



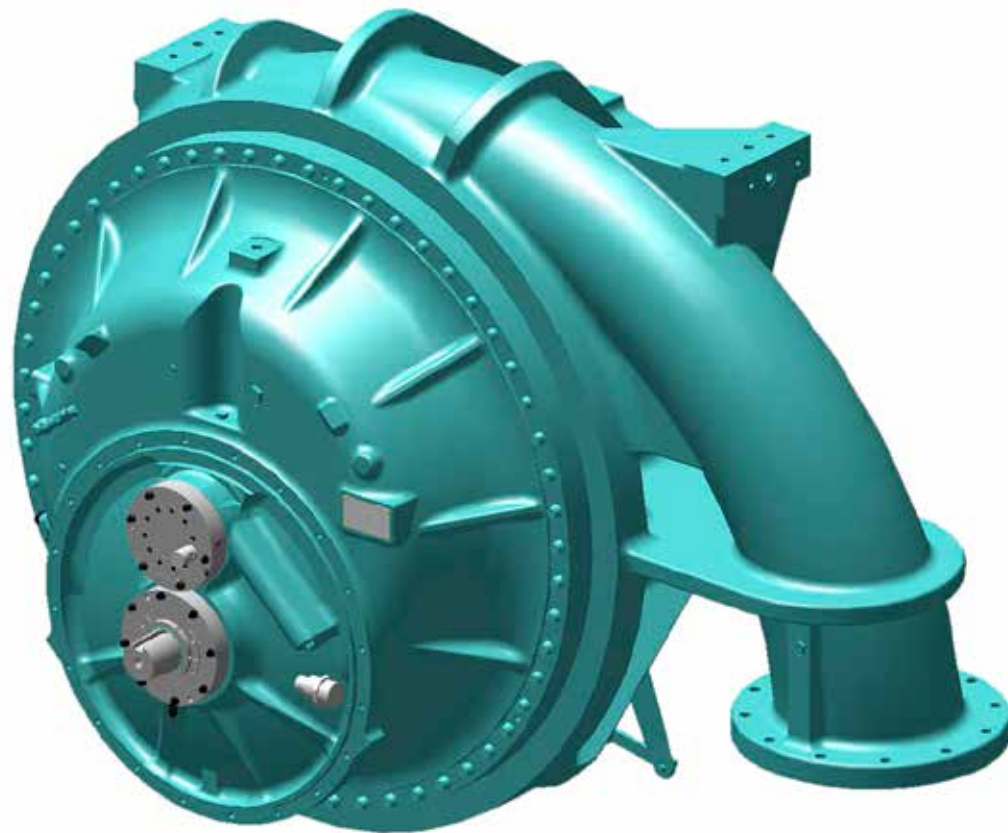
## CENTRIFUGAL COMPRESSORS

SERVICE MANUAL

Supersedes: 160.75-M1 (418)

Form 160.75-M1 (718)

### K COMPRESSOR USED WITH YORK CENTRIFUGAL LIQUID CHILLER



LD17141

Issue Date:  
July 20, 2018



# IMPORTANT!

## READ BEFORE PROCEEDING!

### GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During rigging, installation, operation, maintenance, or service, individuals may be exposed to certain components or conditions including, but not limited to: heavy objects, refrigerants, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of rigging, installation, and operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in

which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized rigging, installation, and operating/service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood the on-product labels, this document and any referenced materials. This individual shall also be familiar with and comply with all applicable industry and governmental standards and regulations pertaining to the task in question.

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## SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to specific situations:



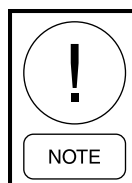
*Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.*



*Identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution if proper care is not taken or instructions and are not followed.*



*Indicates a potentially hazardous situation which will result in possible injuries or damage to equipment if proper care is not taken.*



*Highlights additional information useful to the technician in completing the work being performed properly.*



*External wiring, unless specified as an optional connection in the manufacturer's product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with Johnson Controls' published specifications and must be performed only by a qualified electrician. Johnson Controls will NOT be responsible for damage/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this warning will void the manufacturer's warranty and cause serious damage to property or personal injury.*

## CHANGEABILITY OF THIS DOCUMENT

In complying with Johnson Controls' policy for continuous product improvement, the information contained in this document is subject to change without notice. Johnson Controls makes no commitment to update or provide current information automatically to the manual or product owner. Updated manuals, if applicable, can be obtained by contacting the nearest Johnson Controls Service office or accessing the Johnson Controls QuickLIT website at <http://cgproducts.johnsoncontrols.com>.

It is the responsibility of rigging, lifting, and operating/service personnel to verify the applicability of these documents to the equipment. If there is any question

regarding the applicability of these documents, rigging, lifting, and operating/service personnel should verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the chiller.

### CHANGE BARS

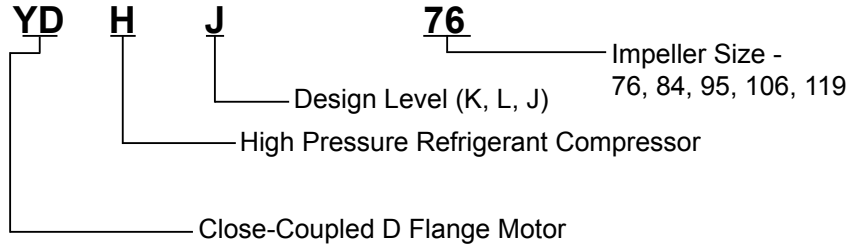
Revisions made to this document are indicated with a line along the left or right hand column in the area the revision was made. These revisions are to technical information and any other changes in spelling, grammar or formatting are not included.

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## ASSOCIATED LITERATURE

MANUAL DESCRIPTION	FORM NUMBER
K Compressor Replacement Parts	160.75-RP2
All Products - Replacement Parts Electrical Connectors	50.20-RP1
All Products - Replacement Parts Fittings	50.20-RP2

## NOMENCLATURE



## MISCELLANEOUS & ACCESSORIES

<b>COMPOUNDS AND ABRASIVES</b>	
Crocus Cloth	041-02729-000
Garnet Paper 180 grit	041-10057-000
Molykote (2 Oz. Can)	364-21508-000
Removable Thread Sealer	013-01678-000
Permanent Thread Locker	013-01671-000
Refrigerant Pipe Sealer	013-02894-000
Primer for Thread Sealers	013-01753-000
Magic Bond Epoxy Stick	044-03420-000
P.O.E. Grease	044-03199-000
Caribbean Blue Enamel	013-01835-000
Gasket Eliminator Sealer	013-02827-000
Valve Stem Lube (2 Oz. Can)	360-00125-000
Lubricant, Nolybdenum	011-00253-000

<b>COMPRESSOR TOOL KITS</b>			
<b>COMPRESSOR CODE</b>	<b>COMPRESSOR MODEL</b>	<b>COMPRESSOR PART NUMBER</b>	<b>TOOL KIT NUMBER</b>
<b>K1</b>	YDHK-76VDD	364-53357-201	364-51844-000
<b>K2</b>	YDHK-84VDD	364-53362-201	364-51728-000
<b>K3</b>	YDHL-95VDD	364-53348-201	364-51835-000
<b>K4</b>	YDHL-106VDD	364-53349-201	364-51835-000
<b>K7</b>	YDHJ-119VDD	364-53350-201	364-51665-000

<b>YORK "K" OIL</b>			
<b>COMPRESSOR CODE</b>	<b>5 GAL CAN 011-00533-000</b>	<b>1 GAL CAN 011-01202-000</b>	<b>TOTAL OIL REQUIRED</b>
<b>K1-K4</b>	4	-	20 Gallons
<b>K7</b>	4	4	24 Gallons

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## SECTION 1 - GENERAL

### GENERAL DESCRIPTION

These compressors are applied to YORK Model YK, YST, CYK and YD Centrifugal Liquid Chillers.

The compressor is a single-stage centrifugal powered by an open-drive steam turbine, gas engine or electric driven. The casing is fully accessible with vertical circular joints and fabricated of close-grain cast iron. The complete operating assembly is removable from the compressor scroll housing. Compressor casting are designed for 300 PSIG working pressure and hydrostatically pressure tested at 900 PSIG.

The rotor assembly consists of a heat-treated alloy steel drive shaft with a lightweight, high strength, cast aluminum, fully shrouded impeller. The impeller is designed for balanced thrust and is dynamically balanced and overspeed tested for smooth, vibration-free operation.

The insert type journal bearings are fabricated of aluminum alloy and are precision bored and axially grooved. Thrust bearings are of the deflection-pad type design. The specially engineered, single helical gears with crowned teeth are designed so that more than one tooth is in contact at all times to provide even distribution of compressor load and quiet operation. Gears

are integrally assembled in the compressor rotor support and are film lubricated. Each shaft is individually mounted in its own journal and thrust bearings.

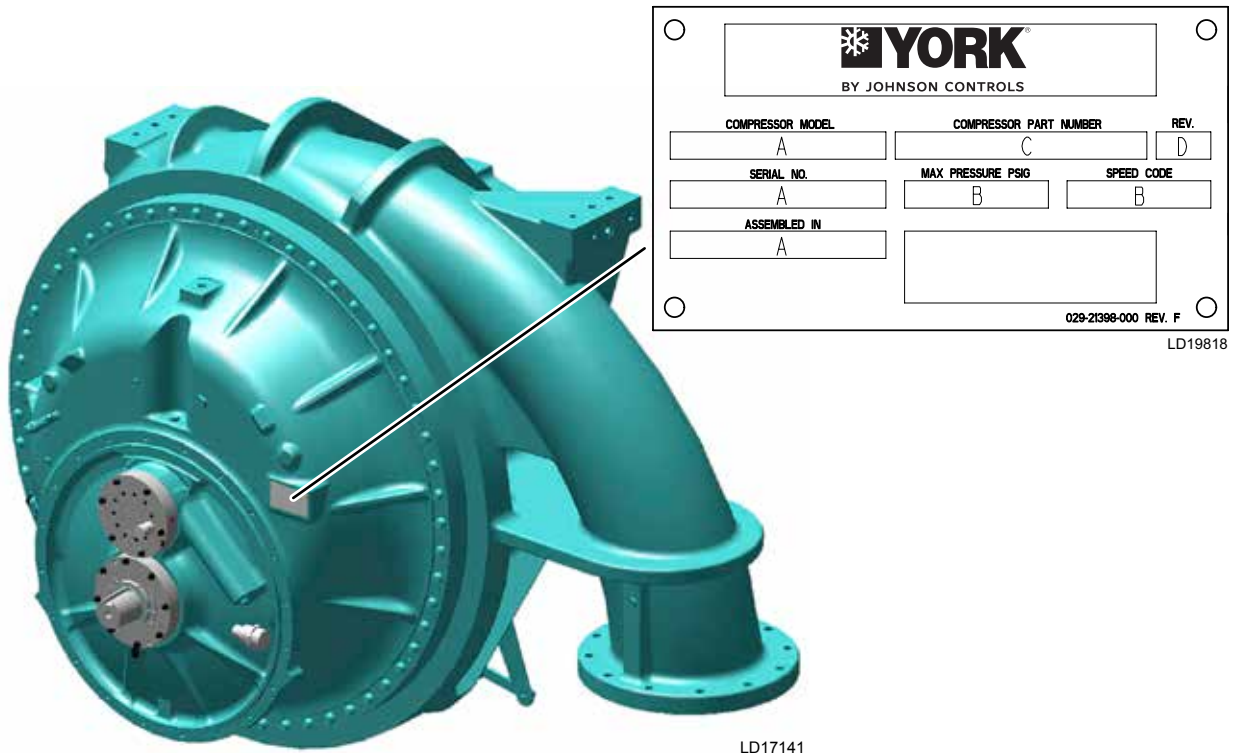
The open-drive compressor shaft seal consists of a spring-loaded bellows seal, high-temperature elastomer O-ring static seal, and a stress-relieved, precision lapped collar. The seal features a small face area and low rubbing speed. It provides an efficient seal under high pressure conditions. The seal is oil-flooded at all times and is pressure-lubricated during compressor operation.

Compressors are available in various impeller sizes (see *Figure 1 on page 11*).

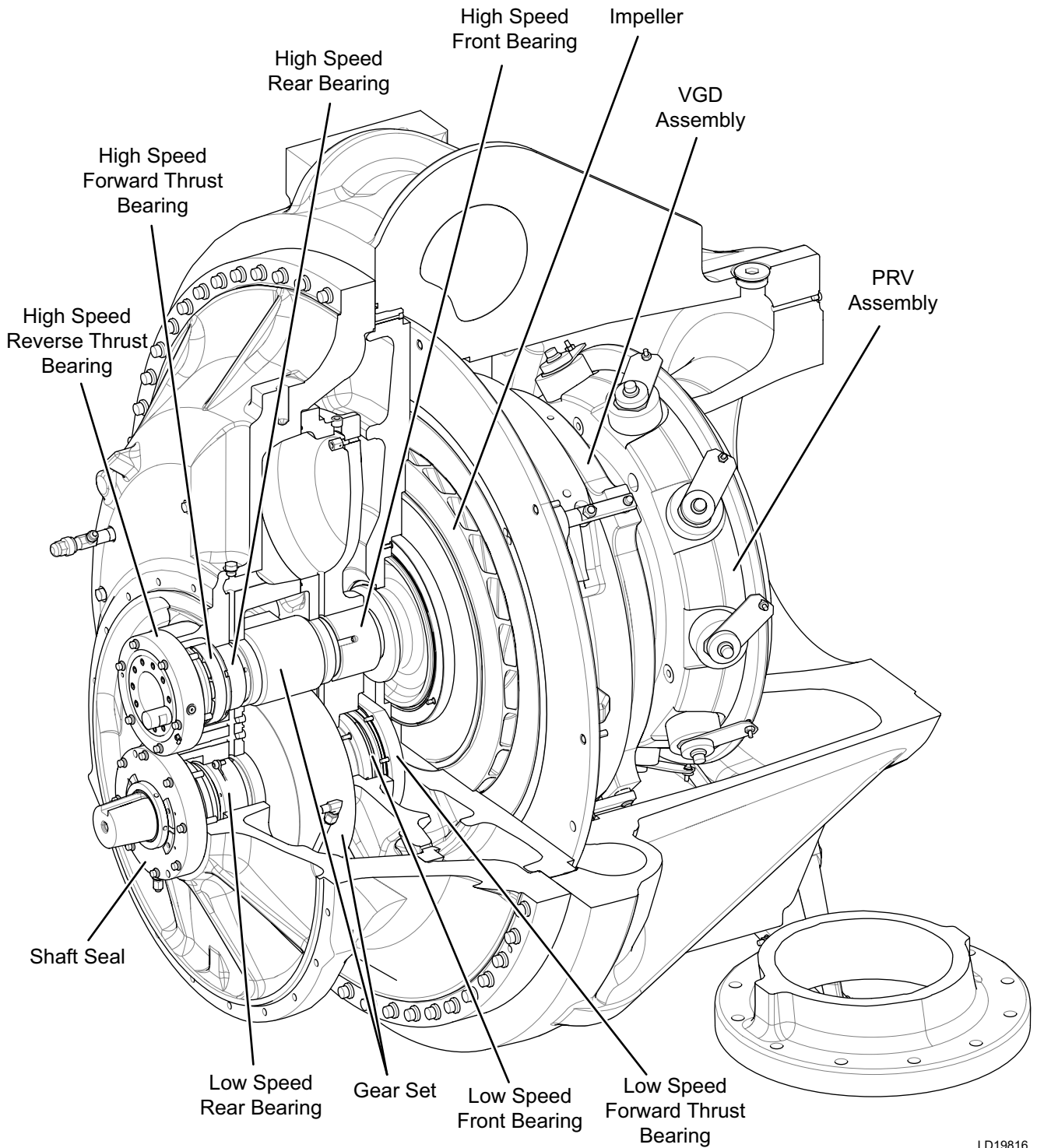
### NOMENCLATURE

#### Compressor Identification

Each compressor is identified by nomenclature as shown below. The nomenclature is printed on a data plate which is located on the side of the unit control panel (see *Figure 1 on page 11*). When contacting the factory or ordering renewal parts, include the complete compressor model and serial number. Be sure these numbers are copied accurately.



**FIGURE 1 - COMPRESSOR IDENTIFICATION**



LD19816

FIGURE 2 - COMPRESSOR COMPONENTS

## SECTION 2 - COMPRESSOR SERVICE

The compressor is the most expensive part of the chiller and every effort should be made to maintain and keep it operating at peak efficiency. Being a precision-built machine, it is important to check the lubrication system for cleanliness by changing the oil filter as documented in the Preventative Maintenance section of the Operating Instructions.

**The compressor should not be disassembled for inspection purposes only.** The high and low speed shaft bearings on YORK single stage centrifugal compressors are aluminum, hydrodynamic fluid film journal bearings. This bearing journal design allows the rotating shafts to ride on an oil film and bearing wear is therefore minimal. The impeller eye and balance piston seals rings are made of a bearing grade aluminum. The thrust bearings are of the hydrodynamic tilting pad design. Here again the thrust collar rides on a cushion of oil and there is no metal to metal contact. On systems with ideal operating conditions there is no need to disassemble compressors for inspection purposes. Analytical tools are available that will identify potential mechanical problems developing prior to a failure occurring, or identify or indicate less than ideal conditions that may warrant an internal inspection. These tools should be used to ensure proper compressor operation and reliability.

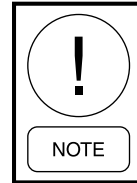
### VIBRATION ANALYSIS

Vibration analysis is valuable in identifying abnormal wear of rotating parts and is particularly helpful when performed on a periodic basis. Having a baseline vibration report to compare vibration signature changes over time can pinpoint potential internal compressor problems. Systematic data collection will identify potential gear wear or excessive vibration that would indicate a need for internal compressor inspection. Vibration data is also helpful in identifying potential motor bearing wear so corrective action can be scheduled to prevent failure.

### THRUST ENDPLAY

To check for low speed thrust bearing wear, one must measure and record the low speed axial thrust endplay and compare the results to design tolerances. The compressor shaft seal will have to be removed to perform the low speed axial thrust reading. To inspect the high speed thrust bearings and thrust collar, the high speed thrust cover plate and thrust collar must be removed.

When performing the low and high-speed thrust inspections, the corresponding rear low and high-speed shaft bearings may be removed from the compressor to check for unusual wear. Corrective action should be taken if inspection shows excessive wear of the thrust or journal bearing surfaces.



*To perform these inspections the refrigerant charge must be removed.*

### COMPRESSOR OIL

The compressor oil filter and oil should be replaced on a yearly basis. A yearly oil sample should be collected and analyzed prior to changing. The key points of the oil analysis report are moisture content and acidity. Spectrographic data supplied on oil analysis reports are not generally a true indicator of wear metals. However, a spectrographic analysis may help to indicate other undesirable contaminants.

As noted, YORK uses aluminum bearings and labyrinth seals. If a bearing or seal starts to wear, this metal is collected in the oil filter. Aluminum that appears in oil sample analysis is almost always an aluminum oxide that is caused by moisture in the oil. The oil filter should be inspected for actual aluminum particles. It is normal on new machines to see some aluminum collected in the filter. This aluminum comes from the eye and balance piston seals as they come into contact with the impeller. Over time only tiny amounts of metal should be seen in the oil filter. If there is a sudden increase in metal collection on the filter, then an inspection of the internal impeller seals or shaft bearings may be warranted.

### REFRIGERANT

Refrigerant analysis should be performed on a yearly basis, again looking for excessive moisture and acidity. Excessive moisture content in the refrigerant (or oil) can cause corrosion of internal parts of the compressor that could in turn lead to failure of the shaft bearings, shaft seal, impeller labyrinth seals or to binding of the pre-rotation vanes.

By following the above listed maintenance procedures compressor health can be determined and ensured. If the compressor is exposed to less than ideal operating conditions (i.e. excessive surging, excessive refrigerant moisture, poor oil quality, or other unusual conditions), then the end user may want to perform an internal compressor inspection for verification that internal components are not damaged.

However, if the compressor fails to function as outlined in the operating manual, it may be necessary to do so. Individual parts are available for replacement as described in the following compressor servicing section.

### SERVICE GUIDELINES

The overhaul and replacement of parts of these compressors, like any other mechanical operation on machinery, is best accomplished by experienced service personnel using tools and measuring instruments to accomplish accuracy in their work.

There are a number of good practices that should be followed in disassembly and reassembly of the compressor, some of these are listed below.

**Do Not Mix Parts** - Keep parts in some general order when removing them from the compressor. It is suggested that parts be laid out to follow exploded views as shown in the many illustrations outlining the disassembly and assembly of the various parts.

**Do Not Mix Cap Screws and Washers** - Cap screws are suited to the location in which they are used. Too long or too short a cap screw can result in leakage and/or interference with some interior parts. Washers have been selected for specific screws, etc. It is very important to use correct washers or lock washers. The Parts List and Figures in this instruction guide show the correct length and size of screws and washers. *Refer to the Renewal Parts Manual 160.75-RP2* to order the correct part numbers.

**Inspect As Compressor is Disassembled** - It is desirable to record shaft and impeller runouts and thrust clearances before disassembly. Once compressor parts have been disassembled and cleaned, many valuable indications of the compressor condition are lost. Materials found in oil or on burned surfaces can often give an indication as to why a part or parts have failed.

**Protect Parts and Surfaces** - Do not pile or throw parts indiscriminately. Oil surfaces are likely to rust. Tape surfaces subject to scratching or nicking during repair operations. Plug off any passages likely to accumulate dust or abrasives. Do not tape the seals.

**Clean Thoroughly** - No compressor is completely overhauled if it is not cleaned internally to “new part” condition. Dirty parts can not be inspected or fitted and will cause excessive wear when the compressor is in operation.

### CLEANING AND CHECKING WEARING PARTS

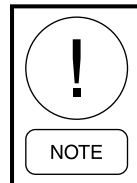
Before reassembling the compressor, all parts should be thoroughly checked for wear. Best practice is to get pictures of the worn parts, to be used in the final inspection report.

Worn parts should be replaced with new and each new part should be thoroughly examined for shipping damage.

While the rotor support is open, carefully clean the interior, using an approved safety solvent and a lint free cloth.

Clean and check all oil passageways and all tubing using pressurized dry air or nitrogen.

Before assembling parts, all friction surfaces should be lightly coated with a molybdenum disulfide lubricant such as “Molykote” or “Molkolube” and oil. Be sure to use new YORK refrigerant Oil.



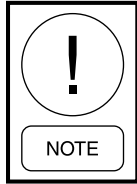
**“Molykote” is available from: Dow Corning Corporation Dept. A0021 P.O. Box 1767 Midland, Michigan**

**Westinghouse Electric Corporation (Sales offices in all major cities). When ordering “Molykote” No. 8565-3, available from YORK Part No. 364-21508 in 2 oz. cans.**

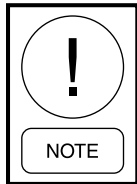
When reassembling parts, each part should be carefully checked for signs of uneven wear, keeping in mind that a nicely polished surface is not an indication of excessive wear. Sudden, excessive wear on any part of the compressor is not normal but is usually caused by some other condition which must be determined and corrected to assure long periods of trouble-free operation.

Bearings and seals may be reused if their rubbing surfaces and matching surfaces of their corresponding rotating parts are nicely polished with no sign of uneven wear or gouging.

The impeller should be checked around its outside circumference for evidence of rubbing. If this condition is found, excessive bearing wear is indicated, and the impeller may be worn sufficiently to require replacement.



*There maybe some grinding at the back-side or front side of the impeller. This is for balancing purposes. No marks should appear on the nozzle or diffuser plates.*



*All gaskets and O-rings must be replaced with new parts when reassembling the compressor to assure that all surfaces have a tight seal after reassembly.*

When checking the compressor tolerances there is not a value of allowable lateral movement on a low or high speed shaft on a YK compressor. The correct way to determine if the journal bearings are worn is to remove them and measure the dimensions compared to the en-

gineering drawing dimensions. If the compressor is making oil pressure without an elevated variable speed drive output frequency and the oil filter is clean, it is not likely there is an issue with the compressor journal bearing tolerances.

**RIGGING THE COMPRESSOR OR MOTOR**

When it becomes necessary to remove a compressor or motor from a unit or base, proper rigging methods must be used to avoid damage to the equipment and/or injury to service personnel. Portable cranes must be of adequate capacity and properly positioned and blocked to prevent tipping or slipping while lifting the compressor or motor. Be sure chains are of adequate strength. Compressor weights are shown in *Table 1* on page 15.

**TABLE 1 - COMPRESSOR WEIGHTS (LBS.) - LESS MOTOR**

COMPRESSOR CODE	COMPLETE COMPRESSOR	ROTOR SUPORT COMPLETE W/ ALL RUNNING GEAR & D-FLANGE	SCROLL ASSEMBLY W/ PRV AND NOZZLE BASE
K1	4,060 lbs.	2,061 lbs.	2,399 lbs.
K2	4,195 lbs.	2,058 lbs.	2,537 lbs.
K3	6,056 lbs.	2,965 lbs.	3,500 lbs.
K4	6,328 lbs.	2,841 lbs.	3,887 lbs.
K7	8,089 lbs.	2,730 lbs.	5,759 lbs.

**NOTE:** Motor weights (lbs.) (Located on Motor Data Plate)

**TABLE 2 - TORQUE VALUES**

BOLT SIZE INCHES	TORQUE POUND FOOT	
	HEX HD	SOCKET OR 12 PT HD
1/4"	10	14
5/16"	20	30
3/8"	35	50
1/2"	75	121
5/8"	155	200**
3/4"	260	395

Unless otherwise specified, all screws must be tightened to the following torque values with lightly oiled threads.

\*\* Lubricated with oil and graphite on male and female threads and under bolt heads. Moly-kote not acceptable.

**TWO PIECE PROXIMITY PROBE**

A two-piece proximity probe is available which provides separate parts for the probe and the electronics module. The two-piece probe is backward compatible on all YK chillers (-70 diameter and larger) and is factory installed on new chillers.

The two-piece probe eliminates the need to recover the chiller refrigerant charge when replacing the electronics module portion of the proximity probe. The electronic module for the proximity probe is mounted into the "D" flange or motor adapter, or onto a bracket for units not utilizing a "D" flange or motor adapter.

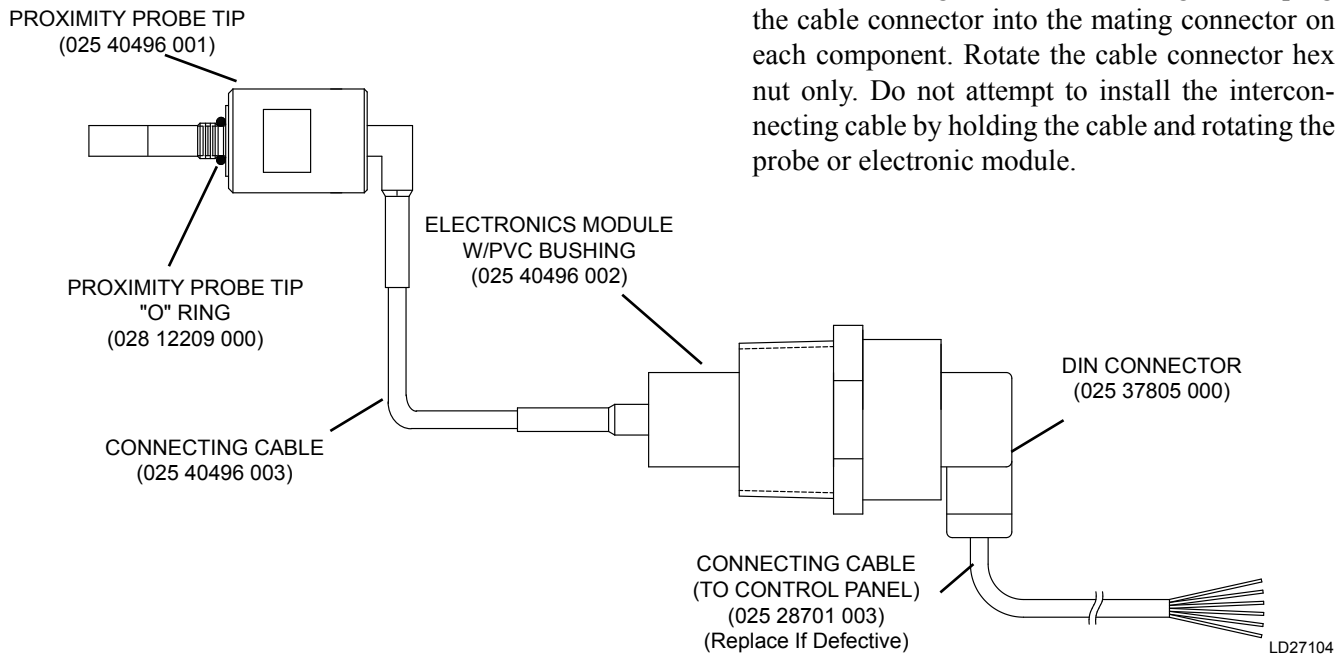
The part number for the new probe is 025 40496 000.

That part number includes the probe tip, electronic module, a PVC bushing and the connection cable from the probe tip to electronic module.

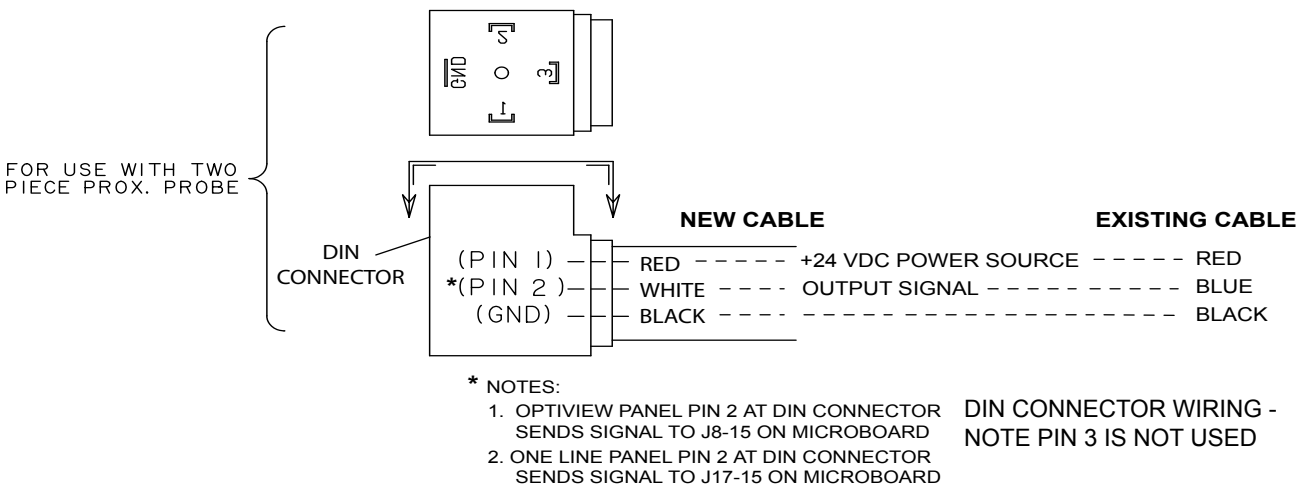
If retrofitting from a single piece probe, all items shown below are needed. Use part number 364-51806-000.

**INSTALLATION**

1. The electronic module to control panel cable should be replaced if an intermittent connection issue is suspected.
2. Installation torque values:  
Probe to compressor: 20 in/lb - use 7/8" wrench  
Electronic Module: 20 in/lb - use 2" Wrench  
Interconnecting Cable Ends: 2 in/lb - use no tools
3. When installing the interconnecting cable, plug the cable connector into the mating connector on each component. Rotate the cable connector hex nut only. Do not attempt to install the interconnecting cable by holding the cable and rotating the probe or electronic module.



**FIGURE 3 - TWO PIECE PROXIMITY PROBE**



**FIGURE 4 - DIN CONNECTOR WIRING**

## MOTOR REMOVAL AND REPLACEMENT



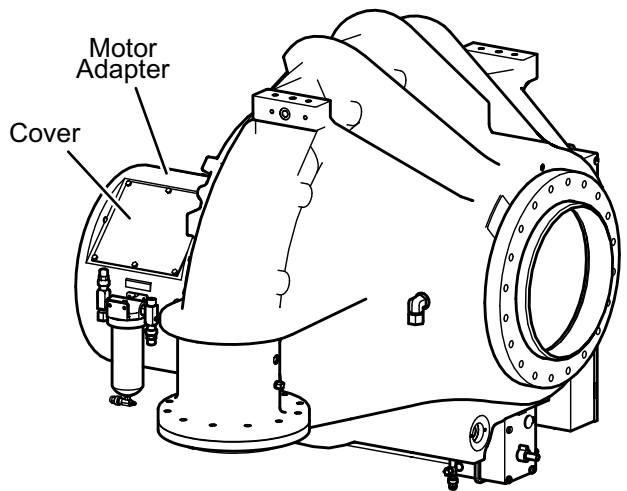
**Be sure the main disconnect switch to the compressor motor is open and tagged, then disconnect the electrical leads at the motor terminals and tape the end of each lead. Make sure leads are marked correctly for later identification.**

### REMOVAL (MOTOR ONLY)

The following paragraphs outline the procedure for replacing or servicing the motor. Always contact the nearest Johnson Controls Service Office when replacing or servicing the motor.

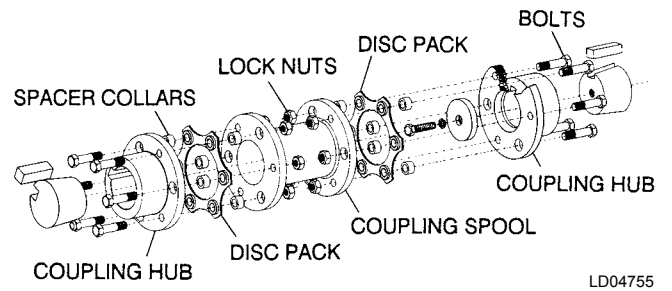
#### Close-Coupled Models

1. Support the weight of the motor from a hoist using eyebolts at locations provided in the motor housing.
2. Remove the hex head cap screws that hold the sheet metal covers to the compressor motor adapter. After all screws are removed, remove covers (see *Figure 5 on page 17*).
3. Remove the bolts holding the coupling hubs to the coupling spool and the disc pack. Note arrangement of these parts (see *Figure 6 on page 17*). Remove the coupling spool and disc packs. If disc packs are required to be replaced, they must be purchased from the manufacturer. All couplings have the manufacturer's ID on the face.



**FIGURE 5 - MOTOR ADAPTER**

LD19819



LD04755

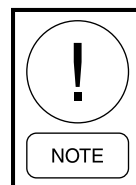
**FIGURE 6 - COMPRESSOR COUPLING**

4. Taking care to see that the motor is properly supported, by rigging assembly remove the bolts that hold the motor to the motor adapter.
5. Remove the bolts, nuts, and washers holding the motor to the mounting rails. Note location of any shims.
6. Lift the motor and pull it away from the compressor. Lower motor to floor for servicing. Remove shims from motor mounting rails. Mark shims location.

### INSTALLATION

#### Close-Coupled Models

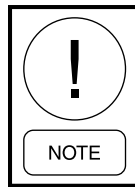
1. Place the number of shims originally required on each motor mounting rail.
2. Lift motor to the proper location and push motor carefully against the compressor motor adapter.
3. Line up holes in the face of the motor with the holes in the compressor motor adapter. Place the hex head cap screws through the compressor motor adapter and screw into the tapped holes on the motor, (but do not fully tighten screws) (Refer to *Figure 5 on page 17*).
4. Place the hex head cap screws and washers in holes in motor feet. Make sure the motor is shimmed correctly. Place hex nuts on screws and tighten and torque.
5. Tighten and torque screws holding motor to motor adapter.
6. Assemble the coupling. Refer to *Coupling Assembly (Form 160.49-N4)*.



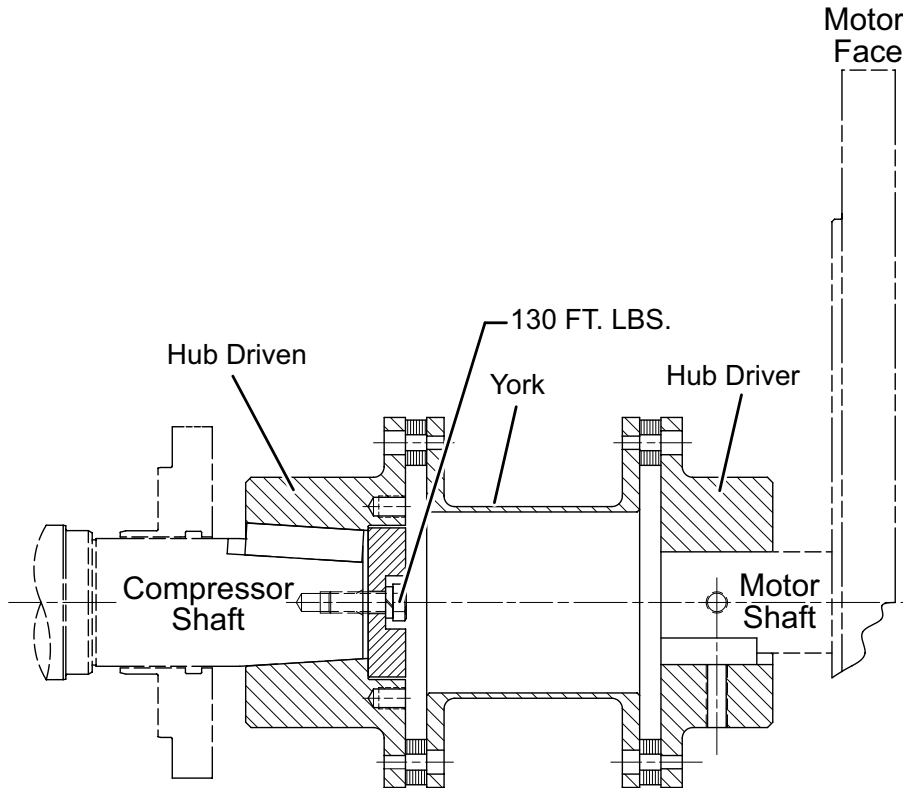
**Bolts head orientation is not a problem.**

**Motor alignment on YK.** Adjust the motor to achieve a parallel alignment see *Table 4 - Total Indicator Reading on page 19* The gap between the shim pack and hub should be 0.010" max. This is a D-flange motor so there will not be much adjustment possible. The rotor may need to be centered in the bearing races in sleeve bearing motors by motor with sleeve bearings should be brought to full speed and the magnetic center marked. When the motor decelerates it may move off of magnetic center. The motor must then be moved

back to the magnetic center marking in order to get the correct coupling space. This will center the rotor. With refrigerant in the machine and the rotor centered, the gap between the coupling hub and the disk pack should be 0.010".



*Use a small dial indicator as much as possible and consider the dial indicator sag.*



LD19860

**FIGURE 7 - MOTOR ALIGNMENT**

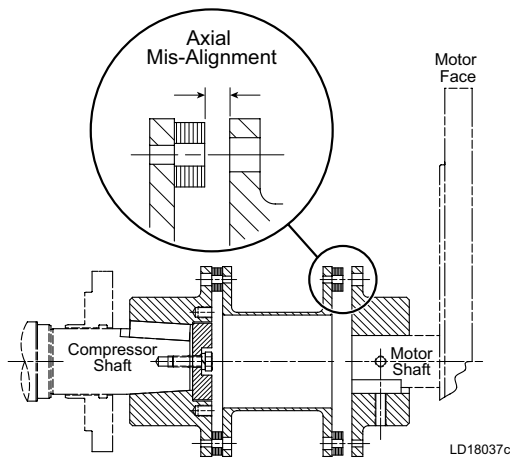
**TABLE 3 - COUPLING TORQUE**

MODEL	COUPLING ASSEMBLY	YORK DRAWING NUMBER	TIGHTENING TORQUE
K1 & K2	364-51837-000	029-24118-000	Follow the torque value shown on the coupling.
	364-51838-000	029-20921-001	
K3	364-52351-000	029-21381-000	Follow the torque value shown on the coupling.
	364-51816-002	029-20899-001	
	364-52351-000	029-21381-000	
K4	364-52351-000	029-21381-000	Follow the torque value shown on the coupling.
	364-51816-002	029-20899-001	
	364-52351-000	029-21381-000	
K7	364-51816-001	029-24887-000	Follow the torque value shown on the coupling.
	364-51817-000	029-25108-000	

## ALIGNMENT

### Axial Shaft to Shaft Spacing

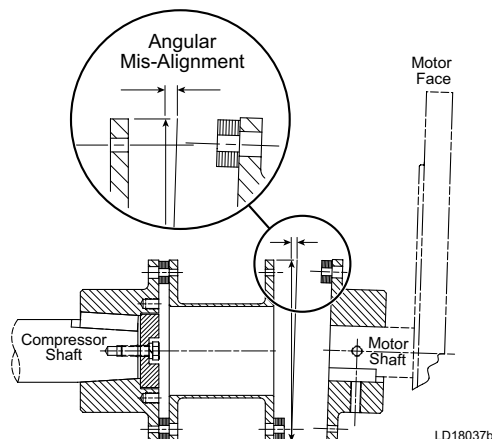
The equipment must sit flat on its base. Any soft foot must be corrected immediately. Set the equipment into the approximate position. Measure the length of the spacer and the thickness of the two unitized flex discs from washer face to washer face to determine the “D” dimension shown in *Figure 8 on page 19*. Measure the separation between the hub flanges and adjust the equipment until the axial hub separation equals the sum of the spacer length and the thickness of the two flex discs.



**FIGURE 8 - AXIAL MISALIGNMENT**

### Angular Alignment

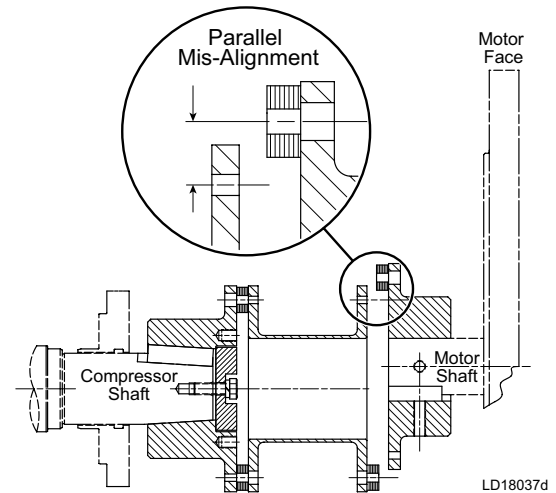
Rigidly mount a dial indicator to one of the hubs (or shaft) and place the pointer on the flange face of the opposite hub, as shown in *Figure 9 on page 19*. Rotate both shafts at the same time making sure the axial spacing remains constant. Adjust the equipment by shimming and/or moving so that the indicator reading is within *Table 4 on page 19*.



**FIGURE 9 - ANGULAR MISALIGNMENT**

### Parallel Alignment

Rigidly mount a dial indicator to one of the hubs (or shaft) and place the pointer on the flange diameter of the opposite hub, as shown in *Figure 10 on page 19*. Compensate for indicator set-up sag. Rotate both shafts at the same time. Adjust the equipment by shimming and/or moving so that the indicator reading is within the tolerances shown in *Table 4 on page 19*.



**FIGURE 10 - PARALLEL MISALIGNMENT**

**TABLE 4 - TOTAL INDICATOR READING**

ALIGNMENT	TOLERANCE (INCHES)	MAX. COMBINATION TOLERANCE
Horizontal or Vertical Parallel	±.014	±.028
Horizontal or Vertical Angular	±.014	

### De-Flange Models

1. Place the number of shims originally required on each motor mounting channel.
2. Lift motor to its proper location on the motor mounting channels. Fasten with cap screws, washers, and hex nuts.
3. Assemble the coupling. Refer to *Coupling Assembly (Form 160.49-N4)*.
4. Re-assemble the coupling guard.

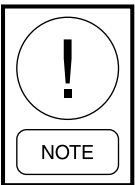


***Before opening any part of the compressor, the compressor must be pumped down to atmospheric pressure.***

## SEAL REMOVAL (BELLOWS TYPE)

To remove/replace the bellows type shaft seal, proceed as follows:

1. Remove compressor coupling as described on previous pages under MOTOR REMOVAL AND REPLACEMENT. Also remove the compressor coupling hub from the compressor shaft.
2. Remove the oil drain line from the bottom of the seal.
3. Loosen the two set screws (C) shown in *Figure 12 on page 21*.
4. Remove the flat head screws and re-attach the retaining clips in the installation position.



***It is important that the shaft seal sleeve is securely attached to the compressor shaft prior to removal of the retaining clips. These clips protect the seal internals from harm during the assembly process and insure the positioning of the shaft seal for proper seal face loading. Anytime a seal cartridge is outside the compressor, the retaining clips need to be in their installation position.***

5. Loosen the 4 set screws (B) shown in *Figure 12 on page 21*.
6. Remove the 8 hex head screws holding the shaft seal to the compressor housing.
7. Using guide pins, carefully remove the seal assembly from the rotor support.
8. Remove the C-ring and sleeve spacer from the compressor shaft.
9. Remove the O-ring from the rotor support housing.

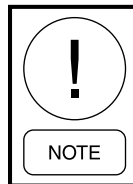
## Installation (Bellows Type)

1. Be sure the shaft seal cavity is thoroughly clean by cleaning it with an approved safety solvent and blowing it dry with compressed air.

2. Inspect all wearing surfaces and replace parts as necessary. See *Cleaning and Checking Wearing Parts on page 14*. Discard all O-rings and replace with new.
3. Thoroughly lubricate shaft and sleeve O-ring and or C-ring with clean YORK refrigerant oil prior to installation.
4. Install the sleeve spacer on the shaft and slide it all the way onto the shaft. The beveled edge should face away from C-ring.
5. Thoroughly lubricate C-ring with clean YORK refrigerant oil. Install the C-ring with the open side of the ring facing the compressor. As pressure increases the C-ring spring will expand to assure an appropriate seal.



**FIGURE 11 - RETAINER RUNNING POSITION** LD22342

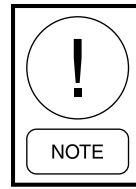


***Care needs to be taken when installing the C-ring to prevent damage to the ring. Any burrs on the shaft or on the snap ring groove may damage the seal.***

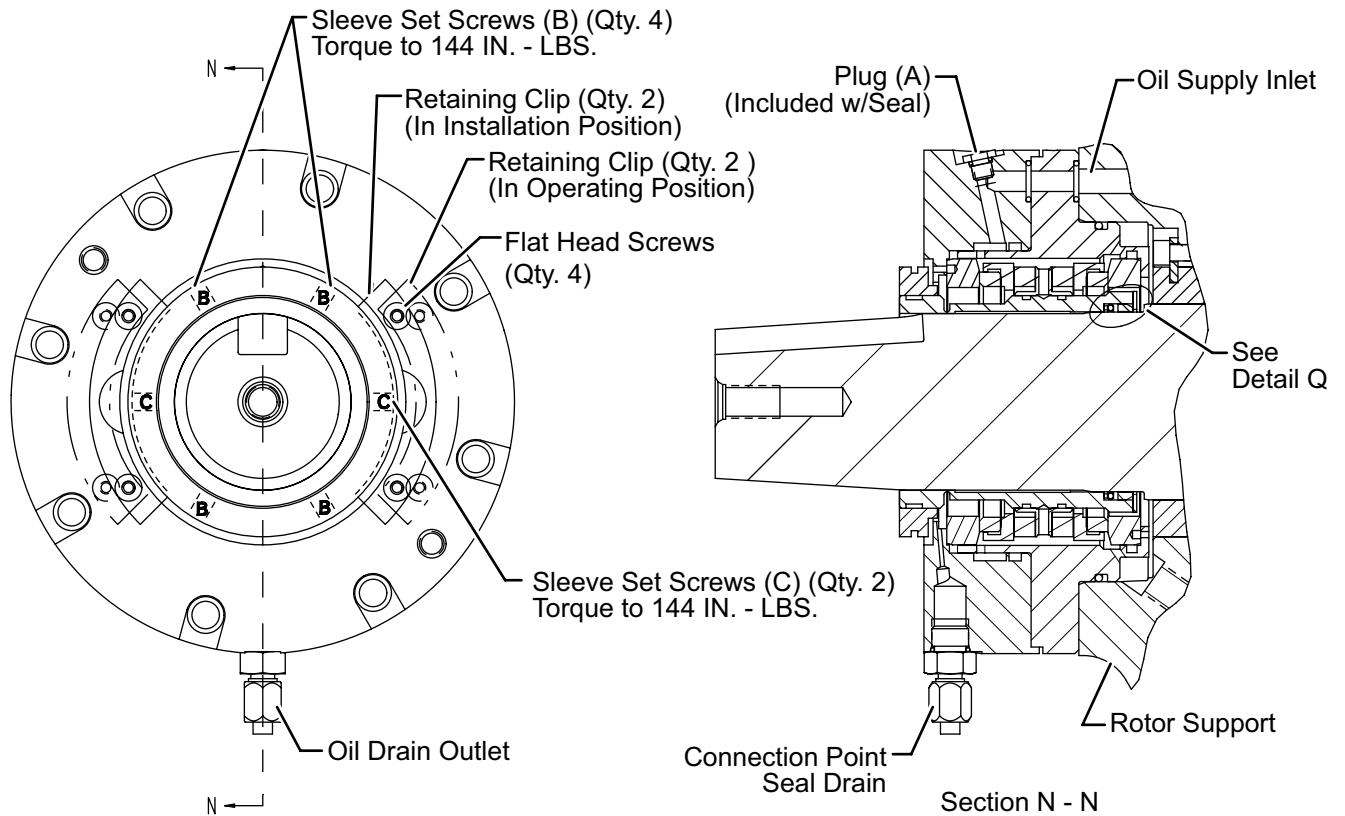
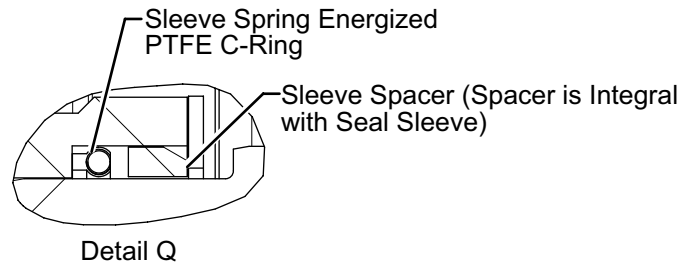
6. Install shaft seal cover O-ring in rotor support housing.
7. Using guide studs, install seal cartridge in rotor support housing and secure with 3/8" or 1/4" mounting screws.
8. Before tightening the shaft seal sleeve set screw, rotate the compressor shaft to insure that the set screws straddle the shaft keyway.

9. Without removing the two shaft seal retaining clips, tighten the 4 accessible sleeve set screws to the compressor shaft (see *Figure 12 on page 21*).
10. Remove the retaining clips and tighten the remaining 2 set screws. Torque all 6 set screws (see *Figure 12 on page 21*) to 144 inch pounds, unless otherwise stamped on the seal face. Install the retaining clips in the operating position on the seal face.

11. Re-connect the oil drain line (if required) and re-install the compressor coupling if no further service is planned.



*After installation of clips to operation position and after the oil pump has been energized the clip should line up with the collar groove.*



LD19861

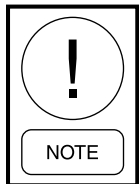
**FIGURE 12 - BELLOWS TYPE SHAFT SEAL**

**DISASSEMBLY OF ROTOR SUPPORT**

The following paragraphs outline the procedure for separating the rotor support from the rotor scroll if it becomes necessary to service internal parts:

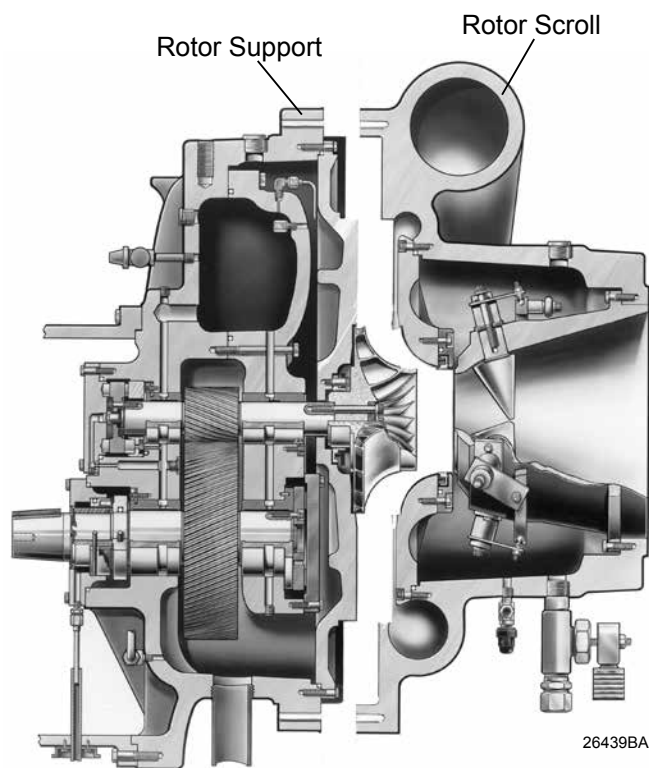
**Removing the Rotor Support from Rotor Scroll**

*For steps 1 through 3 follow the procedures listed on previous pages of this instruction.*



1. Remove all external piping from the rotor support.
2. Using proper rigging techniques, temporarily support the weight of the back end of the rotor support. Keep the motor support (D-flange) for better balance.
3. Insert the 7/8" eye bolt into the top of the rotor support and using the proper rigging methods support the weight of the rotor support see *Table 1 on page 15*.

4. Remove (2) of the 12-pt. cap screws holding the rotor support to the rotor scroll. Insert guide pins in place of the (2) cap screws.
5. Loosen the remaining cap screws.
6. Use (3) of the cap screws as jacking screws in the tapped holes provided to loosen the rotor support from the rotor scroll (see *Figure 13 on page 22*). Carefully pull the rotor support out of the rotor scroll. Rotate the shaft by hand when removing the rotor support to prevent damage to the impeller inlet seal ring.
7. The rotor support can now be removed and rested on the end of the motor adapter.



**FIGURE 13 - DISASSEMBLY OF ROTOR SUPPORT FROM THE ROTOR SCROLL**

## REMOVING THE IMPELLER

1. Before removing the impeller, measure and record the following.

**Detail A** - Impeller Rim Runout (Design 0.003” max.)



26347A

**FIGURE 14 - DETAIL A – CHECKING RIM RUNOUT**

**Detail B** - Impeller Eye Runout (Design 0.002” max.)



26346A

**FIGURE 15 - DETAIL B – CHECKING EYE RUNOUT**

**Detail C** - High Speed Axial Thrust & Low Speed Axial Thrust (*Table 5 on page 23*)



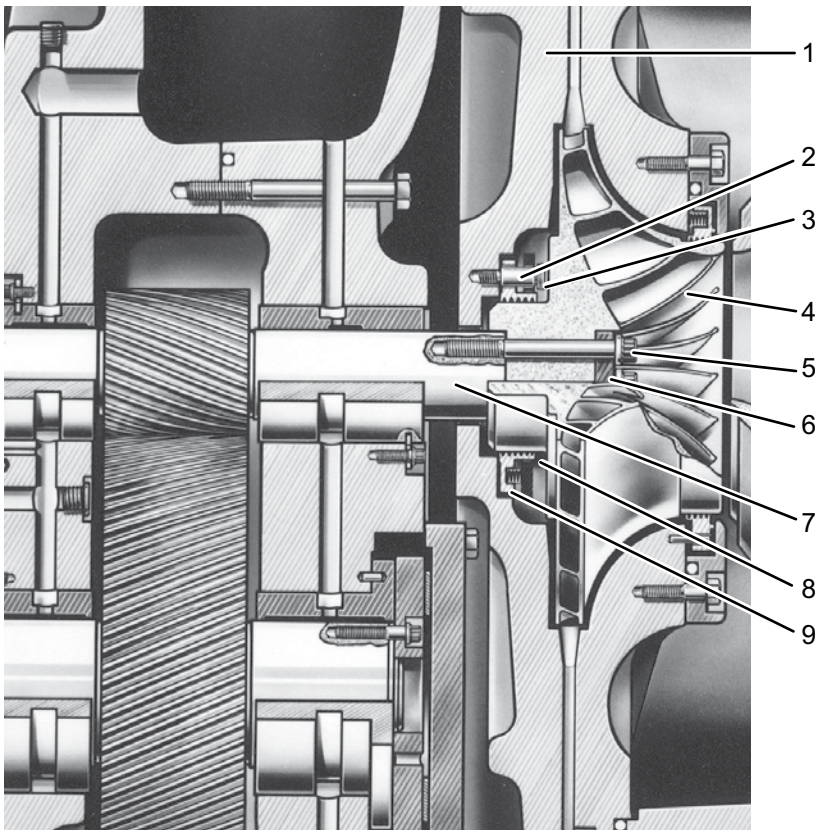
LD22343

**FIGURE 16 - DETAIL C – CHECKING AXIAL THRUST**

**TABLE 5 - IMPELLER INFORMATION**

COMPRESSOR	LOW SPEED AXLE THRUST	HIGH SPEED AXLE THRUST
K1-K7	0.011-0.019"	0.009-0.020"
K2-K4	0.011-0.019"	0.008-0.021"

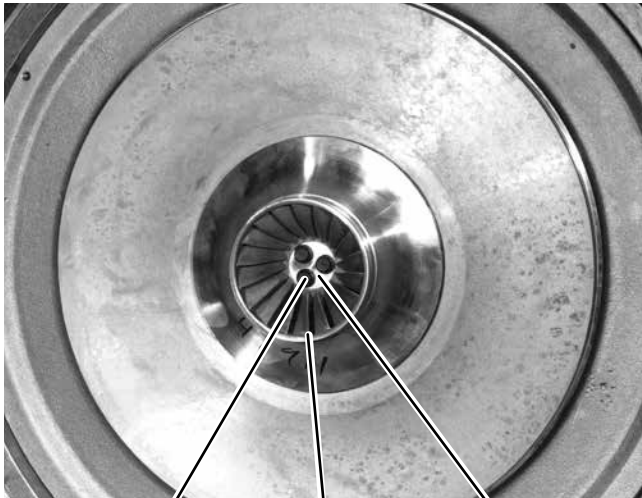
2. Install the gear locking tool on the low-speed shaft (see *Figure 41 on page 34*).
3. Remove the 3 (or 6) screws that hold the impeller to the high-speed shaft (see *Figure 18 on page 24*). Or remove the cap screw and O-ring from the impeller clamping collar. Pull the impeller from the high-speed shaft.
4. Pull the impeller from the high speed shaft. Use care when removing the impeller so that the balance piston seal is not damaged.



ITEM	DESCRIPTION
1	Diffuser Plate
2	Balance Piston Retainer
3	Socket Head Cap Screws (3)
4	Impeller
5	Cap Screws (3 or 6)
6	Impeller Clamping Collar
7	High-Speed Shaft
8	Balance Piston Seal
9	Flat Springs (1)

26439A

**FIGURE 17 - IMPELLER AND BALANCE PISTON**



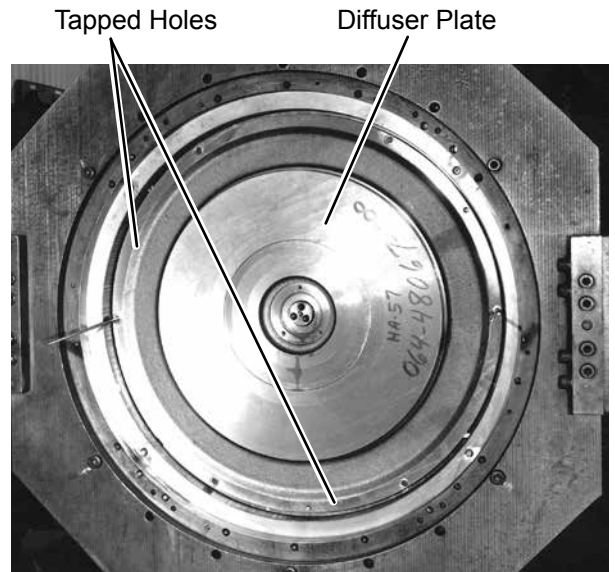
Cap Screws      Impeller      Impeller Clamping Collar

Pull the impeller from the high speed shaft. Use care when removing the impeller so that the balance piston seal is not damaged.

**FIGURE 18 - REMOVING IMPELLER**

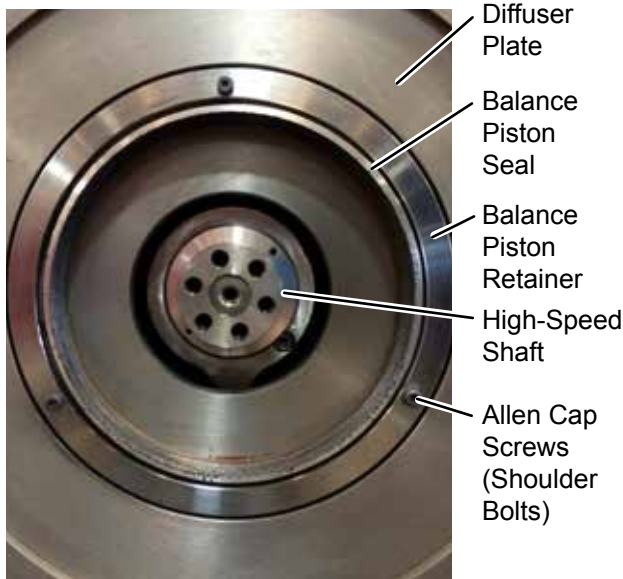
### REMOVING BALANCE PISTON SEAL AND DIFFUSER PLATE

1. Remove the (3) socket head cap screws (shoulder bolts) that fasten the balance piston retainer and balance piston seal to the plate (see *Figure 19 on page 25* and *Figure 20 on page 25*). Remove the balance piston retainer and balance piston seal.
2. Remove (2) of the (6) cap screws that secure the diffuser plate to the bearing housing. Insert guide pins where cap screws were removed. Loosen the (4) remaining cap screws (see *Figure 20 on page 25*). Insert jacking screws into holes provided to loosen diffuser plate from bearing housing.
3. Insert eyebolts from tool kit into jacking holes and use proper rigging methods to lift diffuser plate from compressor. Also, remove the O-ring from the back of the diffuser plate.



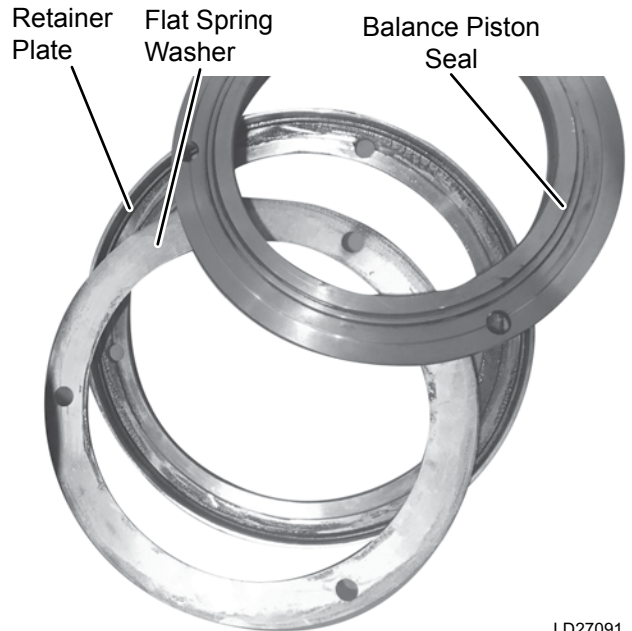
26665A

**FIGURE 20 - REMOVING DIFFUSER PLATE**



LD22344

**FIGURE 19 - BALANCE PISTON SEAL**



LD27091

**FIGURE 21 - BALANCE PISTON SEAL ASSEMBLY**

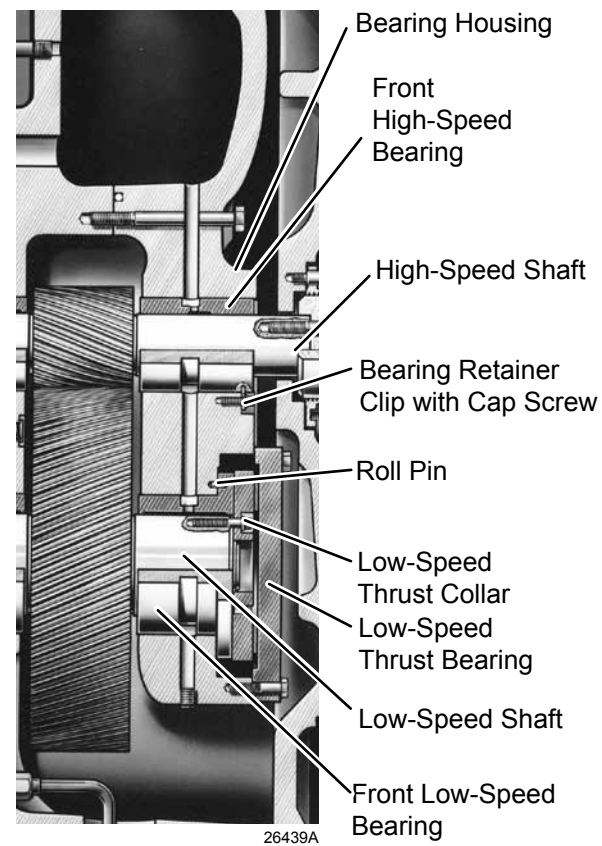
**TABLE 6 - BALANCE PISTON SEAL RING DIMENSIONS**

	IMPELLER B.P O.D	B.P SEAL I.D
K1	7.097" / 7.095"	7.104" / 7.102"
K2		
K3	8.152" / 8.150"	8.162" / 8.160"
K4	9.800" / 9.798"	9.810" / 9.808"
K7		

**REMOVING FRONT LOW-SPEED BEARINGS**

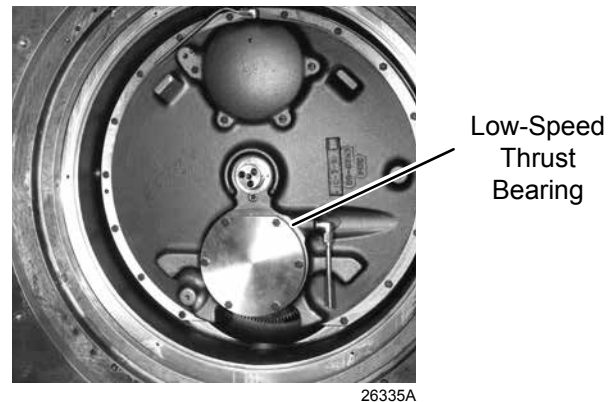
(see *Figure 22 on page 26*)

1. Remove the (6) hex head cap screws that hold the low-speed thrust bearing to the bearing housing, and using (2) guide pins, remove the thrust bearing. Be sure not to damage the bearing pads (see *Figure 23 on page 26* and *Figure 24 on page 27*).
2. Before removing the low-speed thrust collar mount an indicator, as shown in *Figure 25 on page 27*, and check the runout of the thrust collar. Maximum runout should not exceed .001" T.I.R. (It will be necessary to remove the shaft locking tool in order to take this measurement.)
3. Re-install the shaft locking tool. Remove the allen head screws that hold the low-speed thrust collar to the low-speed shaft, and remove the thrust collar (see *Figure 26 on page 27*). Use care when handling so that the surfaces are not damaged.
4. To remove the low-speed bearing, use (2) hook tools (shown in *Figure 27 on page 27*). Carefully pull the bearing out of the bearing housing. Note position of roll pin (see *Figure 28 on page 27*).

**FIGURE 22 - FRONT BEARING COMPONENTS****REMOVING FRONT HIGH-SPEED BEARING**

(See *Figure 22 on page 26*)

1. Remove the cap screw and retainer clip (see *Figure 28 on page 27*).
2. Using (2) 1/4" puller rods as shown in *Figure 29 on page 27*, pull the high-speed bearing out of the bearing housing.

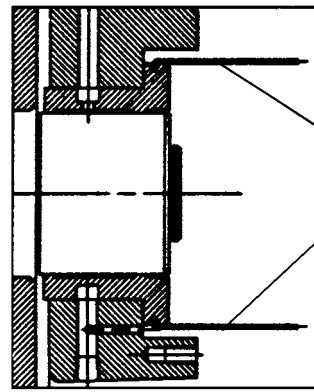
**FIGURE 23 - LOW-SPEED THRUST BEARING**



Low-Speed Forward Thrust Bearing

26334A

**FIGURE 24 - LOW-SPEED THRUST BEARING REMOVED**



LD04837

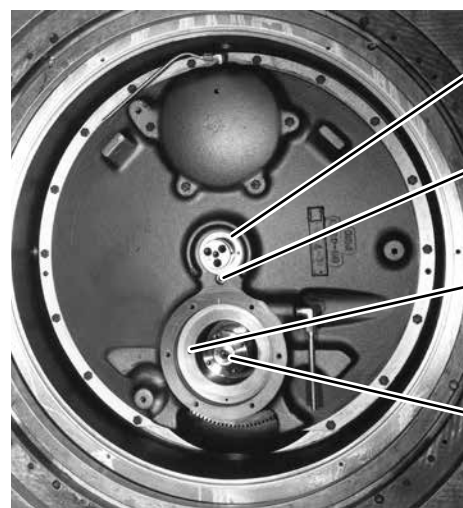
**FIGURE 27 - FRONT LOW-SPEED BEARING REMOVAL**



Low-Speed Thrust Collar

LD22345

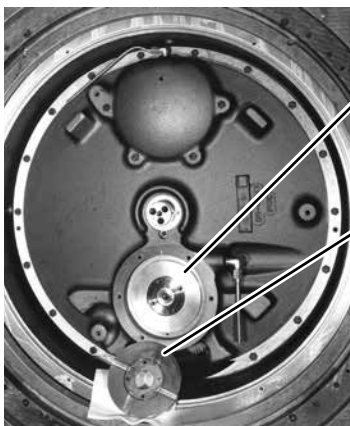
**FIGURE 25 - CHECKING LOW-SPEED THRUST RUNOUT**



Front High-Speed Bearing  
 Retainer Clip With Cap Screw  
 Roll Pin (Location below the Bearing)  
 Low-Speed Shaft

26330A

**FIGURE 28 - LOW-SPEED BEARING REMOVED WITH HIGH-SPEED BEARING IN PLACE**



Low-Speed Bearing and Thrust  
 Low-Speed Thrust Collar (Inside Surface)

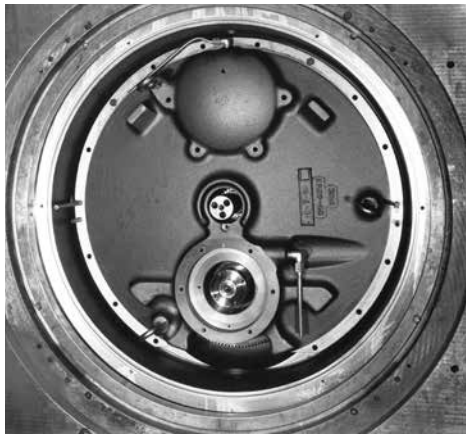
26332A

**FIGURE 26 - LOW-SPEED THRUST COLLAR REMOVED**



LD27093

**FIGURE 29 - FRONT HIGH-SPEED BEARING REMOVAL**



**FIGURE 30 - ALL FRONT END BEARINGS REMOVED**

## REMOVING BEARING HOUSING AND GEARS

### Bearing Housing

1. Insert (2) 3/8" guide pins as shown in *Figure 31 on page 28*. Also insert (3) 3/8" eyebolts as shown. On the compressors, the (3) 1/2" cap screws shown in *Figure 34 on page 29* are used to secure the dowel pins which align the bearing housing with the rotor support.
2. Attach proper rigging, remove the remaining cap screws.

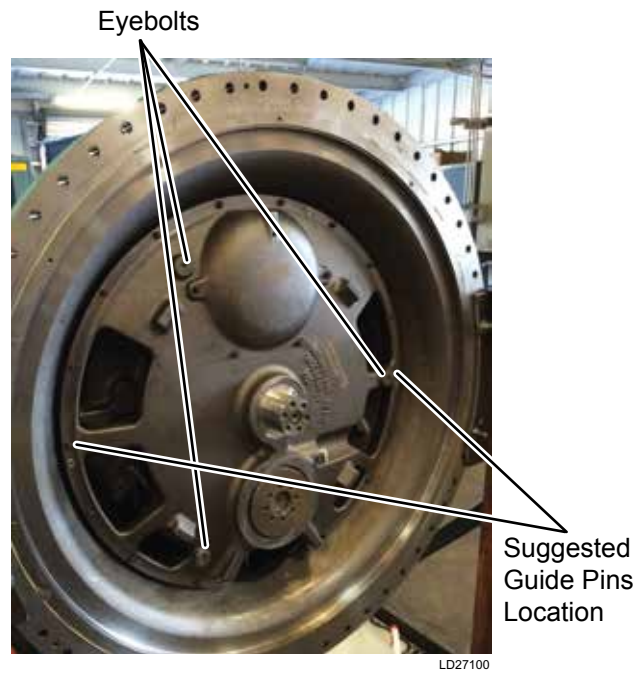


***Remove the bearing housing, using care so that the compressor is not damaged and that no injury occurs to service personnel as the bearing housing is quite heavy.***

### Gears

1. Remove the high-speed reverse thrust bearing, high-speed thrust collar, and high-speed forward thrust bearing.
2. Remove the shaft locking tool.
3. Remove the compressor shaft seal. Do NOT remove the rear low-speed bearing.
4. To remove the low-speed and high speed gears, use a 1/2" - 13 eyebolt in the end of the shaft and pull the gear out of the rotor support.

Before re-assembly, be sure the compressor housing is absolutely clean by cleaning it with an approved safety solvent and blowing it dry with compressed air. Inspect all wearing surfaces and replace parts as necessary. See *Cleaning and Checking Wearing Parts on page 14*. Discard O-rings and replace with new.



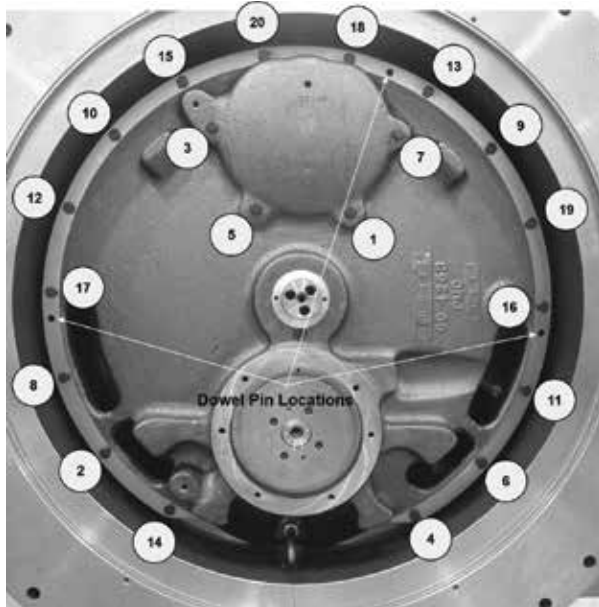
**FIGURE 31 - REMOVING BEARING HOUSING**



**FIGURE 32 - BEARING HOUSING REMOVED**

## INSTALLING BEARING HOUSING

With dowel pins removed and using proper rigging install the bearing housing back into the compressor, be sure that the oil emergency reservoir O-ring is securely installed, insert the 3 dowel pins and torque the 3/8" bolts to 35 ft/lb in the sequence show in *Figure 33 on page 29*.



LD27103

**FIGURE 33 - BEARING HOUSING TORQUE SEQUENCE**

## REAR LOW-SPEED BEARING COMPONENTS

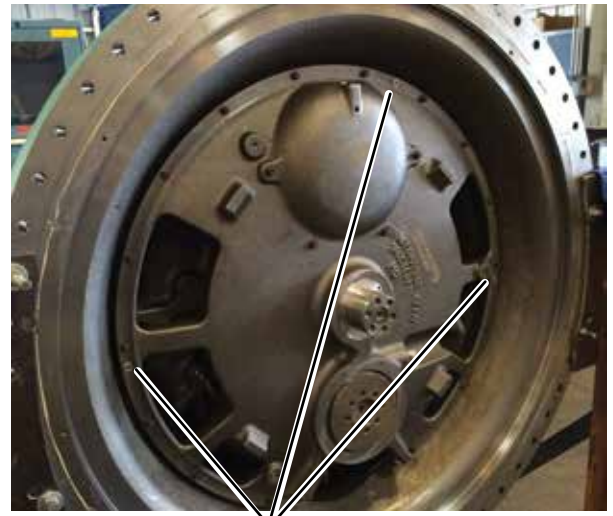
(see *Figure 35 on page 30*)

### Removal

To remove/replace the rear low-speed bearing, proceed as follows:

1. Remove the compressor coupling spool as described in *Motor Removal and Replacement on page 17*. Also remove the compressor coupling hub from the compressor shaft.

2. Remove the compressor shaft seal as described in *Motor Removal and Replacement on page 17*.
3. Remove the screw holding the retainer clip to the compressor.
4. Using the (2) 1/4" puller rods as shown in *Figure 36 on page 30* remove the bearing from the compressor.
5. Inspect the bearing. See *Cleaning and Checking Wearing Parts on page 14*. Replace with new bearing if necessary.



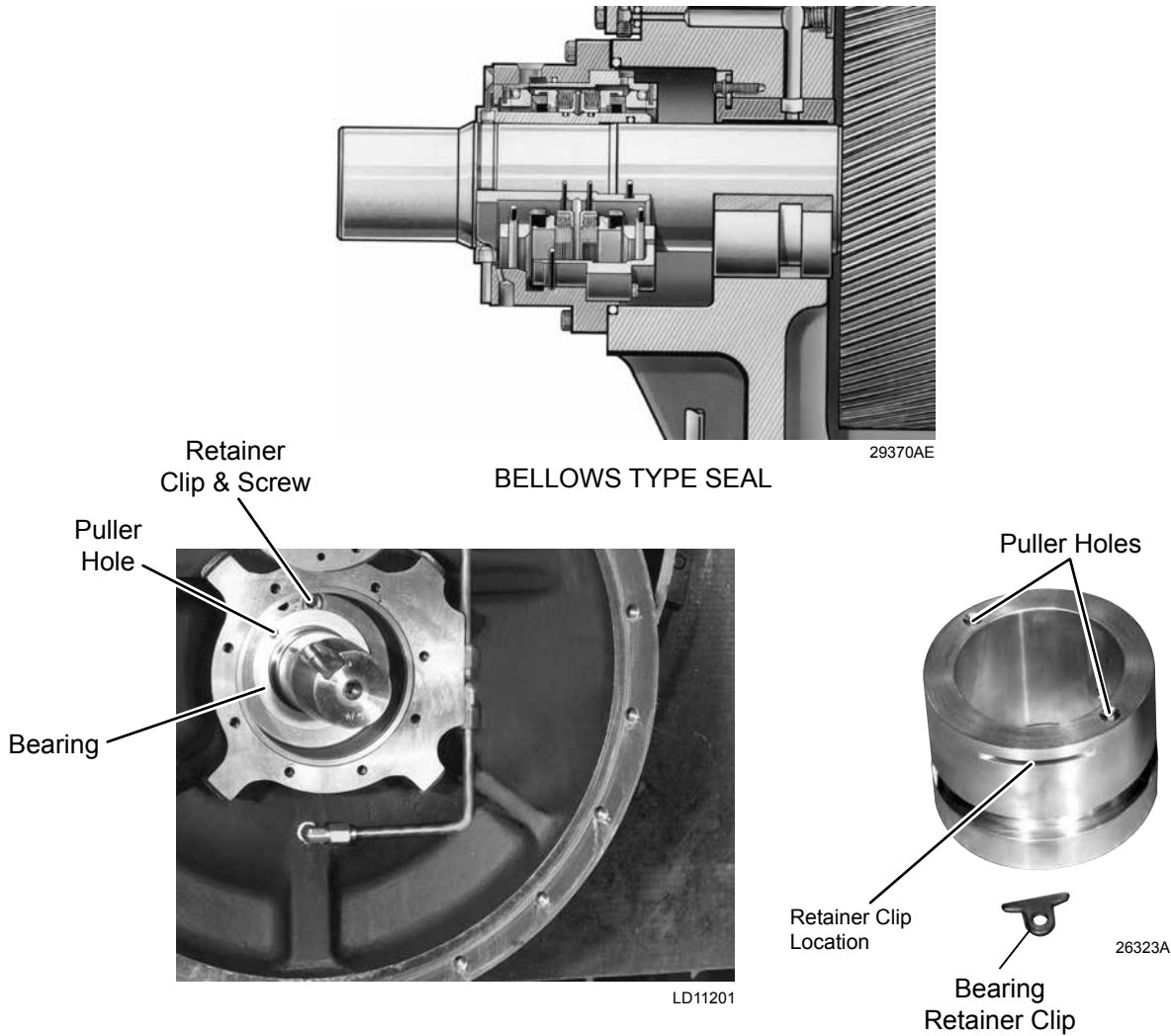
LD27101

Dowel Pins  
(Located Under 1/2" Cap Screws)

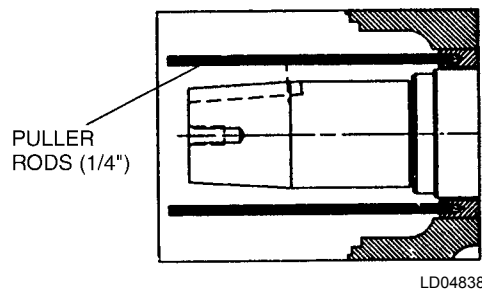
**FIGURE 34 - BEARING HOUSING DOWEL PINS**

**Installation**

1. Inspect the bearing surface of the drive shaft, and be sure the drive shaft is absolutely clean.
2. Apply a light coating of oil and Molykote to the driveshaft and to the inside and outside surfaces of the bearing.
3. Carefully slide the bearing into position over the drive shaft. Be sure it is turned so that the slot for the retainer clip is at the top (see *Figure 35 on page 30*).
4. Install the retainer clip and cap screw.
5. Install the shaft seal and coupling in *Motor Removal and Replacement on page 17*.



**FIGURE 35 - REAR LOW-SPEED BEARING**



**FIGURE 36 - LOW-SPEED REAR BEARING REMOVAL**

## REAR HIGH-SPEED BEARING COMPONENTS

To remove/replace any of the components shown in *Figure 38 on page 34*, proceed as follows:

1. Remove the Proximity Probe. See *Figure 3 on page 16* for replacement proximity probe information if needed.
2. Remove the cap screws holding the high-speed reverse thrust bearing and remove the high-speed reverse thrust bearing (see *Figure 39 on page 34*). Note alignment of oil passages.
3. Before removing the high-speed thrust collar measure the run-out on the collar face. Mount a dial indicator as shown in *Figure 40 on page 34* and rotate the compressor shafts. Maximum allowable run-out is .001".
4. To remove the high-speed thrust collar, it is necessary to lock the shafts to prevent isolation. Use the gear locking tool from the tool kit as illustrated in *Figure 41 on page 34*.
5. Remove the cap screws that hold the high-speed thrust collar to the high-speed shaft (see *Figure 42 on page 34*), and remove the thrust collar (1/4"-20 puller holes are provided for convenience).
6. Remove the high-speed forward thrust bearing (see *Figure 43 on page 35*), #10-24 puller holes are provided for convenience. When inserting puller bolts, use care that bearing pads are not damaged. Note position of indexing roll pin and mating hole in casing.
7. Remove the cap screw holding the high-speed bearing (rear) retainer clip to the casing (see *Figure 44 on page 35*). Using items from the tool kit as shown in *Figure 45 on page 35*, remove the bearing from the compressor.
8. Inspect all parts removed above. See *Cleaning and Checking Wearing Parts on page 14*. Replace with new parts as necessary.

## HIGH SPEED THRUST BEARINGS

Starting December 2010 changes have been implemented for the High Speed Thrust Bearing Assemblies used on the following compressors.

- K3 - YDHL-95
- K4 - YDHL-106
- J7 / K7 - YDHJ-119

## IDENTIFYING COMPRESSORS UTILIZING UPDATED HIGH SPEED THRUST BEARINGS

Compressors manufactured with or updated to the new Thrust Bearing Assembly can be identified by a partially drilled 1/4" hole at 9 o'clock position on the out-board face of the Reverse High Speed Thrust Cover plate (see FIGURE 87 for additional details).

## K3 AND K4 COMPRESSORS

The new Thrust Bearings for these models are not direct replacements for compressors manufactured using the legacy design bearings. Updating a K3 or K4 compressor to utilize the new thrust bearing design requires replacing both the forward and reverse thrust bearings, the thrust collar and installing a new rear high speed journal bearing.

To facilitate this modification a field replacement kit has been created for retrofitting the K3 and K4 compressors. The part number for this kit is 364-53001-000. The kit is supplied with all hardware needed to complete this replacement along with installation instructions and O-rings. Loctite 243 (part # 013-03375-000) used for securing bearing fasteners is not included with kit.

### Individual Part Numbers for New Style K3 and K4 High Speed Thrust Bearings

The updated high speed thrust bearings part numbers used with the K3 and K4 compressors are listed in the following tables.

ITEM	ORIGINAL PART NUMBER	NEW PART NUMBER
HS Forward Thrust Brg	029-25063-000	029-25837-001
HS Thrust Collar	064-51780-000	064-52718-000
HS Reverse Thrust Brg	029-25062-000	029-24758-002
Rear HS Journal Brg	064-51781-000	064-52719-000
Reverse Thrust Brg Cover O-ring	028-12258-000	
Internal O-rings for Reverse Thrust Brg Cover (qty 3)	028-12513-000	
Small Pipe Plugs used w/ Reverse Thrust Brg (qty 3)	023-24908 000	
O-rings for Small Pipe Plugs used w/ Reverse Thrust Brg (qty 3)	028-15846-000	
O-ring for Proximity Probe	028-12961-021	

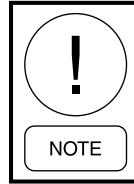
### J7/K7 COMPRESSORS

The new high speed thrust bearing design for this model compressor is a direct replacement. When replacing thrust bearings for this compressor order the part numbers listed below:

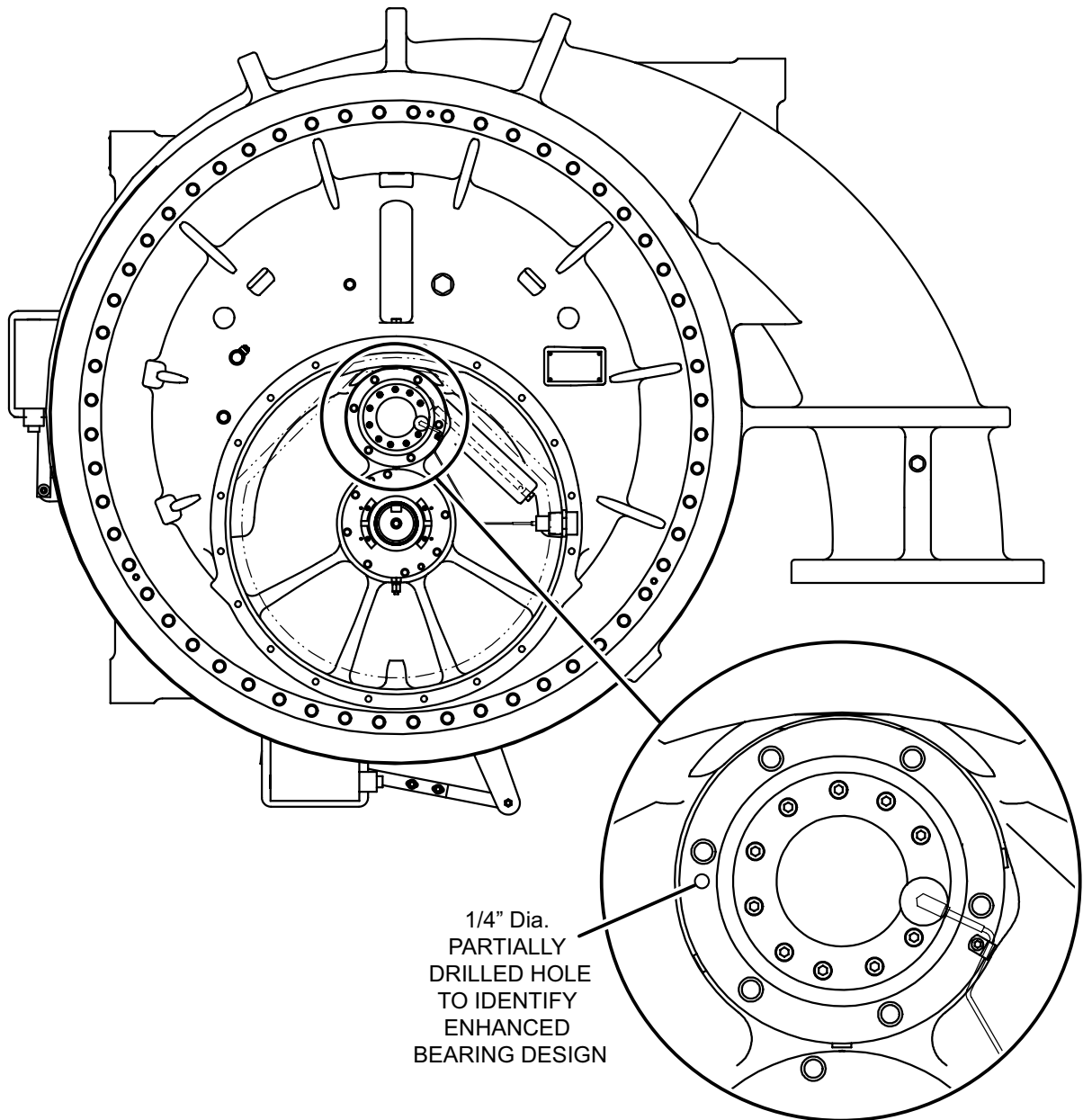
ITEM	ORIGINAL PART NUMBER	NEW PART NUMBER
HS Forward Thrust Brg	029-24759-000	029-24759-001
HS Thrust Collar	064-51493-000	
HS Reverse Thrust Brg	029-24758-000	029-24758-002
Reverse Thrust Brg Cover O-ring	028-12258-000	
Internal O-rings for Reverse Thrust Brg Cover (qty 3)	028-12513-000	
Small Pipe Plugs used w/ Reverse Thrust Brg (qty 3)	023-24908 000	
O-rings for Small Pipe Plugs used w/ Reverse Thrust Brg (qty 3)	028-15846-000	
O-ring for Proximity Probe	028-12961-021	

ITEM	ORIGINAL PART NUMBER	NEW PART NUMBER
O-rings for Small Pipe Plugs used w/ Reverse Thrust Brg (qty 3)	028-15846-000	
O-ring for Proximity Probe	028-12961-021	

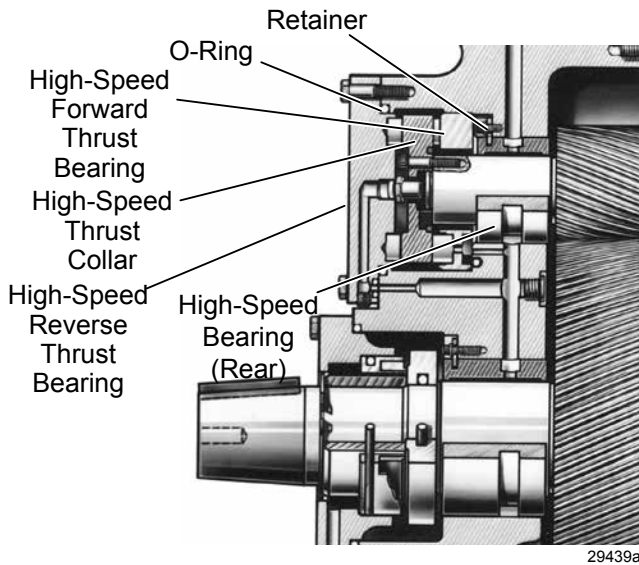
For the J7/K7 compressor each item can be replaced individually (example: if replacing forward thrust bearing the original design reverse thrust bearing can be reused if not damaged).



*It is recommended that when replacing a damaged original design bearing that both the forward and reverse thrust bearings are replaced with the new part numbers.*



**FIGURE 37 - REVERSE HIGH SPEED THRUST COVER PLATE**



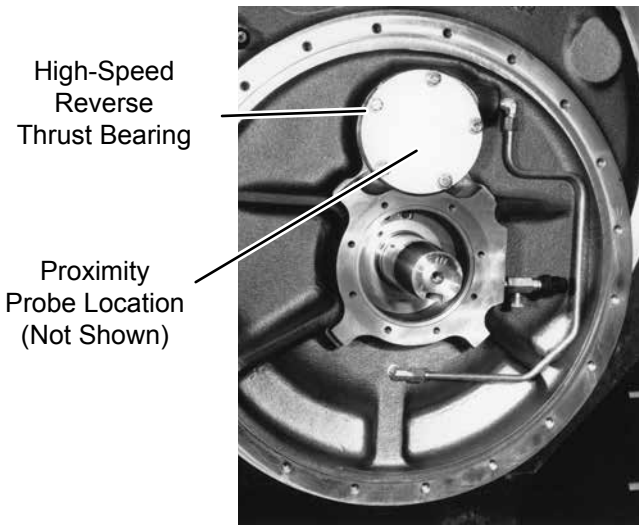
**FIGURE 38 - HIGH-SPEED BEARING COMPONENTS**

29439a



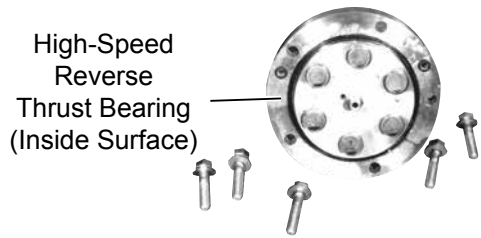
**FIGURE 40 - CHECKING HIGH-SPEED THRUST COLLAR RUN-OUT**

LD22362



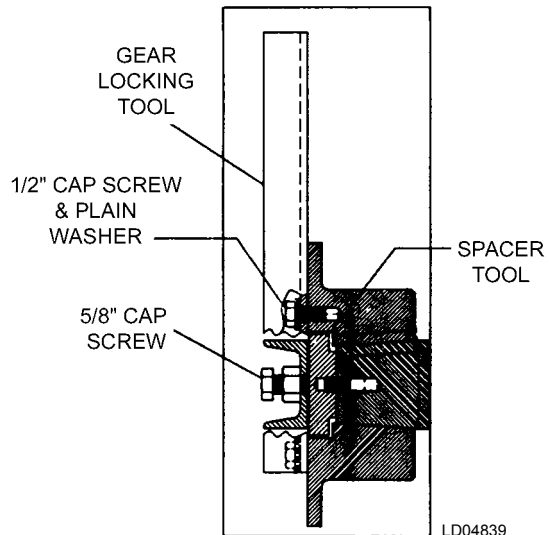
High-Speed Reverse Thrust Bearing  
Proximity Probe Location (Not Shown)

26664A



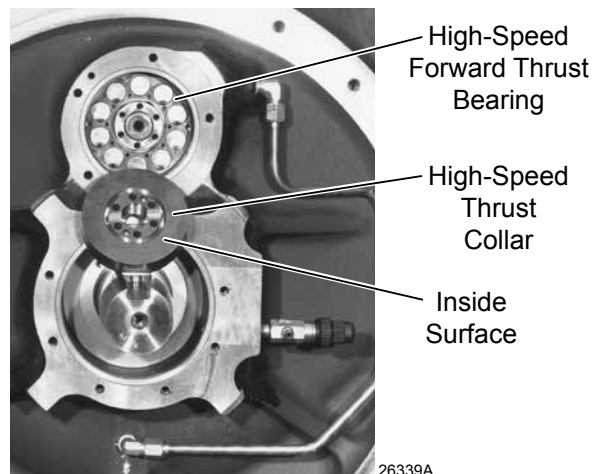
**FIGURE 39 - HIGH-SPEED REVERSE THRUST BEARING**

26662A



**FIGURE 41 - GEAR LOCKING**

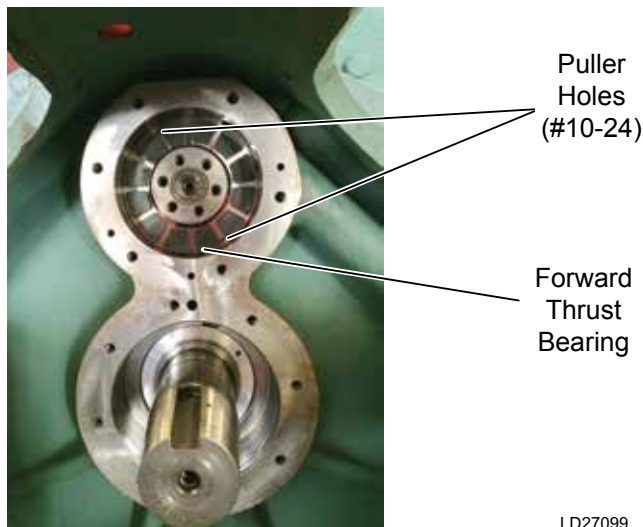
LD04839



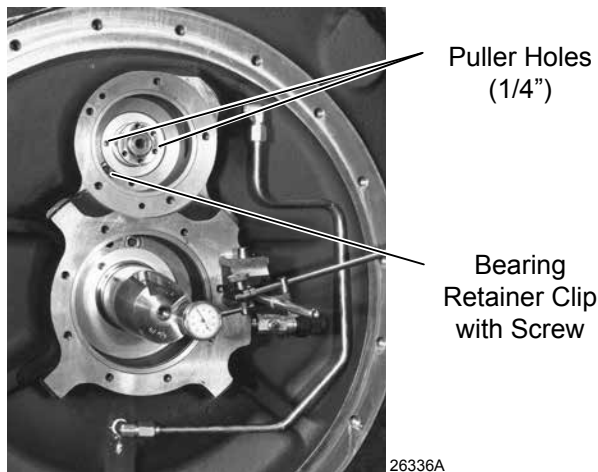
**NOTE:** Oil Piping configuration may vary according to vintage of unit.

**FIGURE 42 - HIGH-SPEED THRUST COLLAR REMOVED**

26339A

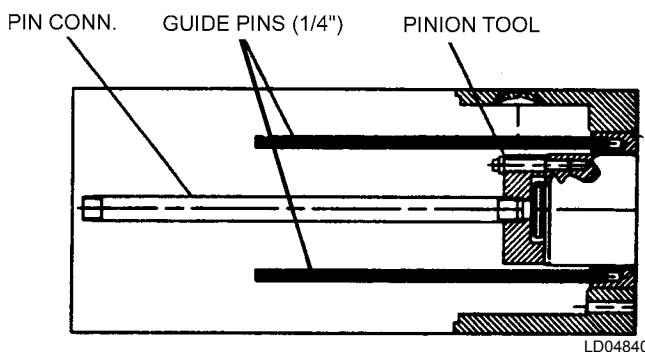


**FIGURE 43 - HIGH-SPEED FORWARD THRUST BEARING**



**NOTE:** Oil Piping configuration may vary according to vintage of unit.

**FIGURE 44 - REAR HIGH-SPEED JOURNAL BEARING**



**FIGURE 45 - HIGH-SPEED REAR BEARING REMOVAL**

To remove/replace any of the components shown in *Figure 38 on page 34*, proceed as follows:

1. Remove the Proximity Probe Assembly as mentioned (See *Two Piece Proximity Probe on page 16*).
2. Remove the cap screws holding the high-speed reverse thrust bearing and remove the high-speed reverse thrust bearing. Note alignment of oil passages. Use guide pin to support the thrust bearing to avoid damaging the bearing ped.
3. Before removing the high-speed thrust collar, measure the run-out on the collar face. Mount a dial indicator as shown in *Figure 44 on page 35* and rotate the compressor shafts to record the run-out. Maximum allowable run-out is .001".
4. To remove the high-speed thrust collar, it is necessary to lock the shafts using the gear locking tool from the tool kit.
5. Remove the (4) hex socket head cap screws that hold the washer and thrust collar to the high-speed shaft. Remove the thrust collar (1/4"-20 puller holes are provided for convenience).
6. Loosen but do NOT remove the (3) hex head cap screws that hold the high-speed forward thrust bearing to the high-speed bearing.
7. Use the #10-24 puller rods to pull the high-speed forward thrust bearing and high-speed bearing from the compressor.
8. Inspect all parts removed above. See *Cleaning and Checking Wearing Parts on page 14*. Replace with new parts as necessary.

### Installing Rear High-Speed Bearings

1. Be sure the bearing surface of the high-speed shaft is clean and is in good condition.
2. Apply a light coating of oil and Molykote to the high-speed shaft and to the inside and outside surfaces of the high-speed bearing. On K1 and K2 style compressors install a new O-ring on the high-speed bearing. K3 through K7 does not have an O-ring.
3. Apply a light coating of oil and Molykote to the inside diameter and pads of the forward thrust bearing.
4. Insert but do NOT tighten the (3) hex head socket screws that hold the high-speed forward thrust bearing to the high-speed bearing.

5. Carefully follow the Replacement Procedures below:

1. Follow the procedures in the correct compressor service manual to access the forward high speed thrust bearing.
2. Remove the existing high speed forward thrust bearing and rear journal bearing with retainer (if the rear journal bearing is being replaced), from the compressor and discard.
3. Clean and examine the bearing bore and thrust bearing land for any damage, high spots or nicks. If damage is spotted, it needs to be repaired before installing the new bearing arrangement.
4. Using removable thread locker (Loctite 243-P/N 013-03375-000) on the bolts, assemble the new forward thrust and journal bearings as shown in *Figure 43 on page 35* and *Figure 44 on page 35*. Torque the 3-1/4" socket head bolts to 80 in-lbs.
5. Insert the thrust and journal bearings into the compressor. Note the location of the anti-rotation hole in the compressor housing and orient the thrust/journal bearing assembly to align the anti-rotation (dowel) pin on the back side of the forward thrust bearing with the hole in the compressor housing. The roll pin will align itself with the retainer bolt hole formerly used to secure the original bearing.
6. Apply a light coating of oil and Molykote to both sides of the thrust collar. Install the thrust collar and tighten the hex socket cap screws to the high-speed shaft. Check the run-out of the shaft collar. Maximum run-out is .001".
7. Apply a light coat of oil and Molykote to the pads of the high-speed reverse thrust bearing. Install reverse thrust bearing using a new O-ring. Be sure oil passages in the bearing line up with the oil passages in the compressor casing.
8. Re-install the Proximity Probe.



**After reinstalling the Proximity Probe, a Calibration Procedure, as outlined in Form 160.54-M1 or 160.76-M1, MUST be performed before restarting the compressor.**



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**FIGURE 46 - PROXIMITY SENSOR**

### Installing Gears into Rotor Support

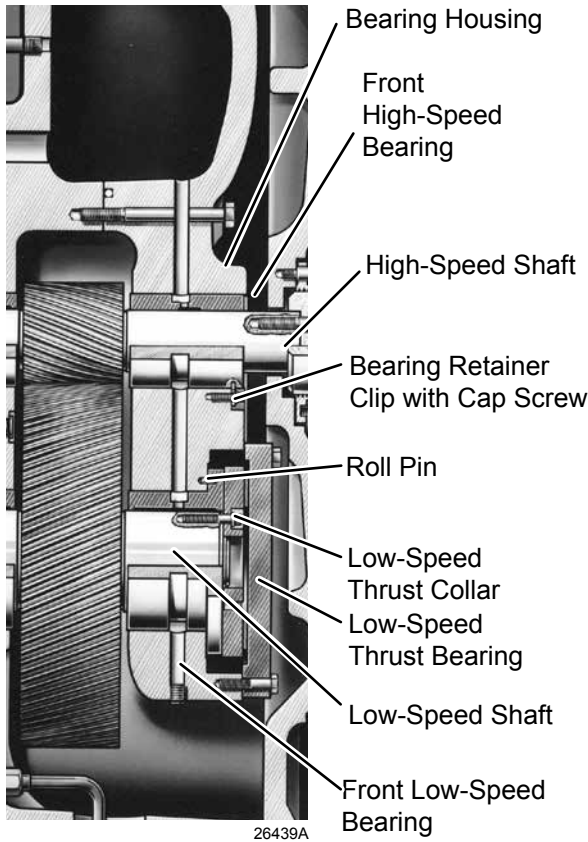
1. Oil the bearing surface on the drive end of the low-speed gear, and carefully insert the low-speed gear into the rear bearing.
2. Oil the rear bearing surface of the high-speed shaft, and insert it into the rear bearing. Mesh the high-speed and low-speed gear teeth and rotate the gears as the gear is installed.
3. Check the clearance between the high-speed pinion and the spray header. Clearance should be 0.12" min. / 0.18" max. Adjust if necessary.

### INSTALLING BEARING HOUSING

1. Install a new O-ring in the groove around the oil reservoir cavity (see *Figure 48 on page 37*). Coat the O-ring with a suitable O-ring lubricant to hold it in the groove.
2. Insert (2) guide pins 180° apart into the rotor support.
3. Lift the bearing housing and carefully push in place over the guide pins. Note location of dowel pins. Be careful not to damage any of the machined surfaces on either the high-speed or low-speed shafts. Leave the guide pins in position to help support the bearing housing.
4. Install the cap screws and dowel pins. Tighten cap screws to proper torque as outlined in *Table 2 on page 15*. Install the (3) 1/2" cap screws used to secure the dowel pins as shown in *Figure 28 on page 27*.

## INSTALLING FRONT HIGH-SPEED BEARINGS

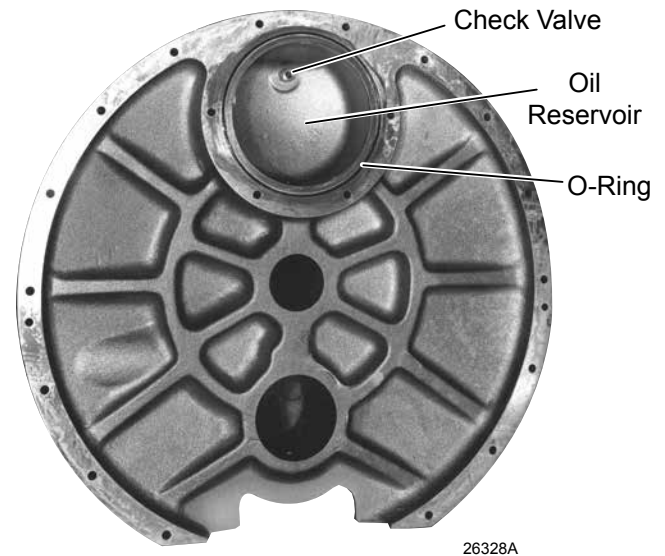
1. Apply a coating of oil and Molykote to the bearing surface of the high-speed shaft.
2. Apply a coating of oil and Molykote to the inside and outside surfaces of the high-speed bearing.
3. Carefully slide the high-speed bearing into place over the shaft and into the cavity in the bearing housing. Install the retainer clip and cap screw.



**FIGURE 47 - FRONT BEARING COMPONENTS**

## INSTALLING FRONT LOW-SPEED BEARINGS

1. Apply a coating of oil and Molykote to the bearing surface of the low-speed shaft.
2. Apply a coating of oil and Molykote to the inside and outside surfaces of the low-speed bearing.



**FIGURE 48 - BEARING HOUSING**

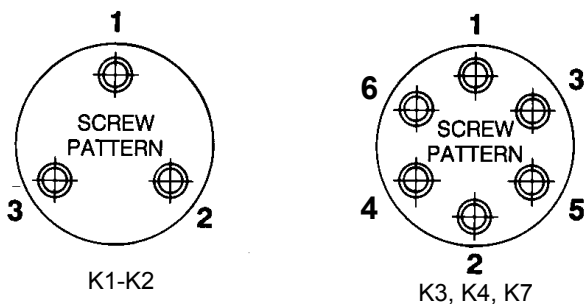
3. Carefully slide the low-speed bearing into place over the shaft and into the cavity in the bearing housing. Be sure hole in bearing flange engages roll-pin in bearing housing (see *Figure 28 on page 27*).
4. Re-install the shaft locking tool.
5. Apply a coating of oil and Molykote to the lapped surfaces of the low-speed thrust collar, using care that no damage occurs. Place the thrust collar into position on the end of the low-speed shaft, insert cap screws, and tighten to the proper torque (see *Table 2 on page 15*).
6. Mount a dial indicator as shown in *Figure 25 on page 27* and check the run-out of the thrust collar. (It will be necessary to remove the shaft locking tool in order to take this measurement). Maximum run-out should not exceed .001" T.I.R.. If run-out exceeds .001" T.I.R. DO NOT proceed with further assembly; contact the YORK Factory Service for assistance.
7. Re-install the shaft locking tool.
8. Apply a coating of oil and Molykote to the bearing pads of the low-speed thrust bearing and to the low-speed thrust collar. Install the low-speed thrust bearing.

## INSTALLING BALANCE PISTON AND DIFFUSER PLATE

1. Install a new O-ring in the groove around the oil reservoir cavity. Coat the O-ring with a suitable O-ring lubricant to hold it in the groove.
2. Insert (2) 1/4" dia. guide pins into the rotor support.
3. Using proper rigging methods, slide the diffuser plate over the guide pins and into position against the rotor support see *Figure 20 on page 25*.
4. Insert (4) of the bolts before removing rigging and guide pins; then insert remaining bolts and tighten.
5. Place the flat side of the balanced piston seal ring facing the diffuser plate. Install the flat spring washer on top of the balanced piston seal ring, install retainer plate on top of both flat spring washer and balanced piston seal ring.
6. Apply Loctite and insert the (3) cap screws and fasten the balance piston seal and balance piston retainer to the diffuser plate.
7. After tightening the (3) cap screws, check that the balance piston is free to "float".

## INSTALLING THE IMPELLER

1. Re-install the shaft locking tool.
2. Apply a light coat of oil or Molykote to the inside diameter of the balance piston seal and impeller.
3. Slide impeller into position on the high speed shaft using care not to damage the balance piston seal.
4. Install the impeller clamping collar and the (3) or (6) cap screws onto the high-speed shaft.
5. Torque cap screws to 120 ft.lbs in (2) equal steps. See to *Figure 49 on page 38* for the proper sequence of tightening screws.



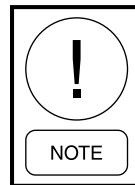
**FIGURE 49 - IMPELLER MOUNTING SCREWS TIGHTENING SEQUENCE**

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6. Remove the shaft locking tool and check rim and eye radial run out using a dial indicator see *Figure 14 on page 23 and Figure 15 on page 23*. Maximum run out on rim is .003" and the run out on eye is .002". If T.I.R. deviates from specification, increase torque to 140 ft.lbs. max to the bolts opposite to the high side. Repeat as necessary until allowable T.I.R is achieved.
7. Check high-speed thrust clearance. Acceptable thrust tolerance is between .008" to .021" for K2, K3 & K4, .009" to .020" for K1 and K7.
8. Check low-speed thrust clearance. Acceptable thrust tolerance is between .011" to .019" See *TTable 5 on page 23*. Note that this measurement must be taken with the shaft seal installed.

**TABLE 7 - PERMISSIBLE RUNOUT OF IMPELLER**

RIM RADIAL	EYE RADIAL
.003	.002



***Make absolutely certain that O-rings are in place prior to installing and torque cap screw.***

9. Torque cap screw to 120 ft.lbs.
10. Remove that shaft locking tool and check the rim and eye radial runout using a dial indicator (see *Figure 22 on page 36*). Maximum runout on rim is .003" and for the eye maximum is .002".
11. Check the high-speed thrust clearance. See *Table 5 on page 23*.
12. Check low-speed thrust clearance. Acceptable thrust tolerance is between .011" to .019". Note that this measurement can be taken with the shaft seal installed.

## DISASSEMBLY OF ROTOR SCROLL

1. Support the weight of the rotor support and motor using proper rigging methods.
2. Remove the cap screws, and then fasten the suction connection and the discharge connection to the scroll housing.
3. Remove all other external piping from the rotor scroll.
4. Support the rotor scroll by proper rigging methods; then remove the bolts holding the rotor scroll to the unit.

- Carefully remove the rotor scroll from the unit base, making sure the rotor scroll is out and away from the seal, and rest it on the end of the suction housing. Do not lose any parts of isolators that were beneath the compressor feet. Be sure the rotor scroll is resting solidly – block if necessary.

**REMOVING THE NOZZLE BASE PLATE (VGD)**

- Remove hand whole cover. Disconnect the VGD Drive linkage at VGD Drive Ring. See *Figure 50 on page 39*.
- Remove the cap screws that hold the nozzle base plate to the rotor scroll housing. Note there are 3 holes spaced at 120° apart, tapped for the eye bolts.
- Using eyebolts, lift the nozzle base plate from the rotor scroll housing.

**NOZZLE BASEPLATE DISASSEMBLY (VGD)**

- Remove brass tipped set screw from tensioner pin in tensioner block.
- Remove tensioner bolt and conical washer set.
- Remove tensioner pin from tensioner block.
- Remove two cap screws from each axial bearing block and remove blocks (3 or 4).
- Remove nuts and washers and remove bearings from bearing block.
- Remove stop bolt from drive ring.
- Rotate drive ring clockwise and remove from bearings on drive pins.

- Remove cap screws, radial bearings and spacers (3 or 4).
- Remove the shoulder bolt and tensioner block.
- Remove nuts and remove bearings and washers from drive pins (3 or 4).
- Working from the nozzle base plate face, remove cap screws (3 or 4 pair) in diffuser ring and remove ring.
- Remove the drive pins.
- Remove the bushings from the nozzle base.

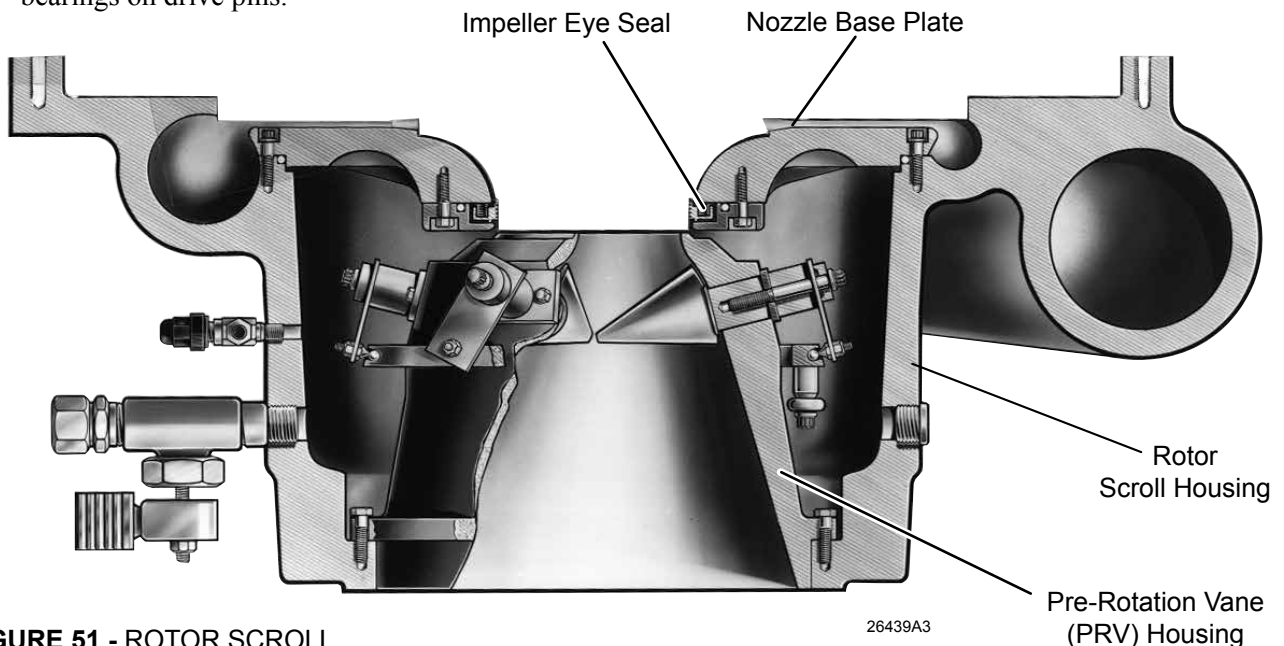
2



Hand Whole Cover

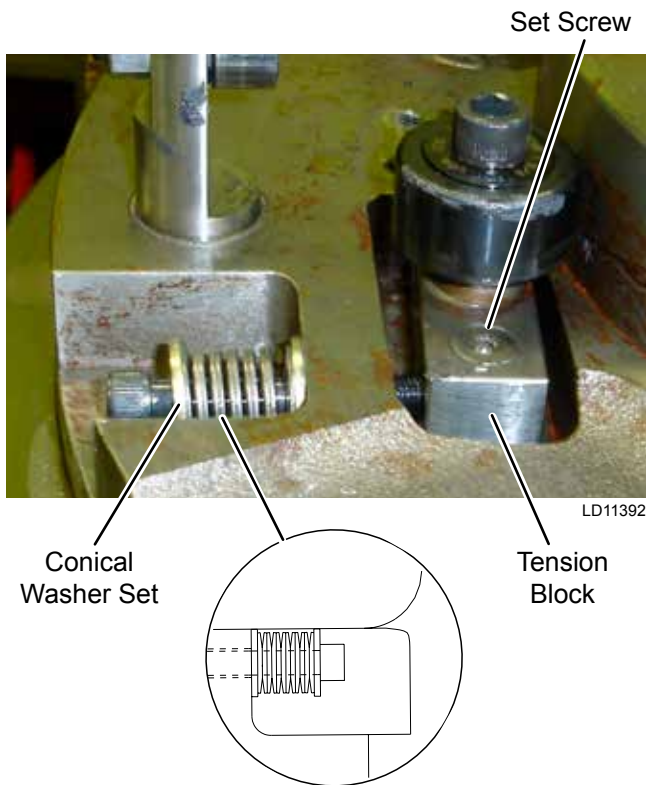
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**FIGURE 50 - HAND WHOLE COVER**



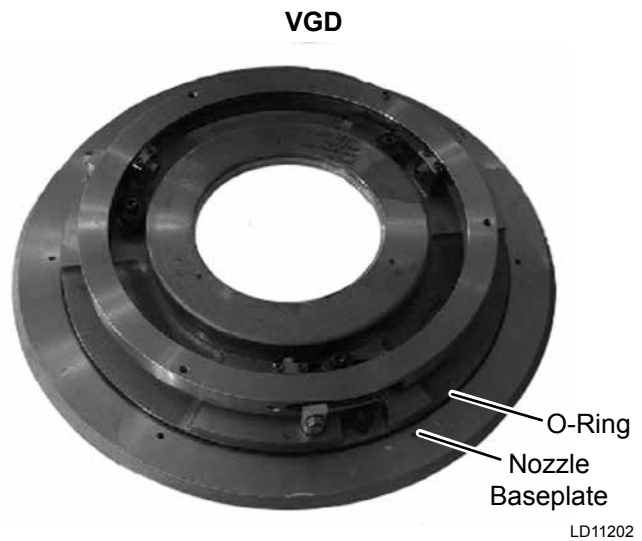
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**FIGURE 51 - ROTOR SCROLL**



**NOTE:** Conical Washer Set Orientation Required as Illustrated above.

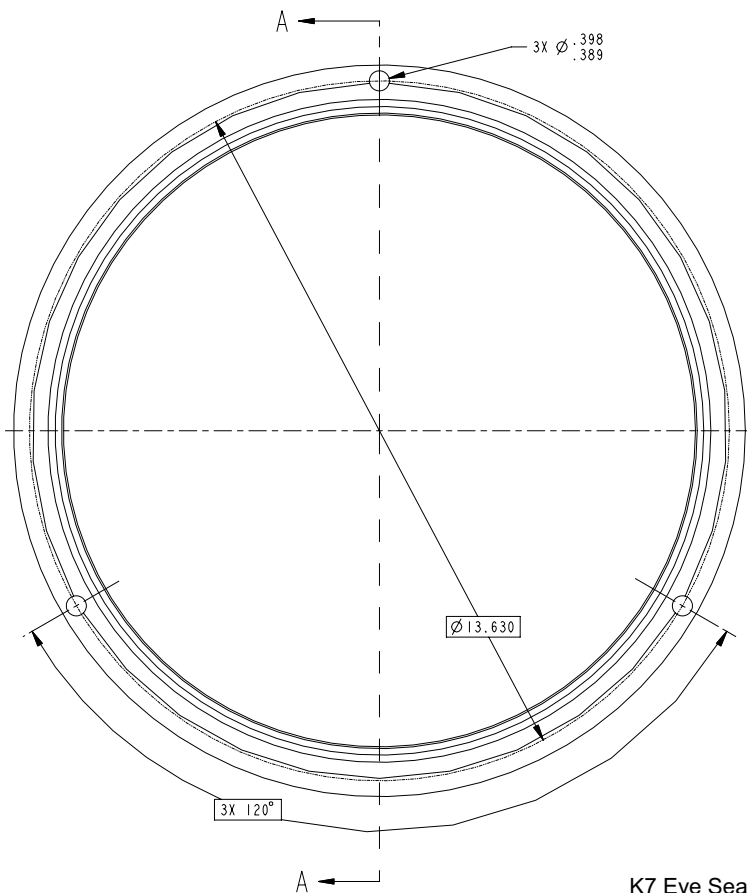
**FIGURE 52 - TENSION BLOCK**



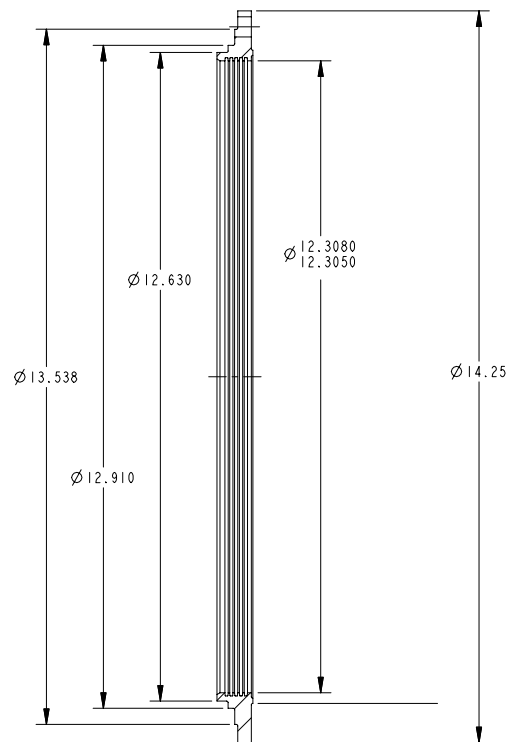
**FIGURE 53 - NOZZLE BASE PLATE**

**REMOVING THE IMPELLER EYE SEAL**

1. Remove the eye seal retainer and the eye seal ring from nozzle base plate see *Figure 55 on page 41*.



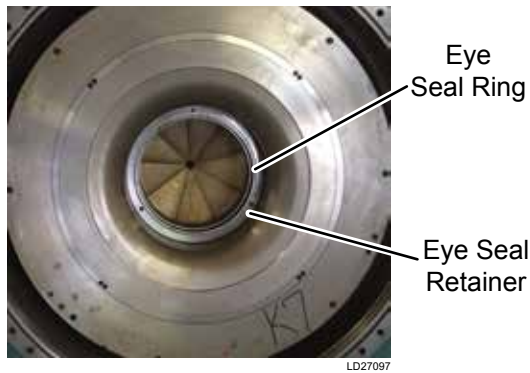
K7 Eye Seal  
064-51506-000



SECTION A-A

LD13195a

**FIGURE 54 - K7 EYE SEAL**



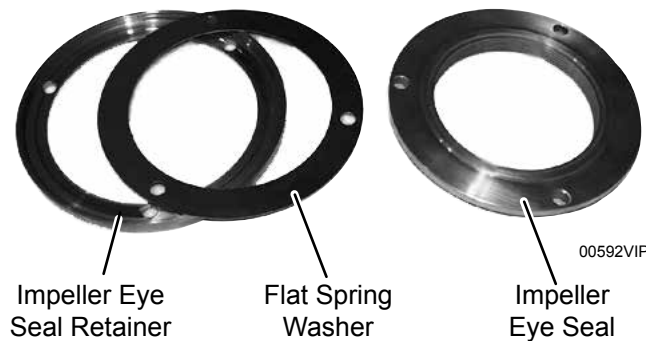
**FIGURE 55 - EYE SEAL INSTALLED**

**TABLE 8 - EYE SEAL DIMENSIONS**

	IMPELLER EYE O.D.	EYE SEAL I.D.
<b>K1</b>	8.0100" / 8.0070"	8.0260" / 8.0230"
<b>K2</b>	8.8420 / 8.8390"	8.8580" / 8.8550"
<b>K3</b>	10.0140" / 10.110"	10.0330" / 10.0300"
<b>K4</b>	11.1930" / 11.1900"	11.2130" / 11.2100"
<b>K7</b>	12.292" / 12.290"	12.3130" / 12.3100"

**RE-ASSEMBLY OF THE EYE SEAL**

1. Inspect all parts before re-assembly. See *Cleaning and Checking Wearing Parts on page 14*. Replace with new parts as necessary.



**FIGURE 56 - EYE SEAL COMPONENTS**

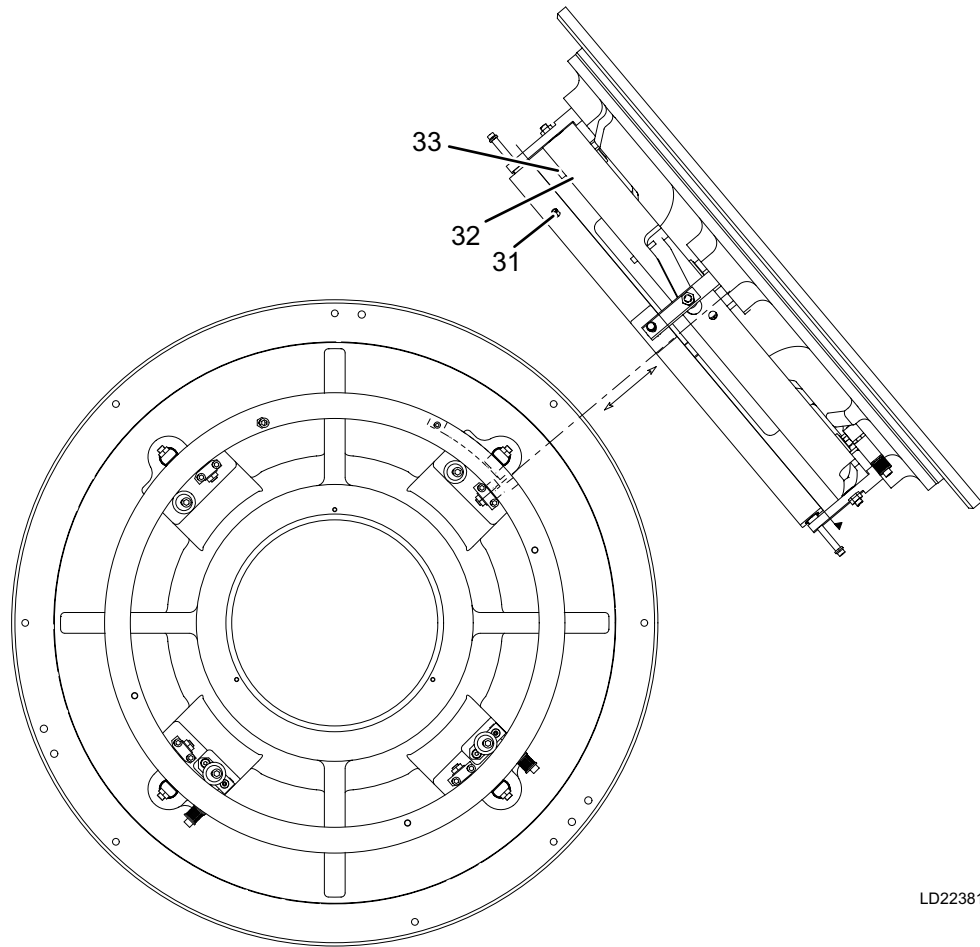
2. Place flat spring washer into retainer and position eye seal over spring retainer.
3. Take complete eye seal assembly and position on nozzle base plate. Insert cap screws and tighten. Check that the seal ring is free to “float”.

**RE-ASSEMBLY OF NOZZLE BASE PLATE  
VGD ASSEMBLE PROCEDURES**

**2**

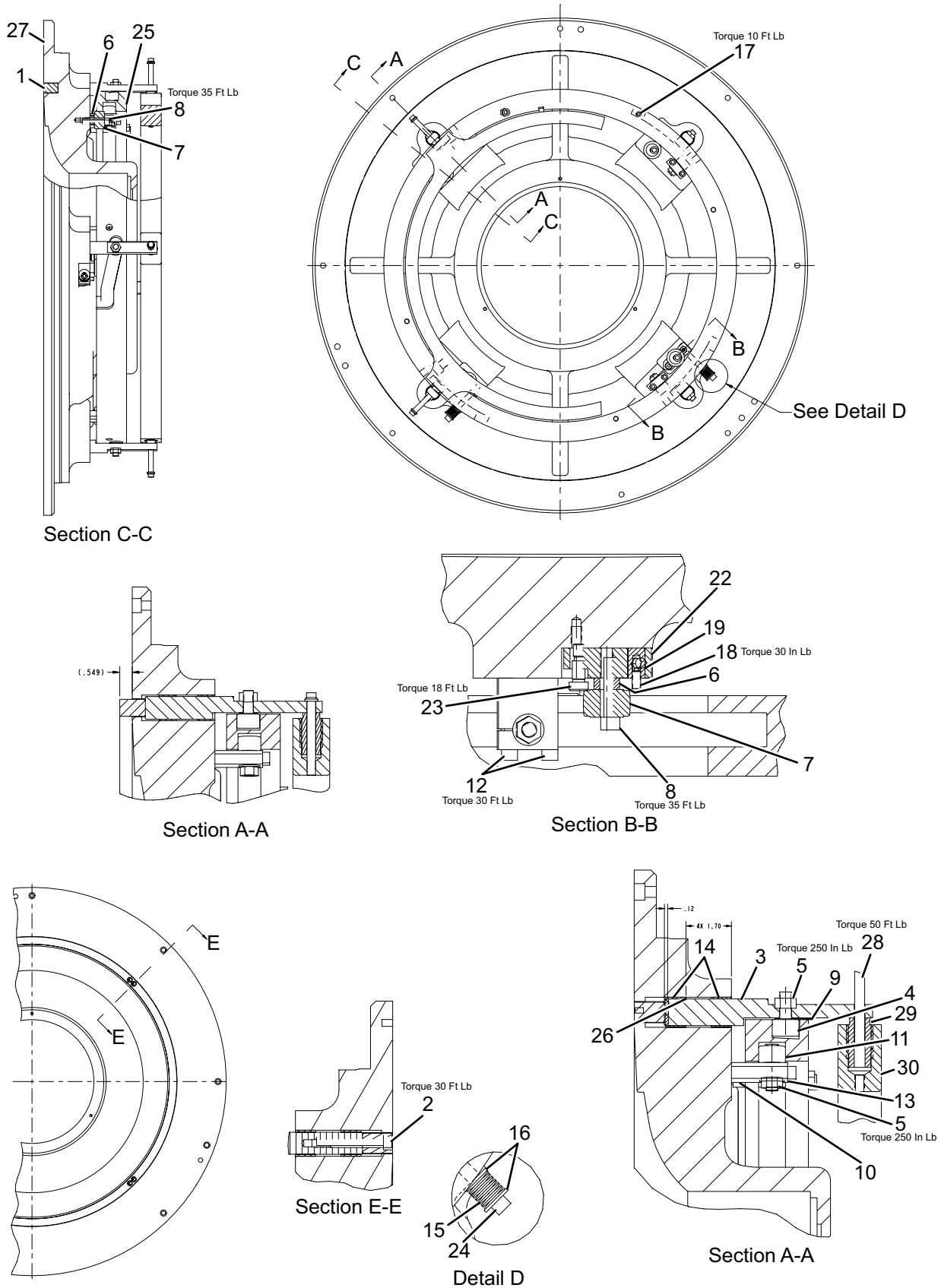
1. Install bushings (item 14) in nozzle base plate (item 27).
2. Install drive pins (item 3) in nozzle base plate. Do not lubricate inside diameter of Bushings (item 14). Lubricate drive pins (item 3) as shown prior to insertion into bushings (item 14). Take special precaution such that end face of pin, threaded holes in end of pin and .12 inch length at end of pin remain dry and completely free of lubricant.
3. Assemble diffuser ring (item 1) to nozzle base plate, align holes with drive pins, Shim to center ring in slot. Using alignment tool 064-51664-000, align drive pins and attach to diffuser ring using screws (item 2).
4. Remove shims and install fixture or block to hold diffuser ring in retracted position.
5. Install cam follower, washer and nut (items 4, 9 and 5) to drive pins, torque nuts.
6. Install two radial bearing tensioner blocks (item 22) to nozzle base using screws (item 23). Verify blocks move freely.
7. Install two tensioner pins (item 19) in tensioner blocks. Position pins so that the tapped holes are aligned with the hole in the tensioner block.
8. Make up two tensioner spring assemblies from screws (item 24), washers (item 16) and conical washers (item 15).
9. Insert tensioner spring assemblies through hole in nozzle base plate, into tensioner block and just start to engage in the tapped hole in the tensioner pin. Do not tighten at this time.
10. Assemble four radial bearings and spacers (items 7 and 6) to the nozzle base plate and tensioner blocks using screws (item 8).
11. Lower drive ring (item 25) over drive pin cam followers and rotate counter clockwise into to fully retracted position.
12. Install drive ring stop screw (item 17).

13. Tighten tensioner spring assemblies to a finger tight condition. do not tighten with tools. This will provide just enough tension to keep drive ring centered.
14. Assemble axial support blocks (item 10), bearings (item 11), washers (item 13), nuts (item 5) and mounting screws (item 12) to nozzle base plate, do not tighten screws or nuts.
15. Align the axial support blocks such that the face of the block is parallel to the inside diameter of drive ring. torque the one mounting screw that is opposite the cut in each block.
16. Lightly snug the mounting screws on cut side of blocks.
17. Snug the nuts on the axial bearings just enough to seat axial bearings against face of support blocks.
18. Rotate drive ring counterclockwise until it stops.
19. Working through the holes in the drive ring, rotate the axial bearings to move the drive ring to the furthest most position away from the nozzle base plate. Work one bearing at a time.
20. Using a dial indicator on the drive ring top face, readjust the axial bearings to obtain a .001" to .002" axial backlash to the drive ring at all four locations.
21. Torque the axial support block mounting screws on the cut side of each block.
22. Torque the axial bearing retaining nuts.
23. Verify backlash at axial bearings.
24. Adjust radial bearing tensioners by tightening screws (item 24) 1-1/2 to 1-3/4 turns. Assemble set screw (item 18) into tensioner pin (item 19) being careful not to get sealer between pin and block (item 22). Torque set screw.
25. Remove any fixtures or blocking. Operate mechanism; it should operate smoothly through the full range of travel, without binding.
26. Check for correct diffuser ring travel per section a-a.
27. Lubricate all moving surfaces with 50/50 mix of molybdenum disulfide and grease (item 25).
28. Assemble four inserts (item 29) into stabilizing ring (item 30).
29. Install stabilizing ring (item 30) at the end of drive pins.
30. Adjust each insert (item 29) such that face of insert bears lightly against face of drive pin (item 3).
31. Install screws (item 28) and torque per specification on drawing.
32. Rotate drive ring (item 25) to fully retract diffuser ring (item 1).
33. Install spring pin (item 31) in stabilizing ring (item 30).
34. Install stop screw (item 32) and nut (item 33).



LD22381

**FIGURE 57 - VSD ASSEMBLY**



LD22380

FIGURE 58 - VSD ASSEMBLY

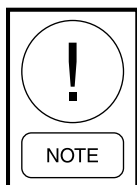
## VGD MOTOR LINKAGE

1. With the drive link disconnected from the external lever (motor lever installed and drive link connected to motor lever), manually operate the VGD control to the fully retracted position (the most clockwise position of the actuator motor).
2. Loosen the two set screws that hold the external lever to the feed through shaft. Verify that these are tight (torque to 120 ft.lbs.). This is just a clamped joint, there is no key or spline.
3. Rotate the external lever counter clockwise approximately 30° with respect to the feed through shaft.
4. Snug the lever screws enough to work the VGD mechanism, but not loosen enough to slip on the shaft.
5. Slowly rotate the external lever clockwise (retracting the VGD mechanism) until it reaches the internal hard limit.
6. Check the alignment of the holes between the external lever and the link. The center of the hole should be to the right of the center of the external lever hole.
7. With the VGD mechanism against the internal limit, loosen the external lever clamp bolts just enough to allow rotation of the lever about the shaft but not loose enough to be overly free.



***Do NOT make bolts too loose as the shaft may want to rotate counter clockwise.***

8. Continue holding the VGD mechanism against the internal stop and rotate the external lever clockwise (slipping on the shaft) to properly align the holes in the link with the hole in the lever. This assures that the VGD mechanism does not bind against the internal limit when fully retracted.



***Proper alignment is obtained when the center of the hole in the lever is approx. 1/8" to the right (over traveling) of the centerline of the hole in the link.***

9. Tighten the actuating arm clamping bolts, torque to 120 ft. lbs.

10. Reassemble the link to the lever.
11. Cycle the VGD mechanism through full travel. The link should never get tight or bind and should always be loose when shaken.

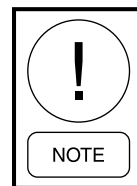
## RE-ASSEMBLY OF SCROLL HOUSING TO ROTOR SUPPORT

1. Using proper rigging methods, lift scroll housing assembly into place on unit base.
2. Using new gaskets, re-connect suction and discharge piping.
3. Insert guide pins into the scroll housing and install a new O-ring.



LD27096

**FIGURE 59 - SCROLL HOUSING READY FOR RE-ASSEMBLY TO MOTOR SUPPORT**



***Coat the O-ring with Loctite 515 or 518 to secure the O-ring into the groove during assembly.***

4. Apply a light coating of oil and Molykote to the impeller where it enters the eye seal ring.
5. Using proper rigging methods, raise the rotor support with motor adapter into proper position, and slide it into place over the guide pins.
6. Carefully slide the rotor support into place against the scroll housing. Use care that the impeller is not damaged as it enters the eye seal ring by rotating the shaft.

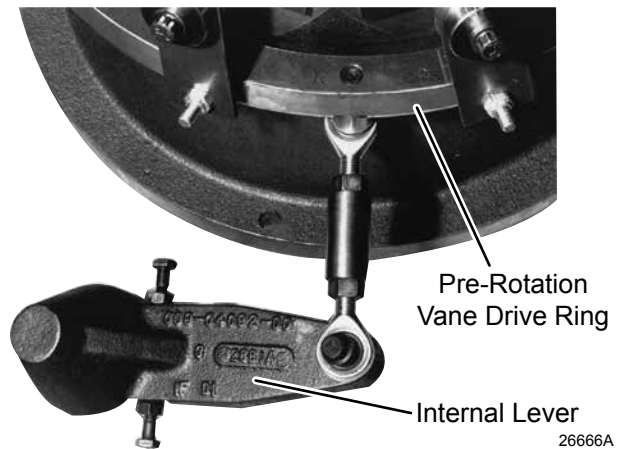
7. Insert the cap screws and tighten to the proper torque specified in *Torque Values on page 15*.
8. Re-install the compressor coupling (see *Coupling Assembly (Form 160.49-N4)*).
9. Bolt the motor to the motor adapter.
10. Re-connect all external piping.

## REMOVING THE PRE-ROTATION VANE HOUSING

The Pre-Rotation Vane Assembly cannot be removed from the suction side of the compressor. The rotor support must first be removed from the rotor scroll and the rotor scroll must be dis-assembled as described previously.

1. Remove the 12 pt. head cap screw and fill piece to disconnect the adjustable bearing rod from the vane driving ring. See *Figure 60 on page 46*.
2. Remove 2 hex head cap screws at approximately 180° apart. Replace these screws with two guide pins from the tool kit. Then remove the remaining screws from around the perimeter of the PRV assembly. Carefully pull the PRV assembly about halfway on the guide studs. Hook a lifting device to the assembly. Pull it off the guide studs and place on a bench to replace any parts.
3. The PRV vanes are actuated by a rotating vane driving ring through individual vane arms to each vane. Individual vanes may be removed by:
  - a. unscrewing the cap screw which secures the vane arm to the vane
  - b. lifting off the vane arm
  - c. lifting off the two special washers and pulling the vane out toward the inside of the vane housing (see *Pre-Rotation Vane Housing Assembly on page 49*)

4. If any of the individual vanes were removed or replaced, coat the vane shank with oil and Molykote. Tighten the vane cap screws when clamped in the closed position to the torque as indicated in *Table 2 on page 15*.
5. Re-assemble the pre-rotation vane assembly and the nozzle base plate together in reverse order. Torque all screws in accordance with *Table 2 on page 15*.



**FIGURE 60 - INTERNAL PARTS - PRE-ROTATION VANE ASSEMBLY**

**TABLE 9 - VGD AND PRV LINKAGE ASSEMBLY**

ITEM	DESCRIPTION	CONSUMABLES	TORQUE
25	Grease Poe	-	-
54	Primer Loquic Grande N, Loctite	-	-
63	Screw, Cap Hex Soc Hd #10	See Item 54 & 118	80 FT/LB
65	Screw, Cap Hex Soc Hd 1/4		10 FT/LB
69	Screw, Cap Hex Soc Hd 5/16		30 FT/LB
70	Screw, Cap Hex Soc Hd 5/16		30 FT/LB
72	Screw, Cap 12 Pt Hd 3/8 52-1		35 FT/LB
73	Screw, Cap 12 Pt Hd 3/8		50 FT/LB
76	Screw, Cap 12 Pt Hd 3/8-16		35 FT/LB
82	Screw, Cap 12 Pt Head 3/8		50 FT/LB
83	Screw, Cap 12 Pt Hd 3/8		35 FT/LB
84	Screw, Cap 12 Pt Hd 1/2		85 FT/LB
85	Screw, Cap 12 Pt Hd 1/2	See Item 54 & 118	50 FT/LB
87	Screw, Cap 12 Pt Hd 1/2	-	85 FT/LB
89	Hhcs, 0.250-20 X 1.500 Gr 5 BI	See Item 54 & 118	14 FT/LB
90	Screw, Cap Hex 1/4 -20unc	See Item 54 & 118	14 FT/LB
116	Sealer Gasket Eliminator	-	-
117	Sealer Grade AVV Loctite 086	-	-
118	Sealer Removable Thread	-	-

2

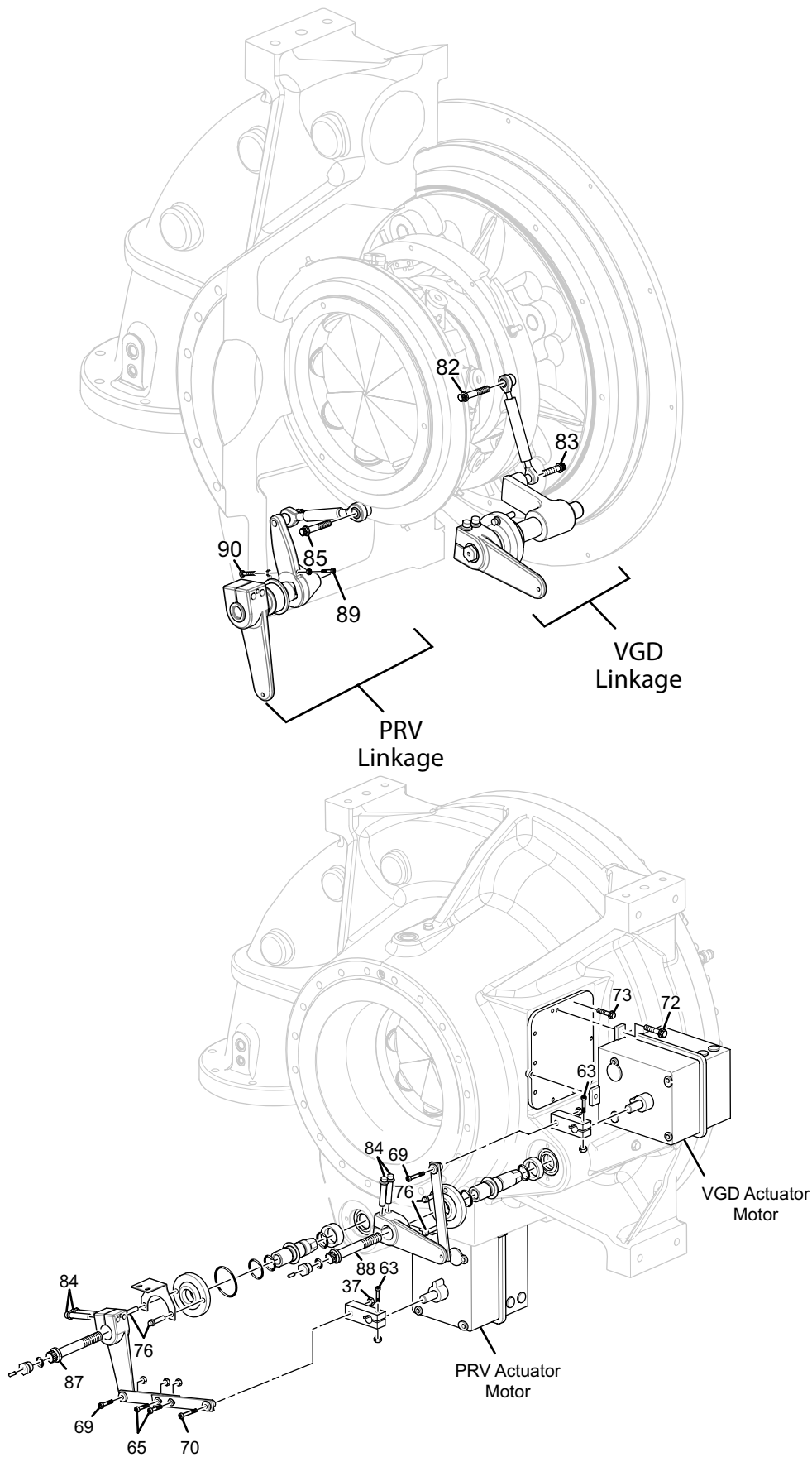
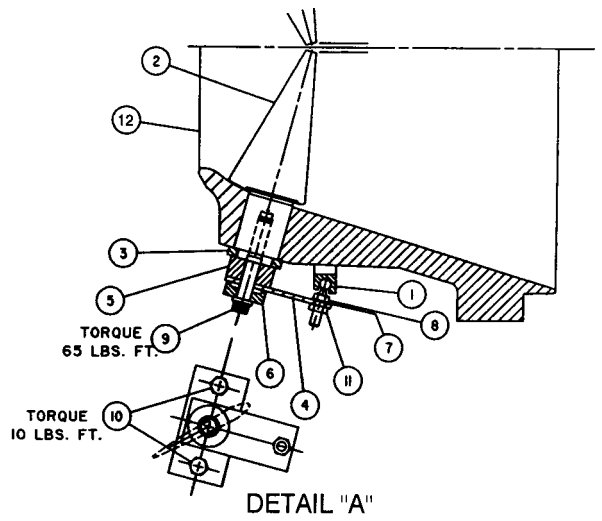


FIGURE 61 - VGD AND PRV LINKAGE ASSEMBLY

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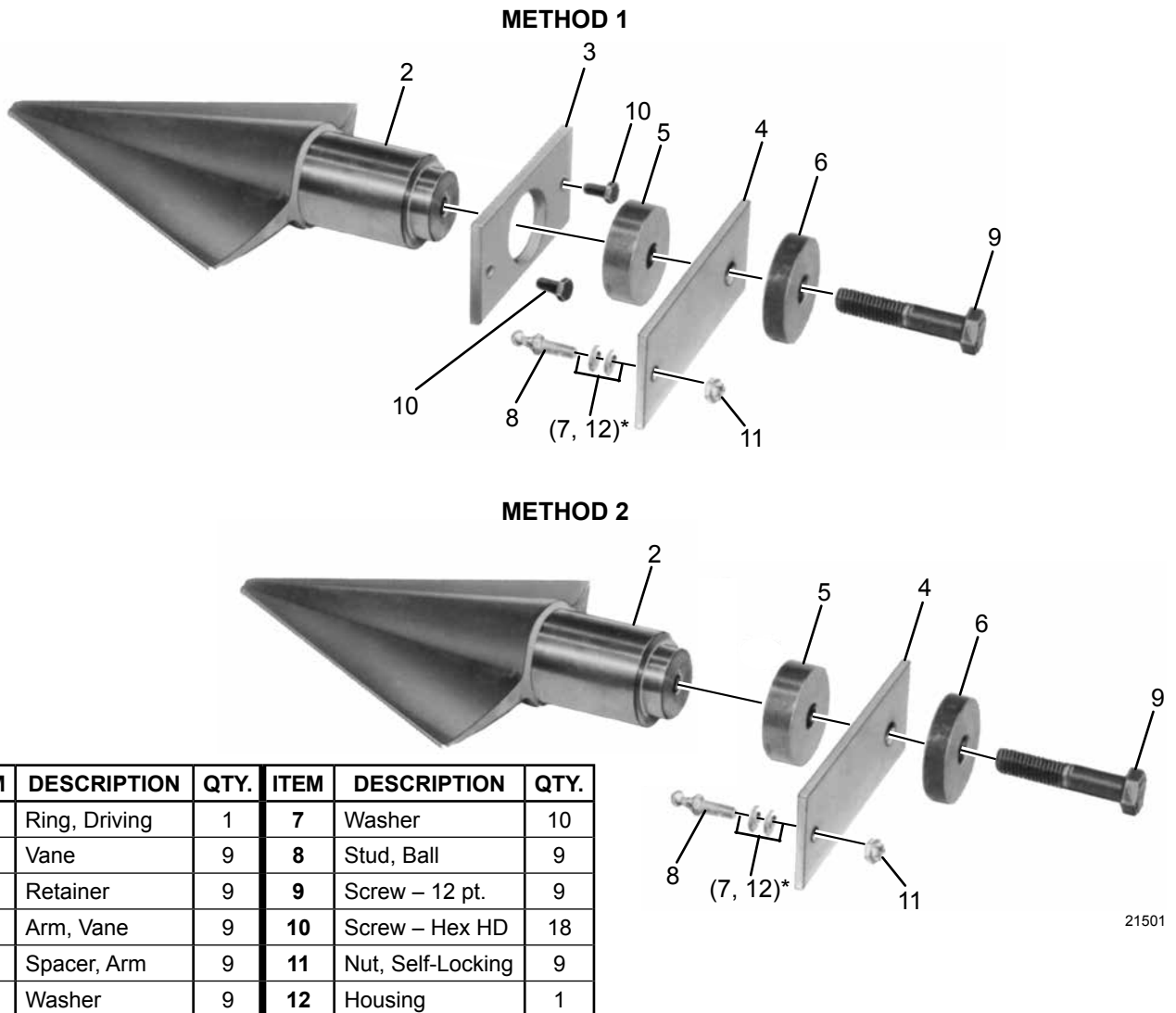


LD27095



LD05191

FIGURE 62 - PRE-ROTATION VANE HOUSING ASSEMBLY



21501

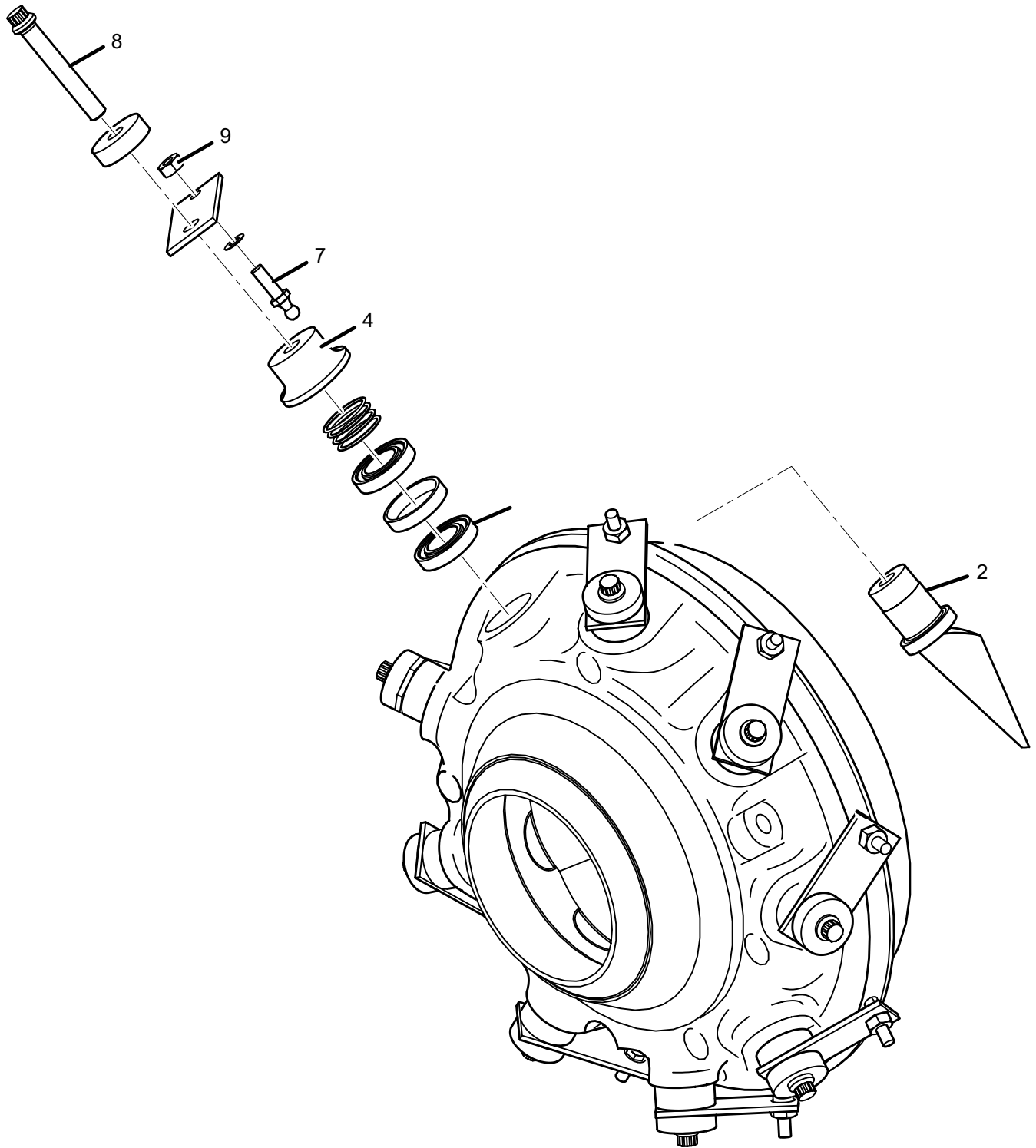
FIGURE 63 - PRE-ROTATION VANE ASSEMBLY

**TABLE 10 - PRE-ROTATION DEVICE**

ITEM	DESCRIPTION	PART NUMBER	CONSUMABLES	TORQUE
2	Vane, Pre-Rotation K1-2 (prior 7/2012)	064 51641 000	See Item 10	-
	Vane, Pre-Rotation K1-2 (after 7/2012)	029 26311 000		
4	Spacer, PRV Arm K1-2	064 51668 000	See Item 10	-
7	Stud, Ball 1/4-28 Unf	029 15924 000	See Item 10	10 FT/LB
8	Screw, Cap 12pt Hd 1/2	021-11515-000	-	85 FT/LB
9	Nut, Selflock 1/4-28 Unf	021-12943-000	See Item 10	9 FT/LB
10	Lubricant, Molybdenum*	011-00253-000	-	10 FT/LB

\*Apply 50/50 mix of lubricant (Item 10) and compressor oil to can shanks, spacers and stud balls.

Verify part numbers before ordering. These part numbers may change.



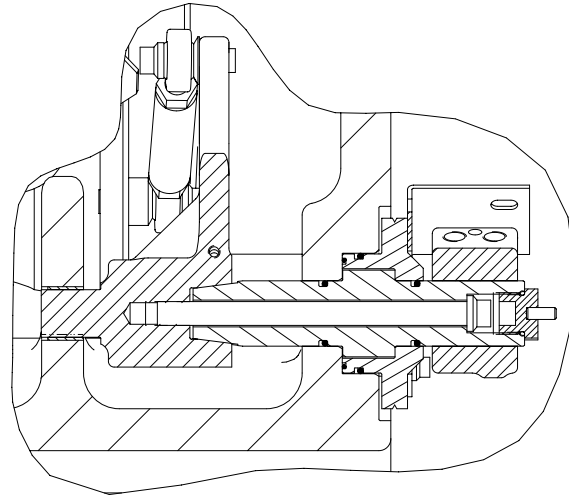
LD19820

**FIGURE 64 - PRE-ROTATION DEVICE**



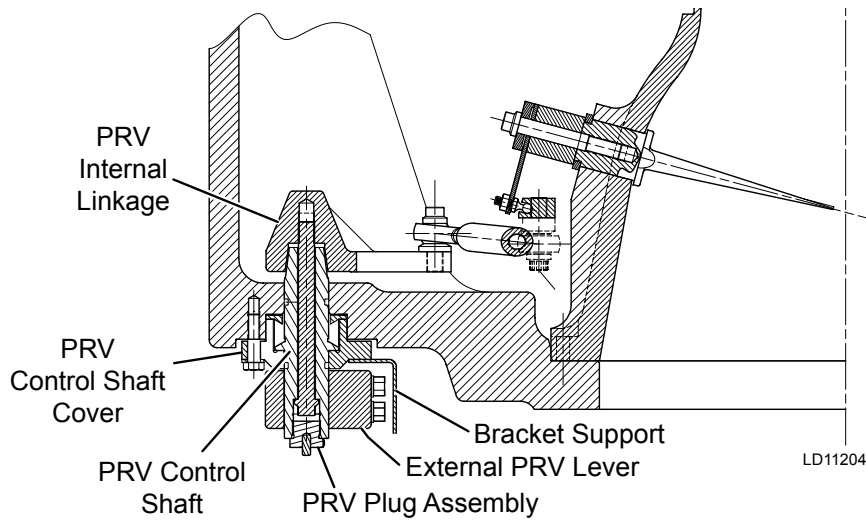
LD27094

External Lever Vane Motor  
**DETAIL A** Linkage



LD22371

**DETAIL B (TAPER DRIVE)**



LD11204

**DETAIL C (SQUARE DRIVE)**

**FIGURE 65 - CONTROL SHAFT ASSEMBLY**

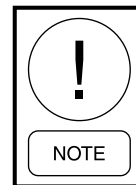
## REPLACING CONTROL SHAFT ASSEMBLY

The external and internal levers are secured to the control shaft by means of a single 12 point head cap screw threaded into the internal lever (see *Figure 65 on page 52*). Adjustable stops are provided in the internal lever arm. These stops are NOT to be used to stop the vanes in the extreme positions of normal travel, but are supplied as protection should some external force be applied to the linkage. The stops are set about 1/32" away from the rotor scroll casting walls when the vanes are in their extreme position, and will prevent overtravel from damaging the internal vane mechanism. Loctite 243 is used on the threads when the stops are initially positioned to prevent any change in position. The compound should be used again if the stops are ever removed.

To replace control shafts, refer to *Figure 65 on page 52* and proceed as follows:

1. Reduce the system pressure to slightly above atmospheric pressure.
2. Disconnect the linkage from the external lever (refer to *Figure 65 on page 52*, Detail A).
3. Loosen and remove the 12 pt. hd. cap screw and washer (refer to *Figure 65 on page 52*, Detail B). For square drive design, the O-ring plug must be removed from the end of the shaft to gain access to the cap screw.
4. Remove external lever (loosen pinch bolts on split lever).
5. Insert the special stud through the hole in the control shaft, and screw the stud into the internal lever. Be sure to put a nut on the outside end of the special stud (see *Figure 65 on page 52*).
6. Using a hammer and block of hard wood, tap the outside end of the stud to loosen the internal lever. **DO NOT REMOVE THE SPECIAL STUD.**
7. Remove the cover plate cap screws.
8. Remove the external lever and the control shaft cover from the scroll.
9. Replace the existing gasket with a new one.
10. Valve Stem Lubricant is a 2 part mixture 50/50 by weight of grease and a dry molybdenum disulphide powder thoroughly blended.
11. Slide the new shaft with O-rings into position over the special stud.

12. Install the cover plate, but do not tighten the cap screws at this time.
13. Tighten the nut on the outside end of the stud against the end of the control shaft to pull the internal lever hard up on the taper of the shaft.
14. With the cover plate loosely installed, close the vanes by turning the nut on the outside end of the stud. Position the external lever on the control shaft so that the indicator pin punch mark or split on the lever aligns with the closed "C" mark on the housing. Push external lever arm slightly to seat on taper for taper type or snug pinch bolts for the split lever.
15. Remove the nut and stud (taper type only).
16. Install the 6" cap screw and washer. Draw the cap screw tight. Move the external lever to the "open" and "closed" positions, to check the indicator points on the cover plate. Readjust the external lever position, if necessary.
17. Using a torque wrench, tighten the cap screw to a torque of 75 ft. lbs for taper type and 85 ft. lbs. for square drive.
18. Move the external lever to its midposition (vanes half open) and tighten the cover plate cap screw to a torque of 35 ft. lbs.



***This is important and assures that the sleeve will twist equally when the vanes are moved to either the wide open or the fully closed position.***

19. Connect the linkage to the external lever.
20. For square drive/split lever design only, torque the lever pinch bolts to 121 ft. lbs. and install the O-ring plug into the end of the shaft.

When connecting the vane linkage to the electric motor, rotate the motor shaft to the closed position and connect the vane linkage while holding the vanes in the closed position. Operate the vane motor open and closed several times to be sure the motor does not jam at either end of its travel. Adjust as necessary by either lengthening or shortening the distance between the motor linkage and the external lever to be sure the vanes are wide open and tightly closed as the motor rotates from one end of its travel to the other.

**IT IS IMPORTANT** that the arm length from motor centerline to force point, the arm length from control shaft centerline to force point and the length of connection arm be the same as original factory settings. Also, the angular position of the motor shaft must be as original factory settings.

## SECTION 3 - OIL PUMP SERVICE

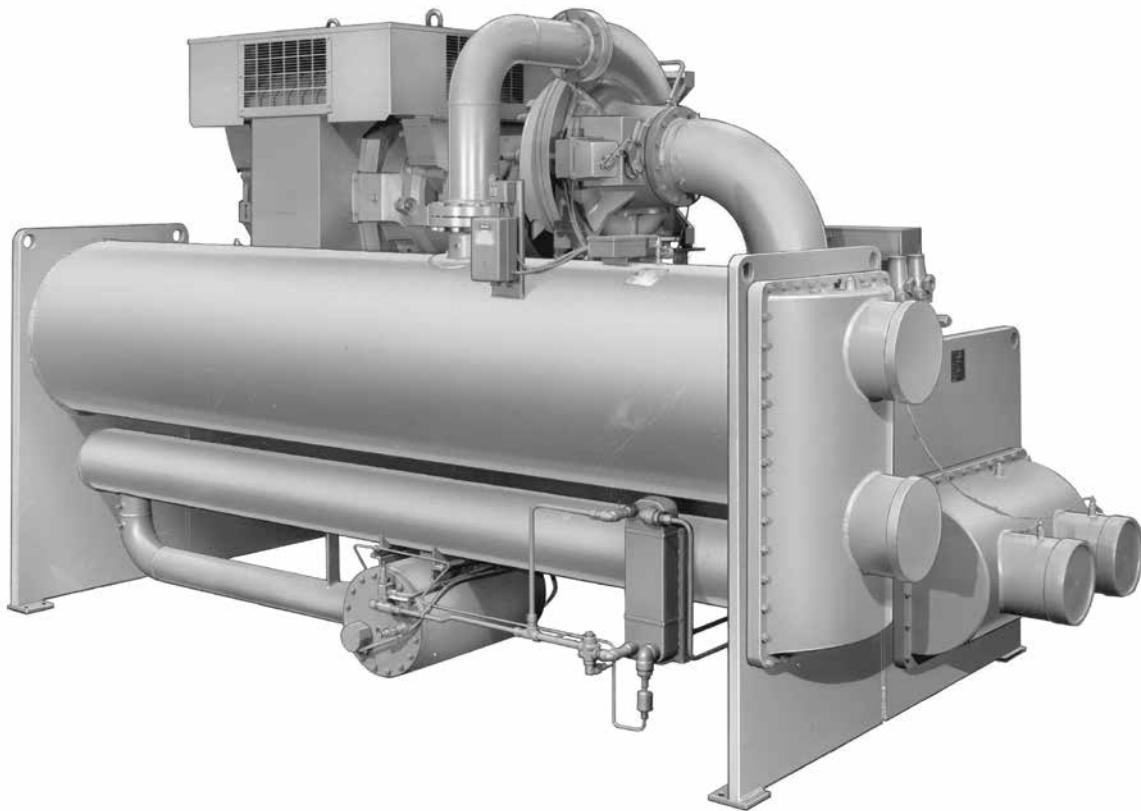
### OIL PUMP

It is quite normal for the compressor oil consumption to increase with rising shaft RPM. The High Speed and Low Speed thrust collars operate in an oil flooded chamber and behave similarly to a centrifugal pump. This is part of the design intended to assist oil flow through the bearings during power outages/coastdown. The Pressure Drop across the compressor will decrease as the machine ramps up in speed. The VSD oil pump maintains the appropriate supply pressure, by increasing the speed/flow. All YK compressors behave in a similar manner.

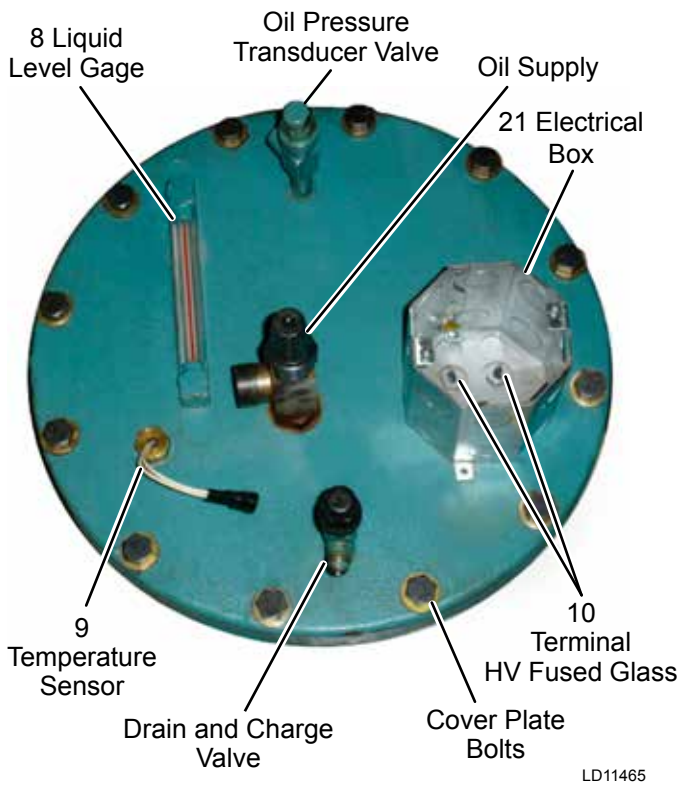
The oil pump supplies oil to the compressor's rotating components prior to start-up, during compressor operation and during coastdown (post lube). If it is necessary to service the oil pump, use the following procedure:

### REMOVING OIL PUMP FROM THE OIL SUMP

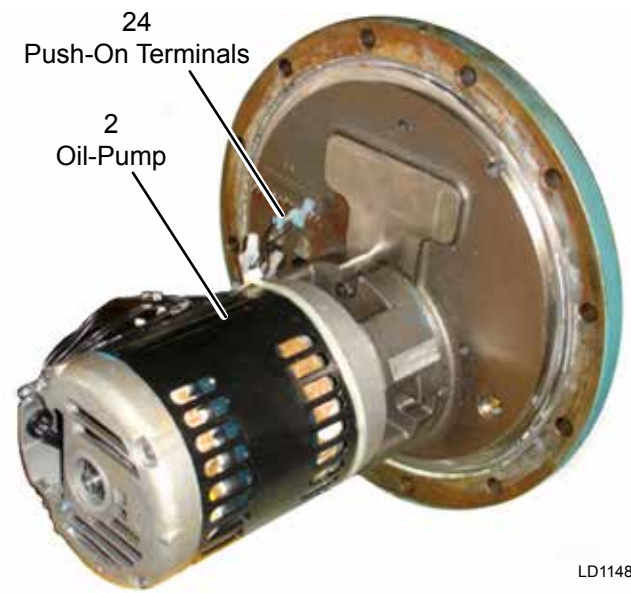
1. Remove the power supply to the oil pump and oil sump heater. Remove electrical leads from fusite connections and transducers.
2. Drain oil from oil sump through drain valve on oil pump housing cover plate.
3. Remove oil eductor line and oil line at the pressure regulator. (NOTE that on Rev. Level E chillers and above that the oil regulating valve has been replaced by using a variable speed oil pump).
4. Remove the 5/8" hex head bolts from the oil pump cover (see *Figure 66 on page 56*).
5. After all bolts are removed, pull the oil sump cover loose and remove the cover and oil pump assembly (see *Figure 67 on page 56*).



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**FIGURE 66 - OIL PUMP HOUSING COVER PLATE**

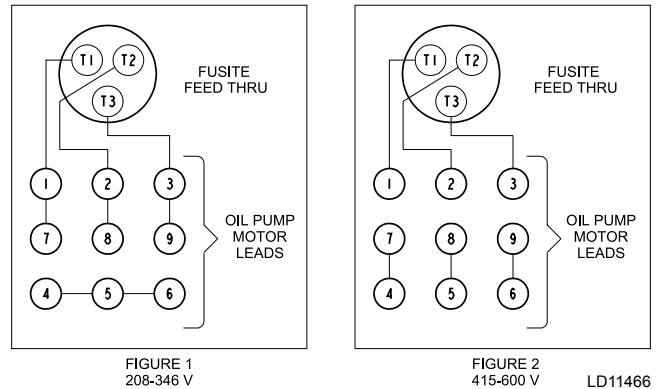


**FIGURE 67 - OIL PUMP & COVER PLATE REMOVAL**

**REASSEMBLING OIL PUMP ASSEMBLY INTO OIL SUMP**

Before assembling oil pump into oil sump pump, clean the oil sump with an approved solvent, using the utmost care to eliminate all dirt.

1. Replace oil sump cover gasket with a new one. Lubricate gasket with YORK refrigerant oil and graphite.
2. Assemble the gasket and the oil pump and sump cover assembly to oil sump using the 3/8" hex bolts, apply one drop of Loctite 243 or equivalent to the threads. Tighten bolts using the alternating tightening method. Torque to 155 ft. lbs.
3. Tighten Cover Plate bolts to a recommended torque value of 120 LB. FT. minimum.
4. Reconnect all electrical leads to fusite connection on sump cover (see *Figure 68 on page 56*). Reconnect oil lines. Reconnect transducers.
5. Charge oil into oil sump. Refer to *Operating Instructions (Form 160.49-01)*. Be sure oil is compatible with refrigerant being used.
6. Make sure there are no leaks around the cover and connections.



P/N	VOLTS-PHASE-HZ	FIGURE
-001	200-3-60	1
	208-3-60	1
	220-3-60	1
	230-3-60	1
	240-3-60	1
	220-3-50	1
	346-3-50	1
-002	415-3-60	2
	380-3-60	2
	380-3-50	2
	400-3-50	2
	415-3-50	2
-003	440-3-60	2
	440-3-50	2
	460-3-60	2
	480-3-60	2
	550-3-60	2
	600-3-60	2

**FIGURE 68 - OIL PUMP MOTOR LEADS**

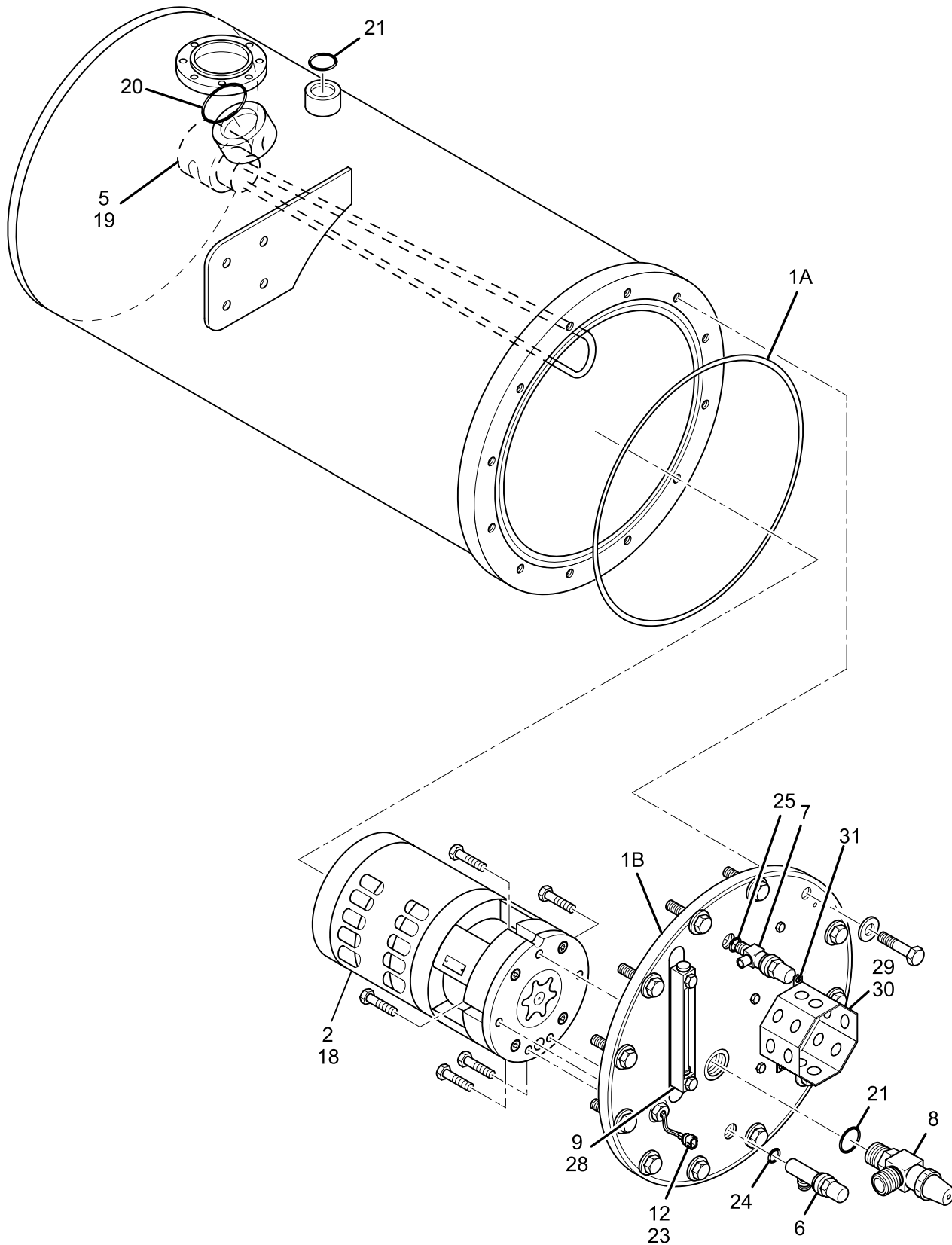
## OIL PUMP HOUSING PARTS

**TABLE 11 - OIL PUMP HOUSING (K1-K4 & K7)**

ITEM	DESCRIPTION	PART NUMBER	FIGURE
1	Body, Oil Pump Housing (K1-K4 and K7)	375-60694-000	80
	Body, Oil Pump Housing (K1-K4 and K7) (Canada)	375-61444-000	
1A	O-ring, Cover 13.475ID .275THK (All)	028-11977-000	
1B	Cover Plate (K1-K7)(All)	075-46360-000	
2	Pump, Oil 20 GPM YK (prior 6-2010)	026-37937-000	80
	Pump, Oil 20 GPM YK (after 6-2010)	026-46326-002	
5	Heater, Electric Immer (3,000 W) (200-346)	025-32909-000	8
	Heater, Electric Immer (3,000 W) (380-416)	025-32917-000	
	Heater, Electric Immer (3,000 W) (440-480)	025-32918-000	
	Heater, Electric Immer (3,000 W) (550-600)	025-32920-000	
6	Valve, Stop Angle Vertical	022-09578-000	80
7	Valve, Stop Angle Vertical	022-09577-000	80
8	Valve, Stop Angle Vertical	022-10047-000	80
9	Gage, Liquid Level Sight Front	026-37571-000	80
12	Sensor, Temp. 50,000 OHMS DIN	025-39993-000	80
13	Terminal, HV Fused Glass	025-32933-000	*
19	O-ring, Neoprene 2.33id .118 Thk	028-12961-010	80
20	O-ring, Neoprene 0.926id .070 Thk	028-12961-016	80
21	O-ring, Neoprene 0.924id .116 Thk	028-12961-006	80
23	O-ring, Neoprene 0.644id .087 Thk	028-12961-004	80
24	O-ring, Neoprene 0.468id 0.78 Thk	028-12961-003	80
25	O-ring, Neoprene 0.351id 0.772 Thk (Terminal)	028-12961-001	80
28	O-ring, Neoprene 0.487id .103 Thk	028-12961-035	80
29	Box, Elec 4 Octagon x 4 Deep	025-33238-000	80
30	Cover, Filter Outout Assy.	375-26580-000	80
31	Screw, Mach Pan Head Recd	021-03741-000	80
33	Terminal, Push-on Str 14-10 (200-346)	025-09455-000	*
34	Terminal, Push-on Str 18-14 (380-416, 440-600)	025-25920-000	*
35	Strap, Cable T and B L7-50-9-M	025-09607-000	80
36	Insr, Elec	025-10371-000	80
37	Ferr, Splice Cap	025-10372-000	80
38	Cap, Sealing Caplug 250	028-04574-000	80
39	O-Ring, Neoprene 1.171id .116 Thk	028-12961-008	80
42	Plate, Oil Pump Mtg Machining (Canada)	075-54038-000	80
43	Pin, Slot Spg 3/16 x 1/2 (Canada)	029-04138-000	80

**NOTE:** Items with an \* are NOT represented.

### K1 - K4 AND K7 COMPRESSORS OIL PUMP HOUSING (K1 - K4 AND K7 COMPRESSORS)



LD13591

**FIGURE 69 - OIL PUMP HOUSING ASSEMBLY (K1 - K4, AND K7 COMPRESSORS)**

## SECTION 4 - VGD THEORY

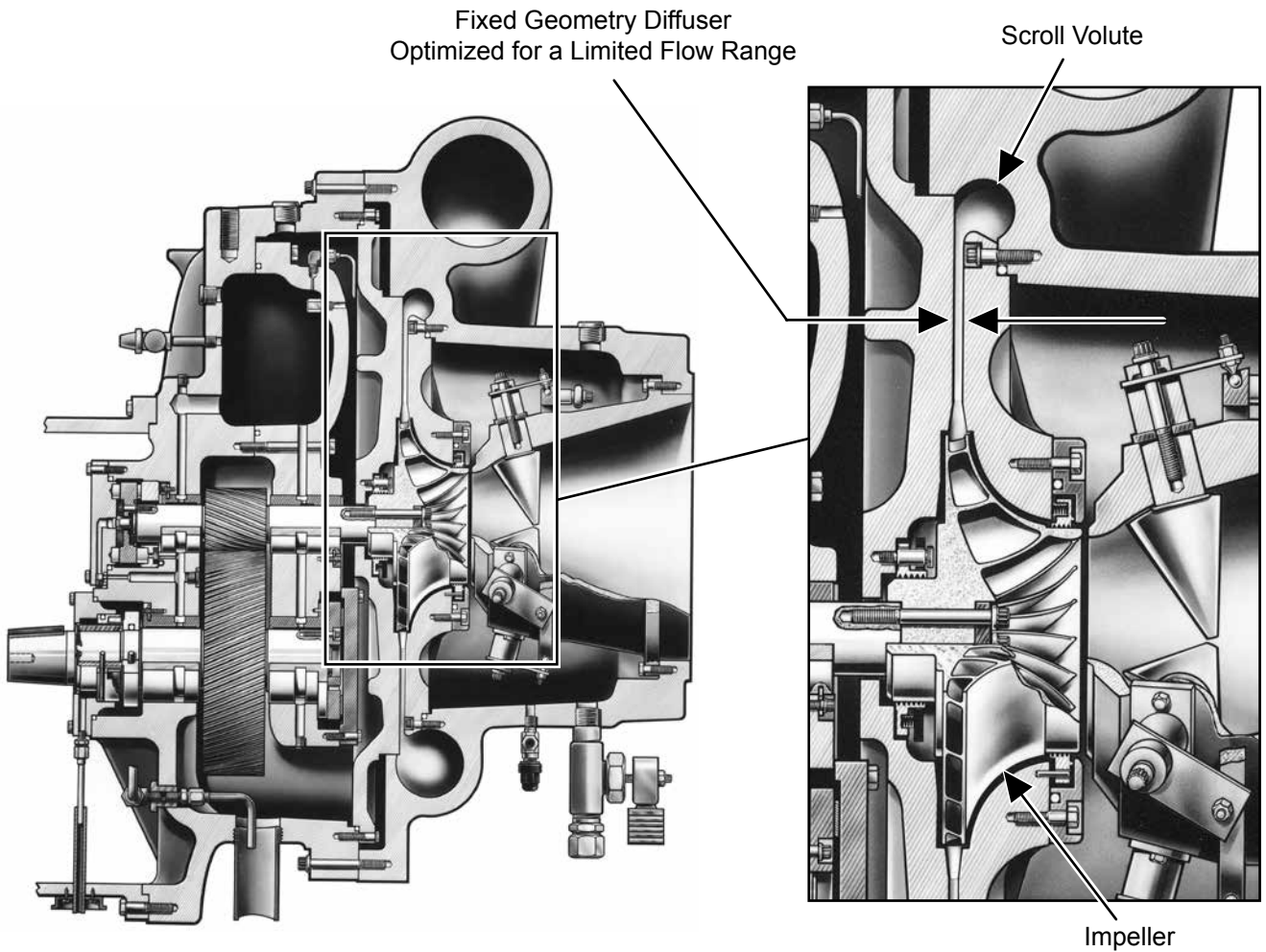
### GENERAL DESCRIPTION

**VGD** = “Variable Geometry Diffuser”

VGD eliminates the rise in noise and vibration - as issues that can arise with all centrifugal compressors when they encounter extreme conditions.

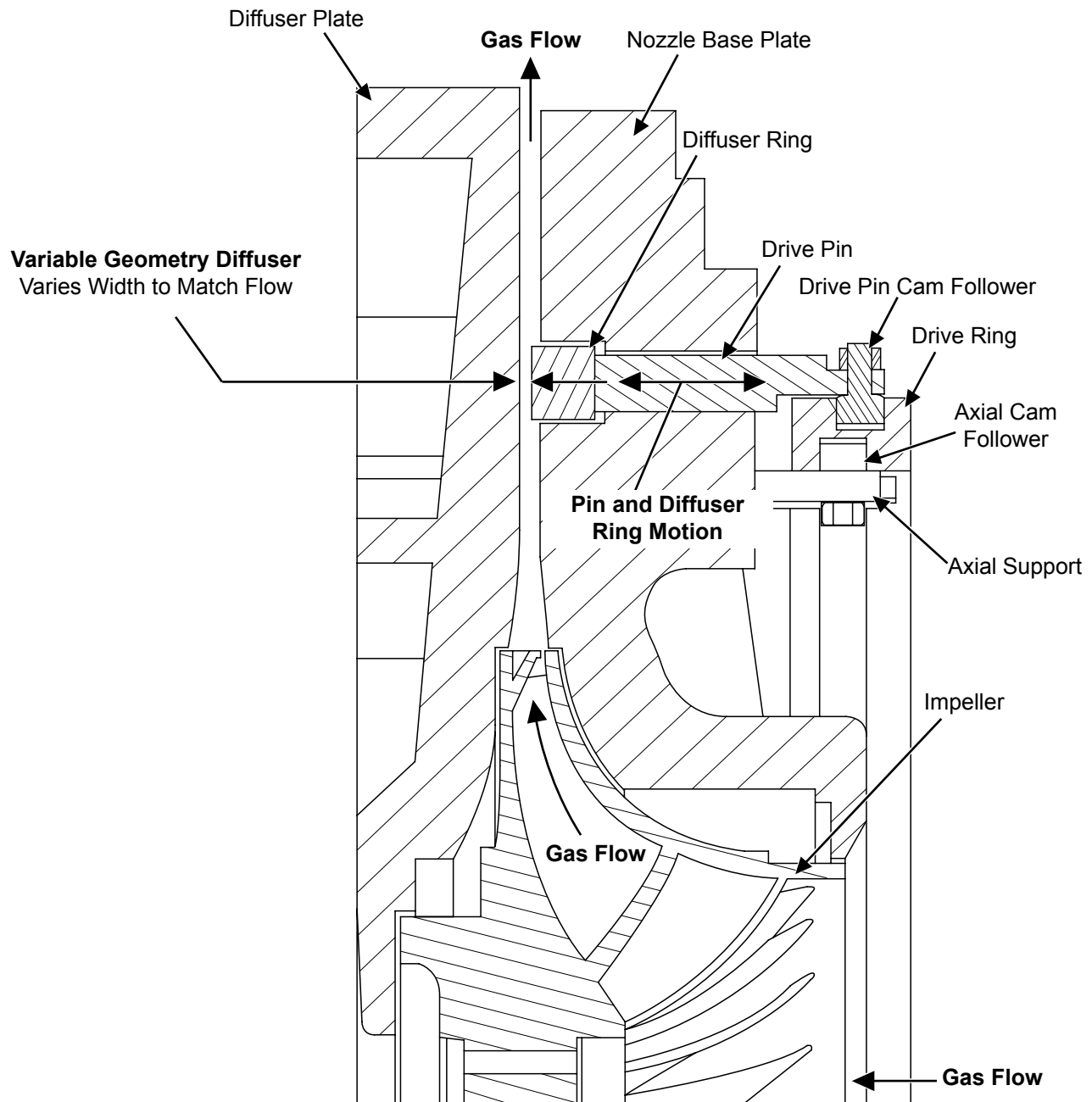
**VGD** accomplishes this by eliminating aerodynamic turbulence within the diffuser by tuning the diffuser geometry (width) to match flow.

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**FIGURE 70 - TYPICAL CENTRIFUGAL COMPRESSOR**



LD11489

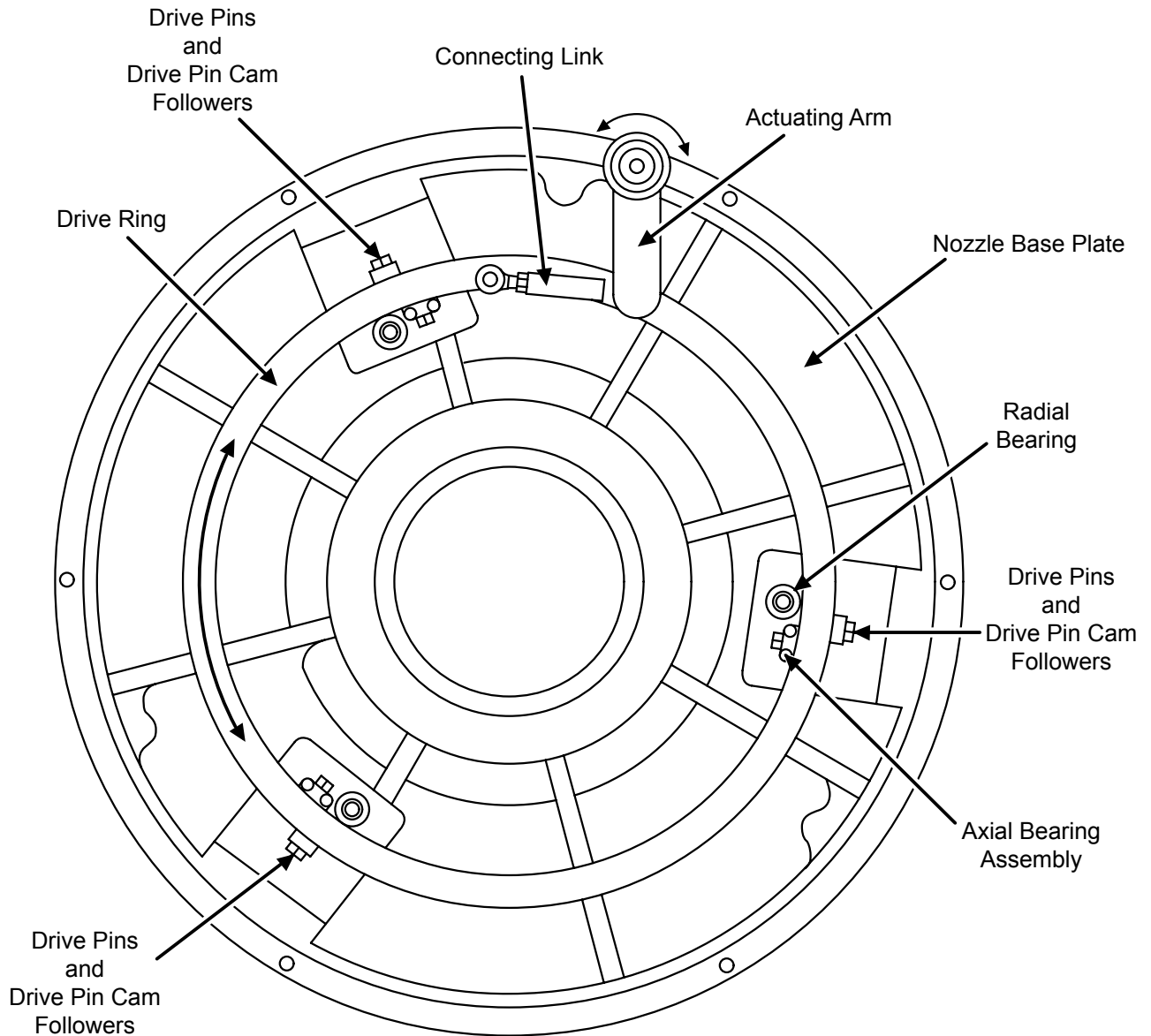
**DRIVE RING** - Circular rotating Drive Ring is driven by an external actuating motor.

**DRIVE PIN CAM FOLLOWER** - Follows precision cam-groove machined into the Drive Ring OD.

**DRIVE PIN** - Multiple drive pins are pushed and pulled by the Drive Pin Cam-Follower.

**DIFFUSER RING** - This circular ring is pushed in and out of the diffuser gap, by the drive pins, continuously varying the diffuser width to match the changing flow.

**FIGURE 71** - TYPICAL VGD SECTION



LD11490

**ACTUATING ARM** - Driven by an external actuating-motor this arm rotates the Drive Ring.

**DRIVE RING** - Circular rotating Drive Ring is driven by an external actuating-motor.

**DRIVE PIN CAM FOLLOWER** - Follows precision cam-groove machined into the Drive Ring OD.

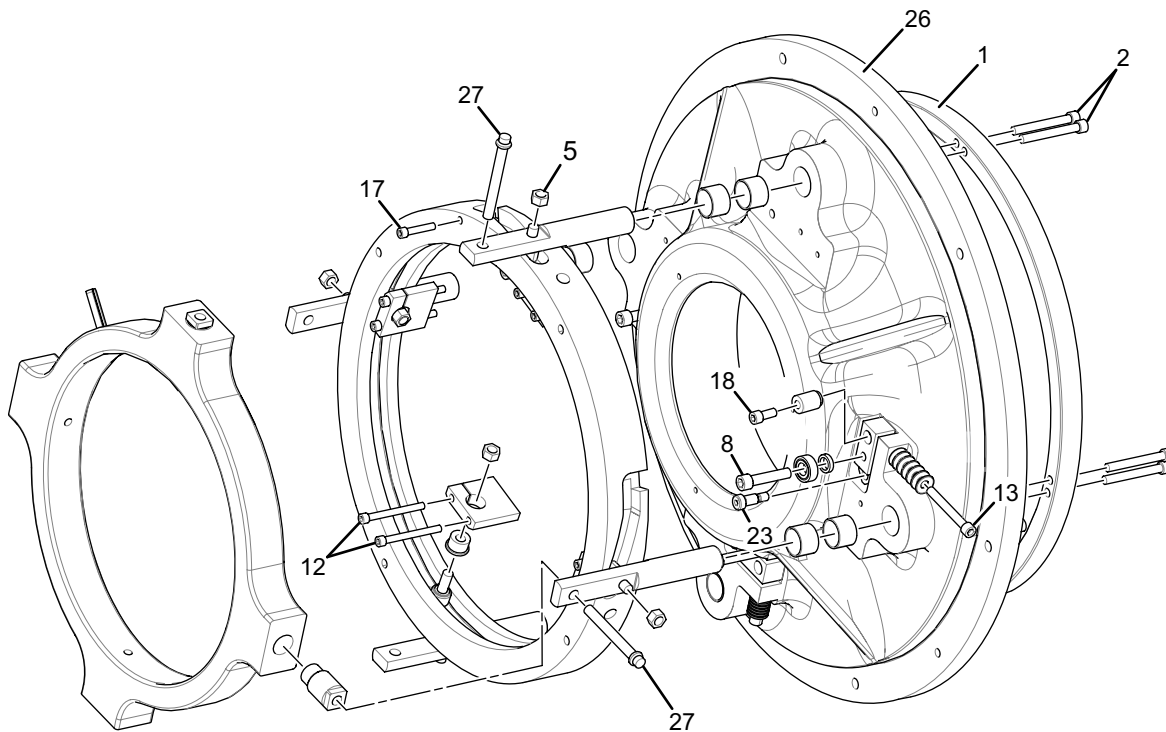
**DRIVE PIN** - Multiple Drive Pins are pushed and pulled by the Drive Pin Cam-Follower.

**DIFFUSER RING** - This circular ring is pushed in and out of the diffuser gap, by the Drive Pins, continuously varying the diffuser width to match the changing flow. Cannot be seen from this view.

**FIGURE 72 - REAR VIEW OF DIFFUSER**

**TABLE 12 - VARIABLE GEOMETRY DIFFUSER (VGD) MODEL K1**

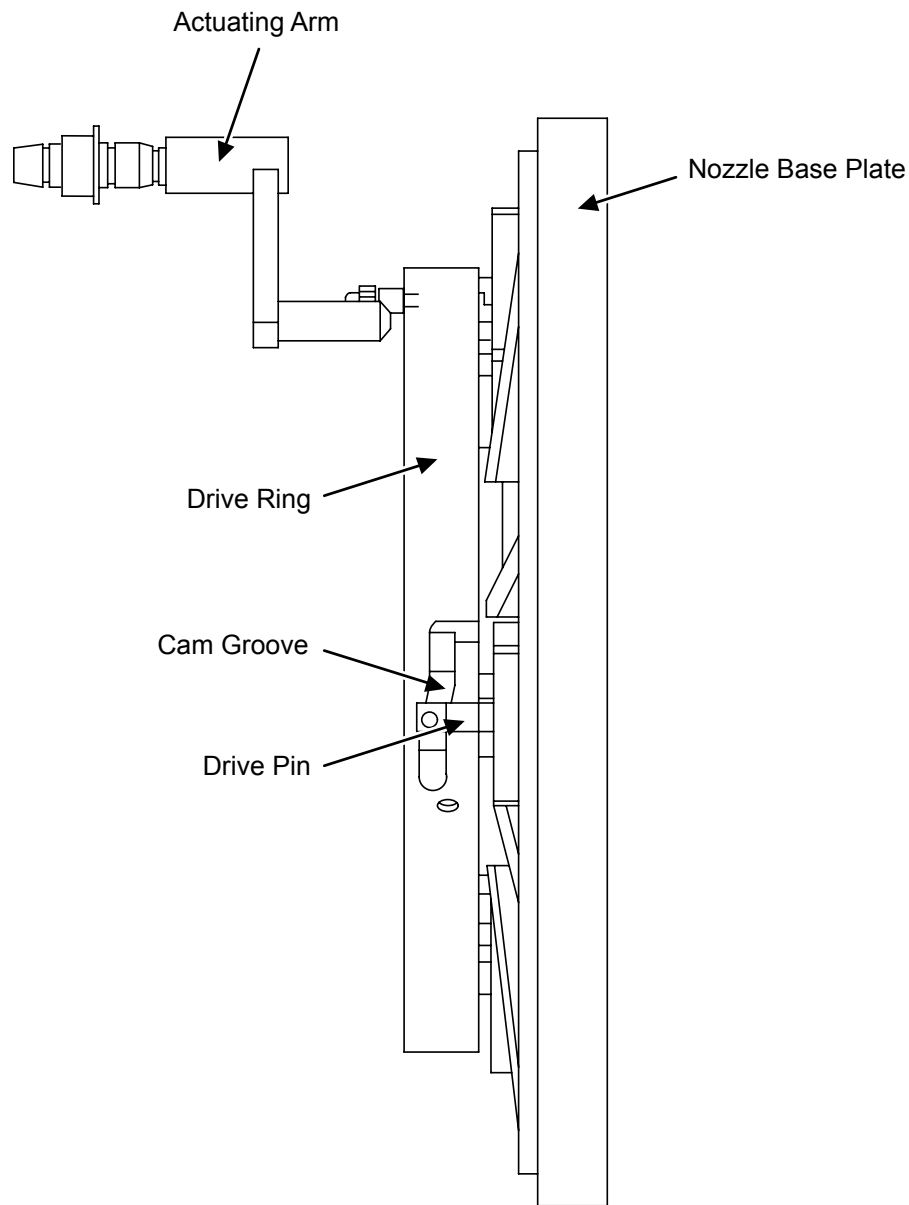
ITEM	DESCRIPTION	CONSUMABLES	TORQUE
2	Screw, Cap Hex Soc Hd 5/16 (prior 5/2012)	See Items 20 & 21	-
	Screw, Cap Hex Soc Hd 5/16 (after 5/2012)		
5	Nut, Hex 3/8 - 24 Unf-2b	See Items 20 & 21	95 in/lb
8	Screw, Cap Hex Soc Hd 3/8	See Items 20 & 21	-
12	Screw, Cap Hex Soc Hd	See Items 20 & 21	-
13	Screw, Cap Hex Soc Hd 5/16	See Items 20 & 21	30 ft/lb
17	Screw, Cap Hex Soc Hd 1/4	See Items 20 & 21	
18	Screw, Set Hex Socket 1/4	See Items 20 & 21	30 in/lb
20	Primer Locquic Grade N, Loctite	-	-
21	Sealer Removable Thread	-	-
23	Screw, Shoulder Soc Hd 5/16	-	18ft/lb
25	Lub Valve Stem 2 oz Tin	-	-
27	Screw, Cap 12pt hd 3/8 (after 4/2012)	See Items 20 & 21	-



364 53356 000

LD19830

**FIGURE 73 - VARIABLE GEOMETRY DIFFUSER (VGD) MODEL K1**



LD11522

**ACTUATING ARM** - Driven by an external actuating-motor this arm rotates the Drive Ring.

**DRIVE RING** - Circular rotating Drive Ring is driven by an external actuating motor.

**CAM GROOVES** - Drive-Pin Cam-Followers (hidden behind the Drive Pins) ride in this groove.

**DRIVE PIN** - Multiple drive pins are pushed and pulled by the Drive Pin Cam-Follower.

**DIFFUSER RING** - This circular ring is pushed in and out of the diffuser gap, by the drive pins, continuously varying the diffuser width to match the changing flow. Cannot be seen from this view.

**FIGURE 74 - SIDE VIEW OF DIFFUSER**

**HOW THE VGD IS CONTROLLED**

1. Compressor Discharge-mounted Pressure Transducer monitors discharge pressure.



PRESSURE TRANSDUCER

LD11524

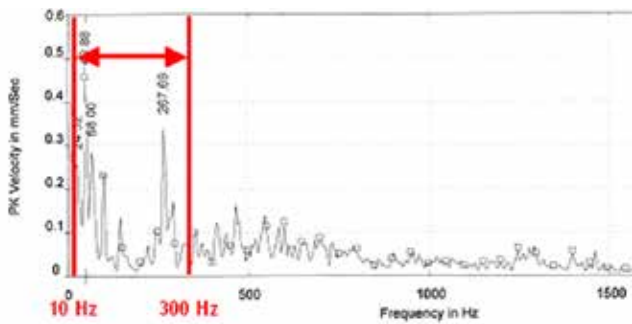
2. Dynamic Pressure Signal sent to Solid State Signal Processor.



SOLID STATE SIGNAL PROCESSOR

LD22363

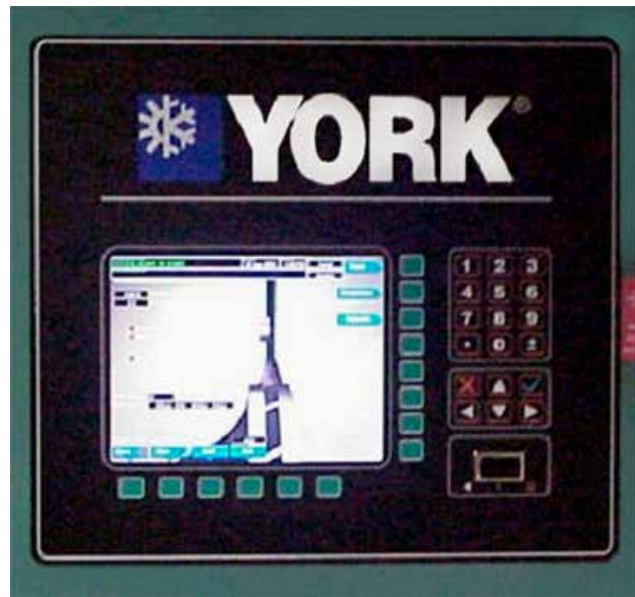
3. Solid State Signal Processor filters and processes signal monitors 10-300Hz range.



TYPICAL COMPRESSOR SPECTRUM

LD11525

4. Output to *OptiView* Control Panel.
5. Signal in from Dynamic Pressure Transducer.



YORK *OptiView*  
Computerized Control Panel

LD11526

6. Internal Solid-State Signal Processor output is used by control logic to optimize chiller performance by adjusting the VGD and Pre-Rotation Vanes for lowest noise and vibration yielding best operating efficiency.



VGD Actuator  
Transducer  
PRV Actuator  
VGD EQUIPPED COMPRESSOR

LD11527

7. Adjust VGD and PRV Actuators for optimum performance.

## SECTION 5 - DISASSEMBLE AND REASSEMBLE CHECKLIST

Before disassembly and after reassembly of the compressor, take the measurements listed in *Table 13* on page 67.

### DISASSEMBLE THE COMPRESSOR

1. De-couple the motor, keep all coupling components together.
2. Rig safely the motor and remove as described later in the manual.
3. Remove all piping connected to the rotor support and remove the proximity sensor.
4. Remove the rotor support and set it up for disassembly safely. Keep compressor motor adapter (D-flange) connected, you may need to add some weight inside to keep the rotor support balanced vertical.
5. Take tolerance measurements for impeller rim runout. Record the actual measurement and note any abnormal condition.
6. Take tolerance measurements for impeller eye runout and compare to specifications. Record the actual measurement.
7. Take tolerance measurements for high-speed axial thrust clearance. Record the actual measurement.
8. Take tolerance measurements for low-speed axial thrust clearance. Record the actual measurement. Remove the shaft seal, including O-rings and C-rings.
9. Remove and inspect the impeller for scratches and wear.
10. Remove the high-speed reverse thrust bearing (Thrust cover).
11. Take tolerance measurements of runout for the high-speed thrust collar. Record the actual measurement.
12. Remove the high-speed thrust collar.
13. Remove the high-speed forward thrust bearing.
14. Remove the high-speed journal bearing.
15. Remove the balance piston seal.
16. Clean and inspect the balance piston seal ring for any damage. Check and record the B.P seal ring clearances.

17. Remove the diffuser plate using 3 eye bolts.
18. Remove the forward low-speed thrust bearing (cover).
19. Take tolerance measurements of runout for the low-speed thrust collar. Record the actual measurement.
20. Remove the low-speed thrust bearing collar.
21. Remove the forward low-speed journal bearing.
22. Remove the forward high-speed journal bearing.
23. Remove the bearing housing dowel pins.
24. Remove the bearing housing.
25. Remove the high-speed and low-speed gears.
26. Remove the rear low-speed journal bearing.
27. Remove and discard all gaskets and O-rings.
28. Remove, clean, and inspect the impeller eye seal ring. Check and record the eye seal ring clearances.
29. Remove, clean, and inspect the nozzle base plate with the VGD. Inspect the PRV assembly for free movements and no broken parts. Check vanes arms for any bent and repair as required.

### ASSEMBLE THE COMPRESSOR

1. Clean all gasket and sealing surfaces to new clean condition, remove old paint and sealant residue. Install the new gaskets and O-rings, referring to the graphic in the appropriate parts manual.
2. Before installing any bearings you must coat them with a mixture of oil and molybdenum disulfide powder. This includes but is not limited to the low speed journal bearing, high-speed journal bearing, low speed thrust and a high-speed thrust.
3. Install the rear low-speed journal bearing.
4. Install the low-speed gear.
5. Install the high-speed gear.
6. Install the bearing housing.
7. Install the bearing housing dowel pins.
8. Install the front high-speed journal bearing.
9. Install the front low-speed thrust collar.

10. Take tolerance measurements of runout for the low-speed thrust collar and compare to specifications. Record the actual measurement.
11. Install the front low-speed thrust bearing/cover.
12. Connect the oil drain line.
13. Install the diffuser plate.
14. Install the rear high-speed journal bearing.
15. Install the high-speed forward thrust bearing.
16. Install the high-speed thrust collar.
17. Take tolerance measurements of runout for the high-speed thrust collar and compare to specifications. Record the actual measurement.
18. Install the high-speed reverse thrust bearing/cover.
19. Install the pressure switch or proximity probe, whichever is applicable.
20. Install new O-rings and C-rings (if applicable) on the shaft seal.
21. Install the shaft seal.
22. Install the impeller.
23. Take tolerance measurements for high-speed axial thrust clearance and compare to specifications. Record the actual measurement.
24. Take tolerance measurements for impeller eye runout and compare to specifications. Record the actual measurement.
25. Take tolerance measurements for impeller rim runout and compare to specifications. Record the actual measurement.
26. Take tolerance measurements for low-speed axial thrust clearance and compare to specifications. Record the actual measurement.
27. Install the PRV assembly if it was removed.
28. Replace the nozzle base plate O-ring and install the nozzle base plate with the VGD.
29. Reassemble and install the eye seal. Center the Eye seal to its most upper position (12oclock) lubricate the impeller eye seal surface with Molybdenum disulfide powder and oil, carefully slide the rotor support into the scroll assembly so as not to damage the impeller or eye seal.

**K1**

L.S. THRUST (INCHES)	H. S. THRUST (INCHES)	H. S. THRUST COLLAR FACE T.I.R (INCHES)	L.S. THRUST COLLAR FACE T.I.R (INCHES)
.011-.019*	.009-.020*	.001	.001

**K2**

L.S. THRUST (INCHES)	H. S. THRUST (INCHES)	H. S. THRUST COLLAR FACE T.I.R (INCHES)	L.S. THRUST COLLAR FACE T.I.R (INCHES)
.011-.019*	.008-.021*	.001	.001

**K3**

L.S. THRUST (INCHES)	H. S. THRUST (INCHES)	H. S. THRUST COLLAR FACE T.I.R (INCHES)	L.S. THRUST COLLAR FACE T.I.R (INCHES)
.011-.019*	.008-.021*	.001	.001

**K4**

L.S. THRUST (INCHES)	H. S. THRUST (INCHES)	H. S. THRUST COLLAR FACE T.I.R (INCHES)	L.S. THRUST COLLAR FACE T.I.R (INCHES)
.011-.019*	.008-.021*	.001	.001

**K7**

L.S. THRUST (INCHES)	H. S. THRUST (INCHES)	H. S. THRUST COLLAR FACE T.I.R (INCHES)	L.S. THRUST COLLAR FACE T.I.R (INCHES)
.011-.019*	.009-.020*	.001	.001

**TABLE 13 - MEASUREMENTS**

	REFERENCE	BEFORE	AFTER
<b>Compressor Measurements</b>			
Eye Runout	0.002"		
Rim Runout	0.003"		
H.S. shaft axial thrust K1 & K7 K2, K3 & K4	0.009" – 0.020" 0.008" - 0.021"		
L.S. shaft axial thrust	0.011" – 0.019"		
H.S Thrust collar Runout	0.001"		
L.S Thrust collar Runout	0.001"		
<b>Motor, Compressor Coupling Measurements</b>			
Angler measurement	0.014"Max		
Parallel Measurement	0.014"Max		
Total Misalignment	0.028"Max		
Hub to hub distance	No more than 0.010" of the disc packs and spool combined		

The following factors can be used to convert from English to the most common SI Metric values.

**TABLE 14 - SI METRIC CONVERSION**

MEASUREMENT	MULTIPLY ENGLISH UNIT	BY FACTOR	TO OBTAIN METRIC UNIT
Capacity	Tons Refrigerant Effect (ton)	3.516	Kilowatts (kW)
Power	Horsepower	0.7457	Kilowatts (kW)
Flow Rate	Gallons / Minute (gpm)	0.0631	Liters / Second (l/s)
Length	Feet (ft)	0.3048	Meters (m)
	Inches (in)	25.4	Millimeters (mm)
Weight	Pounds (lbs)	0.4538	Kilograms (kg)
Velocity	Feet / Second (fps)	0.3048	Meters / Second (m/s)
Pressure Drop	Feet of Water (ft)	2.989	Kilopascals (kPa)
	Pounds / Square Inch (psi)	6.895	Kilopascals (kPa)

**TEMPERATURE**

To convert degrees Fahrenheit (°F) to degrees Celsius (°C), subtract 32° and multiply by 5/9 or 0.5556.

Example:  $(45.0^{\circ}\text{F} - 32^{\circ}) \times 0.5556 = 7.22^{\circ}\text{C}$

To convert a temperature range (i.e., a range of 10°F) from Fahrenheit to Celsius, multiply by 5/9 or 0.5556.

Example:  $10.0^{\circ}\text{F range} \times 0.5556 = 5.6^{\circ}\text{C range}$

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