Gardner Denver

PARTS LIST OPERATING AND SERVICE MANUAL

HELIFLOW

INDUSTRIAL SERIES BLOWERS

4” GEAR DIAMETER

Models
HYCL_CA
HYCM_CA

HF-7-605
Version 00
Nov 01, 2019

MAINTAIN BLOWER RELIABILITY AND PERFORMANCE WITH GENUINE GARDNER DENVER PARTS AND SUPPORT SERVICES

Factory genuine parts, manufactured to design tolerances, are developed for optimum dependability - - - specifically for your blower. Design and material innovations are born from years of experience with hundreds of different blower applications. When you specify factory genuine parts you are assured of receiving parts that incorporate the most current design advancements manufactured in our state-of-the-art blower factory under exacting quality standards.

Your AUTHORIZED DISTRIBUTOR offers all the backup you require. A worldwide network of authorized distributors provides the finest product support in the blower industry.

Your AUTHORIZED DISTRIBUTOR can support your blower investment with these services:

1. Trained parts technical representatives to assist you in selecting the correct replacement parts.

2. Complete inventory of new machines and new, genuine factory parts.

3. A full line of factory tested AEON™ PD blower lubricants specifically formulated for optimum performance in all blowers.

4. Authorized distributor service technicians are factory-trained and skilled in blower maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair service.

INSTRUCTIONS FOR DETERMINING BLOWER CONFIGURATION

1. Face the blower drive shaft.
2. In a **VERTICAL** configuration, air flow is horizontal.
3. In a **HORIZONTAL** configuration, air flow is vertical.
4. In a vertical configuration, a **BOTTOM HAND** exists when the drive shaft is below the horizontal center line of the blower. A TOP HAND exits when the drive shaft is above the horizontal center line of the blower.
5. In a horizontal configuration, a **RIGHT HAND** exists when the drive shaft is to the right of the vertical center line of the blower. A **LEFT HAND** exists when the drive shaft is to the left of the vertical center line of the blower.

INSTRUCTIONS FOR ORDERING REPAIR PARTS

For pricing, and ordering information contact your nearest AUTHORIZED FACTORY DISTRIBUTOR. When ordering parts, specify Blower **MODEL** and **SERIAL NUMBER** (see nameplate on unit).

Rely upon the knowledge and experience of you AUTHORIZED DISTRIBUTOR and let them assist you in making the proper parts selection for your blower.

To Contact Gardner Denver or locate your local distributor:

Visit: www.contactgd.com/blowers

Or

Call: (800) 682-9868

FOREWORD

Gardner Denver® blowers are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine, the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

⚠ DANGER

Danger is used to indicate the presence of a hazard which will cause severe personal injury, death, or substantial property damage if the warning is ignored.

⚠ WARNING

Warning is used to indicate the presence of a hazard which can cause severe personal injury, death, or substantial property damage if the warning is ignored.

⚠ CAUTION

Caution is used to indicate the presence of a hazard which will or can cause minor personal injury or property damage if the warning is ignored.

NOTICE

Notice is used to notify people of installation, operation or maintenance information which is important but not hazard-related.

IC GROUP CO.

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious. Some general safety precautions are given below:

⚠ DANGER

Failure to observe these notices could result in injury to or death of personnel.

- **Keep fingers and clothing away from blower inlet and discharge ports, revolving belts, sheaves, drive coupling, etc.**
- **Do not use the air discharge from this unit for breathing – not suitable for human consumption.**
- **Do not loosen or remove the oil filler plug, drain plugs, covers the thermostatic mixing valve or break any connections, etc., in the compressor air or oil system until the unit is shut down and the air pressure has been relieved.**
- **Electrical shock can and may be fatal.**
- **Blower unit must be grounded in accordance with the National Electrical Code. A ground jumper equal to the size of the equipment ground conductor must be used to connect the blower motor base to the unit base.**
- **Open main disconnect switch, tag and lockout before working on the control.**
- **Disconnect the blower from its power source, tag and lockout before working on the unit – this machine is automatically controlled and may start at any time.**

JC CROSS CO.

⚠ WARNING

Failure to observe these notices could result in damage to equipment.

- **Stop the unit if any repairs or adjustments on or around the blower are required.**
- **Disconnect the blower from its power source, tag and lockout before working on the unit – this machine is automatically controlled and may start at any time.**
- **Do not exceed the rated maximum speed values shown on the nameplate.**
- **Do not operate unit if safety devices are not operating properly. Check periodically. Never bypass safety devices.**

TABLE OF CONTENTS

MAINTAIN BLOWER RELIABILITY AND PERFORMANCE....i
INSTRUCTIONS FOR DETERMINING BLOWER CONFIGURATION....i
INSTRUCTIONS FOR ORDERING REPAIR PARTS....i
FOREWORD.... ii
SAFETY PRECAUTIONS.... iii
MATRIX/MENU vi
INTRODUCTION YOUR KEY TO TROUBLE FREE SERVICE 1
SECTION 1, EQUIPMENT CHECK 2
SECTION 2, INSTALLATION....4
SECTION 3, MAINTENANCE 8
GARDNER DENVER LUBRICANT ORDER INFORMATION....9
SECTION 4, OPERATION 12
SECTION 5, ASSEMBLY TOOLS....15
SECTION 6, DISASSEMBLY INSTRUCTIONS....23
SECTION 7, GEAR DISASSEMBLY 25
SECTION 8, ASSEMBLY INSTRUCTIONS....26
SECTION 9, PARTS LIST 35
WARRANTY 37

IC CROSS CO.

LIST OF ILLUSTRATION

FIGURE 2-1 – BLOWER MOUNTING CONFIGURATIONS 4
FIGURE 2-2 – BELT DRIVE OVERHUNG LOAD CALCULATIONS 6

FIGURE 3-1 - LUBRICATION 8
FIGURE 3-2 – APPROXIMATE OIL CAPACITIES (PINTS) 8
FIGURE 3-3 – SYNTHETIC LUBRICANT CHART 10

FIGURE 4-1 – MAXIMUM OPERATING LIMITATIONS 12

FIGURE 5-1 – ASSEMBLY TOOL ..... .15
FIGURE 5-2 - SEAL PROTECTION SLEEVE ..... .16
FIGURE 5-3 – BEARING DRIVER 16
FIGURE 5-4 – FALSE BEARING 17
FIGURE 5-5 – INSERT DRIVER 17
FIGURE 5-6 – ASSEMBLY GUIDE FOR RINGS 18
FIGURE 5-7 – SLINGER/CARRIER DRIVER 18
FIGURE 5-8 – SEAL DRIVER 19
FIGURE 5-9 – NUT DRIVER 19
FIGURE 5-10 – PULL ROD 20
FIGURE 5-11 – C WASHER 20
FIGURE 5-12 – CAP 21
FIGURE 5-13 – DRIVER 21
FIGURE 5-14 – ROTOR LOCK 22

FIGURE 7-1 – GEAR DISASSEMBLY 25

FIGURE 8-1 – INSTALL PISTON RINGS 26
FIGURE 8-2 – MEASURE STEP IN FALSE BEARING 27
FIGURE 8-3 – PRESS BEARING ONTO ROTOR SHAFT 28
FIGURE 8-4 – INSTALL BEARING RETAINING SCREWS 28
FIGURE 8-5 – INSTALL ROLLER BEARING 29
FIGURE 8-6 – INTERLOBE TIMING 30
FIGURE 8-7 – ROTOR LOCK ASSEMBLY 30
FIGURE 8-8 – AXIAL ENGAGEMENT 31
FIGURE 8-9 – GEAR PRESS 31
FIGURE 8-10 – TIGHTEN SET SCREWS 32
FIGURE 8-11 – MEASURE GEAR BACKLASH 32

R.E. ROSS CO.

GARDNER DENVER HELIFLOW INDUSTRIAL SERIES BLOWERS
MATRIX/MENU

NOTICE TO CUSTOMER – To find the construction options for Your blower unit, FILL IN THE BALANCE OF LETTERS OR NUMBERS FROM YOUR UNIT NAMEPLATE

	H	Y	C			A	A
COLUMN NUMBER:	1	2	3	4	5	6	7

FOLLOW THE LINE DOWN AND OVER FROM EACH SPACE THUS FILLED IN TO FIND THE APPROPRIATE CONSTRUCTION OPTION WITH WHICH YOUR MACHINE IS EQUIPPED.

COLUMN 1 – BASIC DESIGNATOR

COLUMN 2 – PRODUCT FAMILY

COLUMN 3 – GEAR DIAMETER

A.		F.
B.		G.
C.	4”	H.
E.		

COLUMN 4 – CASE LENGTH

L. 8” (HF 408)
M. 6” (HF 406)

IC CROSS CO.

COLUMN 5 – CONFIGURATION

E. Std Blower – Vertical-Bottom Hand-Right Discharged Timed, CCW
F. Std Blower – Vertical-Bottom Hand-Left Discharge Timed, CW
G. Std Blower – Vertical-Top Hand-Right Discharge Timed, CW
H. Std Blower – Vertical-Top Hand-Left Discharge Timed, CCW
J. Std Blower – Horizontal-Right Hand-Bottom Discharge Timed CW
K. Std Blower – Horizontal-Right Hand-Top Discharge Timed CCW
L. Std Blower – Horizontal-Left Hand-Top Discharge Timed CW
M. Std Blower – Horizontal-Left Hand-Bottom Discharge Timed CCW

COLUMN 6 – DESIGN VERSION

COLUMN 7 – ADDITIONAL DESCRIPTION

A. Lip Seal

INTRODUCTION
YOUR KEY TO TROUBLE FREE SERVICE

Thank you for investing in Gardner Denver quality. The Gardner Denver reputation for rugged dependability has been earned by over 50 years of service in demanding, industrial operations where downtime cannot be tolerated and efficient blower performance is expected.

Your Gardner Denver blower is a precision engineered blower that has been carefully manufactured and thoroughly tested at the state-of the-art Gardner Denver Blower Factory in Sedalia, Missouri.

As with other precision machinery, there are several relatively simple installation, operation and maintenance procedures that you must observe to assure optimum blower performance. There is no guesswork in the manufacture of your highly advanced Gardner Denver blower and there must be none in preparing the blower to get the job done in the field.

The purpose of this manual is to help you properly install, operate and maintain your Gardner Denver blower. It is essential that you review all sections of this manual in preparation for installing your blower. Follow the instructions carefully and you will be rewarded with trouble-free Gardner Denver service… year in and year out.

IMPORTANT GARDNER DENVER TELEPHONE NUMBERS

YOUR AUTHORIZED GARDNER DENVER DISTRIBUTION

NAME: _____

TELEPHONE: _____

FAX: _____

CONTACT: _____

JC CROSS CO.

THANKS…FOR THE PRIVILEDGE OF SERVING YOU WITH DEPENDABLE GARDNER DENVER QUALITY.

SECTION 1
EQUIPMENT CHECK

Before uncrating, check the packing slip carefully to be sure all the parts have been received. All accessories are listed as separate items on the packing slip, and small important accessories such as relief valves can be overlooked or lost. After every item on the packing slip has been checked off, uncrate carefully. Register a claim with the carrier for lost or damaged equipment.

⚠WARNING

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

STORAGE

Your Gardner Denver Blower was packaged at the factory with adequate protection to permit normal storage for up to six (6) months.

If the unit is to be stored under adverse conditions or for extended periods of time, the following additional measures should be taken to prevent damage.

1. Store the blower in a clean, dry, heated (if possible) area.
2. Make certain inlet and discharge air ports are tightly covered to prevent foreign material from entering the air box.
3. All exposed, non-painted surfaces should be protected against rust and corrosion.
4. Provide adequate protection to avoid accidental mechanical damage.
5. In high humidity or corrosive environments, additional measures may be required to prevent rusting of the blower internal surfaces.
6. To prevent rusting of gears, bearings, etc., the oil reservoirs may be filled with normal operating oil.

⚠CAUTION

Before running the blower, drain the oil and replace to the proper operating level with clean, fresh lubricant.

7. Rotate the blower shaft (10 to 25 turns) monthly during storage. Inspect the blower shaft (near the shaft seal area) monthly and spray with rust inhibitor if needed.
8. For long term storage (over six (6) months), contact Gardner Denver Customer Service for recommendations.

JC CROSS CO.

REMOVING PROTECTIVE MATERIALS

The shaft extension is protected with rust inhibitor which can be removed with any standard solvent.

⚠ CAUTION
Follow the safety directions of the solvent manufacturer.

Blower inlet and outlet are temporarily capped to keep out dirt and other contaminants during shipment. These covers must be removed before start-up.

The internal surfaces of all HeliFlow blowers are mist sprayed with a rust preventative to protect the machine during shipment. Remove this film upon initial startup, using any commercial safety solvent. Position the blower so that the inlet and discharge connections are in the vertical position (vertical airflow). On vertically mounted units, it will be necessary to lay the unit on its side supporting the ends of the unit so as not to restrict the portion on the bottom side. Place a shallow pan on the underside of the unit. With the blower disconnected from power, spray the solvent in the top port, rotating the impellers by spinning the shaft manually. Continue this procedure until the unit is visibly clean.

⚠ WARNING
Rotating components will cause severe injury in case of personal contact. Keep hands away from blower inlet and discharge ports.

JC CROSS CO.

SECTION 2
INSTALLATION

LOCATION

If possible, install the blower in a well-lit, clean, dry place with plenty of room for inspection and maintenance.

FOUNDATIONS

For permanent installations we recommend concrete foundations be provided, and the equipment should be grouted to the concrete. 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. Before grouting, equipment must be leveled, free of all strains, and anchored so no movement will occur during setting of grout. After grout has completely hardened, a recheck is necessary to compensate for shrinkage, etc. If required, add shims under blower feet after final tightening of foundation anchor bolts to remove strain from the blower housing. Where jack screws or wedges are used during grouting, they must be backed off or removed before final tightening of anchor bolts.

Where a concrete foundation is not feasible, care must be taken to insure that equipment is firmly anchored to adequate structural members.

MOUNTING CONFIGURATIONS

The blower flex-mounting design enables horizontal and vertical mounting configurations with top or bottom hand, right or left hand shaft positioning. The units are discharge timed allowing rotation in only one direction (refer to FIGURE 2-1).

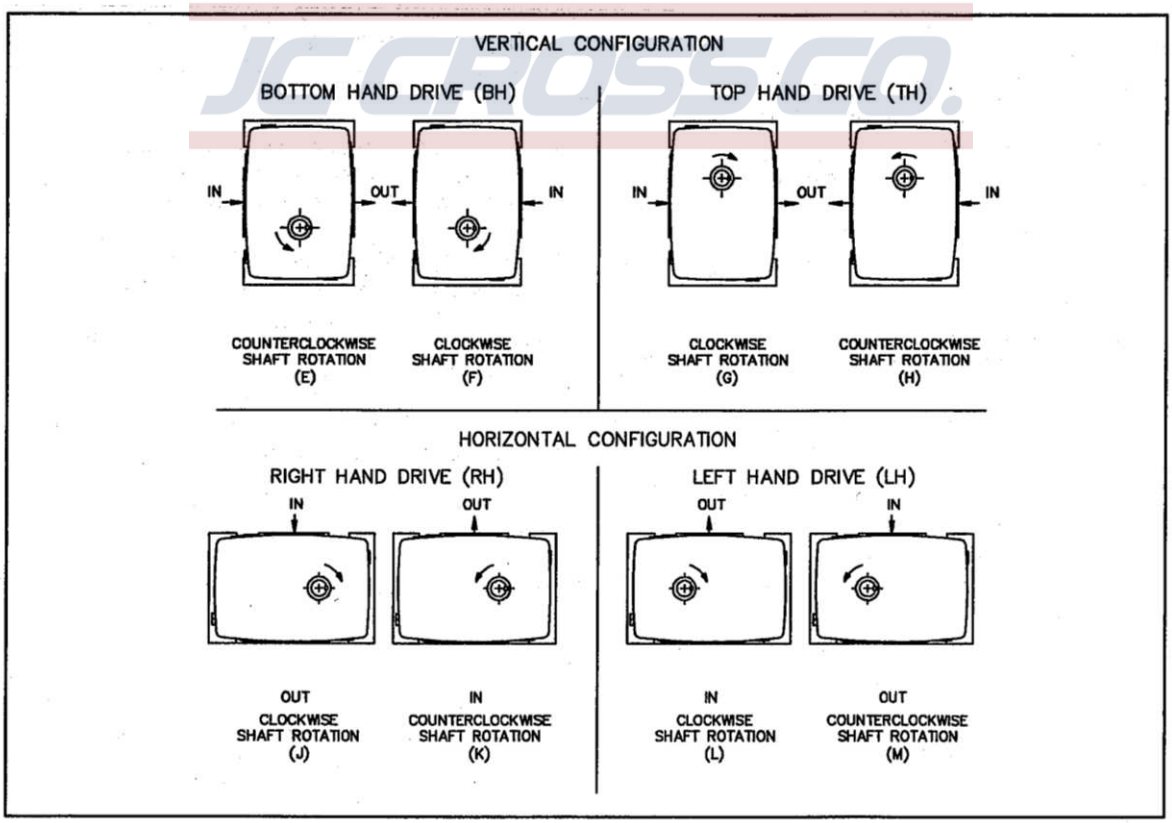


FIGURE 2-1– BLOWER MOUNTING CONFIGURATIONS

NOTICE
When changing mounting configuration, it will be necessary to reposition oil level gauge (H), and drain plug (A). Refer to FIGURE 3-1, page 8, for correct location.

DRIVE INSTALLATION

When selecting a V-belt drive, check to be sure the shaft overhung load limitation is not exceeded. Refer to FIGURE 2-2, page 6, for overhung load calculations and limitations.

Belt drives must be carefully aligned. Motor and blower pulleys must be parallel to each other and in the same plane within 1/32 inch. Belt tension should be carefully adjusted to the belt manufacturer's recommendation using a belt tension gauge. Check tension frequently during the first day of operation.

⚠WARNING
Overtightening belts leads to heavy bearing loads and premature failure.

On the direct connected units, alignment and lubrication of couplings to specifications of the coupling manufacturer is very important. When mounted drives are supplied from the factory, proper alignment has been established before shipment. However, during shipping, handling and installation, it is likely that the alignment has been disturbed and final adjustment must be made before startup.

⚠WARNING
Exceeding overhung load limitations leads to unwarrantable premature bearing failure and shaft breakage.

JC CROSS CO.

The location of the sheave on the blower shaft greatly affects the stress in the shaft. The optimum blower sheave positioning is as close as possible to the blower drive cover, not to exceed dimension "C" in Drive Shaft Illustration, FIGURE 2-2, page 6.

The calculated shaft moment must not exceed the maximum allowable moment listed in Maximum Allowable Moment Chart, FIGURE 2-2, page 6. If the calculated shaft moment exceeds the maximum allowable moment:

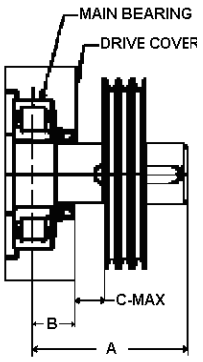
- Increase Sheave Diameters to Reduce Belt Pull
- Use Jackshaft Drive
- Use Direct Coupled or Gearbox Drive

To calculate shaft moment for a given V-Belt Drive Arrangement:

1. Use the formula for Calculation of Belt Pull, FIGURE 2-2, page 6, to calculate belt pull. Refer to Arc of Contact Factor Chart, FIGURE 2-2, page 6.
2. Insert the calculated belt pull into the formula for Calculation of Shaft Moment, FIGURE 2-2, page 6 to arrive at the calculated shaft moment.

Gear Diameter (Inches)	Dimensions (Inches)			Maximum Allowable Moment (LB-IN)
	A	B	C (Max)	
4	4.30	1.46	0.38	1450

MAXIMUM ALLOWABLE MOMENT



DRIVE SHAFT ILLUSTRATION

Z	Ac	Z	Ac	Z	Ac	Z	Ac	Z	Ac	Z	Ac
0.000	1.000	0.250	0.966	0.500	0.926	0.750	0.879	1.000	0.823	1.250	0.751
0.025	0.997	0.275	0.962	0.525	0.922	0.775	0.874	1.025	0.816	1.275	0.742
0.050	0.994	0.300	0.958	0.550	0.917	0.800	0.869	1.050	0.810	1.300	0.734
0.075	0.990	0.325	0.954	0.575	0.913	0.825	0.864	1.075	0.803	1.325	0.725
0.100	0.987	0.350	0.951	0.600	0.908	0.850	0.858	1.100	0.796	1.350	0.716
0.125	0.983	0.375	0.947	0.625	0.904	0.875	0.852	1.125	0.789	1.375	0.706
0.150	0.980	0.400	0.943	0.650	0.899	0.900	0.847	1.150	0.782	1.400	0.697
0.175	0.977	0.425	0.939	0.675	0.894	0.925	0.841	1.175	0.774	1.425	0.687
0.200	0.973	0.450	0.935	0.700	0.889	0.950	0.835	1.200	0.767		
0.225	0.969	0.475	0.930	0.725	0.884	0.975	0.829	1.225	0.759		

ARC OF CONTACT FACTORS

JC CROSS CO.

$$\text{Belt Pull} = \left[\frac{2.5 - Ac}{Ac}\right]\left[\frac{125954 \times Hp \times S.F.}{D \times RPM}\right]$$

Key:
- Ac = Arc of Contact Factor (Refer to Arc of Contact Factor Chart above)
- Hp = Blower Horsepower for Operating Conditions
- S.F. = Actual Drive Service Factor
- D = Blower Sheave Pitch Diameter in Inches
- RPM = Blower Sheave Speed

$$Z = \left[\frac{\text{Large Sheave Pitch Diameter (in)} - \text{Small Sheave Pitch Diameter (in)}}{\text{Sheave Center Distance (in)}}\right]$$

CALCULATION OF BELT PULL

$$\text{Shaft Moment (LB-IN)} = \text{Belt Pull} \times \left[B + C + \left(\frac{\text{Sheave Width}}{2}\right)\right]$$

CALCULATION OF SHAFT MOMENT

FIGURE 2-2 – BELT DRIVE OVERHUNG LOAD CALCULATIONS

PIPING

Inlet and discharge connections on all blowers are large enough to handle maximum volume with minimum friction loss. Reducing the pipe diameter on either inlet or discharge will only create additional line loss and increase the overall pressure differential.

Excessive weight of piping and fittings will cause internal misalignment and premature wear. Never allow the blower to carry the weight of the pipe. If possible, a spool or sleeve-type expansion joint should be installed between the unit and the piping. Where a flexible connection is not practical, the weight of the rigid connection must be separately supported. All system piping must be cleaned internally before connecting to the blower.

Gardner Denver blowers are shipped dry from the factory. Do not attempt to operate the blower before following proper lubrication instructions. Permanent damage to the gears, bearings and seals will occur.

JC CROSS CO.

SECTION 3
MAINTENANCE

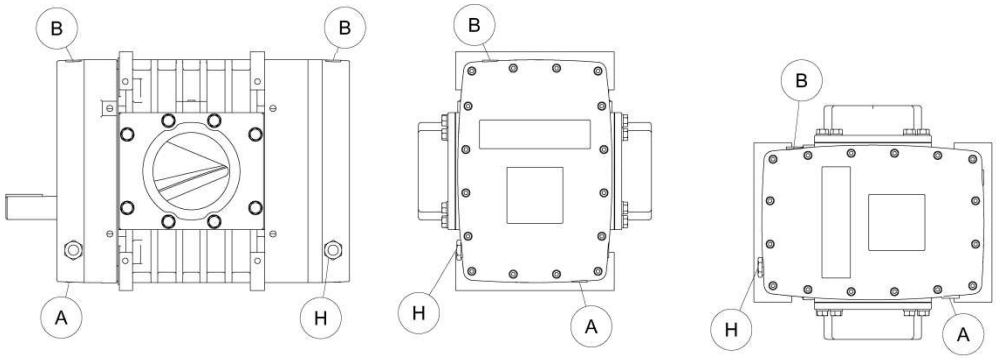


FIGURE 3-1 - LUBRICATION

A. Oil Drain Plug
B. Plug/Oil Fill
H. Oil Level Sight Gauge

GENERAL

Blower efficiency and life depend on the quality of maintenance the blower receives. Maintenance must be done regularly and with care. Clean work space, tools, solvents and wiping rags are necessary to avoid transferring dirt into the unit. Scheduling regular maintenance of the blower will insure long trouble-free service.

LUBRICATION

Gears and bearings are splash lubricated by an oil slinger in each sump. Check the oil level in both sumps daily. Do not operate the blower if the oil level is not in the middle of the sight gauge for each sump when the blower is not running.

FILLING PROCEDURE

Refer to FIGURE 3-1. While the blower is not running remove the plug (B) from each sump. Add oil to each sump until it reaches the middle of each oil level sight gauge (H). Secure the plug (B) in each end.

LUBRICATION SERVICE

Add fresh oil as required to maintain proper level. If premium grade mineral oil is used, the oil should be drained, the gearbox flushed and the oil replaced every 1500 hours or more frequently if inspection so indicates. The oil change period is governed by operating conditions such as load, temperature, dirt, humidity, fumes and the quality of the oil used. The oil drain plug is located at (A). With AEON PD synthetic blower lubricant, perform the above oil-change maintenance after 4500 to 7500 hours.

⚠WARNING
Do not overfill as this will tend to cause excessive heating of the gears and may damage the unit.

RECOMMENDED LUBRICANT

Oil Fill Ports	Vertical	Horizontal
Shaft End	1.0	1.25
Gear End	1.5	2.0

FIGURE 3-2 – APPROXIMATE OIL CAPACITIES (PINTS)

GARDNER DENVER LUBRICANT ORDER INFORMATION

Re-order Part Numbers for AEON PD Series Factory-Recommended Synthetic Lubricants.

AEON PD Synthetic Lubricant

Description	Part Number
1 Quart	28G23
Case/ 12 Quarts	28G24
1 Gallon	28G40
5 Gallon Pail	28G25
55 Gallon Drum	28G28

AEON PD-Food Grade Synthetic Lubricant

Description	Part Number
1 Quart	28H97
Case/ 12 Quarts	28H98
1 Gallon	28H333
5 Gallon Pail	28H99
55 Gallon Drum	28H100

AEON PD-XD Extreme Duty Synthetic Lubricant

JC CROSS CO.

Description	Part Number
1 Quart	28G46
Case/ 12 Quarts	28G47
1 Gallon	28G42
5 Gallon Pail	28G44
55 Gallon Drum	28G45

Call your local Gardner Denver distributor to place your order for Gardner Denver Lubricants. Your Authorized Gardner Denver Distributor is:

AEON PD Series Lubricant is formulated especially for positive displacement blower service to provide maximum blower protection at any temperature. One fill of AEON PD Series Lubricant will last a minimum of 4 times longer than a premium mineral oil. Refer to FIGURE 3-3, page 10.

		Ambient Temperatures				
		Less than 10^0 F *	10^0 F to 32^0 F **	32^0 F to 60^0 F	60^0 F to 90^0 F	Greater than 90^0 F
Blower Discharge Temperatures	Less than 32^0 F	AEON PD AEON PD FG	AEON PD AEON PD FG			
	32^0 F to 100^0 F	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG AEON PD XD	AEON PD AEON PD FG AEON PD XD	
	100^0 F to 200^0 F	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG AEON PD XD	AEON PD AEON PD FG AEON PD XD	AEON PD AEON PD FG AEON PD XD
	200^0 F to 300^0F	AEON PD AEON PD FG	AEON PD AEON PD FG	AEON PD AEON PD FG AEON PD XD	AEON PD XD	AEON PD XD
	Greater than 300^0 F		AEON PD AEON PD FG	AEON PD XD	AEON PD XD	AEON PD XD

* For ambient temperatures less than 10^0 F, but not less than -20^0 F, the use of oil sump heaters or heated enclosures is required.

** For ambient temperatures 10^0 F to 32^0 F, the use of oil sump heaters or heated enclosures is recommended.

FIGURE 3-3 – SYNTHETIC LUBRICANT CHART

JC CROSS CO.

AIR FILTERS AND FILTER SILENCERS

⚠WARNING
Servicing the air filters is one of the most important maintenance operations to be performed to insure long blower life.

Servicing frequency of filter elements is not time predictable. A differential pressure indicator, with a continuous gauge reading, should be installed across the inlet filter. It will tell how much of the service life of the filter element has been used. It will also eliminate both premature filter servicing and premature blower failure due to a plugged filter when the filter pressure drop is used to establish maintenance points.

In all cases refer to the filter manufacturer's service instructions. Due to the many types of filters, it is not practical to give specific instructions covering all models.

NOTICE
No matter what type of filter is used, always make sure all seats, gaskets, clamps and hose connections on the filter and inlet line are absolutely air tight. Each time the filter is serviced, inspect interior of the blower for dirt.

PERIODIC INSPECITIONS

A good maintenance program will provide for periodic inspections of the blower and drive components. The following inspections may prevent major repairs and downtime:

JC CROSS CO.

1. Observe the blower for vibration, heating, noise, oil leaks and excessive air leaks.
2. Check for proper operation of the filters, silencers, couplings, drive belts, motor (or power unit), relief valve, check valve, gauges and other controls.
3. Disconnect the drive and turn the blower by hand to check for drag, tight spots, bearing wear and gear backlash. Rotation should be free with no indication of drag or metallic interference.
4. Inspect the interior of the blower through the inlet or discharge port for cleanliness, corrosion and contact of internal parts.
5. Check the tightness of all screws, bolts and nuts.

SECTION 4
OPERATION

Future operating problems can be avoided if proper precautions are observed when the equipment is first put into service.

NOTICE
Machines are shipped without oil in the sumps. Do not operate before adding lubricant.

Before starting under power, the blower should be turned over by hand to make certain there is no binding, or internal contact.

Each size blower has limits on pressure differential, running speed and discharge temperature which must not be exceeded. These limits are shown in the following tabulation. Refer to FIGURE 4-1, page 12.

⚠WARNING
Operating beyond the specified operating limitations will result in damage to the unit.

It is important that the pressures and temperatures are measured directly at the ports of the blower to avoid error that may be caused by intervening pipe runs, fittings, etc.

Relief valves should be used to protect against excessive pressure or vacuum conditions. These valves should be tested at initial startup to be sure they are adjusted to relieve at or below the maximum pressure differential rating of the blower.

NOTICE
Relief valves should be placed as close as possible to the blower inlet or discharge.

In some instances, pressure may be relieved at a lower point than the blower maximum in order to protect the motor or the equipment served by the blower.

Discharge temperature switches are recommended to protect against excessive inlet restriction or inlet temperatures. Check valves in the discharge line on pressure blowers and in the inlet line on vacuum blowers are recommended to protect the blower from motoring backwards when shut down under load.

LIMITATIONS

For information regarding limitations, refer to FIGURE 4-1, below.

MAXIMUM OPERATING LIMITATIONS

SIZE	RPM	PRESSURE PSI	VACUUM IN HG	TEMPERATURE RISE ° F	DISCHARGE TEMPERATURE ° F
HF 408	4000	15	16	250	350
HF 406	4000	15	16	250	350

DO NOT EXCEED THESE LIMITS

NOTICE
Blower speed, line losses, elevation, and increased inlet temperatures will affect the maximum operating limitations.

FIGURE 4-1 – MAXIMUM OPERATING LIMITATIONS

BLOWER STARTUP CHECKLIST

This startup procedure should be followed during the initial installation and after any shutdown periods or after the blower has been worked on or moved to new location. It is suggested that the steps be followed in sequence and checked off (√) in the boxes provided.

- ☐ 1. Check the unit and all piping for foreign material and clean if required.
- ☐ 2. Check the flatness of the feet and the alignment of the drive. Feet that are bolted down in a bind can cause housing distortion and internal rubbing. Misaligned V-drives can cause the impellers to rub against the head plates and cause a reduction in the volumetric efficiency of the unit. Misaligned couplings can ruin bearings.
- ☐ 3. If the blower is V-belt driven, check the belt tension and alignment. Over-tensioned belts create heavy bearing loads which lead to premature failure.
- ☐ 4. Be sure adequate drive guards are in place to protect the operator from severe personal injury from incidental contact.
- ☐ 5. Check the unit for proper lubrication. Proper oil level cannot be over-emphasized. Too little oil will ruin bearings and gears. Too much oil will cause overheating and can ruin gears and cause other damage.
- ☐ 6. With motor electrical power locked out and disconnected, turn the drive shaft by hand to be certain the impellers do not bind.
- ☐ 7. “Jog” the unit with the motor a few times to check that rotation is in the proper direction, and to be certain it turns freely and smoothly.
- ☐ 8. The internal surfaces of all Gardner Denver units are mist sprayed with a rust preventive to protect the machine during the shipping and installation period. This film should be removed upon initial startup.
- ☐ 9. Start the unit and operate 15 minutes at no load. During this time, check for hot spots and other indications of interference.
- ☐ 10. Apply the load and observe the operation of the unit for one hour. Check frequently during the first day of operation.
- ☐ 11. If malfunctions occur, do not continue to operate. Problems such as knocking rotors can cause serious damage if the unit is operated without correction.

JC CROSS CO.

SAFETY PRECAUTIONS

1. Do not operate blower with open inlet or outlet port.
2. Do not exceed specified vacuum or pressure limitations.
3. Do not operate above or below recommended blower speed range.
4. Blower is not to be used where non-sparking equipment is specified.
5. Do not operate without belt guard or coupling shield.

⚠WARNING
Do not exceed sheave or coupling manufacturer's rim speed limit.

6. The blower and blower discharge piping may be extremely hot and can cause skin burns on contact.

TROUBLE SHOOTING

No matter how well the equipment is designed and manufactured, there may be times when servicing will be required due to normal wear, the need for adjustment, or various external causes. Whenever equipment needs attention, the operator or repairman should be able to locate the cause and correct the trouble quickly. The Trouble Shooting Chart below is provided to assist the mechanic in those respects.

JC CROSS CO.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Knocking	1. Unit out of time. 2. Distortion due to improper mounting or pipe strains. 3. Excessive pressure differential. 4. Worn gears. 5. Worn bearings.	1. Retime impellers. 2. Check mounting alignment and relieve pipe strains. 3. Reduce to manufacturer's recommended pressure. Examine relief valve, re-set if necessary. 4. Replace timing gears. 5. Replace bearings.
Excessive blower temperature.	1. Too much oil in gear case. 2. Too low operating speed. 3. Clogged filter or muffler. 4. Excessive pressure differential. 5. Worn impeller clearances. 6. Internal contact.	1. Reduce oil level. 2. Increase blower speed. 3. Remove cause of obstruction. 4. Reduce pressure differential across the blower. 5. Replace impeller. 6. Correct clearances.
Impeller end or tip drag.	1. Insufficient assembled clearances. 2. Case or frame distortion. 3. Excessive operating pressure. 4. Excessive operating temperature.	1. Correct clearances. 2. Check mounting and pipe strain. 3. Remove causes. 4. Remove causes.
Lack of volume.	1. Slipping belts. 2. Worn clearances. 3. Dirty air filter	1. Tighten belts. 2. Re-establish proper clearances. 3. Clean or replace air filter
Excessive bearing or gear wear.	1. Improper lubrication.	1. Correct lubrication level. Replace dirty oil.
Loss of oil.	1. Bearing housing vents plugged. 2. Worn seal.	1. Clean vents. 2. Replace seals.

SECTION 5
ASSEMBLY TOOLS (SPECIAL)

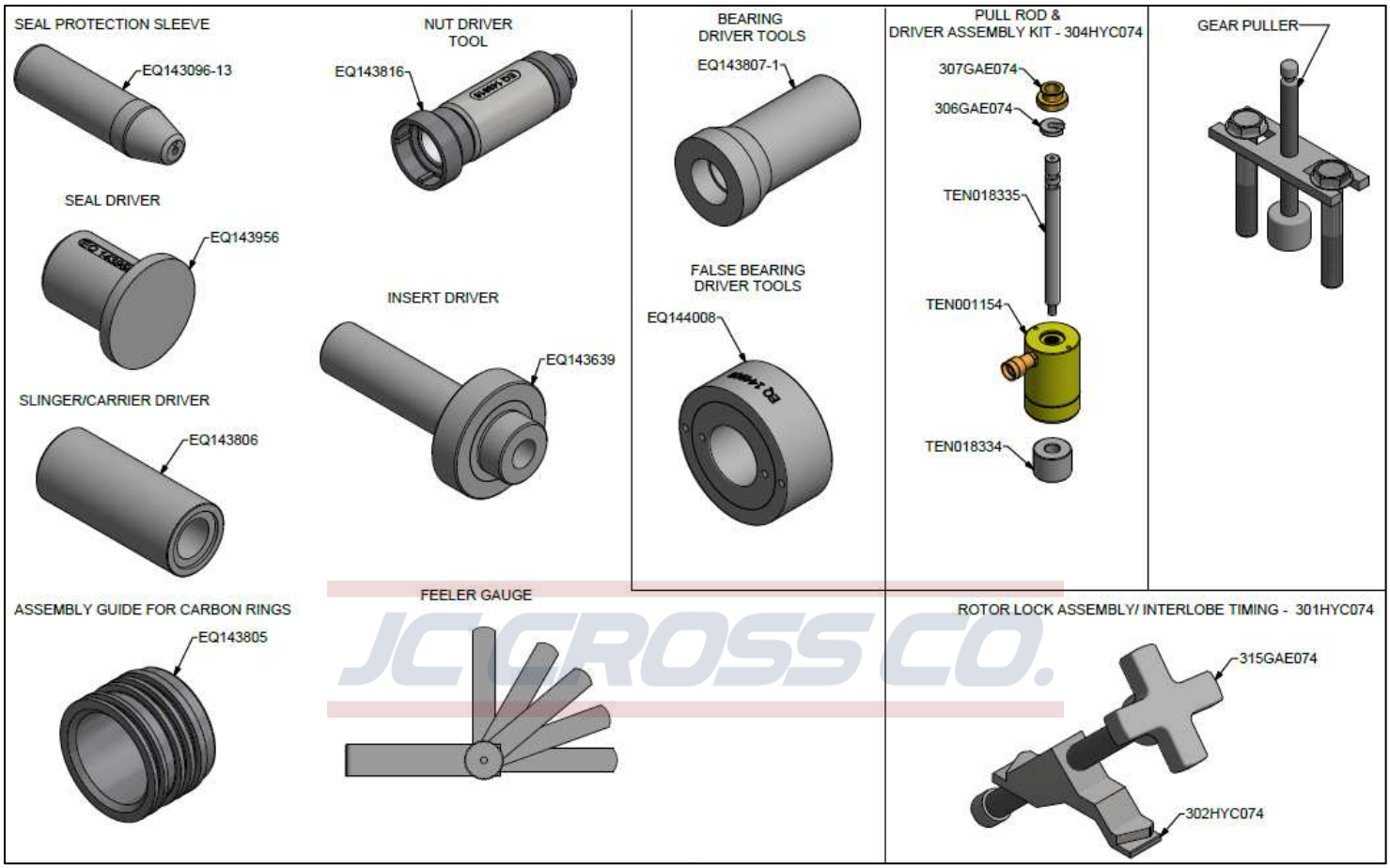
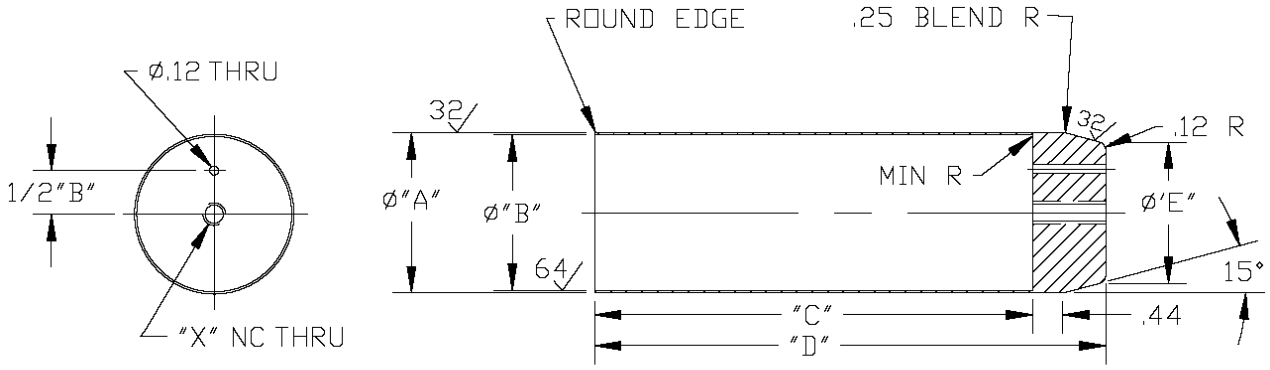


FIGURE 5-1 – ASSEMBLY TOOLS

JCGROSS CO.

SECTION 5
SPECIAL TOOLS

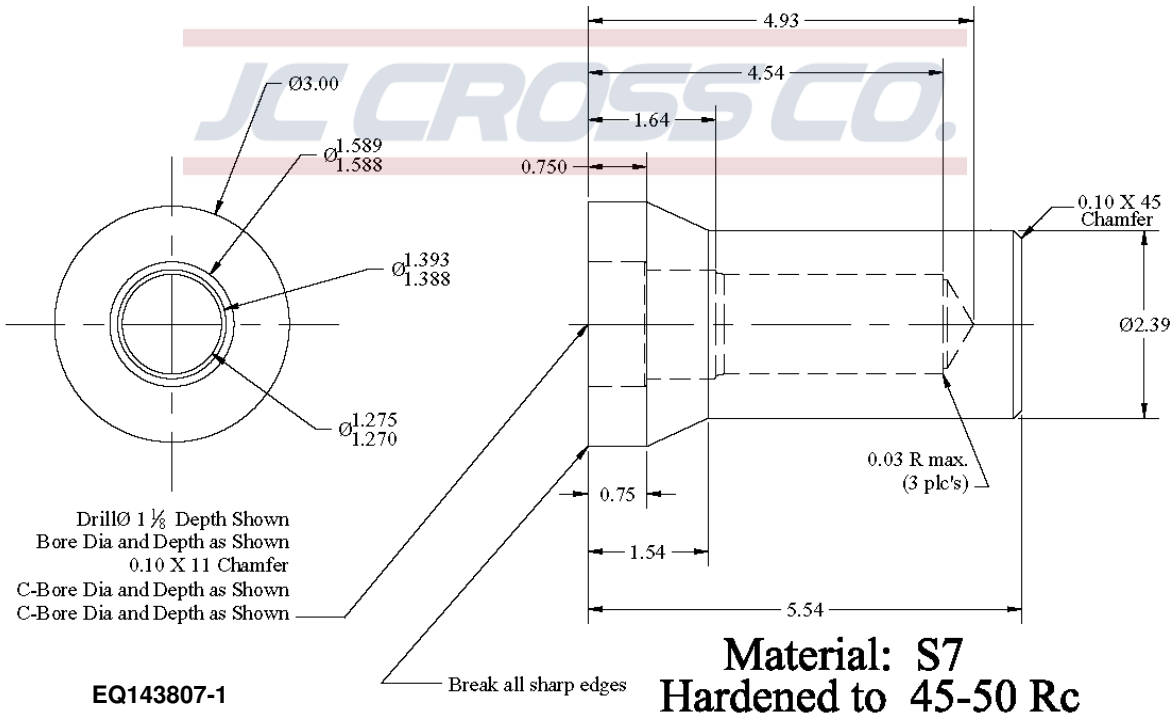
ORDER SPECIAL TOOLS BY PART NUMBER. SEE PAGE 1 FOR ORDERING INSTRUCTIONS.



EQ143096-13

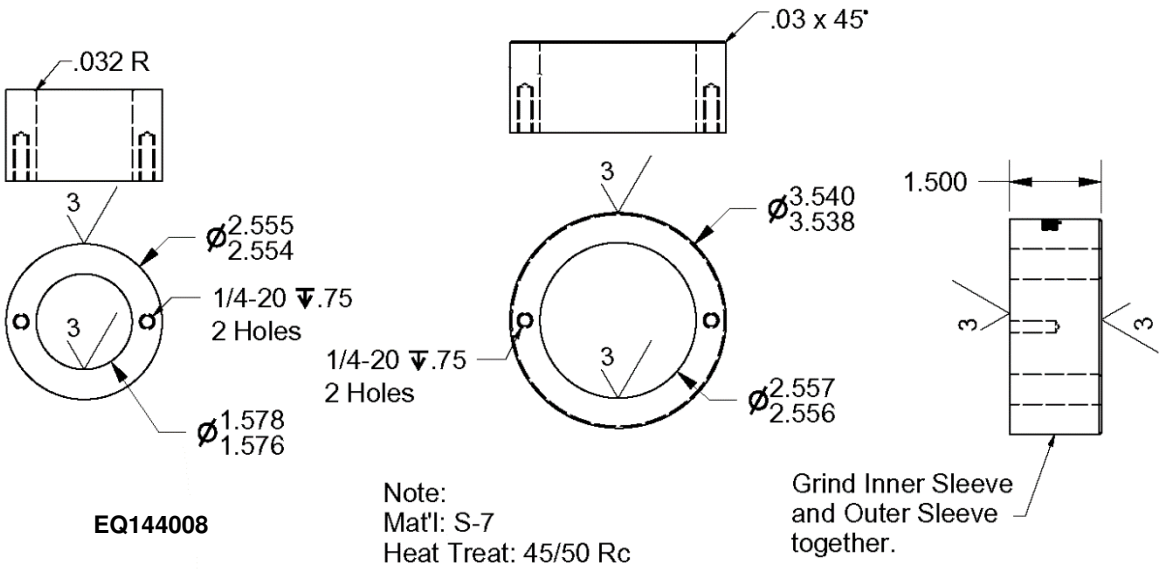
"A" +/-.001	"B" +/-.001	"C"	"D"	"E"	"X"
1.293	1.253	3.25	4.75	0.72	1/4-20

FIGURE 5-2 - SEAL PROTECTION SLEEVE



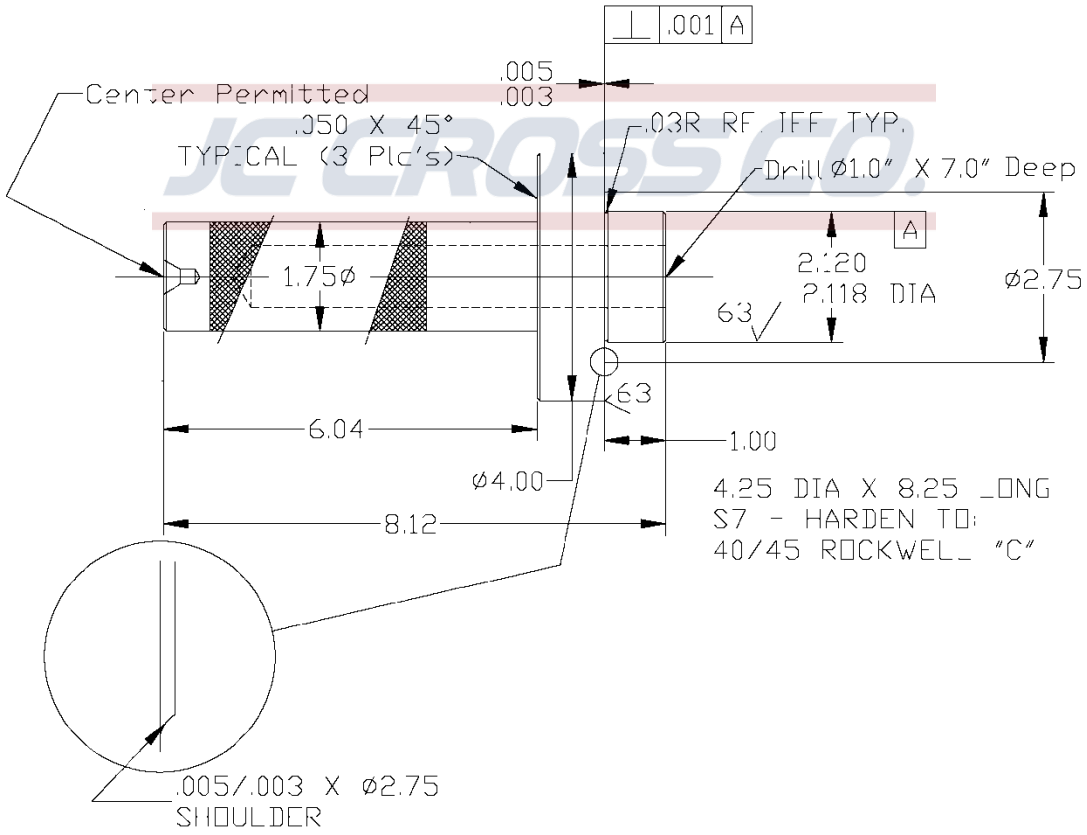
EQ143807-1

FIGURE 5-3 – BEARING DRIVER



EQ144008

FIGURE 5-4 – FALSE BEARING

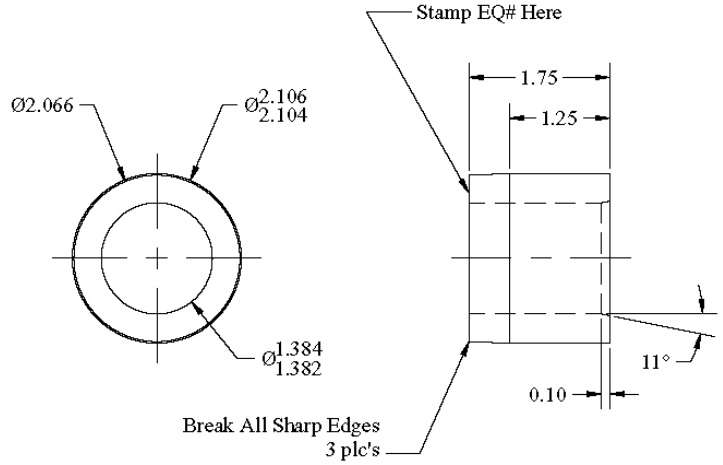


EQ143639

FIGURE 5-5 – INSERT DRIVER

JC CROSS CO.

Material: S7
Hardened to 45 - 50 Rc

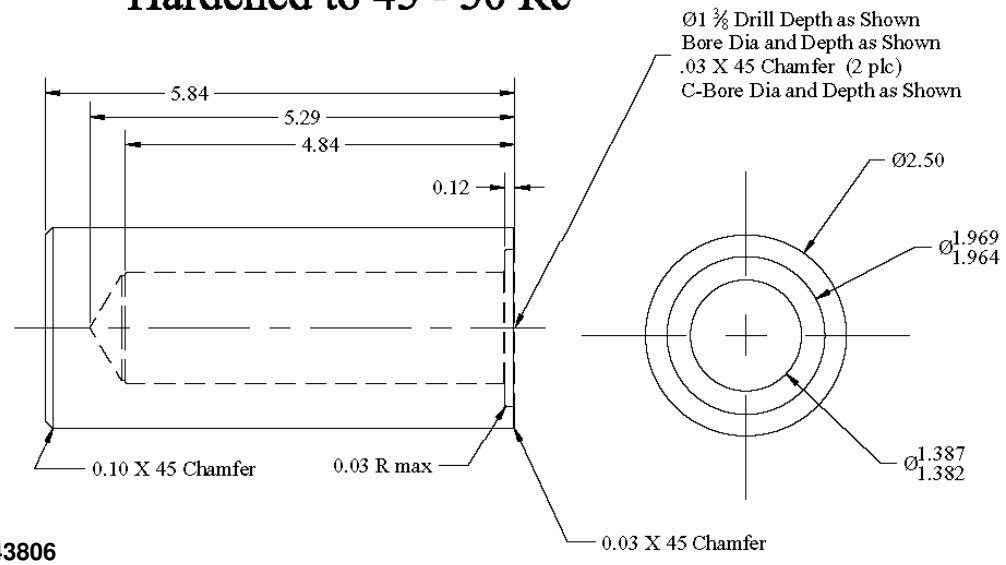


EQ143805

FIGURE 5-6 – ASSEMBLY GUIDE FOR RINGS

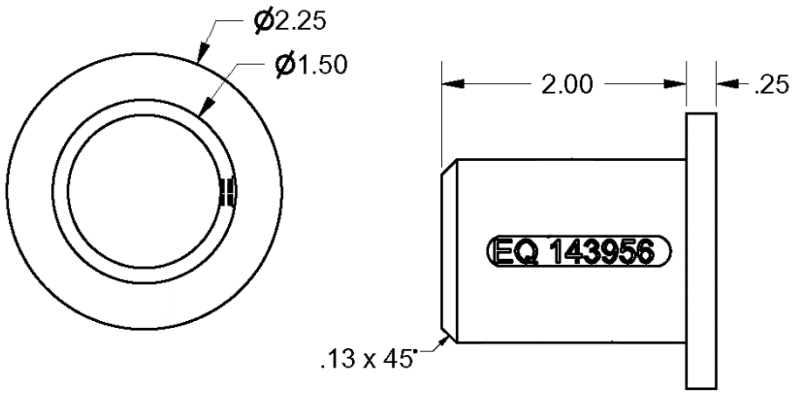
IC CROSS CO.

Material: S7
Hardened to 45 - 50 Rc



EQ143806

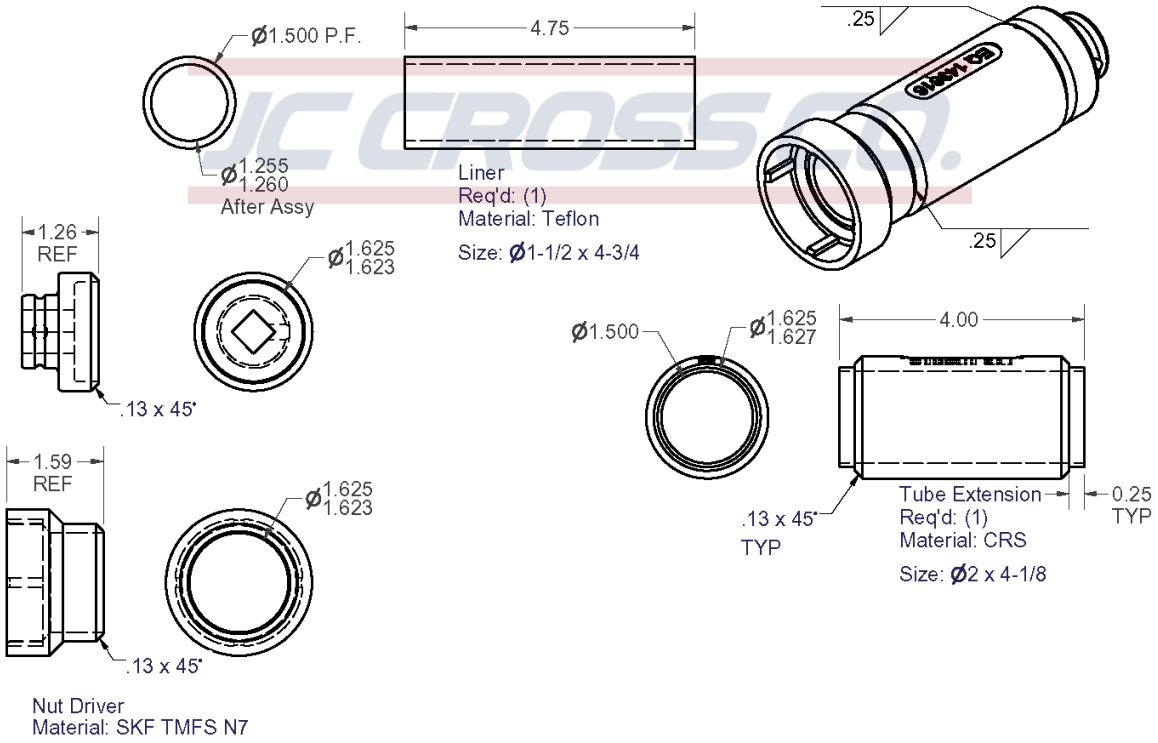
FIGURE 5-7 – SLINGER/CARRIER DRIVER



NOTE:
Material: 4140
Heat Treat RC 45/50
Break All Sharp Edges

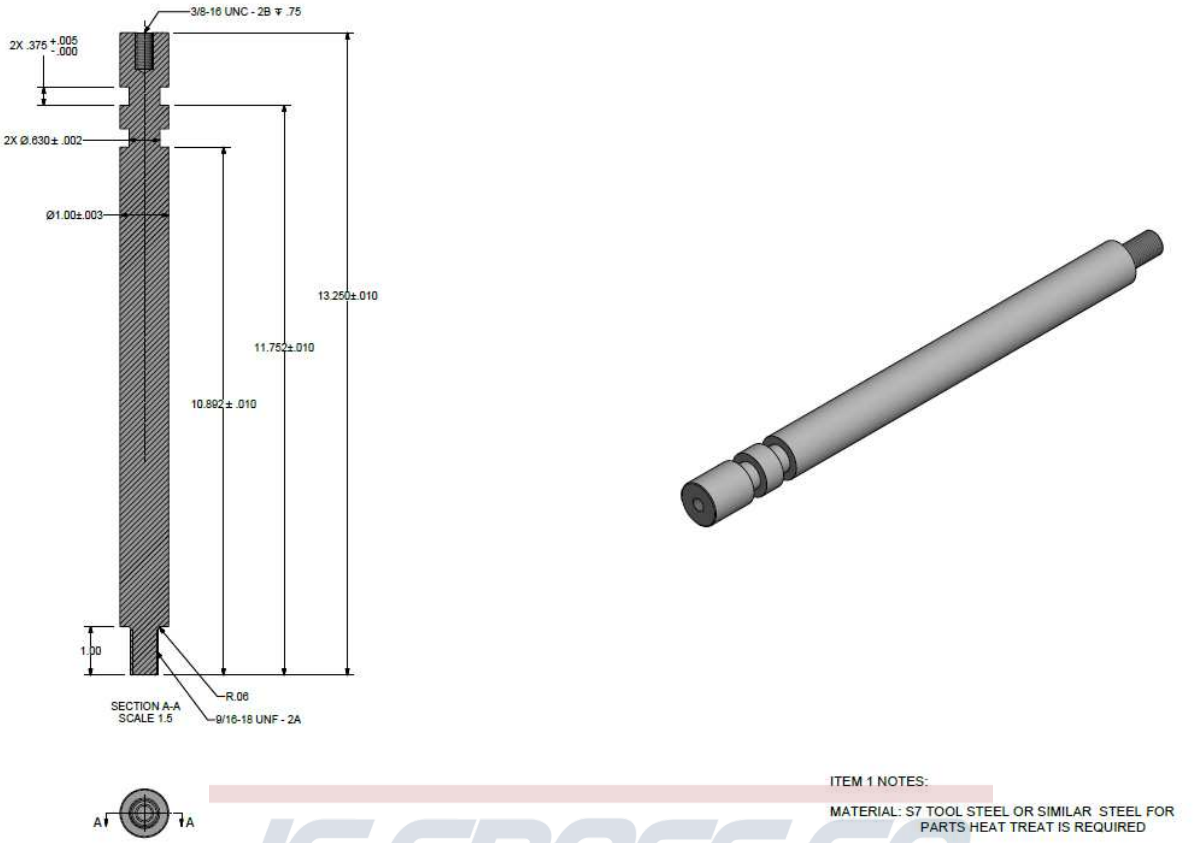
EQ143956

FIGURE 5-8 – SEAL DRIVER



EQ143816

FIGURE 5-9 – NUT DRIVER



JC CROSS CO.

FIGURE 5-10 – PULL ROD

TEN018335

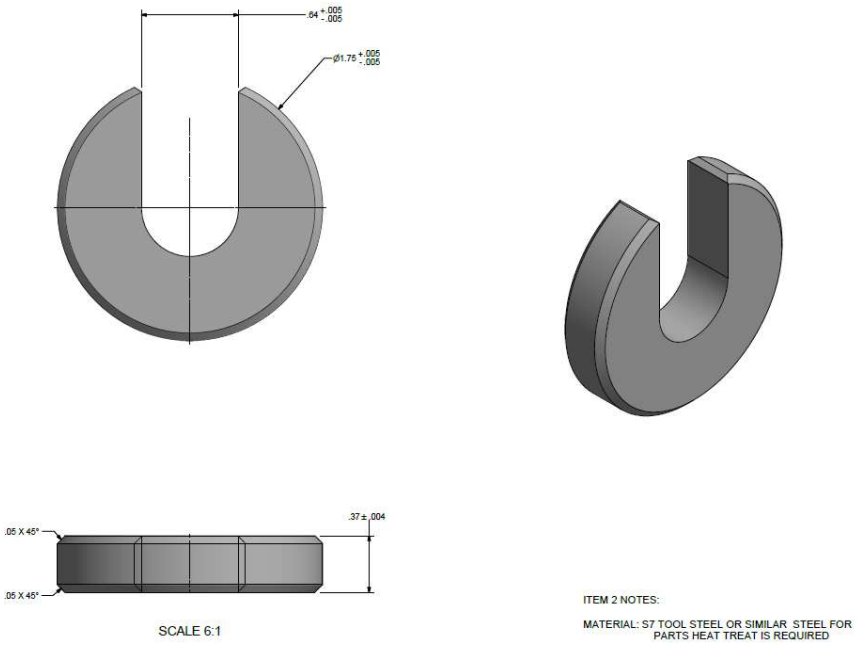
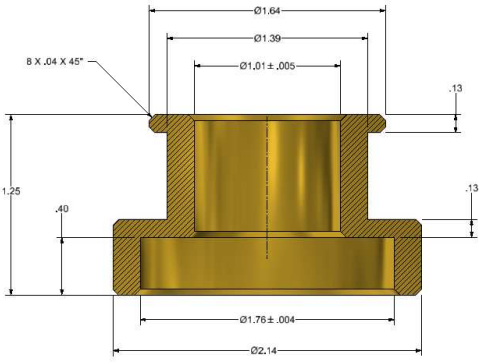
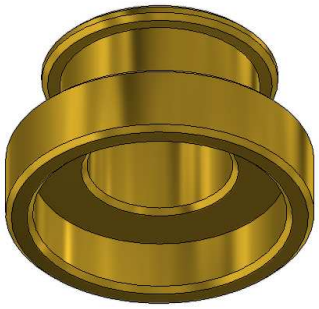


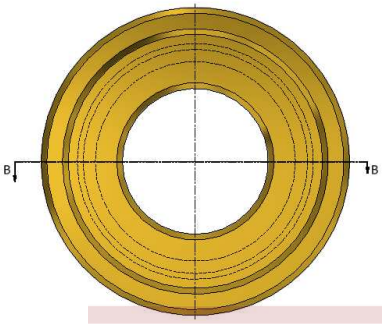
FIGURE 5-11 – C-WASHER

306GAE074



SECTION B-B
SCALE 5:1





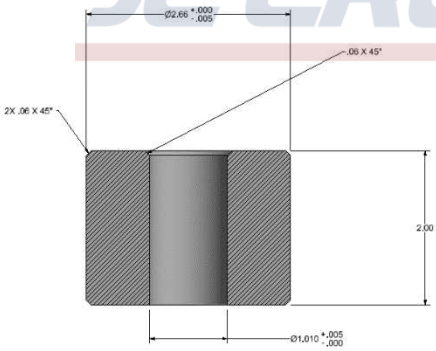
ITEM 3 NOTES:

MATERIAL: S7 TOOL STEEL OR SIMILAR STEEL FOR PARTS HEAT TREAT IS REQUIRED

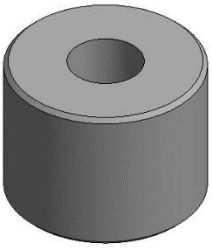
BREAK ALL EDGES .02 UNLESS OTHERWISE SPECIFIED

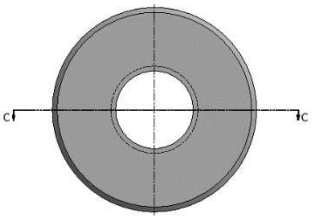
307GAE074 **FIGURE 5-12 – CAP**

JC CROSS CO.



SECTION C-C
SCALE 3



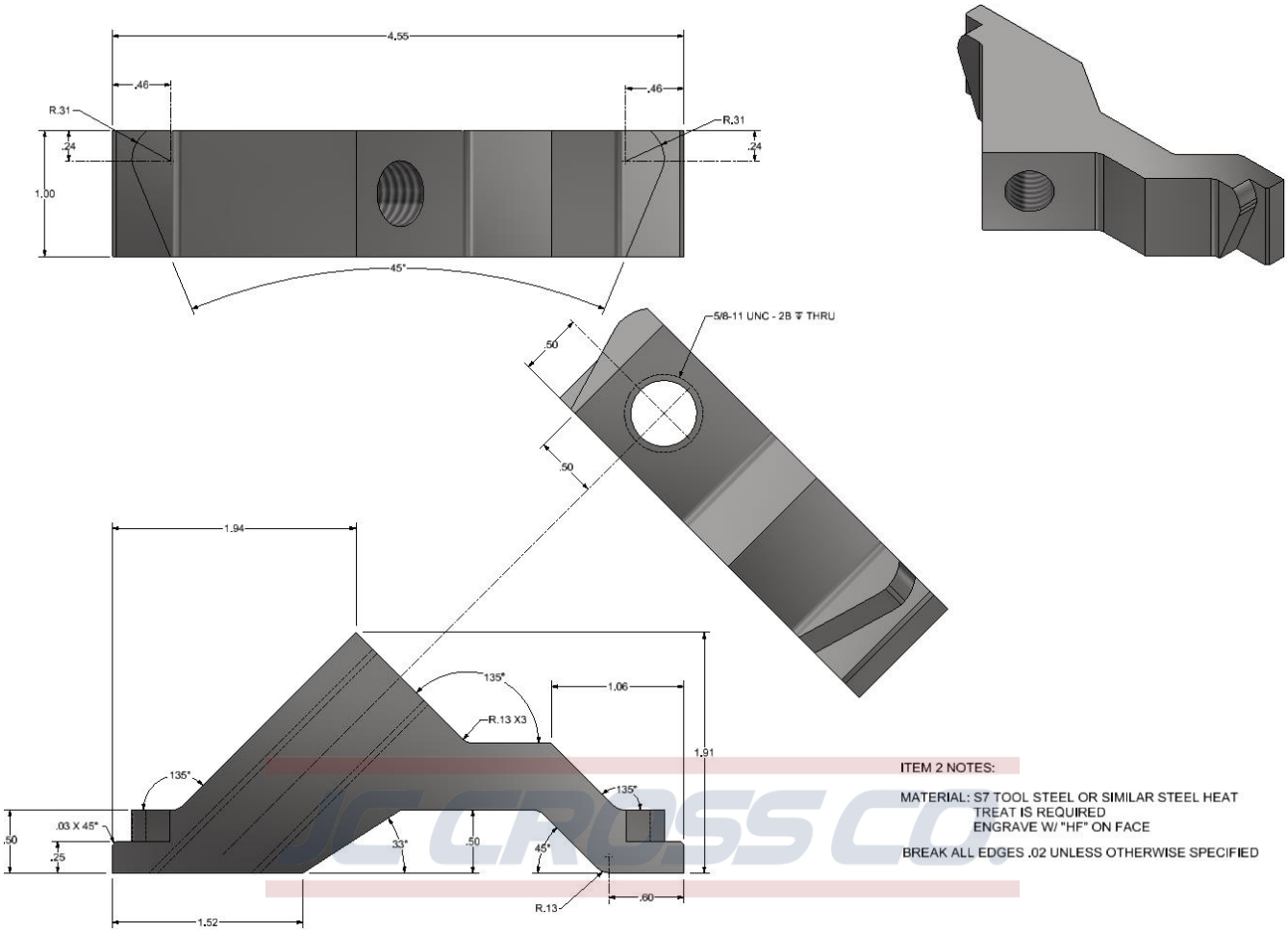


ITEM 4 NOTES:

MATERIAL: S7 TOOL STEEL OR SIMILAR STEEL FOR PARTS HEAT TREAT IS REQUIRED

BREAK ALL EDGES .02 UNLESS OTHERWISE SPECIFIED

TEN018334 **FIGURE 5-13 – DRIVER**



302HYC074

FIGURE 5-14 – ROTOR LOCK

SECTION 6
DISASSEMBLY INSTRUCTIONS

1. Remove the screws (46) and lock washers (48) from the port connectors. Remove the connector (52) and gasket (51) from the inlet and discharge ports.

2. Inspect the interior of the blower for any signs of rotor contact (rotor to rotor, rotor tip to case, rotor end to bearing housing). If there are signs of contact then the various clearances should be measured with feeler gauges prior to any disassembly.

3. Inspect the areas around the drive shaft seal and vent passages in the bearing housing and air cylinder for any signs of oil leaks.

4. Drain the oil from the gear end and drive end sumps by removing their drain plugs (2). A small amount of oil from each sump should be saved in the event that an oil analysis will be required.

5. Remove the screws (5) from the drive end sump cover (29). Remove the sump cover by sliding it off the drive shaft.
6. Inspect the drive shaft in the area of the oil seal for damage and wear. Inspect the oil seal (31).

7. Support the external surface of the drive end sump cover near the oil seal with blocks of wood. Drive the oil seal from the cover using the seal driver tool (EQ143956) and a press or small hammer.

8. Remove the screws (5) from the gear end sump cover (3). Remove the sump cover.

9. Remove the bolt (8), washer (6), and oil slinger (26) from the gear end of its rotor shaft.

10. If it appears the gears can be reused their backlash should be measured. Lock the idler rotor from turning by wedging a shop rag between the tip of a lobe and the air cylinder. Measure the backlash of the gears using a dial indicator and a magnetic base. The backlash should be measured in 3 places (every 1/3 turn).

11. Match mark the gears by making small punch marks on the ends of 2 meshing teeth.

12. Remove the 3 set screws (57) from both gear (9).

13. Remove the gears (9) from both rotor shafts by following steps in page 25.

14. Remove the stepped spacer (55) from each rotor shaft.

15. Remove the 4 bearing retaining screws (10) and washers (12) from the air cylinder.

16. Position the blower assembly vertically with the drive end up. Support the gear end of the air cylinder on blocks to protect the ends of the rotor shafts.

17. Remove the locknuts (36) from both of the rotor shafts on the drive end using nut driver tool (EQ143816).

18. Remove the oil slinger (27) from its rotor shaft.

19. Remove the spacer (84) from each rotor shaft.

20. Remove the 6 socket head screws (21) and washers (20) that attach the bearing housing (24) to the air Cylinder (22).

22. Remove the bearing housing from the air cylinder using two 2-jaw pullers. The puller jaws must be narrow enough to fit in the rectangular holes in the bearing bosses. A shaft protector (soft spacer) must be placed over the end of each rotor shaft. Both pullers must be tightened evenly during this process. There are two dowel pins that locate the bearing housing relative to the air cylinder. If the bearing housing is tilted during removal these dowel pins may break out of their holes.

23. Remove the ball (14) and roller bearing (35) from their bores in the bearing housing using a ball peen hammer and punch. Exercise care not to damage the bearing bores.

24. Remove the two seal flingers (34) from their bores in the bearing housing.

25. Position the blower assembly horizontally.

26. Match mark the rotors by making small punch marks on the ends of meshing lobes.

27. Push the drive rotor (23) shaft through the air cylinder using a 2-jaw puller. The puller jaws must be narrow enough to fit in the rectangular holes in the bearing boss. A shaft protector (soft spacer) must be placed over the end of the rotor shaft. Remove the drive rotor from the air cylinder.

28. Push the idler rotor (23) shaft through the air cylinder using a 2-jaw puller. Remove the idler rotor from the air cylinder.

29. Remove the 2 seal flingers (34) from their bores in the air cylinder.

30. Remove the 2 ball bearings (14) for HF406 or spherical bearings (58) for HF408 from their bores in the air cylinder using a ball peen hammer and punch. Exercise care not to damage the bearing bores. Mark the location and size of each shim (13) behind the bearings.

31. Inspect the 3 piston rings (15) on both ends of both rotors for signs of damage and abnormal wear. Remove the piston rings from each of the 4 ring carriers (33).

32. Inspect the ring carriers for signs of damage and abnormal wear. Normally it is not required to replace the ring carriers.

33. If a ring carrier is damaged it may be removed by heating with a torch. The rotor should be placed in a vertical position and continuously rotated while the ring carrier is being heated. Caution should be used when performing this procedure as the rotor can be damaged by uneven and extreme heating.

34. Inspect the inserts (32) in the 4 bearing bosses (2 in bearing housing and 2 in air cylinder) for signs of damage and abnormal wear. Normally it is not required to replace the inserts.

35. If an insert is damaged it may be removed by using a hydraulic press and suitable driver tool. It must be removed from the air side of the bearing housing or air cylinder.

SECTION 7
GEAR DISASSEMBLY

- Remove screw, washer, and slinger.
- Install gear puller as shown.
- Use a driver in between lead screw and shaft face.
- Use ratchet to tighten stud pressing against shaft.
  (DO NOT USE IMPACT WRENCH).
- Repeat for other gear.

Note: Hydraulic press can be used in replace of lead screw. 15 Ton cylinder is recommended.

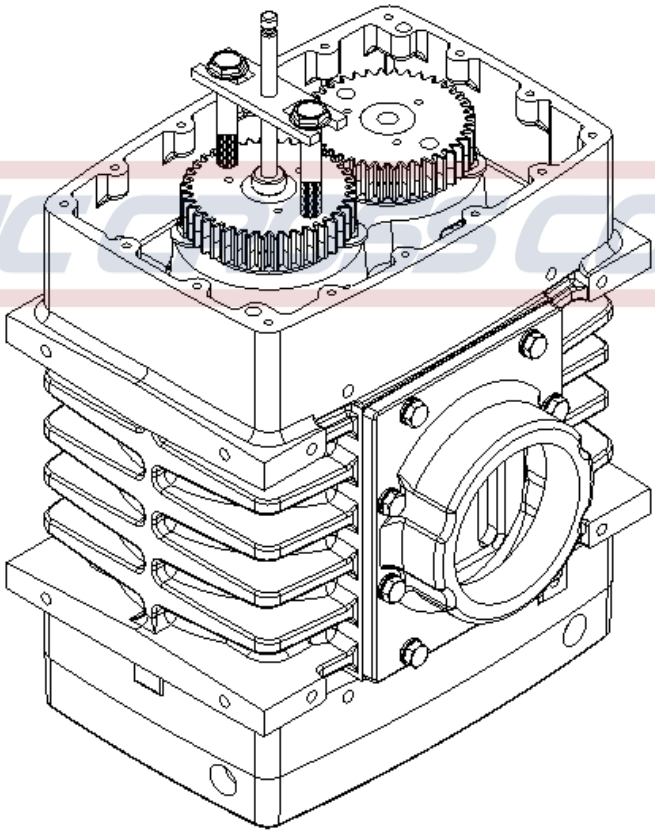


FIGURE 7-1 – GEAR DISASSEMBLY

SECTION 8
ASSEMBLY INSTRUCTIONS

1. Apply a light coating of Loctite 620 to the outside diameter of 2 inserts (32). The wide face of the inserts must face the air side of the bearing housing (24). Position the holes in the inserts so that they are located at the 3, 6, 9, and 12 o'clock positions in the bearing housing bore. Support the bearing housing under the bearing bosses. Use a hydraulic press and insert driver tool (EQ143805) to install the inserts into the bearing housing from the air side. After they are installed ensure that the inserts are slightly below or flush with the air surface of the bearing housing.
2. Install 2 inserts into the air cylinder (22) from the air side using the same procedure and tooling as in step 1. Note the air cylinder must be supported by the bearing bosses during this procedure.
3. Apply Loctite 620 to both ends of the drive (long) rotor (23) shaft (on the largest diameter next to the rotor body). Support the rotor in a vertical position.
4. Heat 2 piston ring carriers (33) to 275 degrees F. After heating use a gauss meter to check the ring carriers for magnetism. The magnetic flux density must be less than one gauss. The carriers must be orientated so that their stepped face does not contact the rotor body. Drive the piston ring carriers up against the face of the rotor body at both locations using the Carrier driver tool (EQ143806). After the ring carriers have cooled ensure that they are still tight against the face of the rotor body.
5. Repeat steps 3 and 4 for the idler (short) rotor (23).

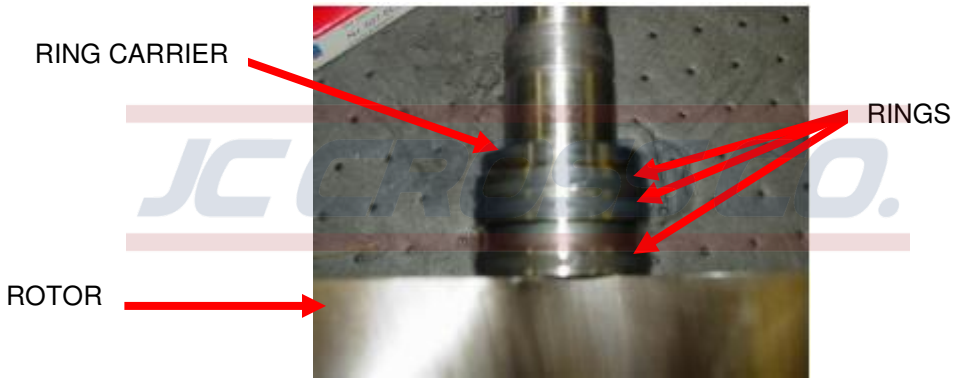


FIGURE 8-1 – INSTALL PISTON RINGS

6. Install the piston rings (15) into the 4 piston ring carriers starting with the ring closest to the rotor body. Ensure that the ring ends are hooked together properly. Offset the gaps in the rings 180 degrees. See Figure 8-1.
7. Position the air cylinder vertically with the gear end on the bottom. Determine the location of the blower discharge port. The discharge port has two feedback slots adjacent to the triangular opening. Refer to the arrows cast into the air cylinder to determine the air flow direction. From the blower model designation determine drive shaft (long rotor) location and the direction it rotates.
8. Apply oil to the inside diameter of the 2 inserts in the gear end of the air cylinder and to the outside diameter of the piston rings on the gear end of both rotors. Place a ring guide tool (EQ143805) on the gear end of both rotor shafts.
9. Install both rotors into the air cylinder. Verify that the long end of the drive rotor is pointing up and that the drive rotor is in the correct bore. Ensure that the rotation of each rotor matches the arrows on the outside of the air cylinder. Ensure that the rotor lobes match the triangular shape of the discharge port. Remove the ring guide tool from each rotor shaft. For proper slinger alignment, the keyways in the shafts must be oriented 90° from each other. Remove the ring guide tool from each rotor shaft.

10. Measure and record the total rotor to bearing housing end clearance for each rotor. This is accomplished by using a depth micrometer to measure the distance from the top edge of the air cylinder to the top of the rotor lobe while the rotor is held as vertically as possible.

11. Apply oil to the inside diameter of the 2 inserts in the bearing housing and to the outside diameter of the piston rings on the drive end of both rotors. Place a ring guide tool (EQ143805) on the drive end of both rotor shafts.

12. Apply Loctite Gasket Eliminator 515 to the sealing surface of the air cylinder. Use a roller to spread the gasket eliminator to an even coat.

13. Install 2 dowel pins (19) into the drive end of the air cylinder.

14. Install the bearing housing over the shafts of the rotors and onto the air cylinder. There is only one orientation of the bearing housing which will allow the dowel pins to line up with their mating holes. Remove the ring guide tool from each rotor shaft.

15. Attach the bearing housing to the air cylinder using 6 socket head screws (21) and washers (20). The screws should have a nylok insert. Tighten the screws in an alternating pattern starting with the middle ones. Torque the screws to 38 ft-lb in 2 steps.

16. Heat 2 seal flingers (34) to 275 degrees F. After heating use a gauss meter to check the flingers for magnetism. The magnetic flux density must be less than one gauss. Use the flinger drive tool (EQ143806) to drive them into position on the ends of the piston ring carriers of the drive end of both rotors. Be careful not to damage the threads on the rotor shafts. Ensure each flinger is seated against the shoulder on the ring carrier and that it is recessed below the end of the ring carrier.

17. Position the air cylinder vertically with the gear end on the top. Support the cylinder so that the rotor shafts may extend through the bearing bores.

18. Heat 2 seal flingers (34) to 275 degrees F. After heating use a gauss meter to check the flingers for magnetism. The magnetic flux density must be less than one gauss. Use the flinger drive tool (EQ143806) to drive them into position on the ends of the piston ring carriers of the gear end of both rotors. Ensure each flinger is seated against the shoulder on the ring carrier and that it is recessed below the end of the ring carrier.

FIGURE 8-2 – MEASURE STEP IN FALSE BEARING

19. Put the false bearing (EQ144008) into the bearing bore for the idler (short) shaft. Screw an eye bolt into the end of the idler rotor and lift the rotor until the ends of the rotor lobes contact the end surface of the air cylinder. Using a depth micrometer measure and record the distance from the top surface of the outer ring of the false bearing to the top surface of the inner ring. The inner ring of the false bearing should be above the outer ring. See FIGURE 8-2.

20. The number measured in step 19 should be .004 - .005“. If it is less than this then shims equal to the difference must be installed on the shaft of that rotor.

21. Lower the rotor and remove the eye bolt. Remove the false bearing. Install the required amount of shims (13) as determined in step 20 onto the idler rotor shaft.

22. Repeat steps 19 through 21 for the drive (long) rotor.

23. Apply oil to the drive and idler rotor bearing bores in the air cylinder.

FIGURE 8-3 – PRESS BEARING ONTO ROTOR SHAFT

24. Place the air cylinder vertically in a hydraulic press with the gear end on top. The bottom of the idler rotor shaft must be in contact with the bed of the press. The bottom of the drive rotor shaft must not be in contact with the bed of the press. The blower air cylinder must be cradled on its sides but must not be restrained in the vertical direction. Place ball bearings (14) for HF406 or spherical bearings (58) for HF408 over the rotor shaft with the numbers on the bearing facing up. Press the bearing onto the idler rotor shaft using the hydraulic press and the bearing driver tool (EQ143807-1). See FIGURE 8-3.

25. Repeat step 24 for the drive rotor bearing. In this step the bottom of the drive rotor shaft must be in contact with the bed of the press and the bottom of idler shaft must not be in contact with the bed of the press.

FIGURE 8-4 – INSTALL BEARING RETAINING SCREWS

26. Install the 4 bearing retaining screws (10) and washers (12) into the gear end of the air cylinder. The screws should have a Loctite patch. Tighten the screws to 38 ft-lb. See FIGURE 8-4.

27. Position the air cylinder vertically with the drive end on the top.

28. Apply oil to the drive and idler rotor bearing bores in the bearing housing.

29. Place the air cylinder vertically in a hydraulic press with the drive end on top. The bottom of the idler rotor shaft must be in contact with the bed of the press. The bottom of the drive rotor shaft must not be in contact with the bed of the press. The blower air cylinder must be cradled on its sides but must not be restrained in the vertical direction. Place a ball bearing (14) over the rotor shaft with the numbers on the bearing facing up. Press the bearing onto the idler rotor shaft using the hydraulic press and the bearing driver tool.

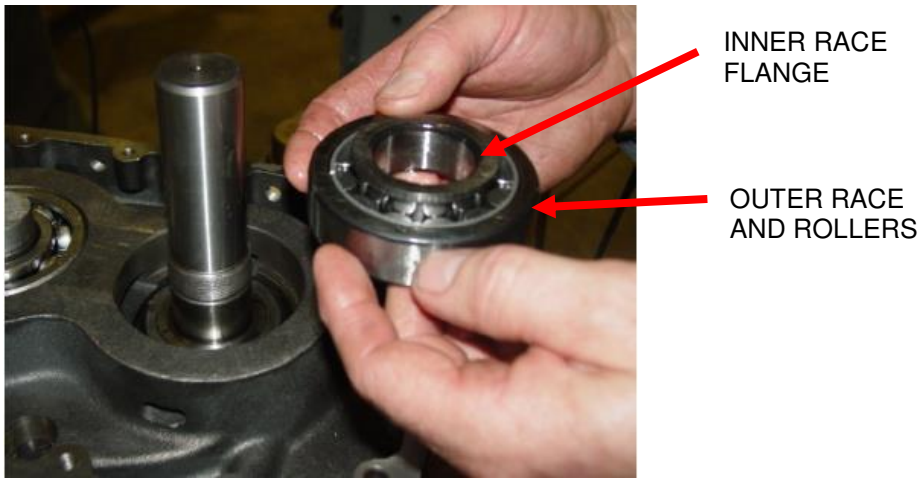


FIGURE 8-5 – INSTALL ROLLER BEARING

30. Repeat step 29 for the drive rotor bearing with the exception that this bearing is a roller bearing (35). One side of the inner race of this bearing has a flange and one side does not have a flange. The bearing should be installed so that the end of the inner race that does not have a flange is in contact with the ring carrier. In this step the bottom of the drive rotor shaft must be in contact with the bed of the press and the bottom of idler shaft must not be in contact with the bed of the press. The inner race and outer race (and rollers) must be engaged with each other while the bearing is being pressed onto the rotor shaft. See Figure 8-5.

31. Position the air cylinder vertically on a work table with the drive end on the top. Support the cylinder so that the rotor shafts are free to move in the vertical direction.

32. Measure the fixed end (gear end) axial clearance for both rotors. This can be accomplished by inserting feeler gauges between the end of the rotor lobe and the inner surface of the bearing housing. This clearance should be measured and recorded for all 3 lobes on both rotors. These measurement should fall between (0.002"-0.004") for HF408 or (0.002"-0.004") for HF406. Do not proceed with the assembly if these measurements are not equal to or greater than the minimum specified.

33. Position the air cylinder vertically with the gear end on the top. Support the cylinder so that the rotor shafts are free to move in the vertical direction.

34. Repeat step 32 (with gear end on the top) to measure the floating end (drive end) axial clearance.

35. With the gear end on top measure and record the gear end axial clearance for all 3 lobes on both rotors. Note there are no specifications on the clearance drawing for this measurement. This measurement will be used to determine the axial movement of the bearings.

36. Position the air cylinder horizontal.

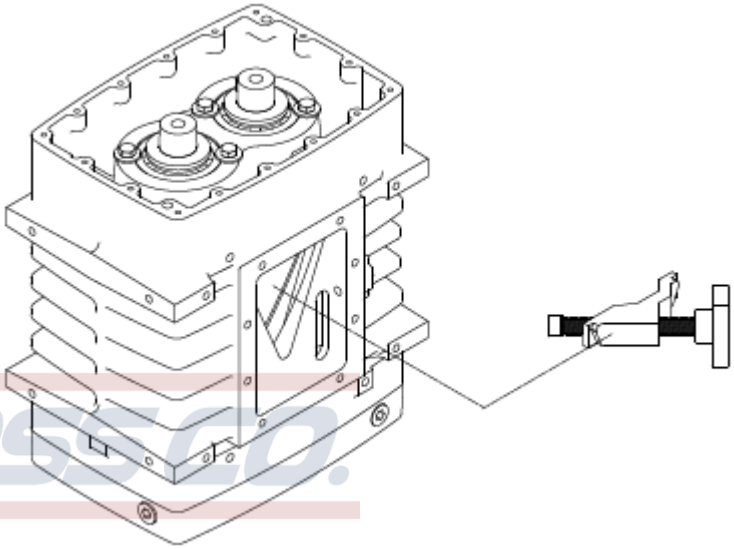
37. Using feeler gauges measure the clearance between the rotor tips and the air cylinder. This measurement should be taken for the drive and the idler rotor. The first measurement (for both rotors) should be taken on the inlet side of the air cylinder (by going through the inlet port). The second measurement (for both rotors) should be taken on the discharge side of the air cylinder (by going through the discharge port). The clearance should be measured along the entire length of the lobe and for all 3 lobes on both rotors. Record these clearances and verify that they are within the range specified on the clearance drawing.

38. Place 2 spacers (55) on both shafts.

39. Setting interlobe clearance

- Using the table below, assemble rotor locking device with proper feeler gauge.

HF406 & HF408	0.012”



JC CROSSCO.

FIGURE 8-6 – INTERLOBE TIMING

- Position rotor locking device in inlet port while positioning feeler gauge in between the rotors as shown.
- Tighten adjusting knob until locked firmly against impeller body.

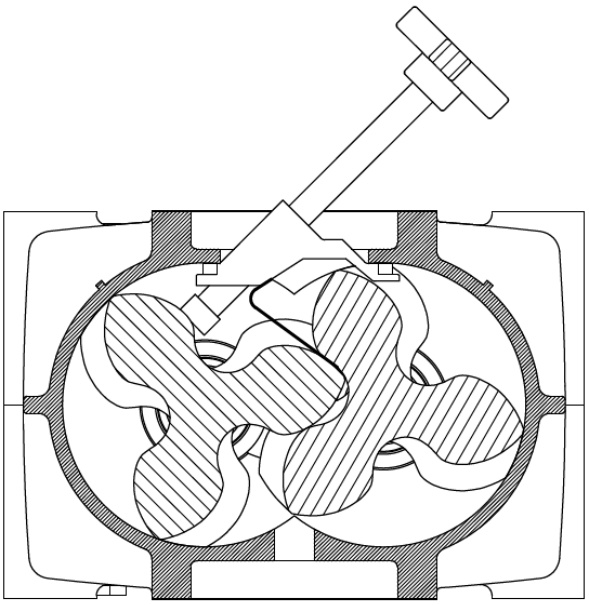


FIGURE 8-7 – ROTOR LOCK ASSEMBLY

40. Gear Installation (idler gear)

- Place a gear (9) on idler shaft and install pull rod (D) on shaft.
- Position driver (E) over pull rod so top of driver is even with lower groove.
- Release driver allowing it to freely drop on the gear, seating gear on shaft.
- Remove driver.
- Using a depth micrometer, measure dimension A ensuring minimum is achieved.

HF406 & 408	0.070” min

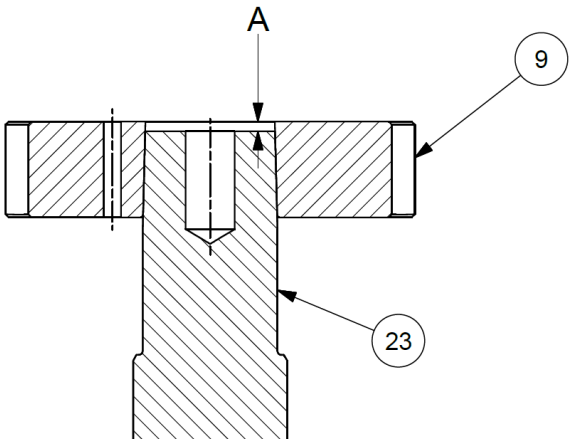


FIGURE 8-8 – AXIAL ENGAGEMENT

- Place driver (E), hydraulic ram (C) over pull rod (D).
- Install retaining c-washer (F) in upper groove and slide safety cap (G) over shaft and washer to secure.
- Apply hydraulic pressure to ram to press gear into place.
- NOTE – Driver (E) is designed to not travel beyond shoulder on shaft, allowing gear face to be flush with shoulder.
- Repeat steps for the drive gear.

Note: If gear face is not flush with shaft face, increase the pressure of the ram.

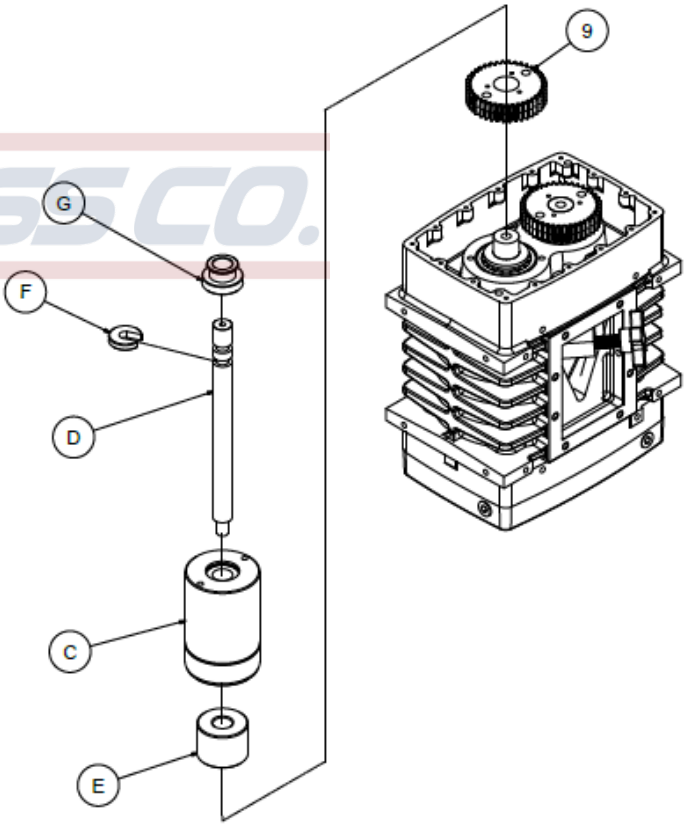


FIGURE 8-9 – GEAR PRESS

JC CROSS CO.

41. Apply Loctite 243 to 6 set screws (57) {M6 x 12mm}. Install 3 of these screws into each of the 2 gears. The purpose of these set screws is to keep pressure on the spacer that is between the gear and bearing inner race. Tighten the screws to 25 in-lb. of torque. See FIGURE 8-6

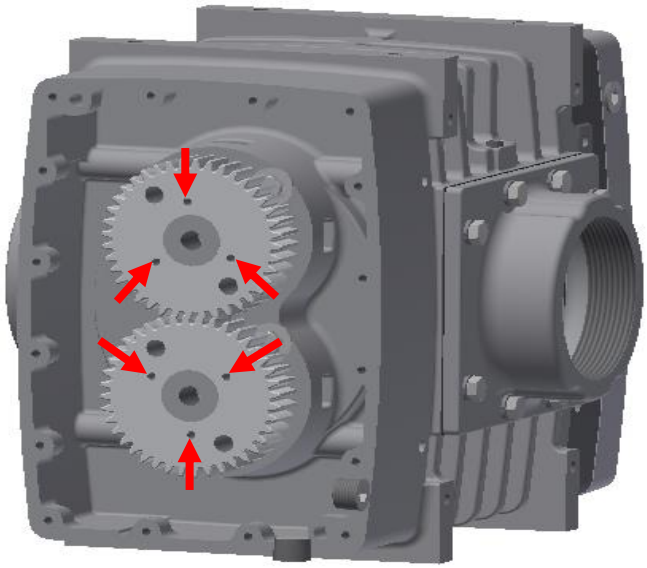


FIGURE 8-10– TIGHTEN SET SCREWS

42. Lock the idler rotor from turning by wedging a shop rag between the tip of a lobe and the air cylinder. Measure the backlash of the gears using a dial indicator and a magnetic base. Gear backlash is the distance (in the circumferential direction) a gear tooth can freely move when the mating gear is fixed. This should be measured in 3 places (every 1/3 turn) and recorded. Verify that the backlash is within the range specified on the clearance drawing. See FIGURE 8--7

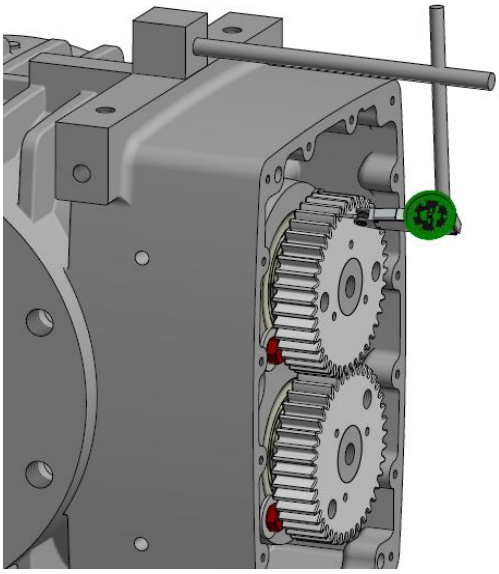


FIGURE 8-11 – MEASURE GEAR BACKLASH

42. Measure the runout of the teeth on both gears using a dial indicator and a magnetic base. Verify that the runout is within the range specified on the clearance drawing.

43. Use a feeler gauge to verify that there is at least .010“ clearance between the heads of the 4 bearing retaining bolts (10) and the inside surface of the gears.

44. Attach an oil slingers (26) with bolts (8) and washers (6) to the gear end of the appropriate rotor shaft. Tighten the bolt to 91 ft.-lbs. Apply Loctite 262 to each bolt.

45. Install a spacer (84) onto both rotor shafts on the drive end.

46. Install an oil slinger (27) onto both rotors on the drive end.

47 Apply Loctite 262 to 2 bearing locknuts (36). Install the locknuts onto both of the drive end rotor shafts using nut driver tool (EQ143816). Tighten the locknuts to 70 ft-lb.

48. Check that the oil seal bore in the drive end sump cover (29) is clean, dry, and free of nicks or burrs. Lay the cover flat with the external surface facing up. Support the area under the seal bore with a block of wood. Determine the proper orientation of the seal (31). The seal has two lips. The outer lip is shorter and when installed should point toward the keyway end of the drive rotor shaft. The inner lip is longer and should point toward the oil inside of the sump.

49. Drive the oil seal into the sump cover from the external surface using the seal driver tool (EQ143956) and a press or small hammer. After installation the seal case should be flush with the external surface of the sump cover. Apply oil to both of the seal lips.

50. Apply Loctite Gasket Eliminator 515 to the flange surface of the drive end sump cover.

51. Slide the seal protection sleeve (EQ143096-13) over the drive shaft. Apply oil to the outside surface of the sleeve. Gently slide the drive end sump cover over the drive shaft.

52. Attach the cover to the bearing housing using 16 screws (5). Tighten the screws to 96 in-lbs.

53. Remove the protective sleeve from the drive shaft.

54. Apply Loctite Gasket Eliminator 515 to the flange surface of the gear end sump cover (3).

55. Attach the cover to the gear end of the air cylinder using 16 screws (5). Tighten the screws to 96 in-lbs.

56. Install plugs (47) in the 2 instrument holes in the air cylinder near the inlet and discharge port.

57. Determine the appropriate hole in each sump cover for the oil level gauge (40). The oil level will be in the lower part of the oil sump. Apply Loctite 243 to the threads of each gauge. Install one oil level gauge in each sump.

58. Install plugs (2) in the remaining holes in each sump cover. If breathers are used make sure to install it in the top side of the sump cover.

59. Measure the runout of the end of the drive shaft using a dial indicator and a magnetic base. Verify that the runout is within the range specified on the clearance drawing.

60. Check the keyway on the end of the drive rotor for burrs. Install the drive shaft key (25) into the drive shaft. Ensure that it is a snug fit. Tape the key to the shaft so that it does not get lost.

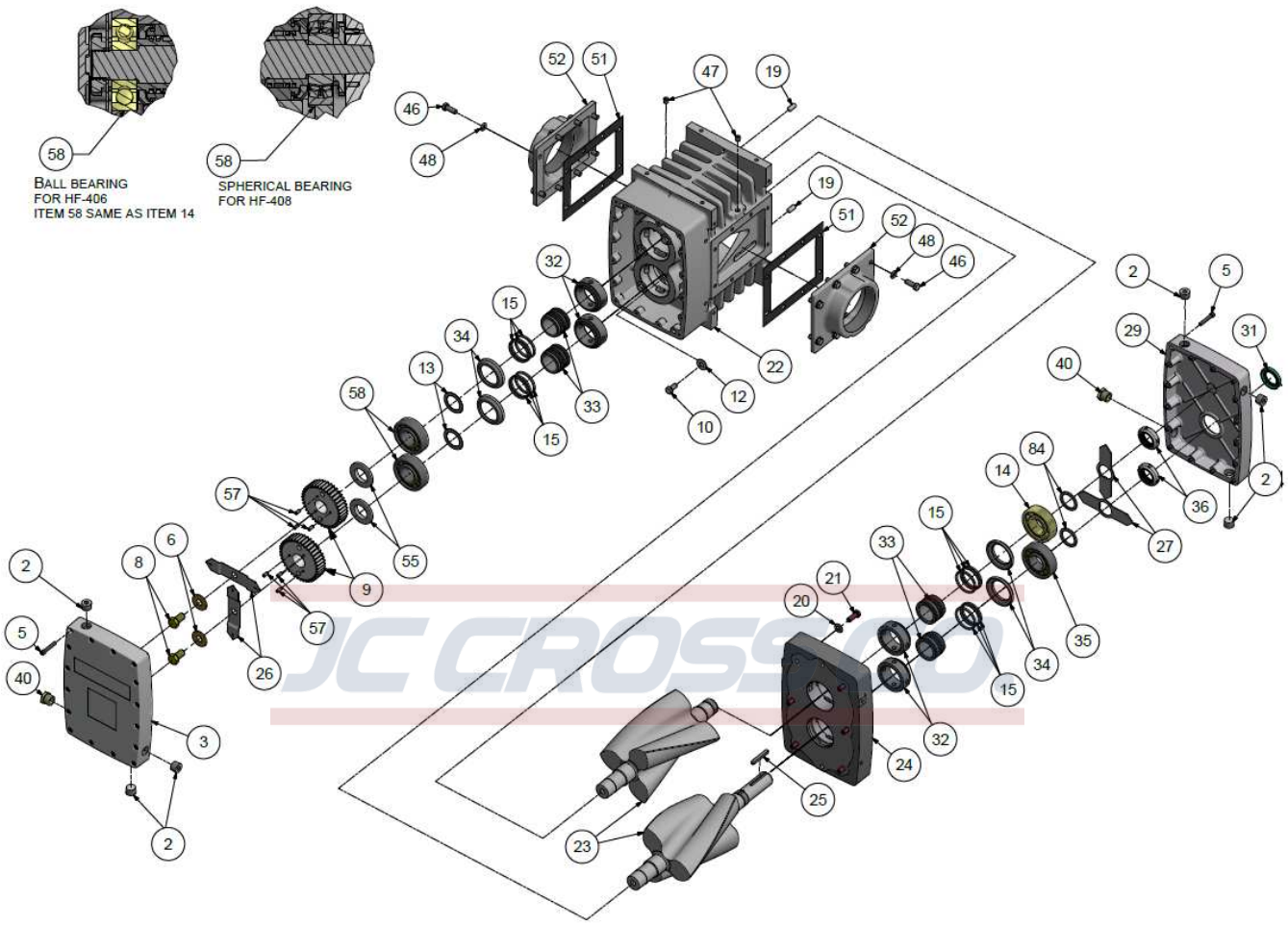
61. Attach a port connector (52) to the inlet and discharge ports. Install a gasket (51) between the connector and the air cylinder. Use the required number of screws (46) and lock washers (48). The screws (1/2 – 13 UNC) for the HF406 blower should be torqued to 75 ft.-lbs. The screws (3/8 – 16 UNC) for the HF408 blower should be torqued to 30 ft.-lbs.

JC CROSS CO.

THIS PAGE INTENTIONALLY LEFT BLANK

JC CROSS CO.

SECTION 9
PARTS LIST



307HYC810-00
(Ref. Drawing)

JC CROSS

Order by Part Number and Description. Reference Numbers are for your convenience only.

Ref. No.	Description	No. Req'd	MODEL 408 HYCL_CA	406 HYCM_CA
2	PLUG	14	64AC4	64AC4
3	COVER-GEAR, 4"	1	304GYC602	304GYC602
5	SCREW	32	75P25	75P25
6	WASHER, FLAT	2	95A6Z	95A6Z
7	GASKET-ELIM	1	25BC256	25BC256
8	SCREW	2	75D100Z	75D100Z
9	GEAR KIT,HELIFLOW,406,408	1	301HYC6008	301HYC6008
10	SCREW	4	655ED03P	655ED03P
12	WASHER-PLAIN	4	A93139190	A93139190
13	SHIM-SET	1	300GYC732	300GYC732
14	BEARING-BALL	1	12BA247	----------
14	BEARING-BALL	3	----------	12BA247
15	RING-PISTON,PLAIN COMPRESSION-HOOK JOINT	12	DF139986	DF139986
19	PIN-DOWEL	2	62M48	62M48
20	WASHER-PLAIN	6	95W48	95W48
21	SCREW	6	655ED04N	655ED04N
22	CYLINDER-AIR HF408	1	304HYC002	305HYC002
23	GRP-ROTOR CW DRIVE ROTATION	1	315HYC4028	314HYC4028
23	GRP-ROTOR CCW DRIVE ROTATION	1	316HYC4028	317HYC4028
24	HOUSING-BRG, HELIFLOW 4"	1	302HYC006	302HYC006
25	KEY-SQUARE .250 X 2.00 LG	1	900639910305	900639910305
26	SLINGER,	2	306HYC173	306HYC173
27	SLINGER,	2	304HYC173	304HYC173
29	COVER-DRIVE 4" TRIFLOW	1	303GYC477	303GYC477
31	SEAL-OIL	1	60DD811	60DD811
32	INSERT, PISTON RING STATOR, 4" TRIFLOW	4	300GYC248	300GYC248
33	CARRIER, PISTON RING 4" TRIFLOW	4	300GYC1148	300GYC1148
34	SLINGER, 4" TRIFLOW	4	302GYC173	302GYC173
35	BEARING-ROLLER	1	12BA215	12BA215
36	LOCKNUT-BRG	2	50Z7	50Z7
40	GAUGE-OIL LEVEL 1/2" NPT GLASS SIGHT	2	40P31	40P31
45	PAINT,BULK,GDP188,ALUMINM-GLOSS	0	28H485	28H485
46	SCREW	16	655ED040	----------
46	SCREW	8	----------	655ED070
47	PLUG	2	64AC1	64AC1
48	WASHER-LOCK	16	95B3	----------
48	WASHER-LOCK	8	----------	95B5
51	GASKET	2	DF135718	301HYC715
52	CONNECTOR	2	DF137356	301HYC1170
*53	PLUG,CAPLUG	2	8503065	8503064
55	SPACER,GEAR END	2	304HYC144	304HYC144
57	SCREW-SET	6	VP1004579	VP1004579
58	BEARING, SPHERICAL ROLLER	2	900811060801	----------
84	SPACER, DRIVE END DRIVEN	2	300GYC144	300GYC144
*101	GRP-BASIC PARTS,	1	323HYC4000	317HYC4000
*103	LUBRICANT,AEON PD,BULK	0	28G38	28G38
*105	KIT-OVERHAUL, HELIFLOW	1	306HYC6010	305HYC6010
*900	GRP-IDENT & INSTR - HELIFLOW CW ROT	1	300HYC4011	300HYC4011

* NOT SHOWN

JC CROSS CO.

GENERAL PROVISIONS AND LIMITATIONS

Gardner Denver, Inc. (the "Company") warrants to each original retail purchaser ("Purchaser") of its products from the Company or its authorized distributor that such products are, at the time of delivery to the Purchaser, made with good material and workmanship. No warranty is made with respect to:

1. Any product which has been repaired or altered in such a way, in the Company's judgment, as to affect the product adversely.
2. Any product which has, in the Company's judgment, been subject to negligence, accident, improper storage, or improper installation or application.
3. Any product which has not been operated or maintained in accordance with the recommendations of the Company.
4. Components or accessories manufactured, warranted and serviced by others.
5. Any reconditioned or prior owned product.

Claims for items described in (4) above should be submitted directly to the manufacturer.

WARRANTY PERIOD

The Company's obligation under this warranty is limited to repairing or, at its option, replacing, during normal business hours at an authorized service facility of the Company, any part which in its judgment proved not to be as warranted within the applicable Warranty Period as follows.

BARE BLOWERS

Basic bare blowers, consisting of all parts within, are warranted for 24 months from date of initial use or 30 months from date of shipment to the first purchaser, whichever occurs first. Any disassembly or partial disassembly of the blower, or failure to return the "unopened" blower per Company instructions, will be cause for denial of warranty.

LABOR TRANSPORTATION AND INSPECTION

The Company will provide labor, by Company representative or authorized service personnel, for repair or replacement of any product or part thereof which in the Company's judgment is proved not to be as warranted. Labor shall be limited to the amount specified in the Company's labor rate schedule.

Labor costs in excess of the Company rate schedules caused by, but not limited to, location or inaccessibility of equipment, or labor provided by unauthorized service personnel is not provided for by this warranty.

Transportation of Company's choice, within the continental United States, is covered by this warranty for replacement of any blower which in the Company's judgment proved not to be as warranted. For user locations outside the continental United States, the Company will provide transportation, by the carrier of its choice, to and from the nearest Authorized Distributor and the Company's designated facility. The Company may require the return of any blower or part claimed not to be as warranted to one of its facilities as designated by the Company, transportation prepaid by Purchaser, to establish a claim under this warranty.

Replacement parts provided under the terms of the warranty are warranted for the remainder of the Warranty Period of the product upon which installed to the same extent as if such parts were original components thereof.

DISCLAIMER

THE FOREGOING WARRANTY IS EXCLUSIVE AND IT IS EXPRESSLY AGREED THAT, EXCEPT AS TO TITLE, THE COMPANY MAKES NO OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

THE REMEDY PROVIDED UNDER THIS WARRANTY SHALL BE THE SOLE, EXCLUSIVE AND ONLY REMEDY AVAILABLE TO THE PURCHASER AND IN NO CASE SHALL THE COMPANY BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES. UNDER NO CIRCUMSTANCES SHALL THE COMPANY BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOSSES OR DELAYS HOWSOEVER CAUSED.

No statement, representation, agreement, or understanding, oral or written, made by any agent, distributor, representative, or employee of the Company which is not contained in this Warranty will be binding upon the Company unless made in writing and executed by an officer of the Company.

This warranty shall not be effective as to any claim which is not presented within 30 days after the date upon which the product is claimed not to have been as warranted. Any action for breach of this warranty must be commenced within one year after the date upon which the cause of action occurred.

Any adjustment made pursuant to this warranty shall not be construed as an admission by the Company that any product was not as warranted.

COPYRIGHT© 2019 Gardner Denver, Inc..

NOTES:

JC CROSS CO.

NOTES:

JC CROSS CO.

NOTES:

JC CROSS CO.

HΦ–7–605çEP00

JC CROSS CO.

Gardner Denver®

For additional information, contact your local representative or visit:
www.contactgd.com/blowers

©2019 Gardner Denver, Inc. Printed in U.S.A.

ENERGY STAR PARTNER

CERTIFIED QUALITY MANAGEMENT SYSTEM ISO 9001:2008 ANAB DNV

MEMBER OF CAGI Compressed Air & Gas Institute

Please recycle after use.