

RCS

8 inch gear diameter

INSTRUCTIONS

ROTARY LOBE BLOWERS

CONTENTS

NUMBERS IN () ARE METRIC EQUIVALENTS

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DO THESE THINGS To Get The Most From Your Roots Blower

- 1 Check shipment for damage in transit. After filing claim with carrier, notify nearest Sales Office. See list on last page.
- 2 Unpack shipment carefully and check contents against Packing List. Notify Sales Office if a shortage appears.
- 3 Store in a clean, dry location until ready for installation, if possible. Lift by methods discussed under INSTALLATION to avoid straining or distorting the equipment. Keep covers on all openings. Protect against weather and corrosion if outdoor storage is necessary.
- 4 Read LIMITATIONS and INSTALLATION sections in this manual and plan the complete installation. If supervision by a Service Engineer is needed, contact the nearest Dresser Parts and Service Center at least two weeks in advance and confirm by your purchase order. Standard charges will be made.
- 5 Provide for adequate safeguards against accidents to persons working on or near equipment during both installation and operation. See PRECAUTIONS.
- 6 Install all equipment correctly. Foundation design must be adequate and piping carefully done. Use recommended accessories for operating protection.
- 7 Make sure both driving and driven equipment is correctly lubricated before start-up. See LUBRICATION.
- 8 Read starting check points under OPERATION. Run equipment briefly to check for obvious faults, and make corrections. Follow with a trial run under normal operating conditions.
- 9 In the event of trouble during installation or operation of a new unit, do not attempt repairs. Notify nearest Sales Office, giving all nameplate information plus an outline of operating conditions and a description of the trouble.
- 10 Units out of warranty may be repaired or adjusted by the owner. It is recommended that such work be limited to the operations described in this manual, using Factory Parts. Good inspection and maintenance practices should reduce the need for repairs.

NOTE—Information in this manual is correct as of the date of publication. The Manufacturer reserves the right to make design or material changes without notice, and without obligation to make similar changes on equipment of prior manufacture.

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***Roots Products are sold subject to the
current General Terms of Sale, GTS-5001.***

OPERATING CHARACTERISTICS

Roots RCS blowers, as covered in this manual, are available in basic frame size of 8 inch gear diameter. Within this frame size are three case lengths, selected to produce reasonable steps in blower capacity ratings. All units are designated as air blowers, and may be used for handling air in either pressure or vacuum service. They are unsuitable for handling gases because shaft seals are not designed to prevent leakage to atmosphere.

The basic Roots rotary lobe blower is a positive displacement type unit, whose pumping capacity is determined by size, operating speed and pressure conditions. It employs two double-lobe impellers mounted on parallel shafts and rotating in opposite directions within a cylinder closed at the ends by headplates. As the impellers rotate, air is drawn into one side of the cylinder and forced out the opposite side against the pressure existing there. *The pressure developed, therefore, depends on the resistance of the discharge system.*

Effective sealing of the blower inlet area from the discharge area is accomplished by use of very small operating clearances. Resulting absence of moving contacts eliminates the need for any internal lubrication. Clearance between the impellers during rotation are maintained by a pair of accurately machined timing gears, mounted on the two shafts extended outside the blower casing.

Operation of the rotary lobe blower is illustrated in FIGURE 1, where air flow is right to left from inlet to discharge with the lower impeller rotating clockwise. In Position 1 it is delivering a known volume (A) to the discharge, while space (B) between the upper impeller and cylinder wall is being filled. Counterclockwise rotation of this impeller then traps equal volume (B) in Position 2, and further rotation delivers it to the discharge in Position 3. At the same time, another similar volume is forming under the lower impeller, and will be discharged when rotation reaches Position 1 again.

One complete revolution of the driving shaft alternately traps four equal and known volumes of air (two by each impeller) and pushes them through to the discharge. The pumping capacity of a lobe blower operating at a constant speed therefore remains relatively independent of reasonable inlet or discharge pressure variations. To change capacity, it is necessary either to change speed of rotation or vent some of the air.

No attempt should ever be made to control capacity by means of a throttle valve in the intake or discharge piping. This will not only increase the power load on the driver, but can also overload and seriously damage the blower. If a possibility does exist that flow to the blower inlet may be cut off during normal operation of a process, then an adequate vacuum relief valve *must* be installed near the blower. A pressure type relief valve in the discharge line near the blower is *required* for protection against cut-off or blocking in this line. See Figure 2.

When a belt drive is employed, blower speed can usually be adjusted to obtain desired capacity by changing the diameter of one or both sheaves. In a direct coupled arrangement a variable speed motor or transmission is required, or excess air may be blown off through a manually controlled unloading valve and silencer. If returned to the blower inlet, the air *must* be cooled to 100°F (38°C) through a bypass arrangement to maintain acceptable blower temperatures.

Before making any change in blower capacity, or operating conditions, contact the nearest Sales Office for specific information applying to your particular blower. In all cases, operating conditions must be maintained within the approved range of pressures, temperatures and speeds as stated under LIMITATIONS. Also, the blower must not be used to handle air containing liquids or solids. Serious damage to the rotating parts will result.

OPERATING LIMITATIONS

To permit continued satisfactory performance, a Roots RCS blower must be operated within certain approved limiting conditions. The Manufacturer's warranty is, of course, also contingent on such operation.

Maximum limits for pressure, temperatures and speed are specified in Table 1 for various sizes of RCS blowers. These limits apply to all blowers of normal construction, having operating clearances as listed in Table 5, when operated under standard atmospheric conditions. Do not exceed any one of these limits.

Example: The listed maximum allowable temperature rise (increase in air temperature between inlet and discharge) for any particular blower may occur well before its maximum pressure or vacuum rating is reached. This can easi-

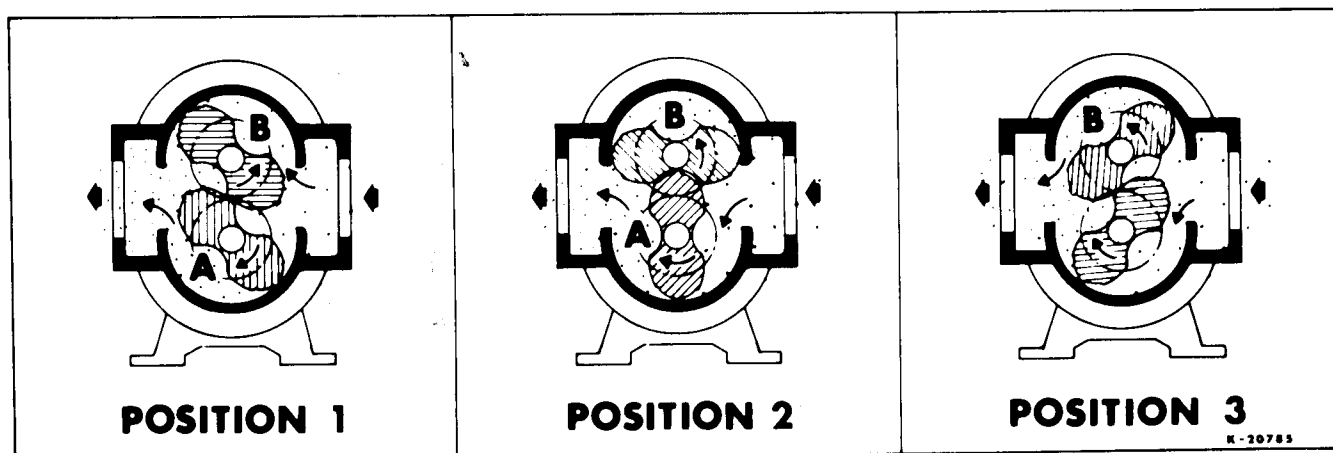


Figure 1 — Flow Through RCS Blower

ly occur at high altitude or at very low speed. *Temperature rise then is the limiting condition.* In other words, the operating limit is always determined by the maximum rating reached first. It can be any one of the three: pressure, temperature or speed.

Be sure to arrange connections or taps for thermometers and mercury type pressure or vacuum gauges at or near the inlet and discharge connections of the blower. These, along with a good tachometer, will enable periodic checks of operating conditions to be made easily.

PRESSURE - On pressure service; the pressure rise (between blower inlet and discharge) must not exceed the figure listed for the specific blower frame size concerned. Also, in any system where the blower inlet is at a positive pressure above atmosphere, the discharge pressure must never exceed 25 PSI (172 kPa) gauge regardless of blower size.

On vacuum service, with the discharge going to atmospheric pressure, the inlet suction or vacuum must not be greater than values listed for the specific frame size.

TEMPERATURE - Various blower frame sizes are approved only for installations where the following temperature limitations can be maintained in service.

- A. Measured temperature rise must not exceed listed values when the inlet is at ambient temperature. Ambient is considered as the general temperature of the space around the blower. This is not outdoor temperature unless the blower is installed outdoors.
- B. If inlet temperature is higher than ambient, the listed allowable temperature rise values must be reduced by $\frac{2}{3}$ of the difference between the actual measured inlet temperature and the ambient temperature.
- C. An average temperature between inlet and discharge up to 230 °F. (110 °C).

SPEED RANGE - RCS blowers may be operated at speeds up to the maximums listed for the various frame sizes. They may be direct coupled to suitable constant speed drivers if pressure/temperature conditions are also within limits. At low speeds, excessive temperature rise may be the limiting factor as noted in the preceding example.

Table 1 —
Maximum Allowable Operating Conditions

Frame Size	Speed RPM	Press. Rise		Inlet Vac.		Temp. Rise	
		PSI	(kPa)	In. Hg.	(kPa)	F°	C°
817	2250	15	(104)	15	(50)	230	(128)
				*16	*(54)	*260	*(144)
824	2250	15	(104)	15	(50)	230	(128)
				*16	*(54)	*260	*(144)
827	2250	13	(83)	15	(50)	230	(128)
				*16	*(54)	*260	*(144)

*800 Series with internal water-cooled oil coolers

INSTALLATION

Roots RCS blowers are internally and externally treated after factory assembly to protect against normal atmospheric corrosion before installation. The maximum period of internal protection is considered to be one year

under average conditions, if closing plugs or seals are not removed. *Protection against chemical or salt water atmosphere is not provided.* Avoid opening the blower until ready to start installation, as protection will be lost quickly by evaporation.

If there is to be an extended period between installation and start up, the following steps should be taken to insure corrosion protection:

1. Coat internals of cylinder, gearbox and drive end bearing reservoir with Motorstor or equivalent. Repeat once a year or as conditions may require. Motorstor is oil soluble and does not have to be removed before lubricating. If desired, Motorstor may be removed from within the cylinder shortly before start up by spraying a fine mist of petroleum solvent through the blower while it is running at a slow speed with open inlet and discharge, or it can remain in the blower if it is not harmful to the operation of the connected system. Motorstor is a product of Daubert Chemical Co., 2000 Spring Rd., Oak Brook, Ill. 60521.
2. Paint shaft extension, inlet and discharge flanges, and all other exposed surfaces with Nox-Rust X-145 or equivalent.
3. Seal inlet, discharge, and vent openings. It is not recommended that the unit be set in place, piped to the system, and allowed to remain idle for extended periods. If any part is left open to the atmosphere, the Motorstor vapor will escape and lose its effectiveness.
4. Units are not to be subjected to excessive vibration during storage. If stored outdoors, provide coverage such as a tarpaulin or lean-to.
5. Rotate drive shaft three or four revolutions every two weeks.
6. Prior to start up, remove flange covers on both inlet and discharge and inspect internals to insure absence of rust. Check all internal clearances. Also, at this time, remove gearbox and drive end bearing cover and inspect gear teeth and bearings for rust.

Because of the completely enclosed blower design, location of the installation is generally not a critical matter. A clean, dry and protected indoor location is preferred. However, an outdoor or wet location will normally give satisfactory service. Important requirements are that the correct grade of lubricating oil be provided for expected temperatures, and that the blower be located so that routine checking and servicing can be handled conveniently after installation. Effect of the location on driver and accessory equipment must also be considered.

Supervision of the installation by a Factory Service Engineer is not usually required for these blowers. Workmen with experience in installing light-medium weight machinery should be able to produce satisfactory results. Handling of the equipment needs to be accomplished with care, and in compliance with safe practices. Blower mounting must be solid, without strain or twist, and air piping must be clean, accurately aligned and properly connected.

Blower without base is to be lifted using lifting brackets provided on the blower. Make sure that the lifting bracket capscrews are tight.

When blower is furnished *mounted on a baseplate*, with or without a driver, use of lifting slings passing under the base flanges is required. Arrange these slings so that no strains are placed on the blower casing or mounting feet, or on any mounted accessory equipment. **DO NOT** use the lifting brackets in the top of the cylinder.

Before starting the installation, remove plugs, covers or seals from blower inlet and discharge connections and inspect the interior completely for dirt or foreign material. If cleaning is required, finish by washing the cylinder, headplates and impeller thoroughly with a petroleum solvent such as DuPont Triclene D. After this, turn the drive shaft by hand to make sure that the impellers turn freely at all points. Anti-rust compound on the connection flanges and drive shaft extension may also be removed at this time with the same solvent. Then cover the flanges again to keep out dirt until ready to connect the air piping. Washing out is not required if the interior is found to be clean. The corrosion inhibitor used will vaporize and disappear during operation.

Care, plus consideration of all possible problems, will pay dividends when arranging the blower mounting. This is especially true when the blower is a "bare" unit, furnished without a baseplate. The convenient procedure may be to mount such a unit directly on a floor or small concrete pad, but this generally produces least satisfactory results. It definitely causes the most problems in leveling and alignment.

Direct use of structural framing members is also not a recommended mounting. If unavoidable, the members must be rigidly reinforced when part of a building, and spring type mountings should not be used. Noise transmission can usually be reduced by use of a cork insulating pad 1 to 2 inches (25 to 50 mm) thick. The pad should be supported by a full steel plate attached to the structure, with a rigid concrete slab laid on top of the cork to carry the blower and driver.

For a blower without base, it is recommended that a well anchored and carefully leveled steel or cast iron mounting plate be provided at the installation point. The plate should be at least 1 inch (25 mm) thick, with its top surface machined flat, and large enough to provide leveling areas at one side and one end after the blower is mounted. It should have properly sized studs or tapped holes located to match the blower foot drilling. As an alternative, smaller plates at each end of the blower may be used. This is more complicated usually making leveling more difficult, and can produce twist or strains in the blower. Use of a high quality machinist's level is important.

With the mounting plate in place and leveled, set the blower on it without bolting and check for rocking. If it is not solid, determine the total thickness of shims required under one foot to stop the rocking. Place half of this under each of the diagonally-opposite short feet, and tighten the mounting studs or screws. Rotate the drive shaft to make sure the impellers still turn freely. If the blower is to be direct coupled to a driving motor, consider the height of the motor shaft and the necessity for it to be aligned very accurately with the blower shaft. Best arrangement is for the blower to be bolted directly to the mounting plate while the driver is on shims of at least $\frac{1}{8}$ inch (3 mm) thickness. This allows adjustment of motor position in final shaft alignment by varying the shim thicknesses.

When blower and driver have been factory mounted on a common baseplate, the assembly will have been properly aligned and is to be treated as a unit for leveling purposes. Satisfactory installation can be obtained by setting the baseplate on a concrete slab that is rigid and free of vibration, and leveling the top of the base carefully in two directions so that it is free of twist. The slab must be provided with suitable anchor bolts. The use of grouting under and

partly inside the base, after it has been carefully leveled by shimming, is recommended.

It is possible for a base-mounted assembly to become twisted during shipment, thus disturbing the original alignment. For this reason, make the following checks after the base has been leveled and bolted down. Disconnect the drive and rotate the blower shaft by hand. It should turn freely at all points. Loosen the blower foot hold-down screws and determine whether all feet are evenly in contact with the base. If not, insert shims as required and again check for free impeller rotation. Finally, if blower is direct coupled to the driver, check shaft and coupling alignment carefully and make any necessary corrections.

In planning the installation, and before setting the blower, consider how piping arrangements are dictated by the blower design and assembly. Drive shaft rotation is established accordingly, and is indicated by an arrow near the shaft. The rotation *cannot* be reversed at will. Blower inlet flange has cast marking on the flange outer diameter. Inlet piping should be connected to this flange.

When a blower is DIRECT COUPLED to its driver, the driver RPM must be selected or governed so as not to exceed the maximum speed rating of the blower. Refer to LIMITATIONS for allowable speeds for various blower sizes. A *flexible* type coupling should always be used to connect the driver and blower shafts.

Coupling halves must be accurately aligned, and a sufficient gap between shaft ends provided so that side strains and end thrust on either shaft are avoided or minimized. This will require considerable care in the mounting of the driver. The two shafts must be in as near perfect alignment in all directions as possible, and the gap must be established with the motor armature on its electrical center if end play exists.

The following requirements for a good installation are recommended. Coupling halves must be fitted to the two shafts with an interference fit. Maximum deviation in off-set alignment of the shafts should not exceed .005" (.13 mm) total indicator reading, taken on the two coupling hubs. Maximum deviation from parallel of the inside coupling faces should not exceed .001" (.03 mm) when checked at six points around the coupling.

When a blower is BELT DRIVEN, the proper selection of sheave diameters will result in the required blower speed. This flexibility can lead to operating temperature problems caused by blower speed being too low. Make sure the drive speed selected is within the allowable range for the specific blower size, as specified under LIMITATIONS.

Blower sheave minimum diameter is 13.2" (335 mm) and maximum width is 7.19" (183 mm).

Belt drive arrangements usually employ two or more V-belts running in grooved sheaves. Installation of the driver is less critical than for direct coupling, but its shaft must be level and parallel with the blower shaft. The driver should be mounted on the inlet side of a vertical blower (horizontal piping) and on the side nearest to the shaft on a horizontal blower. The driver must also be mounted on an adjustable base to permit installing, adjusting and removing the V-belts. To position the driver correctly, both sheaves need to be mounted on their shafts and the nominal shaft center distance known for the belt lengths to be used.

Install the blower sheave so that its inner hub face is not more than $\frac{1}{8}$ inch (.3 mm) from the drive end cover. The shaft fit should be such that the sheave can be worked into place

by hand or by very light tapping. A tight or driving fit can damage a bearing, and may cause internal blower damage by forcing the impeller out of its normal operating position. A loose fit or wobbly sheave will cause vibration, and may result in shaft breakage.

The driver sheave should also be mounted as close to its bearing as possible, and again should fit the shaft correctly. Position the driver on its adjustable base so the $\frac{1}{2}$ of the total movement is available in the direction away from the blower, and mount the assembly so that the face of the sheave is accurately in line with the blower sheave. This position minimizes belt wear, and allows sufficient adjustment for both installing and tightening the belts. After belts are installed, adjust their tension in accordance with the manufacturer's instructions. However, only enough tension should be applied to prevent slippage when the blower is operating under load. *Excessive tightening* can lead to early bearing failures.

In the absence of belt manufacturer's instructions for tensioning, the following procedure may be used.

1. With the belts loose, pull the slack on all of them to the bottom side of the drive.
2. Adjust motor position to tighten belts until they appear to be seating in the sheave grooves.
3. Thump the belts with your fist. If they feel dead, tighten them more until they vibrate and feel springy when struck.
4. Run-in the drive for a short period, after preparing the blower as instructed in a following paragraph. While running adjust until only a very slight bow appears in the slack side of the belts.
5. Stop the motor and compare the tensions of the individual belts by pressing down firmly with one hand on the top surface. It should be possible to deflect each belt only to the point where its top surface is even with the bottom of the other undeflected belts.
6. A new set of belts should be first tensioned about $\frac{1}{8}$ greater than normal to allow for stretch and wear-in. Before putting the drive into normal operation, increase the tension as obtained above by a small amount. recheck after each 8 hour operating period during the first 50 hours and, adjust as necessary.

Before operating the drive under power to check initial belt tension, first remove covers from the blower connections. Make sure the interior is still clean, then rotate the shaft by hand. Place a coarse screen over the inlet connection to prevent anything being sucked into the blower while it is operating, and avoid standing in line with the discharge opening. Put oil in the sumps per instructions under LUBRICATION.

Before connecting PIPING, remove any remaining anti-rust compound from blower connections. Pipe used should be no smaller than these connections, and clean, new piping throughout is strongly recommended. In addition, make sure it is free of dirt, scale, cuttings, weld beads, or foreign materials of any kind. To further guard against damage to the blower, especially when an inlet filter is not used, install a substantial screen of 16 mesh backed with hardware cloth at or near the inlet connections. Make provisions to clean this screen of collected debris after a few hours' operation. It should be removed when its usefulness had ended, as the wire will eventually deteriorate and small pieces going into the blower may cause serious damage.

Pipe flanges or male threads *must* meet the blower connections accurately and squarely. **DO NOT** attempt to cor-

rect misalignment by springing or cramping the pipe. In most cases this will distort the blower casing and cause impeller rubbing. In severe cases it can prevent operation or result in a broken drive shaft. For similar reasons, piping should be supported near the blower to eliminate dead weight strains. Also, if pipe expansion is likely to occur from temperature change, installation of flexible connectors or expansion joints is advisable.

Figure 2 represents in diagram form a blower installation with all accessory items that might be required under various operating conditions. Inlet piping should be completely free of valves or restrictions. When a shut-off valve (not shown) cannot be avoided, make sure a full size vacuum relief is installed near the blower inlet. This will protect against blower overload caused by accidental closing.

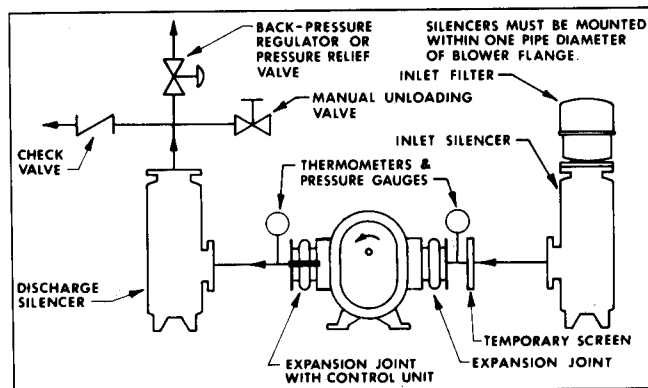


Figure 2 – Installation With Accessories

Need for an inlet silencer will depend on blower speed and pressure, as well as sound-level requirements in the general surroundings. An inlet filter is normally *recommended*, especially in dusty or sandy locations, for blower protection. A discharge silencer is also normally *suggested*. Specific recommendations on silencing can be obtained from the nearest Sales Office.

Discharge piping *requires*, a pressure relief valve, and should include a manual unloading valve to permit starting the blower under no-load conditions. Reliable pressure/vacuum gauges and good thermometers at both inlet and discharge are *recommended* to allow making the important checks on blower operating conditions. The back-pressure regulator shown in Figure 2 is useful mainly when volume demands vary while the blower operates at constant output. If demand is constant, but somewhat lower than the blower output, excess may be blown off through the manual unloading valve.

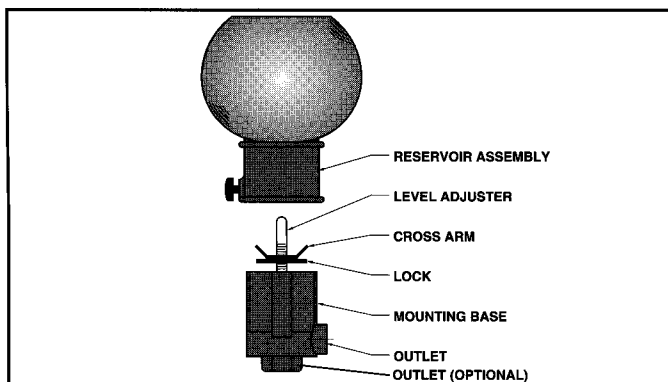
In multiple blower installations where two or more units operate with a common header, use of check valves is *necessary*. These should be of a direct acting or free swinging type, with one valve located in each line between the blower and header. Properly installed, they will protect against damage from reverse rotation caused by air and material back-flow through an idle blower.

After piping is completed, and before applying power, rotate the drive shaft by hand again. If it does not move with uniform freedom, look for uneven mounting, piping strain, excessive belt tension or coupling misalignment. **DO NOT** operate the blower at this time unless it has been lubricated per instructions. Read LUBRICATION section.

LUBRICATION

A very simple lubrication system is employed in RCS blowers. On the gear end, the gears, the bearings and the seals are lubricated by the action of oil slinger (46). On the drive end, the bottom rollers of the bearings are partially submerged in oil. Splash caused by bearings lubricate the oil seals. Entrance of lubricating oil into the blower air chamber is prevented by the use of double shaft sealing. Lip type seals, located inboard of the bearings in each headplate, effectively retain oil within the sumps. Any leakage that may occur passes into a cavity in each headplate that is vented. In addition, sealing rings are provided on both shafts where they pass through the inner walls of the headplates. These serve to reduce air leakage from or into the air chamber and also minimize oil carryover into the air chamber. They are not sufficiently effective to enable the blower to handle gases, however.

The drive end sumps use constant level oilers. As shown in Figure 3, the level adjusting mechanism uses adjusting cross arm and locking nut so to set the oil level at the center of the sight gauge. Located on the side of the end covers. Do not set oilers so that the oil level is above the sight gauge or excess lubricant may cause excessive oil temperature and oil leakage.



To fill either of the drive end sumps, remove the top glass reservoir. Fill it with recommended lubricant and place it on its holder and let the bottom empty to fill the sump. Repeat this procedure till the reservoir quits filling, and the oil reaches the center of the sight gauge.

Filling the sumps should be accomplished with the *blower not operating*, in order to obtain the correct oil level. Approximate oil quantities required for blowers of the various configurations are listed in Table 3. **Do not overfill.**

The level should *never* be allowed to fall below the oil level gauge ring when the blower is not operating. It may rise on the gauge during operation, to an extent depending somewhat on oil temperature and blower speed, but it should not be permitted to rise above the oil level gauge ring. On drive end, keep the bottles full.

During the first week of operation, check the oil levels in the oil sumps about once a day, and watch for leaks. Replenish as necessary. Thereafter, and occasional check should be sufficient.

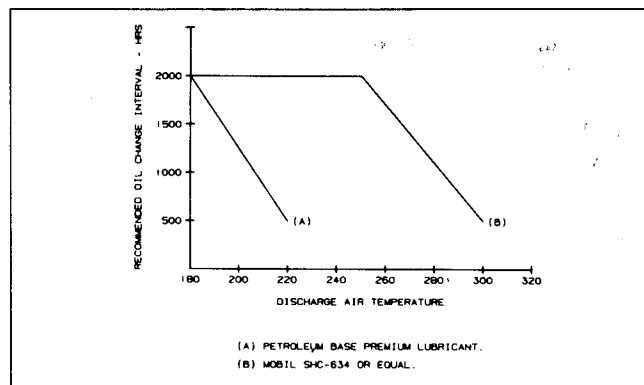


Figure 4 Oil Change Hours

The type of lubricant preferred is Roots Synfilm GT ISO 220, 320, or 460 synthetic oil or equal. This lubricant has better oxidation resistance at expected higher oil temperatures.

If the discharge air temperature is less than 220° F, petroleum base rust, oxidation and foam inhibited premium grade of non-detergent oil of the correct viscosity grade as listed in Table - 2 should be satisfactory. Figure 4 provides guide lines for recommended oil change interval. In a very dusty location, more frequent oil change may be required. Gear end sump is drained by removing plug (22). For draining drive end sumps, remove oiler reservoirs, remove plugs at the bottom of the oilers.

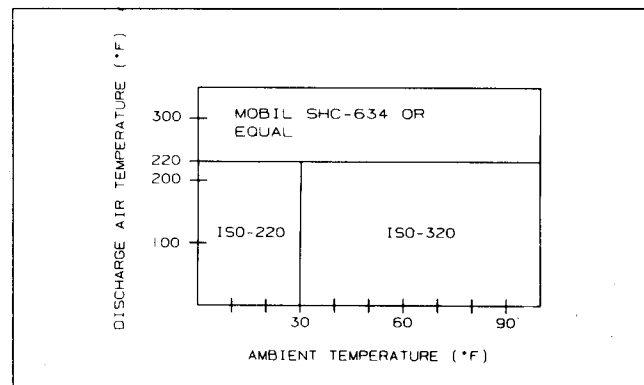


Figure 5 - Oil Grades

ISO-VG	eSt @ 40° C	APPROX. SUS @ 100°F
100	90-110	465
150	135-165	700
220	198-242	1000
320	288-352	1500
460	460	2391

Table 2 - Recommended Oil Grades

FRAME SERIES	GEAR BOX		DRIVE END	
	PINTS	LITERS	OUNCES	LITERS
800-H	16	7.6	8	.24
800-V	2	1.0	8	.24

Table 3 - Oil Fill Amounts

Some oil seal leakage will occur since an oil film under the seal lip is required for proper operation. Periodically, the leaked oil should be wiped off from the blower as well as the baseplate surfaces since even a small amount of hot leaked oil spreads over a larger area making the leakage look worse than it actually is.

OPERATION

Before operating a blower under power for the first time, recheck the unit and the installation thoroughly to reduce the likelihood of avoidable troubles. Use the following procedure list as a guide, but consider any other special conditions in the installation.

1. Be certain that no bolts, tools, rags or dirt have been left in the blower air chamber.
2. Be certain that inlet piping is free of any debris. If an outdoor intake without filter is used, be sure the opening is located so it cannot pick up dirt and is protected by a strong screen or grille. Use of the *temporary* protective screen at the blower as described under INSTALLATION is strongly recommended.
3. Recheck blower leveling, drive alignment and tightness of all mounting bolts if installation is not recent. If belt drive is used, adjust belt tension correctly.
4. Turn drive shaft by hand to make sure impellers still rotate without bumping or rubbing at any point.
5. Make sure oil levels in the main oil sumps are correct.
6. Check lubrication of driver. If it is an electric motor, be sure that power is available and that electrical overload devices are installed and workable.
7. Open the manual unloading valve in the discharge air line. If a valve is in the inlet piping, be sure it is open.
8. Bump blower a *few revolutions* with driver to check that direction of rotation agrees with arrow near blower shaft, and that both units coast freely to a stop.

After the preceding points are cleared, blower is ready for trial operation under "no-load" conditions as set up under Item 7. The following procedure is suggested to cover this initial operation test period.

- a. Start blower, let it accelerate to full speed, then shut off. Listen for knocking sounds, both with power on and as speed slows down.
- b. Repeat above, but let blower run 2 or 3 minutes. Check for noises, and overall vibration levels of 1.0 in/sec. maximum.
- c. Operate blower for about 10 minutes unloaded. Check oil levels. Feel cylinder and headplate surfaces for development of spots too hot to touch, indicating impeller rubs. Be aware of any noticeable increase in vibration.

Assuming that all trials have been satisfactory, or that necessary corrections have been made, the blower should now have a final check run of at least one hour under normal operating conditions. After blower is restarted, gradually close the discharge unloading valve to apply working pressure. At this point it is recommended that a good pressure gauge or manometer be connected into the discharge line if not already provided, and that thermometers be in both inlet and discharge lines. Readings from these instruments will show whether pressure or temperature ratings of the blower are being exceeded.

During the final run, check operating conditions frequently and observe the oil levels at reasonable intervals. If excessive noise or local heating develops, shut down immediately and

determine the cause. If either pressure rise or temperature rise across the blower *exceeds the limit specified in this manual*, shut down and investigate conditions in the piping system or in the process to which air is being supplied. Refer to the TROUBLE SHOOTING CHECKLIST for suggestions on various problems that may appear.

The blower should now be ready for continuous duty operation at full load. During the first few days make periodic checks to determine whether all conditions remain steady, or at least acceptable. This may be particularly important if the blower is supplying air to a process system where conditions can vary. At the first opportunity, stop the blower and clean the temporary inlet protective screen. If no appreciable amount of debris has collected, the screen may be removed. See comments under INSTALLATION. At this same time, verify leveling, coupling alignment or belt tension, and mounting bolt tightness.

Should operating experience prove that blower capacity is a little too high for the actual air requirements, a *small* excess may be blown off continuously through the manual unloading or vent valve. Never rely on the pressure relief valve as an automatic vent. Such use may cause the discharge pressure to become excessive, and can also result in failure of the valve itself. If blower capacity appears to be too low, refer to the TROUBLE SHOOTING CHECKLIST first. If no help is found there it may be possible to increase the blower speed. Before attempting this change, contact the nearest Sales Office for recommendations. Be prepared to furnish data on actual air requirements and operating pressure/temperature conditions.

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 the discharge air stream.
- ☐ Stay clear of open inlet piping (suction area) of pressure blowers, and the open discharge blast from vacuum blowers.
- ☐ Stay clear of the blast from pressure relief valves and the suction area of vacuum relief valves.
- ☐ Avoid extended exposure in close proximity to machinery which exceeds safe noise levels. Use proper ear protection
- ☐ Use proper care and good procedures in handling, lifting, installing, operating and maintaining the equipment.
- ☐ Casing pressure must not exceed 25 PSI (172 kPa) gauge. Do not pressurize vented cavities from an external source, nor restrict the vents.

TROUBLE SHOOTING CHECKLIST

TROUBLE	ITEM	POSSIBLE CAUSE	REMEDY
No Air Flow	1	Speed too low	Check by tachometer and compare with speed shown on Roots Order Acknowledgement. Compare actual rotation with Figure 1 and arrow on blower. Compare driver if wrong. Check piping, screen, valves, silencer, to assure an open flow path.
	2	Wrong rotation	
	3	Obstruction in piping	
Low Capacity	4	Speed too low	See item 1. If belt drive, check for slippage and readjust tension. Check inlet vacuum and discharge pressure, and compare these figures with specified operating conditions on Order. See item 3. Check inside of casing for worn or eroded surfaces causing excessive clearances.
	5	Excessive pressure	
	6	Obstruction in piping	
	7	Excessive slip	
Excessive Power	8	Speed too high	Check speed and compare with Roots Order Acknowledgement. See item 5. Inspect outside of cylinder and headplates for high temperature areas, then check for impeller contacts at these points. Correct blower mounting, drive alignment.
	9	Pressure too high	
	10	Impellers rubbing	
Overheating of Bearings or Gears	11	Inadequate lubrication	Restore correct oil levels in main oil sumps.
	12	Excessive lubrication	Check oil level. If incorrect, drain and refill with clean oil of recommended grade.
	13	Excessive pressure	See item 5.
	14	Coupling misalignment	Check carefully. Realign if questionable.
	15	Excessive belt tension	Readjust for correct tension.
Vibration	16	Misalignment	See item 14. See item 10. Check gear backlash and condition of bearings. Scale or process material may build up on casing and impellers, or inside impellers. Remove build-up to restore original clearances and impeller balance. Tighten mounting bolts securely. Determine whether standing wave pressure pulsations are present in the piping. Refer to Sales Office.
	17	Impellers rubbing	
	18	Worn bearings/gears	
	19	Unbalance or rubbing	
	20	Driver or blower loose	
	21	Piping resonances	

- ☐ Do not use air blowers on explosive or hazardous gases.
- ☐ Other potential hazards to safety may also be associated with operation 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.

MAINTENANCE & REPLACEMENTS

A good program of inspection and maintenance servicing followed consistently, is the most reliable method of minimizing repairs to a blower. A simple record of services and dates will help keep this work on regular schedule. Basic service needs are lubrication, checking for hot spots or increase in vibration and noise, and the recording of operating pressures and temperatures. Above all, a blower must be operated within its specified rating limits to obtain satisfactory service life.

A newly installed blower should be checked frequently during the first month of full-time operation. Attention thereafter may be less frequent, depending on what the early checks have shown. Lubrication is normally the most important consideration. Unless operating conditions are unusually severe, a weekly check of oil levels in the gear-box and bearing reservoirs, with addition of oil as required, should be sufficient. Complete oil changes at intervals of 500 operating hours is normal; more frequent if oil condition becomes poor. Change intervals may be extended for light duty (see Fig.-4).

Driver lubrication practices should be in accordance with the manufacturer's instructions. If directly connected to blower through a lubricated type coupling, the coupling should be checked and greased each time blower oil is changed. This will help reduce wear and prevent it from causing vibration. In a belted drive system, check belt tension periodically and inspect for frayed or cracked belts. Refer to tensioning instructions under INSTALLATION.

In a new and properly installed blower there are no moving contacts between the two impellers, or between the impellers and cylinder or headplates. Wear is then confined to the bearings which support and locate the shafts, the oil seals, and the timing gears. All are lubricated and wear should be minimal if clean oil of the correct grade is always used. Seals are subject to deterioration as well as wear, and may require replacement at varying periods.

Sealing rings are designed to operate with no rubbing contact, once temperature and thermal growth have stabilized. The rings, which are stationary, do rub the rotating sleeves briefly during temperature cycles which result from starting and stopping the blower. However, the hardened sleeves and the sealing rings are treated with a dry lubricant coating which provides initial lubrication during break-in wear.

If the sealing rings become excessively worn, greater leakage from the vents will occur. Seal rings should be replaced if vent leakage becomes excessive, or if inspection at the time of blower disassembly shows more than .010" (.25 mm) axial clearance between ring and groove.

Shaft bearings have been selected to have optimum life under average conditions with proper lubrication. They are critical in the service life of the blower. Gradual bearing wear may allow a shaft position to change slightly, until rubbing develops between impeller and cylinder or headplate. This will cause spot heating, which can be detected by feeling these surfaces. Sudden bearing failure is usually more serious. Since the shaft and impeller is no longer supported and properly located, extensive general damage to the blower casing and gears is likely to occur.

Oil seals should be considered expendable items, to be replaced whenever drainage from the headplate vent cavity becomes excessive, or when the blower is disassembled for any reason. Sealing effectiveness can vary considerably from seal to seal, and is also affected to surprising degree by shaft smoothness and freedom from scratches under the seal lip. Because of these normal variables, minor seal leakage should not be considered as indicating a need for replacement.

Timing gear wear, when correct lubrication is maintained should be negligible over a period of years. Gear teeth are cut to provide the correct amount of backlash, and gears correctly mounted on the shafts will accommodate a normal amount of tooth wear without permitting contact between lobes of the two impellers.

However, a high oil level will cause churning and excessive heating indicated by an unusually high temperature at the bottom of the gear housing. Consequent heating of the gears will result in loss of tooth clearance or backlash, and rapid wear of the gear teeth usually will develop. Continuation of this tooth wear will eventually produce impeller contacts (knocking), and from this point serious damage will be unavoidable if blower operation is continued. A similar situation can be produced suddenly by gear tooth fracture, which is usually brought on by sustained overloading or momentary shock loads.

Operating problems may also develop from causes other than internal parts failure. Operating clearances within a blower are only a few thousandths of an inch. This makes it possible for impeller interferences or casing rubs to result from shifts in the blower mounting, or from changes in piping support. Foreign materials sucked into the blower will also cause trouble, which can only be cured by disconnecting the piping and thoroughly cleaning the blower interior.

If this type of trouble is experienced, and the blower is found to be clean, try removing mounting strains. Loosen blower mounting bolts and reset the leveling and drive alignment. Then tighten mounting again, and make sure that all piping meets blower connections accurately and squarely before reconnecting it.

A wide range of causes for operating troubles are covered in the TROUBLE SHOOTING CHECKLIST. The remedies suggested there in some cases need to be performed by qualified mechanics with a good background of general experience, using procedures detailed in this manual. Major repairs generally are to be considered beyond the scope of maintenance, and should be referred to the nearest Sales Office listed on the last page.

Warranty failures should not be repaired at all, unless specific approval has been obtained through a Sales Office before starting work. Unauthorized disassembly within the warranty period may void the warranty.

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 downtime. Under favorable conditions, protection will probably not be needed if shutdown is not longer than a month. Under atmospheric conditions producing rapid corrosion, the blower should be protected immediately. Simplest treatment is to spray or flush the interior with a mixture of light oil and kerosene, making sure it reaches all surfaces. Piping should be disconnected first, and the connections sealed after treatment. Before putting back in service, check internal condition visually and rotate the drive shaft by hand.

If preferred, a commercial compound may be used instead of kerosene-oil for protection. Among suitable ones is Nox-Rust 207, marketed by Daubert Chemical Company. Best applied by spraying at 120°F. (49°C), it may also be brushed on. Special care should be taken to insure good coverage between ends of the impellers and the headplates. After completing the application, seal all blower openings with vapor barrier paper or tape.

This protection is normally effective for about one year. Before returning blower to service, inspect all internal surfaces. If dirt of any kind is found, clean all surfaces thoroughly with a good petroleum solvent. Otherwise, blower may be connected and operated without cleaning. Be sure tape or plug is removed from vent holes near bottom of each headplate.

It is recommended that major repairs, if needed, be performed at the Factory or at a Dresser Service facility. However, it is recognized that this may not always be practical, especially when a spare blower is not available. If a blower is out of the warranty period, mechanical adjustments and parts replacement may be undertaken locally at the owner's option and risk. It is recommended that Factory Parts be used to insure fit and suitability. The maintenance of a small stock of on-hand spare parts can eliminate possible delays. When ordering parts give Item Numbers and their word descriptions from Figures 6 or 7 and Table 6. Also specify quantities wanted, and the blower size and serial number from the nameplate.

Repairs or adjustments are best performed by personnel with good mechanical experience and the ability to follow the instructions in this manual. Some operations involve extra care and patience, and a degree of precision work. This is especially true in timing impellers and in handling bearings. Experience indicates that a high percentage of bear-

ing failures is caused by dirt contamination before or during assembly. Therefore, the work area should be cleaned before starting disassembly, and new or re-usable parts protected during progress of the work.

In the following outlines of repair procedures, numbers shown in brackets () correspond to the Item Numbers used in assembly drawing, Figure 11 and parts list, Table 6. It is recommended that the procedures be studied carefully and completely, with frequent reference to the drawing, before starting work. This will produce better efficiency through an understanding of what work is to be done, and the order of doing it. Before disassembly, mark all parts so that they may be returned to original locations or relative positions.

Requirements for special tools will depend on the work to be done.

Design of the RCS blowers is basically simple, and most repair operations are straightforward. For this reason, the following procedures are intended mainly to indicate a preferred order of work and to call out points to be observed. Where special operations are required, detailed coverage is given.

DISASSEMBLY OF GEAR END

1. Drain oil completely from the gearbox sump by removing plug (22) in bottom of the headplate (2).
2. Remove all capscrews (26) holding the gearbox except the upper two. Bump the gearbox to break the joint, remove the last two capscrews and lift off the gearbox carefully in the horizontal plane avoiding contact with the gears. Remove gasket (7).
3. Be sure that each gear is marked for return to the same shaft and that the gears have match marks for the teeth alignment. Wedge the impellers as shown in Fig. 6; then

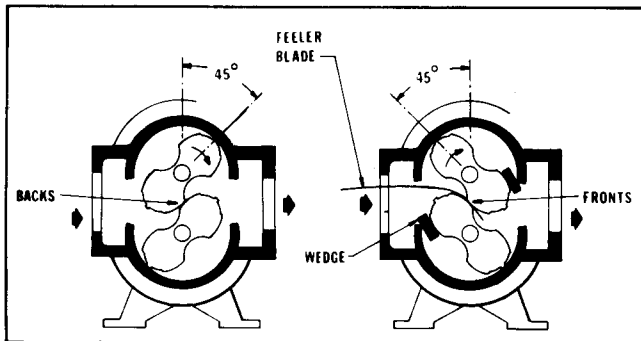


Figure 6 — Impeller Timing Viewed From Gear End

remove the gear capscrew (31) and washer (69). Remove the drive gear first as described below.

Install gear back up plate per Fig. 7 at the end of the shaft using the same gear capscrew. Two Grade-8, $\frac{3}{4}$ -10, 3" long capscrews will be required for gear removal. Oil capscrew threads and install thru the back-up plate and into gear puller holes. Tighten the capscrews evenly till the gear is unseated from the shaft fit.

Caution: The gear may jump off the taper fit, keep hands away from the space between the gear and the back-up plate. Remove the other gear in the same manner.

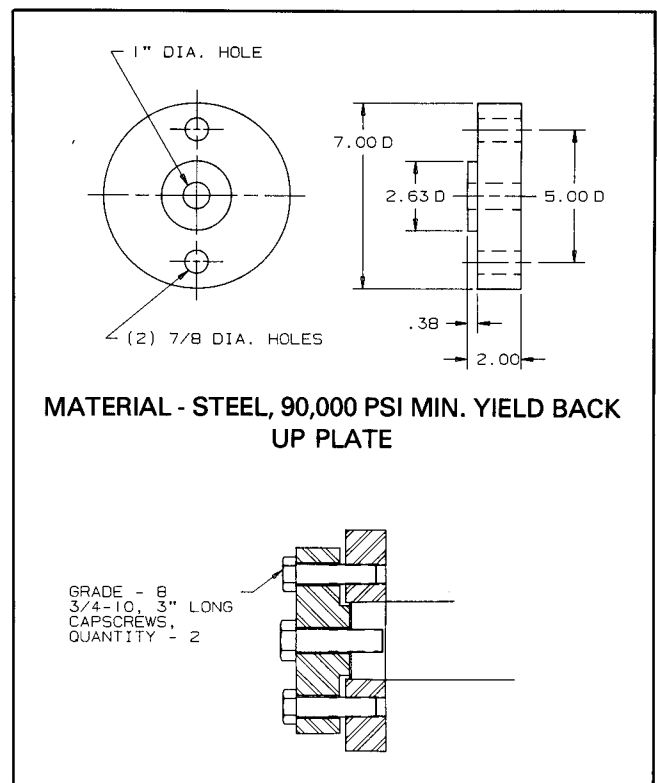


Figure 7 — Gear Removal

4. Loosen bearing clamp plates (34) by loosening cap screws (32). Remove shims (74) and mark them. Remove clamp plates.
5. Removal of gear end bearings will require partial disassembly of the drive end. Remove sheave or coupling. Remove the oiler reservoirs. Drain the sumps by removing plugs at the bottom of the oilers. Unscrew capscrews (62) and remove the drive end sumps.
6. Install spacer sleeve and drive end back-up plates per Fig. 8.
7. Gear end headplate removal — remove all capscrews holding the headplate to the cylinder. Insert (4) $\frac{5}{8}$ -11, grade-8 jacking screws in threaded holes in the headplate flange and turn them in evenly. The head

Figure 8 — Drive End Shaft Blocking

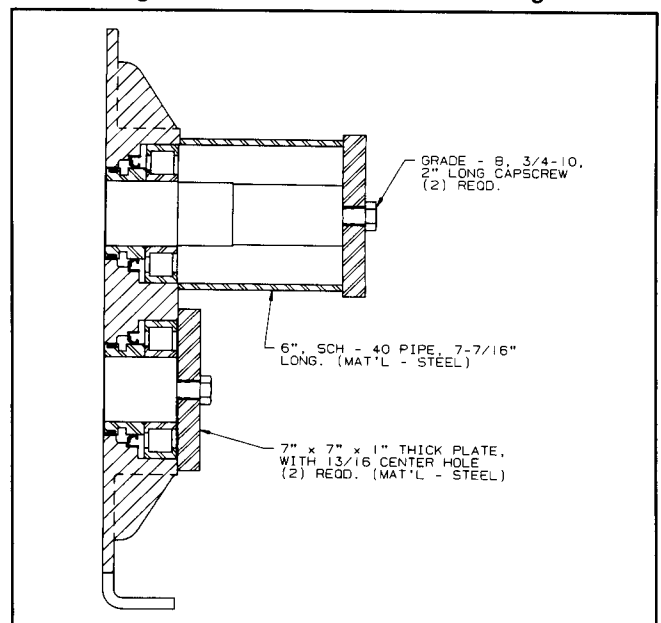


plate will separate from the cylinder. The lip seals (27) and bearings (15) are removed with the headplate and can be pressed out later.

8. Remove the sleeve (28) from the shaft with the aid of a bearing puller by inserting the puller jaws in the groove in the sleeve and applying the jacking screw against the end of the shaft. Protect the threaded hole and the end of the shaft with a flat spacer between the shaft and the puller.
9. Remove the sealing rings (28) by inserting a thin, pointed tool at the gap to lift one end over the other so it springs free.
10. Remove plates and sleeve used to block shafts on drive end Fig. 8.

DISASSEMBLY OF DRIVE END

1. Drive end headplate removal — Remove all capscrews (23) holding the headplate. Insert jacking screws into the four threaded flange holes and turn them in evenly. The headplate will separate from the cylinder. The lip seals (27) and bearing outer race and rollers are removed with the headplate and can be pressed out later.
2. Remove the bearing inner race and the sleeve from the shaft as mentioned previously. Remove sealing rings.

ASSEMBLY

Prior to any assembly operation, it is essential that all parts are completely clean and free from nicks and scratches.

1. Assembly of sealing rings (28) - The sealing ring groove in the shaft sleeve must be coated with a dry film graphite lubricant (slip plate, or equal), before installing the ring. To avoid scratching the lip seal surface, install the sealing rings (28) in the sleeves (38) from the end nearest the groove before assembling the sleeve on the shaft. Unhook the gap joint and expand the ring while sliding it to the groove, then compress it so one end of the hook joint slides over the other. Move the ring in the groove to be sure it is free.
2. Installation of sleeves (38) - Heat the sleeve to 300°F. (149°C) in oven then quickly slide it on the shaft tightly against the impeller. If the sleeve hangs up during assembly, it can be pressed into place using a tubular pressing tool with square, clean ends.
3. Assembly of seals (27) in headplate (1) - Place headplate flat with seal bores up. Be sure the pressing tool face is clean and square and there is a smooth, clean entering bevel in the headplate. Lubricate the seal lips and use sealant on outer diameter. Place seal over the bore with lip facing up, then press the seal evenly until it is flush against front face.
4. Assembly of impellers (12 and 13) to headplate (2) - Place gear and headplate flat on 4 in. (100 mm) blocks with the smallest bores facing up. Inspect entering bevels to be sure they are smooth and clean. Locate the drive impeller correctly (top for vertical units and toward the driver for horizontal units.) Place the seal ring gaps toward the inlet. Insert the impeller shafts in the headplate so the impellers rest on the headplate. Use care to avoid damaging the lip seals.
5. Assembly of cylinder (11) to gear end headplate (2) - Install dowel pins (16) and secure cylinder to headplate with capscrews (23). Then, install drive end headplate (1) and dowel pins (16) and secure with capscrews (23).
6. Installation of drive end bearings (14) - Heat bearing inner race to 300°F. (149°C) in an oven or hot oil; then

slide it onto the shaft so the bearing shoulder is snugly against the sleeve. After the inner race has cooled, lubricate the rollers and insert the bearing outer race in each bore and tap lightly into place.

7. Installation of gear end bearings (15) - Set the blower on its feet. Lubricate the stud and install it in the end of the shaft. Install two wavy washers (29) per bearing in the bearing bore. Apply oil on bearing bore and OD, also lubricate bearing balls. Place bearing on shaft. Install sleeve and washer per Fig. 9. Lubricate nut

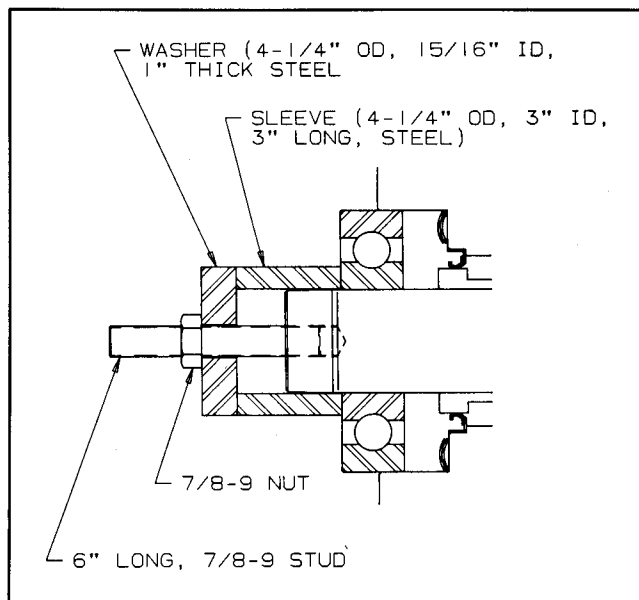


Figure 9 — Gear End Bearing Installation

threads and face and install it on the stud. Block the impellers per Fig. 6. Push the bearing all the way against the sleeve (38) by turning the nut. Repeat for the second bearing.

8. The end clearances are set during the installation of bearing clamp plates. Install bearing clamp plates (34) using self locking screws (32). Measure the gear end clearance; turn the screws (34) in evenly till gear end clearance per Table 5 is achieved. Rotate the impellers a few times to center the bearings and recheck end clearances. Measure clearance between the bearing clamp plate and the headplate under the screw heads. This clearance should be same under each head. Obtain shim (74) equal to this clearance. Insert shim (74) between clamp plate and headplate under each capscrew (32). Tighten capscrews (32). Recheck end clearances.
9. Installing driven gear - Be sure shaft taper fits and gear bores are clean and free of scratches. THE GEAR BORES AND THE SHAFT TAPER FITS MUST BE FREE OF OIL. Place hardwood wedges as shown in Fig. 6. Install oil slinger (46) on the backside of the driven gear using washer (59) and capscrew (58). Torque the capscrews to 25 ft-lb. These capscrews are self locking type and should be replaced during each tear down. Apply Molykote Gn Paste to gear capscrews (31), on the threads and under the heads. Molykote Gn paste is available from Bearing Distributors. Install driven gear (4), washer (30), washer (69) and capscrew (31) so that match mark at tooth is at the line of engagement. Tighten the capscrew (31) to the torque in Table 4.

GEAR SIZE	TORQUE			
	W/ MOLY PASTE (CAPSCREW THREADS)		W/OIL (CAPSCREW THREADS)	
	FT-LBS	(Kg-m)	FT-LBS	(Kg-m)
8	450	63	650	91

Table 4 Gear Torque

10. Installing drive gear (4) - Install a long, metal feeler gauge between the impeller lobes at the fronts as shown in Figure 6. Feeler gauge thickness to be a middle value from Table 5 for fronts. Align the gear so the tooth match marks agree with the driven gear, then install washer (30), washer (69) and capscREW (31). Tighten lightly with a small wrench, then check front and back clearances against Table 5 for each 45° position. Both fronts should be about the same and backs should about equal and within the specified range in Table 5. Adjust gear position, if necessary, then insert the corrected feeler gauge and wedges and use a torque wrench to tighten the gear capscREWS to the torque specified in Table 4. Remove wedges and rotate the drive shaft by hand to make sure there are no gear tight spots or impeller contacts.
Caution! Keep fingers away from impellers and gears.
11. Units with oil coolers - The gear end oil cooler is a formed copper tubing and is held in position by the tank fittings installed in the gear box. During re-installation make sure that the cooler does not interfere with the gears or the slinger. The drive end covers have 1/4" NPT connections for water cooling.
12. Install gearbox (3) with gasket (7) and capscREWS (26).
13. Install drive end cover (5) and gasket (10) with spring pins (17) in place. Install capscREWS (62). Check seal bore for concentricity with shaft using an indicator; reposition pins if necessary. Apply sealant on outer diameter of the seal (33). Lubricate seal lip and install it with lip facing inward using care to avoid scratching seal on keyway.
14. Install breather plug (21) in the gear end headplate and breather plugs (73) in the drive end headplate.
15. Replace oil drain plugs at the bottom of the oilers and refill drive ends and gear sump with proper grade of oil as discussed under lubrication.
16. Install drive sheave or coupling half and install blower, refer to Installation Instructions.

BLOWER ORIENTATION

The unique removable feet feature of 800 RCS blowers permit field modification of blower mounting by repositioning blower feet. (Refer to Fig.10).

Three blower mounting positions are possible:

1. Vertical mounting, horizontal air flow, drive shaft on top, discharge on left.
2. Horizontal mounting, vertical air flow, drive shaft on left, bottom discharge.
3. Horizontal mounting, vertical air flow, drive shaft on right, top discharge.

Changing from vertical to horizontal - bottom discharge.

1. Remove oiler assembly from the drive end.
2. Place blower on its discharge flange, block properly as required.
3. Remove lifting brackets and feet.
4. Install feet on bottom cylinder lugs and lifting brackets on top cylinder lugs.
5. Place blower on its feet on a flat surface. Loosen feet bolts, level feet and tighten feet bolts. Feet bolts (44) and lifting bracket bolts are to be torqued to 85 ft-lbs.
6. Remove the sight glass and install it in the lower center hole. Remove the breather from the side of the head plate to the top of the head plate. Apply thread sealant on sight glass and plugs, close all opened up holes in the gearbox and the headplates.
7. Remove drive (5) and driven covers (5a).
8. Turn the driven cover 90° so that the oiler holes are on the bottom. Install the oiler on the right hand side.
9. Remove drive seal (33) from the drive end cover and discard it. It should be replaced with a new seal. Install drive end cover. Indicate seal bore with respect to the drive shaft, run out must not be greater than .002 TIR. Re-drill pin holes (17) using 1/4" drill. Install pins (17). Double check end cover bore run out. Apply lubricant on seal (33) lip and sealant on seal outer diameter. Install seal (33).
10. Install the oiler on the left hand side of the drive cover.
11. Remove breathers (73) from the drive end head plate and install them on top of the head plate. Plug the head plate holes previously occupied by the breathers.

Changing from vertical to horizontal - top discharge:

The general procedure is the same as above, except set the blower on the inlet flange and relocate the feet and the lifting brackets.

Changing from horizontal to vertical.

Install eye bolts in the top flange. Lift the unit up and relocate feet and the lifting brackets. Place blower on its feet and use the general procedure as above. Note that on the drive end head, 90°, 1/4", elbows will be required to locate the breathers vertically up.

BLOWER FRAME SIZE	IMPELLER LOBES AT 45 DEG. (FIG 4)		IMPELLER ENDS TO HEAD PLATE		IMPELLER TIPS TO CYLINDER	
	FRONTS	BACKS	GEAR END	DRIVE END	INLET & DISCH.	CENTER
817	.014/.019 (.36-.48)	.014/.019 (.36-.48)	.007 (.18)	.024/.031 (.60-.79)	.015/.017 (.38-.43)	.011/.013 (.28-.33)
824	.014/.019 (.36-.48)	.014/.019 (.36-.48)	.008 (.20)	.028/.036 (.71-.91)	.019/.023 (.48-.58)	.012/.014 (.30-.36)
827	.014/.019 (.36-.48)	.014/.019 (.36-.48)	.009 (.23)	.029/.037 (.74-.94)	.019/.022 (.48-.56)	.013/.015 (.33-.38)

Table 5 800 RCS Internal Clearances — Inches (mm)

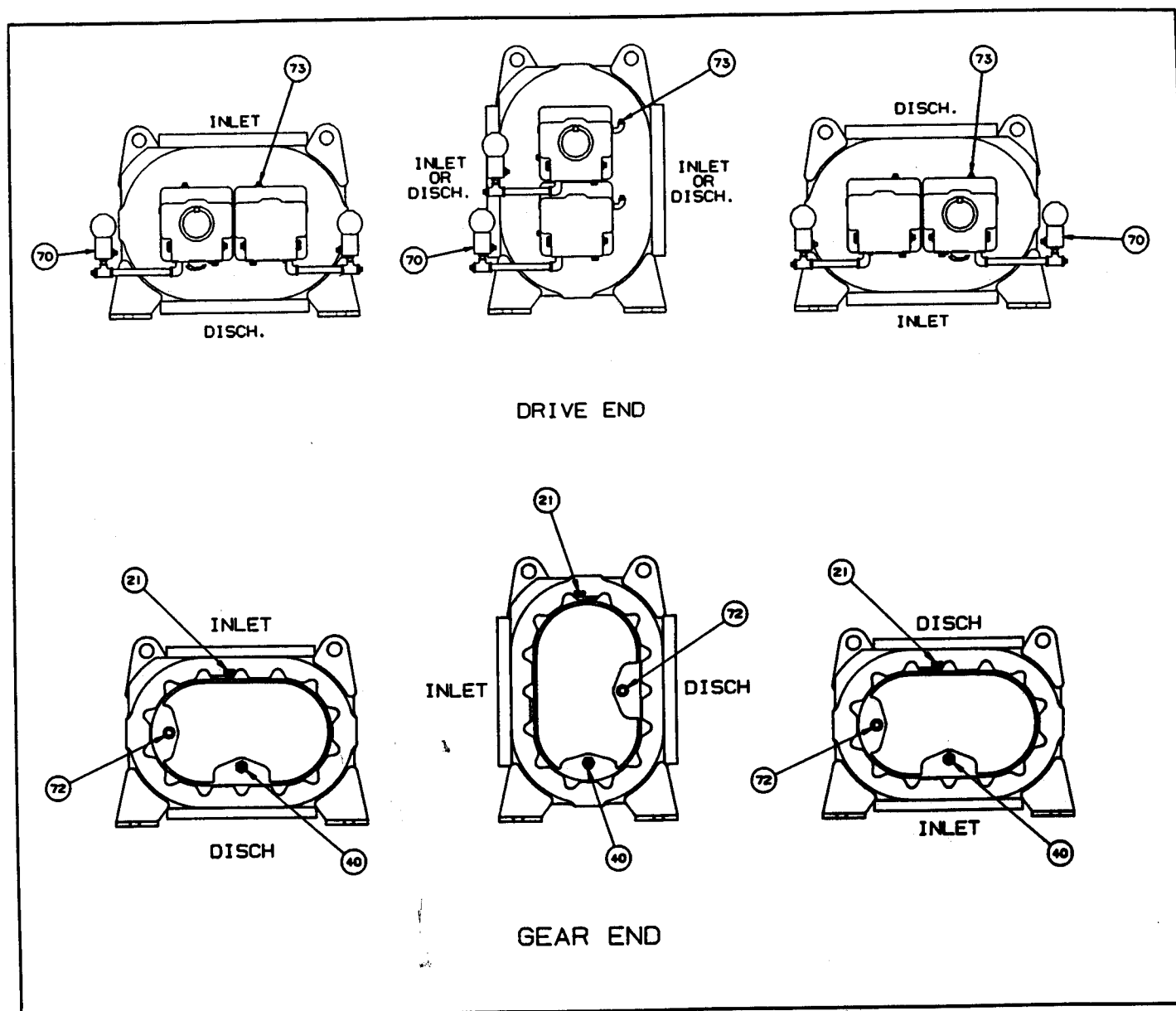
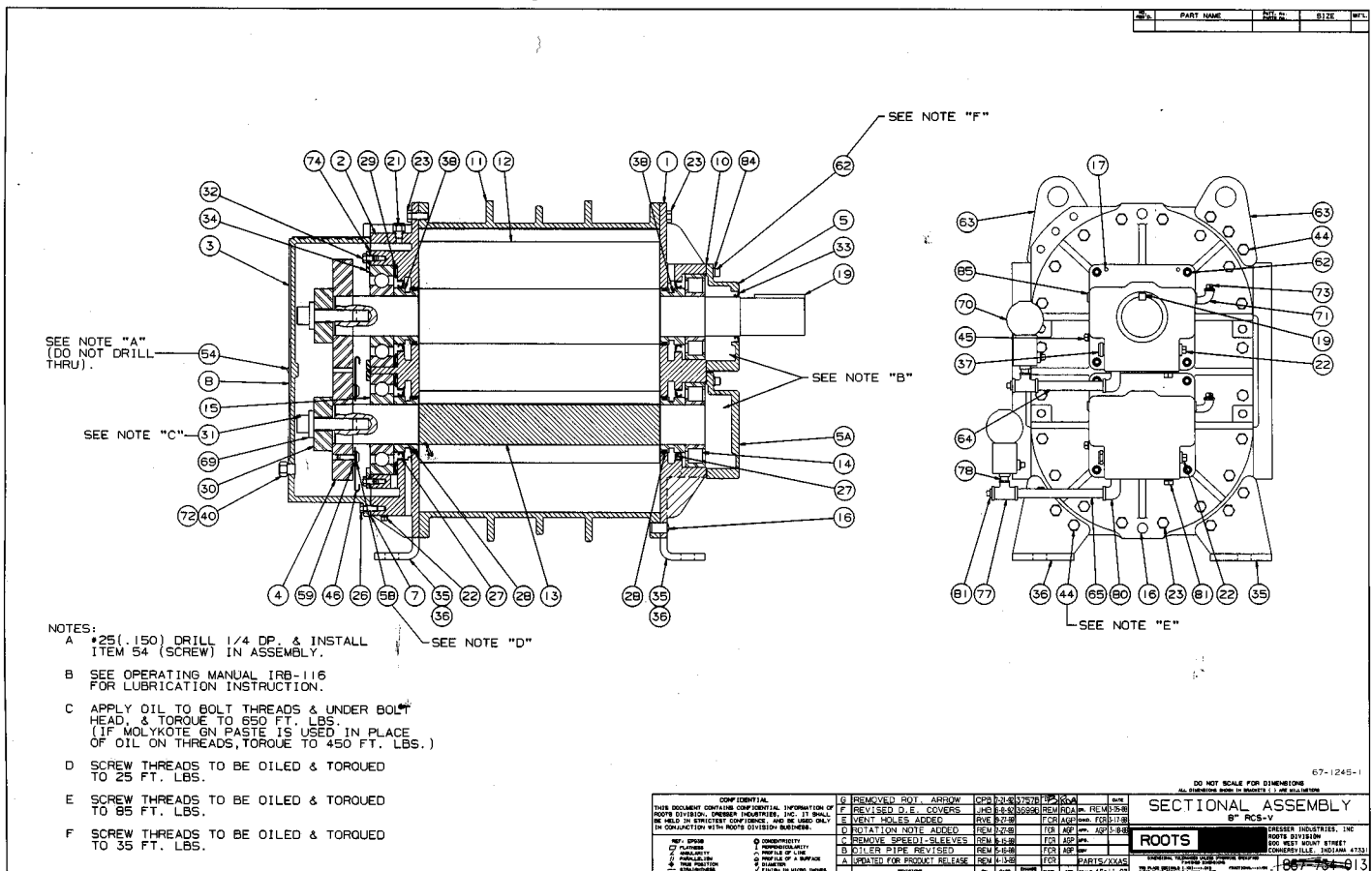


Figure 10 — Blower Orientation

TABLE 6 — PARTS IDENTIFICATION LIST FOR FIGURE 11

ITEM NUMBER	QUANTITY USED	IDENTIFICATION	ITEM NUMBER	QUANTITY USED	IDENTIFICATION
1	1	Drive end headplate	34	2	Bearing clamp plate
2	1	Gear end headplate			plate
3	1	Gearbox	35	2	Foot, R.H.
4	2	Gears	36	2	Foot, L.H.
5	1	Drive end, Drive Cover	37	2	Sightplug-oil level
5a	1	Drive end, Driven Cover	38	4	Sleeve
7	1	Gearbox Gasket	40	1	Sight Plug
8	1	Name Plate	44	18	Capscrew
10	2	Gasket, Drive end Covers	45	2	Pipe plug
11	1	Cylinder	46	1	Slinger
12	1	Driven Impeller	54	1	Screw
13	1	Drive Impeller	58	2	Screw
14	2	Drive end Bearings	59	2	Washer
15	2	Gear end Bearings	62	8	Capscrew
16	4	Dowel Pins	63	2	Lifting Brackets
17	2	Spring Pins	64	2	Pipe
19	1	Key	65	1	Pipe nipple
21	1	Gear end Vent Plug	69	2	Washer, hardened
22	3	Pipe Plugs	70	2	Oilers
23	40	Capscrew	71	2	Street Elbow
26	14	Capscrew	72	1	Pipe plug
27	4	Seals	73	2	Vent, plug, D.E.
28	4	Piston Ring	74	Varies	Shim
		Seals	77	2	Pipe tee
29	4	Wavy Spring Washers	78	2	Pipe nipple
30	2	Gear Mounting Washer	80	2	Street elbow
31	2	Capscrew	81	3	Pipe plug
32	6	Capscrew	84	8	Lockwasher
33	1	Drive Seal	85	4	Pipe plug

Figure 11 — 8" RCS Blower Sectional



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