID INJECTED APPLICATION
New <i>(Qx™ models only)</i>	30 months from date of shipment, or 24 months after initial startup date, whichever occurs first.	Consult Factory
New <i>(all other models)</i>	24 months from date of shipment, or 18 months after initial startup date, whichever occurs first	18 months from date of shipment, or 12 months after initial startup date, whichever occurs first
Repair	12 months from date of shipment, or remaining warranty period, whichever is greater	12 months from date of shipment, or remaining warranty period, whichever is greater

THIS WARRANTY EXTENDS ONLY TO BUYER AND/OR ORIGINAL END USER, AND IN NO EVENT SHALL THE SELLER BE LIABLE FOR PROPERTY DAMAGE SUSTAINED BY A PERSON DESIGNATED BY THE LAW OF ANY JURISDICTION AS A THIRD PARTY BENEFICIARY OF THIS WARRANTY OR ANY OTHER WARRANTY HELD TO SURVIVE SELLER'S DISCLAIMER.

All accessories furnished by Seller but manufactured by others bear only that manufacturer's standard warranty.

All claims for defective products, parts, or work under this warranty must be made in writing immediately upon discovery and, in any event within one (1) year from date of shipment of the applicable item and all claims for defective work must be made in writing immediately upon discovery and in any event within one (1) year from date of completion thereof by Seller. Unless done with prior written consent of Seller, any repairs, alterations or disassembly of Seller's equipment shall void warranty. Installation and transportation costs are not included and defective items must be held for Seller's inspection and returned to Seller's Ex-works point upon request.

THERE ARE NO WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS OF PURPOSE.

After Buyer's submission of a claim as provided above and its approval, Seller shall at its option either repair or replace its product, part, or work at the original Ex-works point of shipment, or refund an equitable portion of the purchase price.

The products and parts sold hereunder are not warranted for operation with erosive or corrosive material or those which may lead to build up of material within the product supplied, nor those which are incompatible with the materials of construction. The Buyer shall have no claim whatsoever and no product or part shall be deemed to be defective by reason of failure to resist erosive or corrosive action nor for problems resulting from build-up of material within the unit nor for problems due to incompatibility with the materials of construction.

Any improper use, operation beyond capacity, substitution of parts not approved by Seller, or any alteration or repair by others in such manner as in Seller's judgment affects the product materially and adversely shall void this warranty.

No employee or representative of Seller other than an Officer of the Company is authorized to change this warranty in any way or grant any other warranty. Any such change by an Officer of the Company must be in writing.

The foregoing is Seller's only obligation and Buyer's only remedy for breach of warranty, and except for gross negligence, willful misconduct and remedies permitted under the General Terms of Sale in the sections on **CONTRACT PERFORMANCE, INSPECTION AND ACCEPTANCE** and the **PATENTS** Clause hereof, the foregoing is **BUYER'S ONLY REMEDY HEREUNDER BY WAY OF BREACH OF CONTRACT, TORT OR OTHERWISE, WITHOUT REGARD TO WHETHER ANY DEFECT WAS DISCOVERED OR LATENT AT THE TIME OF DELIVERY OF THE PRODUCT OR WORK.** In no event shall Buyer be entitled to incidental or consequential damages. Any action for breach of this agreement must commence within one (1) year after the cause of action has occurred.

May 2008

OPERATING DATA

It is to the user's advantage to have the requested data filled in below and available in the event a problem should develop in the blower or the system. This information is also helpful when ordering spare parts.

Model No. _____ V-Belt Size: _____ Length: _____
Serial No. _____ Type of Lubrication: _____
Startup Date _____
Blower RPM _____ Operating Pressure _____
Blower Sheave Diameter: _____ Any other special accessories supplied or in use: _____
Motor Sheave Diameter: _____
Motor RPM _____ HP _____

NOTES: _____

IMPORTANT

All blowers and boosters manufactured by Tuthill Vacuum & Blower Systems are date coded at time of shipment. In order to assure you of the full benefits of the product warranty, please complete, tear out and return the product registration card below, or you can visit our product registration web page at:

http://vacuum.tuthill.com/product_registration

IMPORTANT

All blowers manufactured by Tuthill Vacuum & Blower Systems are date coded at time of shipment. In order to assure you of the full benefits of the product warranty, please complete, tear out and return this product registration card.

Company _____

Location _____

	City	State/Province	ZIP/Postal Code	Country
--	------	----------------	-----------------	---------

Telephone : () _____

E-mail: _____

Model: _____

Serial Number: _____

Date of Purchase: _____

Date of Startup: _____

PLEASE CHECK ONE

Pneumatic Conveying

Food

Vacuum

Paper

Wastewater

Gas/Petrochemical

Other _____



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 2912 SPRINGFIELD MO

POSTAGE WILL BE PAID BY ADDRESSEE

ATTN. CUSTOMER SERVICE – BLOWER PRODUCTS
TUTHILL VACUUM & BLOWER SYSTEMS
PO BOX 2877
SPRINGFIELD MO 65890-2150

