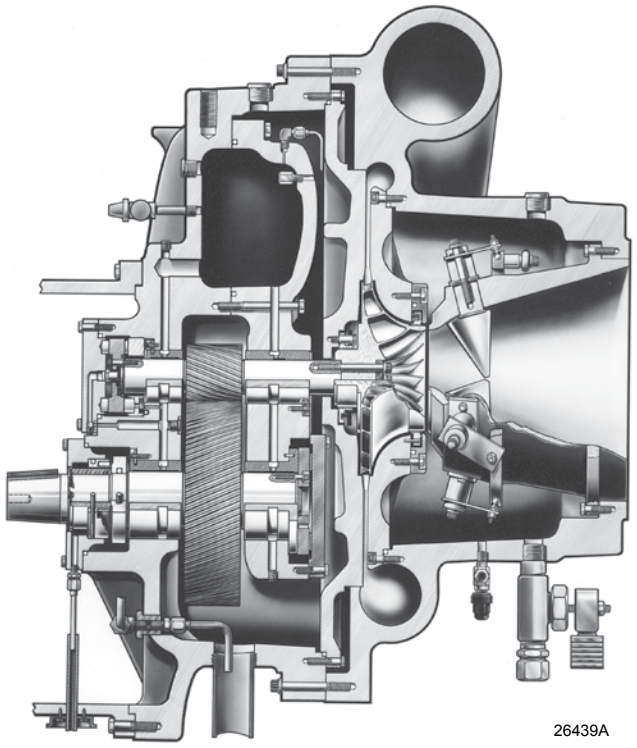
YORK BY JOHNSON CONTROLS	CENTRIFUGAL COMPRESSORS	
SERVICE INSTRUCTION	Supersedes: 160.49-M1 (601)	Form 160.49-M1 (615)

USED WITH YORK MODEL YK CENTRIFUGAL LIQUID CHILLERS

COMPRESSOR MODEL	COMPRESSOR CODE
YDHF-39	P1
YDHF-40	P2
YDHF-42	P3
YDHF-44	P4
YDHA-36 & LHA-36	G3
YDHA-41 & LHA-41	G4
YDHA-46 & LHA-46	H0
YDHA-50N & LHA-50N	H1
YDHA-50W & LHA-50W	H1
YDHB-57, LHB-57, HA-57	H2
YDHB-61	H3
YDHD-46	H4
YDHD-50N & 50W	H5
YDHD-57	H6
YDHD-59	H7
YDHD-61	H8
YDHA-65 & LHA-65	J1
YDHA-73 & LHA-73	J2
YDHA-81 & LHA-81	J3
YDHA-90 & LHA-90	J4

(Also see NOMENCLATURE, page 5)



Issue Date:
June 30, 2015

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.

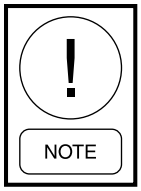
SAFETY SYMBOLS

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.

ASSOCIATED LITERATURE

MANUAL DESCRIPTION	FORM NUMBER
Installation – Unit	160.49-N1
Operation – Unit	160.49-O1
Renewal Parts – Unit	160.49-RP1
Renewal Parts – Compressor	160.49-RP2
Coupling Assembly	160.49-N4

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SECTION 1 - GENERAL

GENERAL DESCRIPTION

These compressors are applied to YORK Model YK Centrifugal Liquid Chillers.

The compressor is a single-stage centrifugal type powered by an open-drive electric motor. 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 castings 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, precision carbon ring, 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.

NOMENCLATURE

Compressor Identification

Each compressor is identified by nomenclature as shown. The nomenclature is printed on a data plate which is located on the side of the unit control panel. (See *Figure 1 on page 5*) When contacting the factory or ordering renewal parts, include the complete compressor model and serial number. Be sure these numbers are copied accurately.

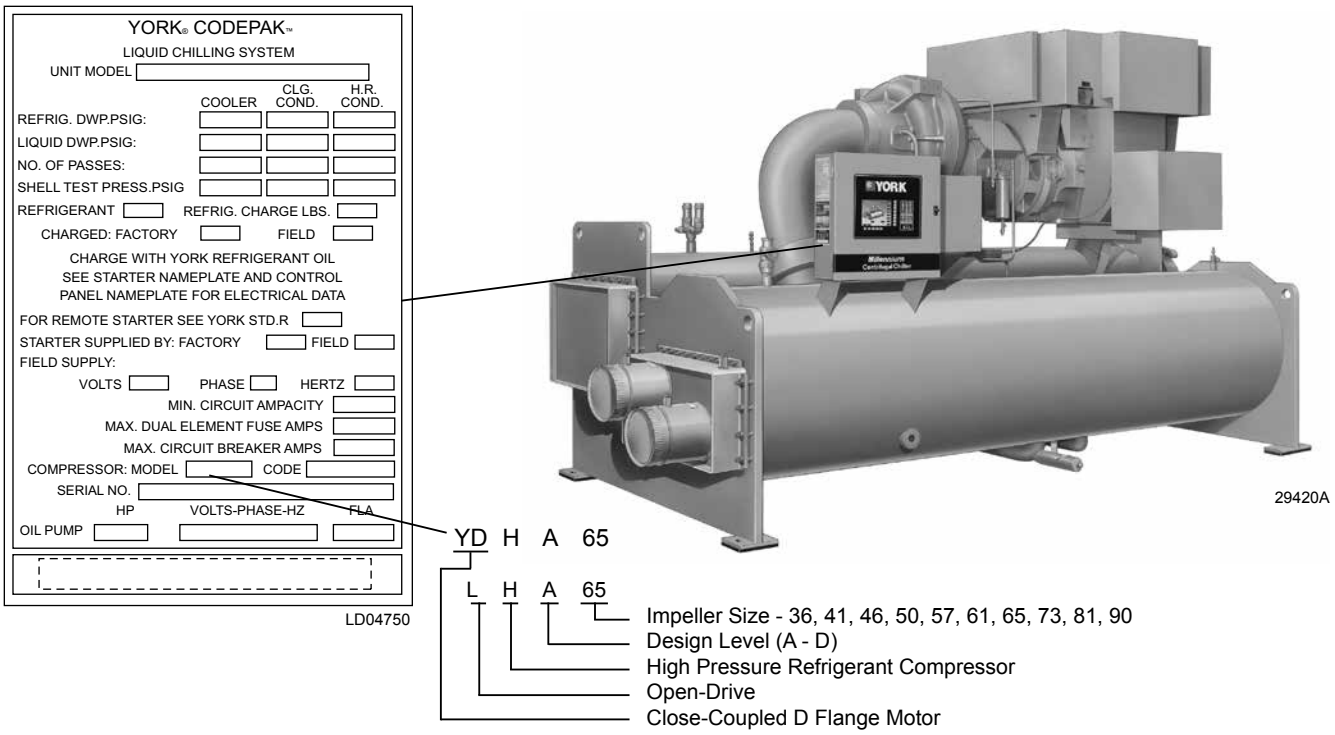

FIGURE 1 - COMPRESSOR IDENTIFICATION

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SECTION 2 - COMPRESSOR SERVICE

The compressor is the heart 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 mentioned under Preventative Maintenance in the Operating Instruction.

The compressor should not be disassembled for inspection purposes only. 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 lockwashers. The parts list and figures in this instruction show the correct length and size of screws and washers. See the Renewal Parts Manual to order the correct part numbers.

Inspect As Compressor is Disassembled – If possible, 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 likely to rust. Tape surfaces subjected 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 compressor is in operation.

CLEANING AND CHECKING WEARING PARTS

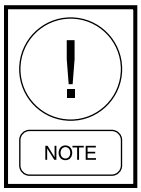
Before reassembling the compressor, all parts should be thoroughly checked for excessive wear.

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.

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.



"Molkolube" is available from:
Dow Corning Corporation
Dept. A0021
P.O. Box 1767
Midland, Michigan

It is also 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.

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

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 8* – Compressor Weights (lbs.) – Less Motor. Motor weights are shown in *Table 2 on page 8* – Motor Weights (lbs.).

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

COMPRESSOR CODE	COMPLETE COMPRESSOR	ROTOR SUPPORT COMPLETE WITH ALL RUNNING GEAR	SCROLL ASSEMBLY WITH PRV HOUSING
P1, P2, P3, P4	2,450	1,500	950
G4, H0, H1, H2, H3, H4, H5, H6, H7, H8	3,500	2,250	1,300
J1 & J2	4,000	2,525	1,475
J3 & J4	5,000	3,150	1,775

TABLE 2 - MOTOR WEIGHTS (LBS)

LOW VOLTAGE		
MOTOR CODE		WEIGHTS
60 HZ	50 HZ	
CH	–	940
CJ	5CE	940
CK	5CF	1440
CL	5CG	1440
CM	5CH	1700
CN	5CI	1700
CP	5CJ	1700
CR	5CK	1700
CS	5CL	2635
CT	5CM	2635
CU	5CN	2635
CV	5CO	2635
CW	5CP	2930
CX	5CQ	2930
CY	5CR	2930
CZ	5CS	2930
CA	5CT	5750
CB	5CU	5750
DA	5CV	5750
DB	5CW	6800
DC	5CX	6800
–	5DA	7300
–	5DB	7300

HIGH VOLTAGE		
MOTOR CODE		WEIGHTS
60 HZ	50 HZ	
CH	–	2670
CJ	5CE	2670
CK	5CF	3100
CL	5CG	3100
CM	5CH	3100
CN	5CI	3100
CP	5CJ	3700
CR	5CK	3700
CS	5CL	3700
CT	5CM	3700
CU	5CN	3700
CV	5CO	4500
CW	5CP	4500
CX	5CQ	4500
CY	5CR	4500
CZ	5CS	4500
CA	5CT	5800
CB	5CU	5800
DA	5CV	5800
DB	5CW	6800
DC	5CX	6800
DD	5DA	7300
DE	5DB	7300
DF	5DC	7500
DH	5DD	7500
DJ	5DE	7900
–	5DF	7900
–	5DG	7900
–	5DH	7900

TABLE 3 - TORQUE VALUES

BOLT SIZE INCHES		TORQUE POUND FOOT
1/4"	HEX HD	10
	12pt or SOC HD	14
3/8"		35
1/2"		85
5/8"		200**
3/4"		300

Unless otherwise specified, all screws must be tightened to the torque values at left with lightly oiled threads:
** Lubricated with oil and graphite on male and female threads and under bolt heads. Molykote not acceptable.

SPECIAL TOOLS

Special tools are available as an option and will be furnished when ordered. These tools are listed in *Table 4 on page 9 through Table 8 on page 13*. Use of the tools is shown in *Figure 2 on page 9 through Figure 6 on page 13*.

TABLE 4 - COMPRESSOR TOOL KIT – 364K50048-000 (COMPRESSOR SIZES -39, -40, -42, -44)

ITEM	DESCRIPTION	QTY. PER KIT	PART NO.
1	Gear Locking Tool	1	364-50212
2	Screw Cap Hex .375 -16	2	021-01511
3	Washer Plain .375	14	021-01262
4	Hex Nut .375 - 16	2	021-00467
5	Guide Pin #10 - 24	2	064-46488
6	Eye Bolt .3125 - 18	2	021-12420
7	Washer Plain .3125	16	021-05166
8	Guide Pin .250 - 20	2	064-46499
9	Hook Tool	2	064-46610
10	Guide Pin .375 - 16	2	064-18716
11	Stud Spl .500 - 20	1	064-14500

ITEM	DESCRIPTION	QTY. PER KIT	PART NO.
12	Hex Nut .500 - 20	1	021-00483
13	Eye Bolt .875	1	021-07703
14	Washer Plain .875	2	021-05158
15	Eye Bolt .375 - 16	3	021-13498
16	Washer Plain .375	39	021-05167
17	Spacer	1	064-50213
18	Screw Cap Hex .625 - 16	1	021-08389
19	Tool Spacer	1	364-50210
20	Puller Tool	1	064-50211
21	Screw Cap Hex .500 - 20	1	021-10832
22	Screw Cap Hex .500 - 20	1	021-14162

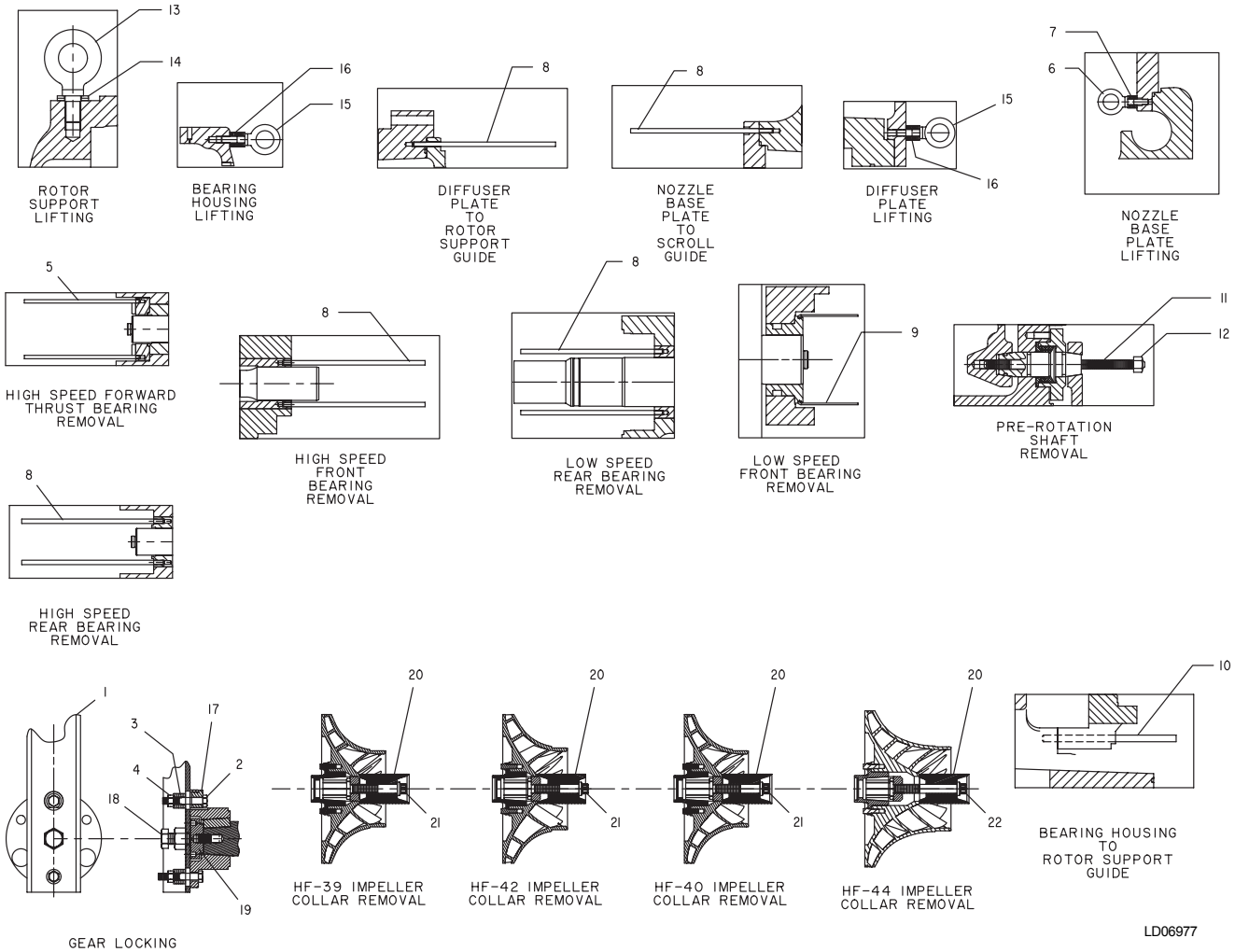


FIGURE 2 - USE OF COMPRESSOR TOOLS (-39, -40, -42, -44)

TABLE 5 - COMPRESSOR TOOL KIT 364-48026 (COMPRESSOR SIZES -65, -73, -81, -90)

ITEM	DESCRIPTION	QTY. PER KIT	PART NO.
1	Gear Locking Tool	1	364-48023
2	Cap Screw - 5/8”	1	021-08389
3	Spacer Tool	1	364-48022
4	Cap Screw - 1/2”	2	021-08388
5	Washer, Plain - 1/2”	2	021-01276
6	Bar Tool	1	064-47031
7	Hex Nut - 1/4”	4	021-00451
8	Guide Pin	2	064-46499
9	Hook Tool	2	064-46610
10	Guide Pin	3	064-18716
11	Stud	1	064-14500

ITEM	DESCRIPTION	QTY. PER KIT	PART NO.
12	Hex Nut - 1/2” Heavy	1	021-00483
13	Eyebolt - 7/8”	1	021-07703
14	Washer, Plain - 7/8”	5	021-05158
15	Eye Bolt - 3/8”	3	021-13498
16	Washer, Plain - 3/8”	11	021-05167
17	Eye Bolt - 5/16”	2	021-12420
18	Washer, Plain - 5/16”	2	021-05166
19	Pinion Tool (Mod. 65 & 73)	1	064-48028
20	Pinion Tool (Mod. 50 & 57)	1	064-48029
21	Pipe	1	023-15508

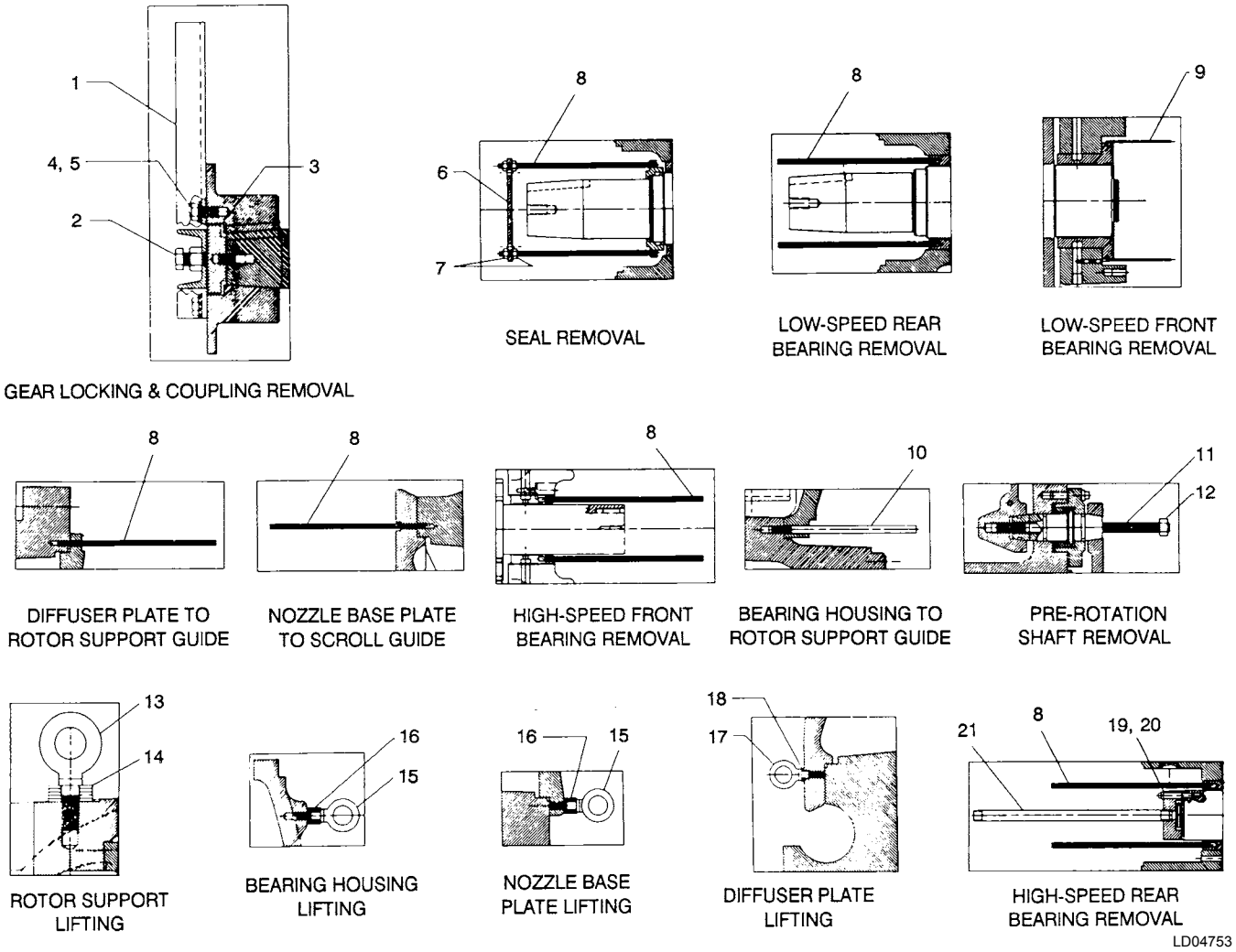


FIGURE 3 - USE OF COMPRESSOR TOOLS (-64, -73, -81, -90)

TABLE 6 - COMPRESSOR TOOL KIT 364-49275 (COMPRESSOR SIZES -46, -50, -57, -59, -61)

ITEM	DESCRIPTION	QTY. PER KIT	PART NO.
1	Gear Locking Tool	1	364-48023
2	Screw Cap Hex 1/2”	2	021-14249
3	Washer Plain 17/32”	14	021-01276
4	Nut Hex Hvy 1/2”	2	021-02860
5	Pin Guide	2	064-46488
6	Bolt Eye 5/16”	2	021-12420
7	Washer Plain 11/32”	16	021-05166
8	Pin Guide 1/4-20Unc	2	064-46499

ITEM	DESCRIPTION	QTY. PER KIT	PART NO.
9	Hook Tool	2	064-46610
10	Pin Guide 3/8”	2	064-18716
11	Stud Special	1	064-14500
12	Nut Hex Hvy 1/2”	1	021-00483
13	Bolt Eye 7/8”	1	021-07703
14	Washer Plain 15/16”	2	021-05158
15	Bolt Eye 3/8”	3	021-13498
16	Washer Plain 13/32”	39	021-05167

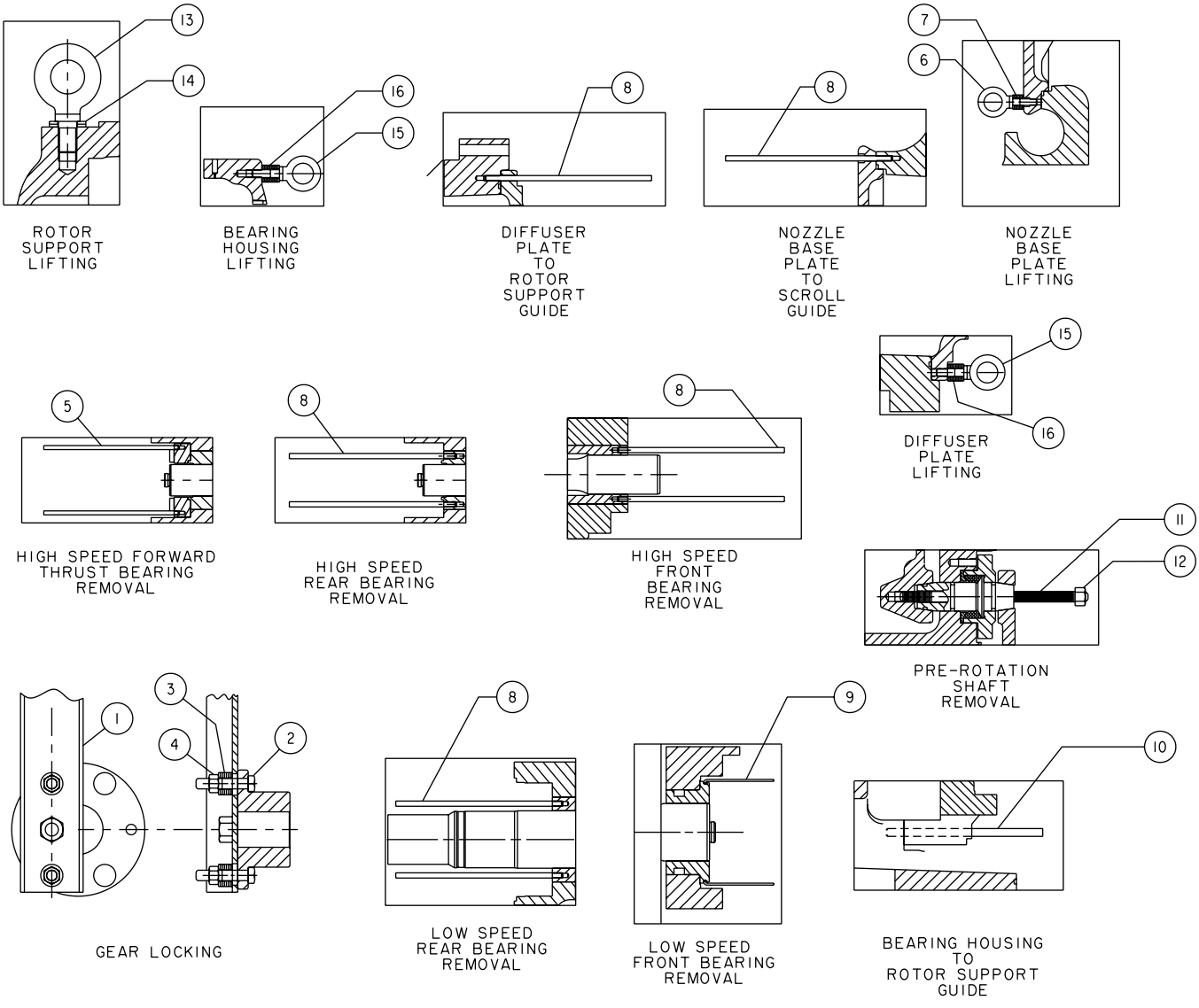


FIGURE 4 - USE OF COMPRESSOR TOOLS (-46, -50, -57, -59, -61)

TABLE 7 - COMPRESSOR TOOL KIT 364-48145 (COMPRESSOR SIZE -41)

ITEM	DESCRIPTION	QTY. PER KIT	PART NO.
1	Gear Locking Tool	1	364-48023
2	Screw Cap Hex - 5/8”	1	021-08389
3	Tool Spacer	1	364-48022
4	Screw Cap Hex 1/2”	2	021-08388
5	Washer Plain 17/32”	2	021-01276
6	Bar Tool	1	064-48345
7	Nut Hex	4	021-00451
8	Pin Guide	2	064-46499
9	Hook Tool	2	064-46610
10	Pin Guide 3/8”	3	064-18716
11	Stud Special .500	1	064-14500

ITEM	DESCRIPTION	QTY. PER KIT	PART NO.
12	Nut Hex Hvy 1/2”	1	021-00483
13	Bolt Eye 7/8”	1	021-07703
14	Washer Plain 15/16”	5	021-05158
15	Bolt Eye 3/8”	3	021-13498
16	Washer Plain 13/32”	11	021-05167
17	Bolt Eye 5/16”	2	021-12420
18	Washer Plain 11/32”	2	021-05166
19	Tool Special	1	064-48133
23	Seal O-Ring 7/16”	1	028-12551
25	Adapter 36-41 Imp	1	064-48282
26	Puller Tool 36-44 Imp	1	064-48281

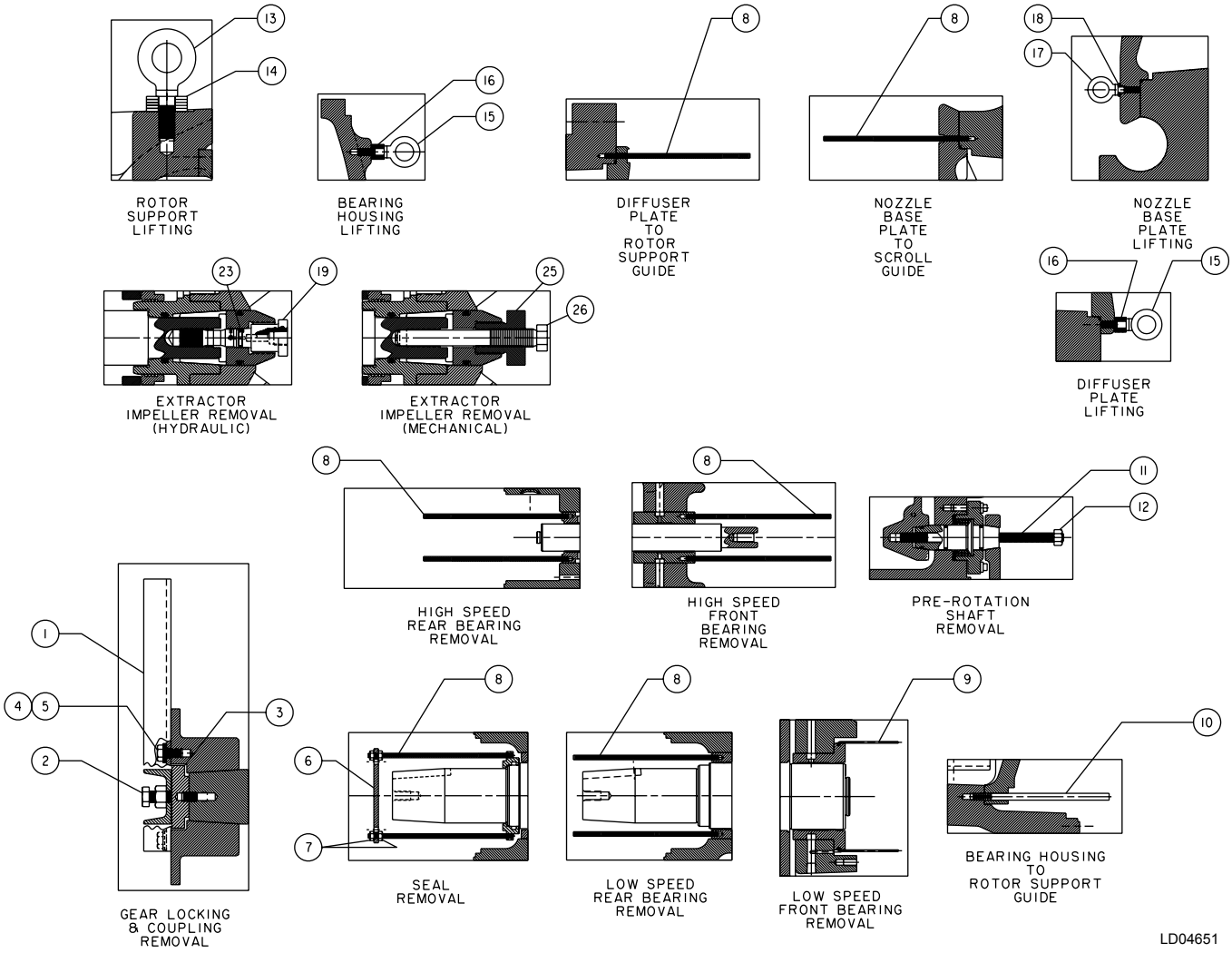


FIGURE 5 - USE OF COMPRESSOR TOOLS (-41)

TABLE 8 - COMPRESSOR TOOL KIT 364-48343 (COMPRESSOR SIZE -61)

ITEM	DESCRIPTION	QTY. PER KIT	PART NO.
1	Gear Locking Tool	1	364-48023
2	Screw Cap Hex - 5/8”	1	021-08389
3	Tool Spacer	1	364-48022
4	Screw Cap Hex 1/2”	2	021-08388
5	Washer Plain 17/32”	2	021-01276
6	Bar Tool	1	064-48345
7	Nut Hex 1/4”	4	021-00451
8	Pin Guide 1/4”	2	064-46499
9	Hook Tool	2	064-46610
10	Pin Guide 3/8”	3	064-18716

ITEM	DESCRIPTION	QTY. PER KIT	PART NO.
11	Stud Special .500	1	064-14500
12	Nut Hex Hvy 1/2”	1	021-00483
13	Bolt Eye 7/8”	1	021-07703
14	Washer Plain 15/16”	5	021-05158
15	Bolt Eye 3/8”	3	021-13498
16	Washer Plain 13/32”	11	021-05167
17	Tool Special	1	064-48133
18	Seal O-Ring 7/16”	1	028-12551
20	Adapter Impr	1	064-48318
21	*I* Puller Tool	1	064-48342

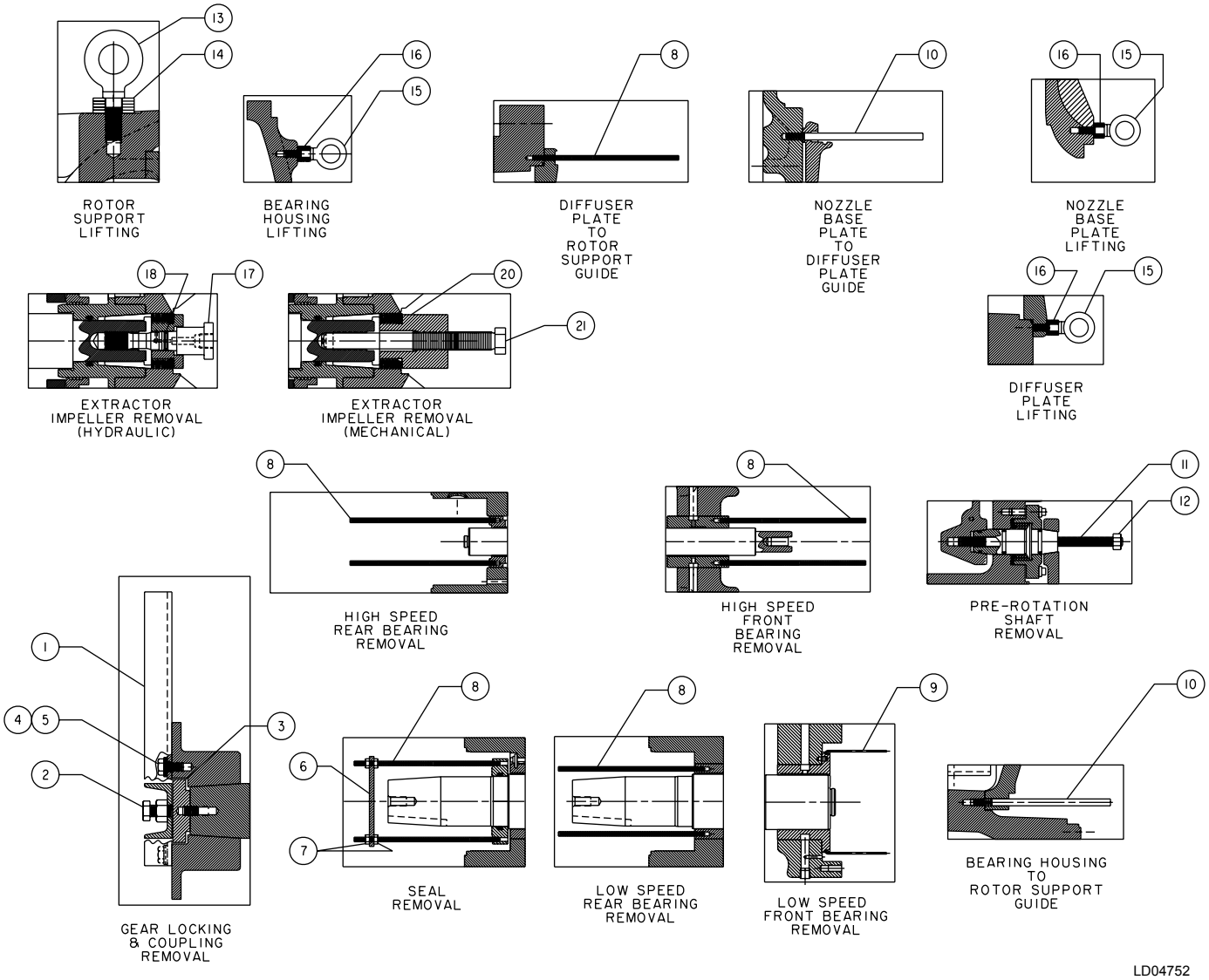


FIGURE 6 - USE OF COMPRESSOR TOOLS (-61)

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 7 on page 14*)
3. Remove the internal coupling guard. The internal coupling guard is fastened to the compressor with (4) hex head cap screws. (See *Figure 8 on page 14*)
4. Remove the bolts holding the coupling hubs to the coupling spool and the disc pack. Note arrangement of these parts. (See *Figure 9 on page 14*). Remove the coupling spool and disc packs.
5. Taking care to see that the motor is properly supported, remove the bolts that hold the motor to the motor adapter.

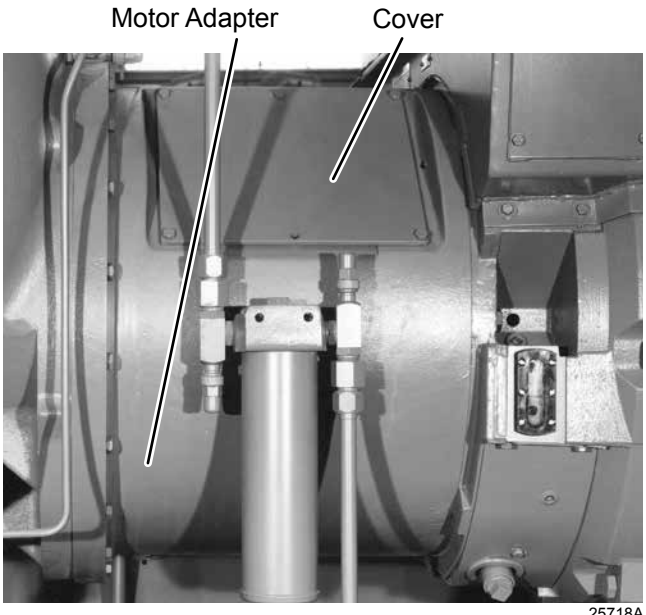


FIGURE 7 - MOTOR ADAPTER

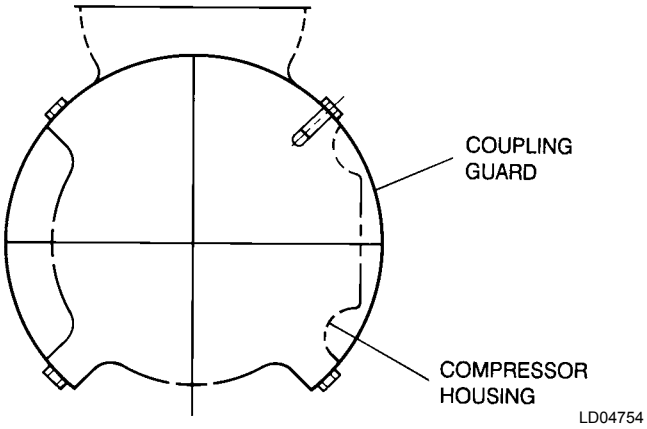


FIGURE 8 - INTERNAL COUPLING GUARD

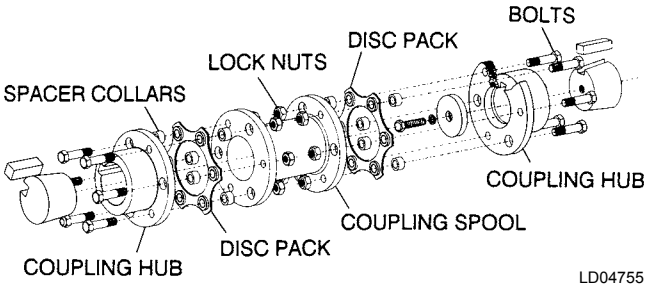


FIGURE 9 - COMPRESSOR COUPLING

6. Remove the bolts, nuts, and washers holding the motor to the mounting rails. Note location of any shims.
7. Lift the motor and pull it away from the compressors. Lower motor to floor for servicing. Remove shims from motor mounting rails.

Open-Drive Models

1. Remove the coupling guard. (See *Figure 10 on page 15*)
2. Remove the bolts holding the coupling hubs to the coupling spool and the disc pack. Note arrangement of these parts. (See *Figure 9 on page 14*) Remove the coupling spool and disc packs.
3. Remove the bolts, nuts and washers holding the motor to the mounting rails. Note location of any shims.
4. Prior to performing Step 5, be sure to support the back end of the rotor support.
5. Taking care to see that the motor is properly supported, remove the bolts that hold the motor to the motor adaptor.
6. Lift the motor and pull it away from the compressor. Lower motor to floor for servicing. Remove shims from motor mounting rails.

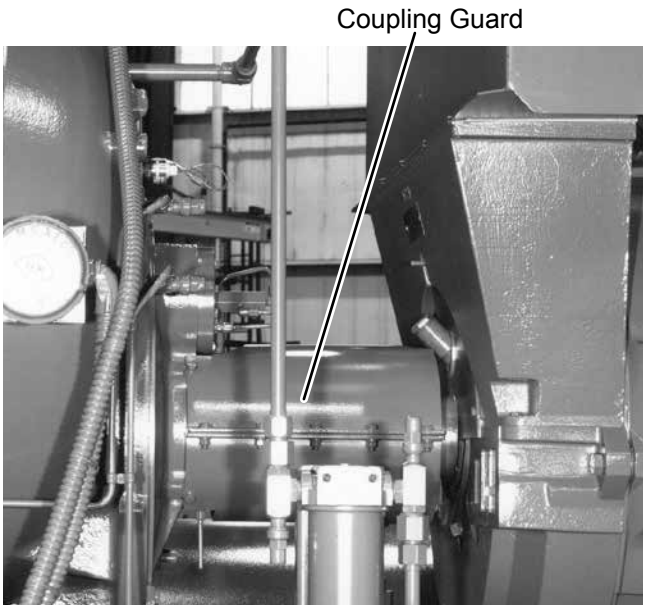


FIGURE 10 - COUPLING GUARD (OPEN-DRIVE MODELS)

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). (See *Figure 7 on page 14*)
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 *Installation Instructions (Form 160.49-N4).*

Open-Drive 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 *Installation Instructions (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.

2

SHAFT SEALS

Shaft seals applied to these compressors are of two different designs. Original design compressors used a carbon ring cartridge type shaft seal. This design is shown in *Figure 11 on page 15* through *Figure 15 on page 16*; procedures for removal and installation are shown. Beginning approximately May 1998, compressors are equipped with a bellows-type shaft seal. This seal is shown in *Figure 16 on page 17*; procedures for removal and installation are shown.

Removal (Cartridge Type Seal)

To remove/replace the cartridge 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 shaft seal cover plate. (See *Figure 12 on page 16*)
3. Remove the (8) cap screws holding the cover plate and remove the cover plate. The stationary carbon seal will remain in the cover plate as it is removed. Do not touch the carbon seal surface.
4. Remove the snap ring and sleeve.
5. Remove the seal cartridge assembly from the cover plate. Do not disassemble the cartridge assembly.
6. Using items from the tool kit as shown in *Figure 13 on page 16* remove the seal collar from the shaft. (also see *Figure 14 on page 16* and *Figure 15 on page 16*)

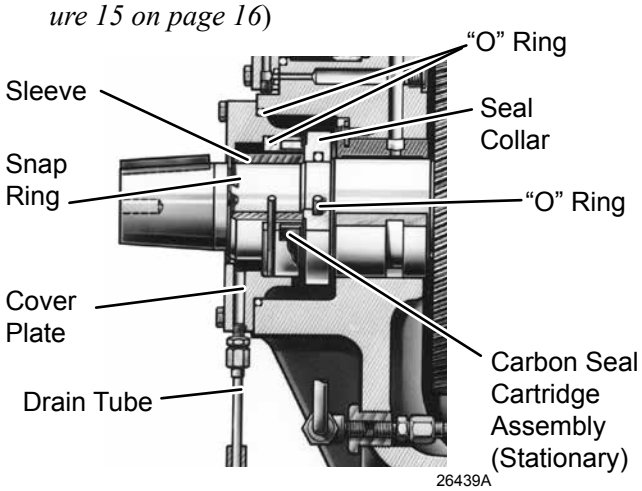


FIGURE 11 - CARTRIDGE TYPE SHAFT SEAL CROSS

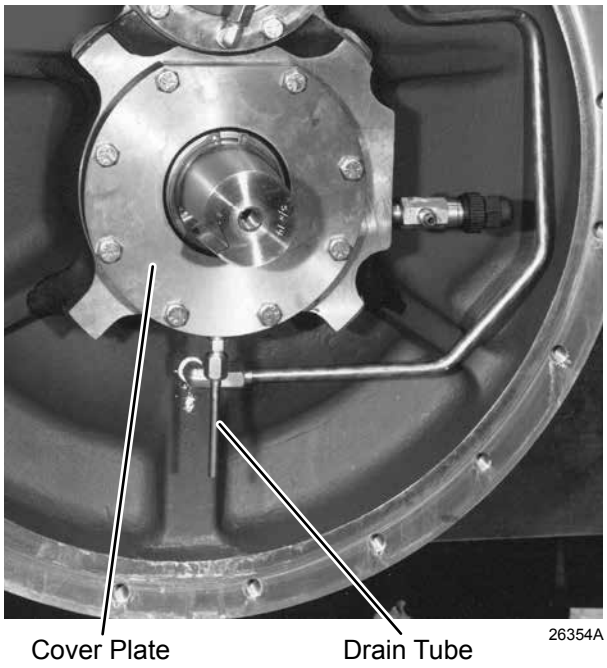


FIGURE 12 - SHAFT SEAL COVER PLATE

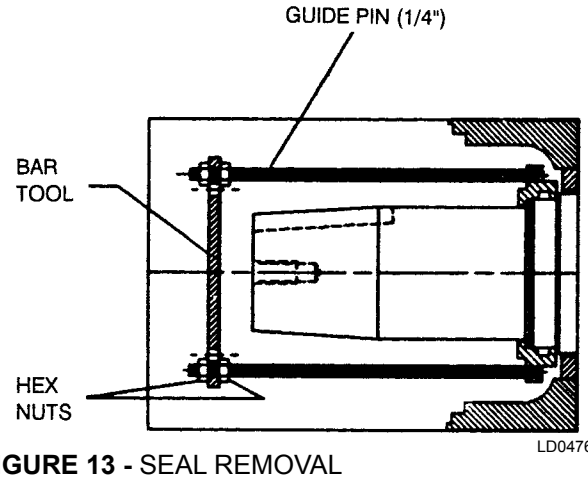


FIGURE 13 - SEAL REMOVAL

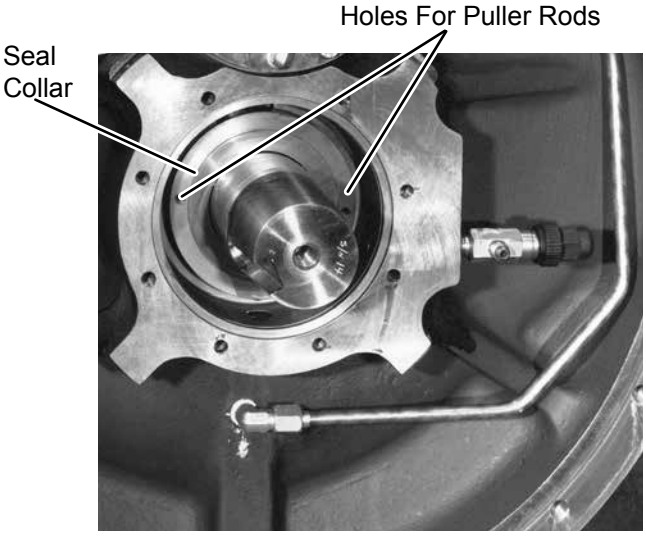


FIGURE 14 - SEAL PLATE

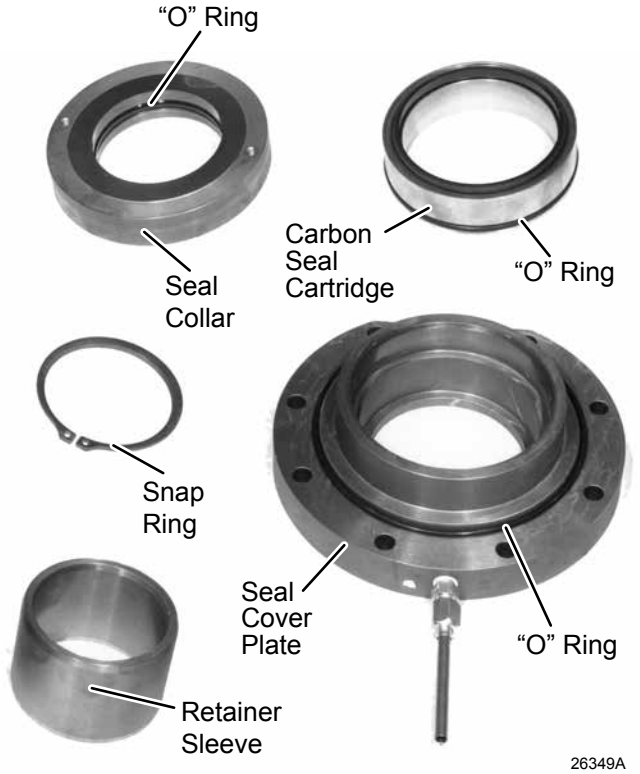


FIGURE 15 - CARTRIDGE TYPE SHAFT SEAL COMPONENTS

Installation (Cartridge Type Seal)

1. Be sure the shaft seal cavity is absolutely 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 7*. Discard all "O" rings and replace with new.
3. Slide the seal collar onto the compressor shaft. Be sure it is positioned with the lapped surface facing out. (See *Figure 14 on page 16*)
4. Re-install the cover plate and seal cartridge assembly. Use care so that the carbon seal is not damaged.
5. Re-install the sleeve and secure it with the snap ring.
6. Re-connect the oil drain line and re-install the compressor coupling if no further service is planned.

BELLOWS TYPE SEALS

NOTE

There are 2 versions of the bellows type shaft seals used on compressors manufactured after May of 1998. One version is used on the HA and HB family of compressors and the second version is used on the HD and HF family of compressors. The HA and HB seal has a separate sleeve spacer and C-ring that needs to be manually inserted before installing the seal assembly. The HD and HF version have the sleeve spacer and C-ring already installed in the seal. Below are instructions on how to remove and install these seals.

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.
3. Loosen the two set screws (C) shown in *Figure 16 on page 17*.
4. Remove the flat head screws and re-attach the retaining clips in the Installation position.

NOTE

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 proper 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 16 on page 17*.
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 compressor shaft on HA and HB style compressors.
9. Remove the O-ring from the rotor support housing.

Seal Installation (Bellows Type)

1. Be sure the shaft seal cavity is absolutely 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 7*. Discard all O-rings and replace with new.

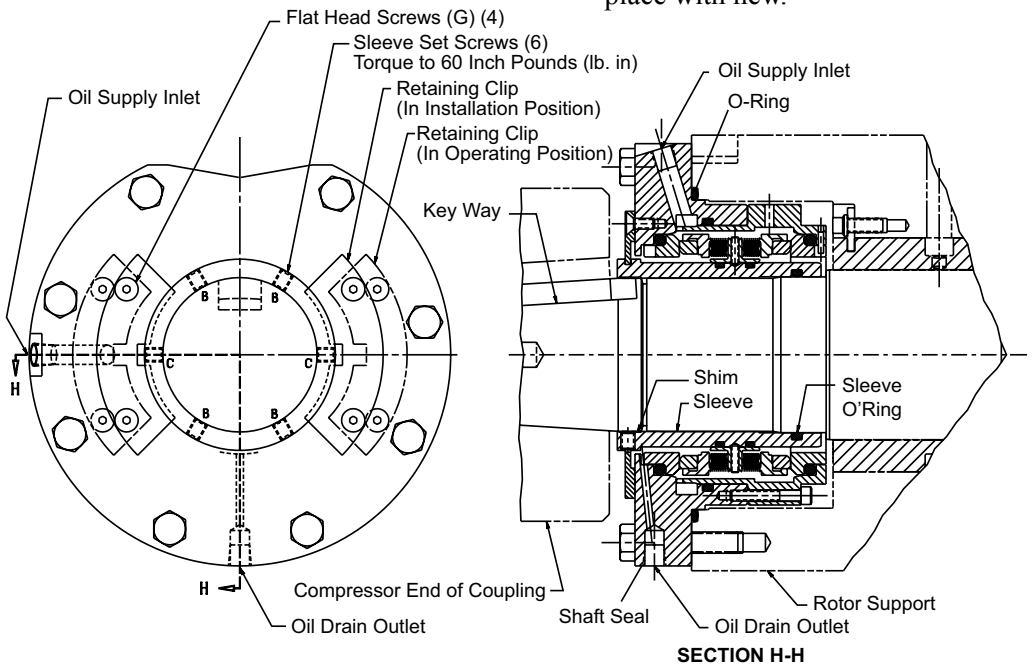


FIGURE 16 - BELLOWS TYPE SHAFT SEAL

3. Thoroughly lubricate shaft with clean YORK refrigerant oil prior to installation. For HD and HF compressors, proceed to Step 6.
4. Install the sleeve spacer on the shaft and slide it all the way onto the shaft.
5. Thoroughly lubricate C-ring with clean YORK refrigerant oil. Install the C-ring with the open side of the ring facing the compressor.

NOTE

Care needs to be taken when installing the C-ring to prevent damage to the ring on any burrs on the shaft or on the snap ring grove that may be on the shaft of older compressors.

6. Install the shaft seal cover o-ring in the rotor support housing.
7. Using guide studs install the seal cartridge in the rotor support housing and secure it with the existing 3/8" mounting screws.
8. Before tightening the shaft seal sleeve set screw, rotate the compress shaft to insure that the set screws straddle the shaft keyway.
9. Without removing the two shaft seal sleeve retaining clips, tighten the four accessible set screws to the compressor shaft.
10. Remove the retaining clips and tighten the remaining setscrews. Torque all six setscrews to 60 inch pounds. Install retaining clips in the Operating Position on seal face.
11. Re-connect the oil drain line and re-install the compressor coupling if no further service is planned.

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 Supports from Rotor Scroll

NOTE

For steps 1 thru 4 follow procedures listed on previous pages of this instruction.

1. Remove the compressor coupling.
2. Remove all external piping from the rotor support.
3. Using proper rigging techniques, temporarily support the weight of the back end of the rotor support.
4. Taking care that the motor is properly supported, remove the bolts that hold the motor to the motor adaptor. Remove the motor from the chiller and sit away from work area. See *Motor Removal and Replacement on page 14*. **DO NOT** remove the motor adaptor from the compressor.
5. Insert eyebolt into the top of the rotor support and using proper rigging methods support the weight of the rotor support.
6. Remove (2) of the 12 point cap screws holding the rotor support to the rotor scroll. Insert guide pins in place of the (2) cap screws.
7. Loosen the remaining cap screws. Do not remove the (2) set screws/studs with nuts from the bottom of the flange near the drain pipe. Remove the nuts only.

NOTE

On the HF family of compressors it may be necessary to temporarily rig a support for the oil sump. The sumps on these compressors are not attached to the shell.

8. 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 17 on page 19*) 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.
9. The rotor support can now be removed and rested on the end of the motor adapter.

Removing The Impeller (Size 46 & Larger)

1. Before removing the impeller, measure and record the following. (See *Figure 19 on page 20*) Position compressor so that it is sitting on the correct horizontal plane to assure correct readings.
   a. Impeller rim Runout (Design 0.003" max.)
   b. Impeller eye Runout (Design 0.002" max.)
   c. High Speed Axial thrust (Design 0.008" to 0.021")
   d. Low Speed Axial Thrust (Design 0.011" to 0.019")
2. Install the gear locking tool on the low-speed shaft. (See *Figure 44 on page 28*)
3. Remove the 3 (or 6) screws that hold the impeller to the high-speed shaft. (See *Figure 20 on page 20*) Pull the impeller from the high-speed shaft. Use care when removing the impeller so that the balance piston seal is not damaged.

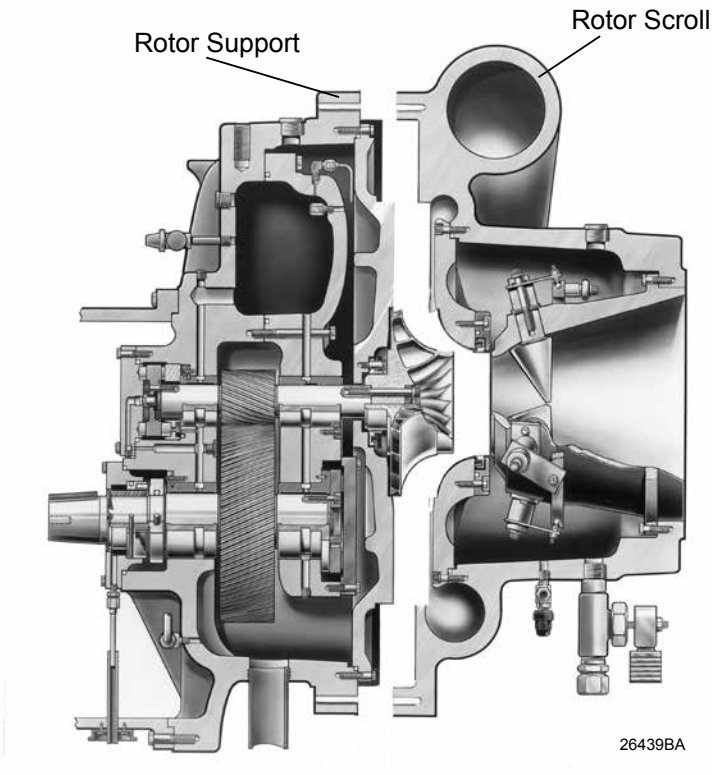


FIGURE 17 - DISASSEMBLY OF ROTOR SUPPORT FROM THE ROTOR SCROLL

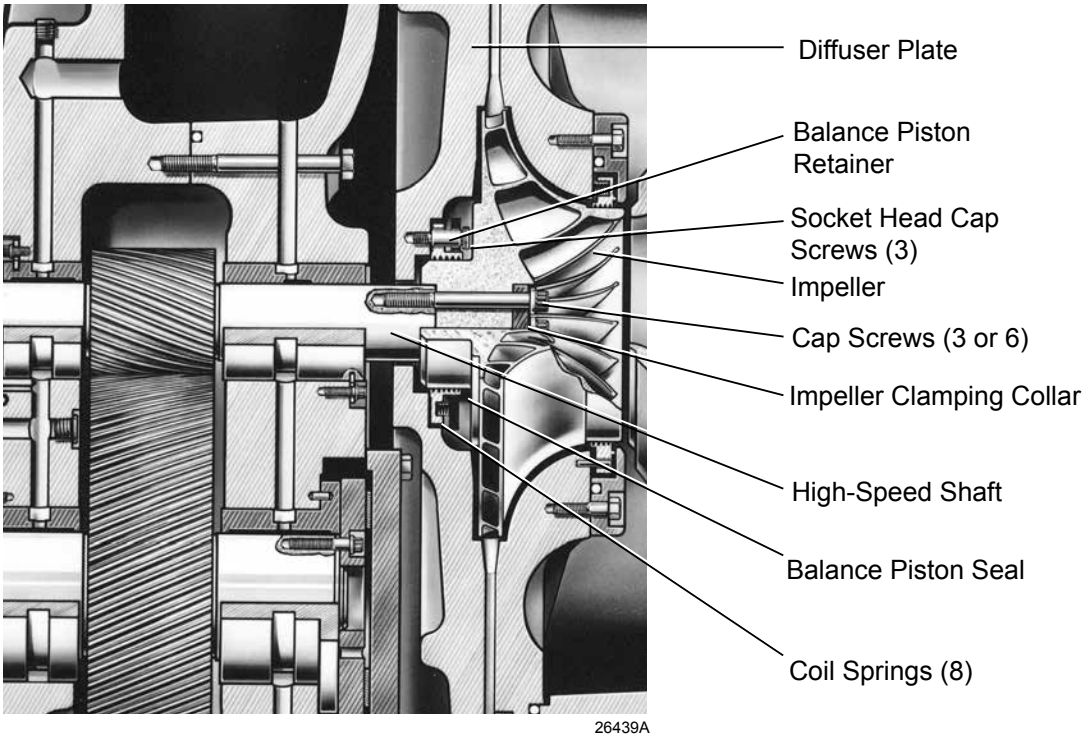


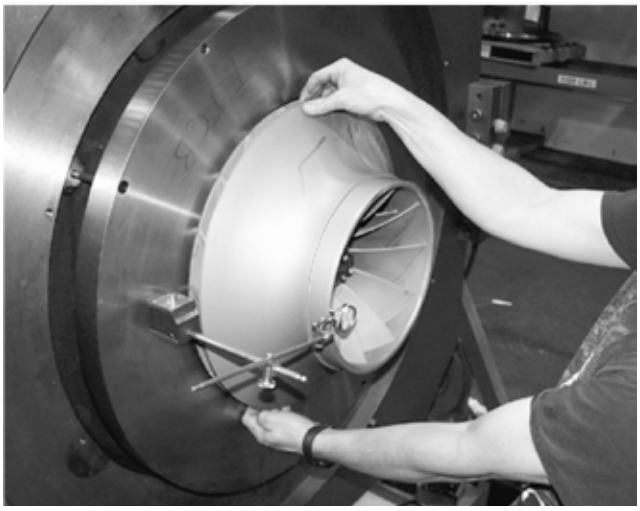
FIGURE 18 - IMPELLER AND BALANCE PISTON (IMPELLER SIZES 46 AND LARGER)

26347A

Detail A – Checking Rim Runout (Tolerance - .003")

26346A

Detail B – Checking Eye Runout (Tolerance - .002")



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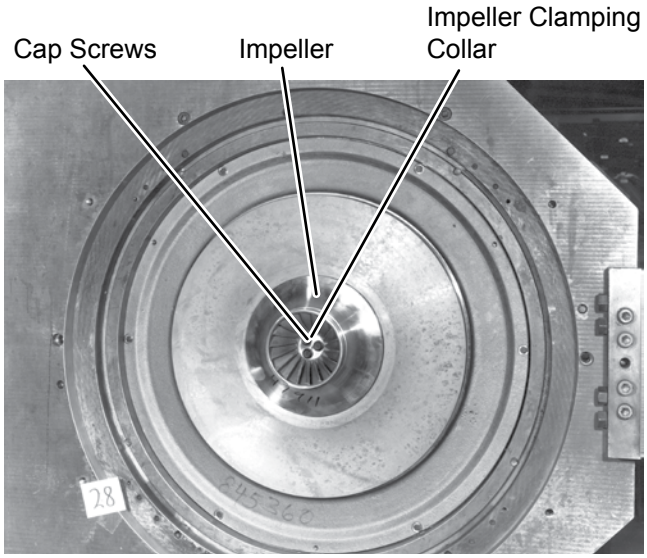
Detail C – Checking Axial Thrust

FIGURE 19 - CHECKING IMPELLER TOLERANCES



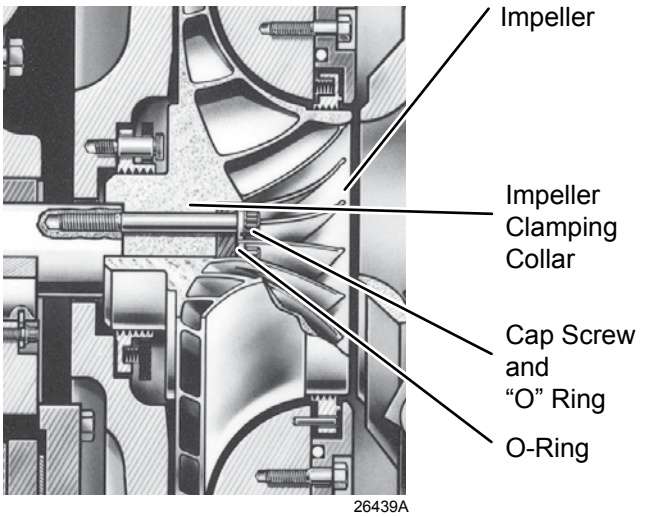
26345A

FIGURE 20 - REMOVING IMPELLER (IMPELLER SIZES 46 AND LARGER)

REMOVING THE IMPELLER (HA36 & HA41 Compressors)

See *Figure 21 on page 20* and *Figure 22 on page 21*

1. Before removing the impeller, measure and record the following: (See *Figure 19 on page 20*) Position compressor so that it is sitting on the correct horizontal plane to assure correct readings.
   a. Impeller rim Runout (Design 0.003" Max.)
   b. Impeller eye Runout (Design 0.002" Max.)
   c. High Speed Axial thrust (Design 0.008" to 0.021")
   d. Low Speed Axial Thrust (Design 0.011" to 0.019")



26439A

FIGURE 21 - IMPELLER MOUNTING (IMPELLER SIZES 36 AND 41)

2. Install the gear locking tool on the low-speed shaft. (See *Figure 44 on page 28*)
3. Remove the cap screw and O-ring from the impeller-clamping collar.
4. Mechanical Method – Install the adaptor and puller tool, found in the tool kit, as shown in *Figure 22 on page 21*. Apply a wrench to the puller tools to remove the impeller clamping collar.

NOTE

Considerable torque will have to be applied to the wrench in order to remove the impeller-clamping collar.

5. Hydraulic Method – Install the hydraulic removal tool, found in the tool kit, as shown in *Figure 23 on page 21*. Connect a source of hydraulic pressure (5000 PSI minimum) to the head of the removal tool (1/8" NPT). Carefully and gradually apply hydraulic pressure until the clamping collar is loosened.
6. Pull the impeller from the high speed shaft. Use care when removing the impeller so that the balance piston seal is not damaged.

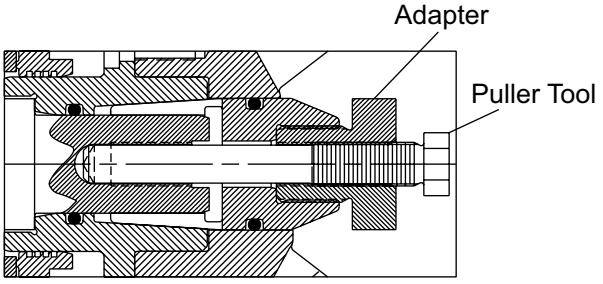


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FIGURE 22 - REMOVING THE IMPELLER (IMPELLER SIZES 36 AND 41)

Removing The Impeller (HF Compressors)

1. Before removing the impeller, measure and record the following. (See *Figure 19 on page 20*) Position compressor so that it is sitting on the correct horizontal plane to assure correct readings
   a. Impeller rim Runout (Design 0.003" Maximum)
   b. Impeller eye Runout (Design 0.002" Maximum)
   c. High Speed Axial thrust (Design 0.009" to 0.020")
   d. Low Speed Axial Thrust (Design 0.011" to 0.019")

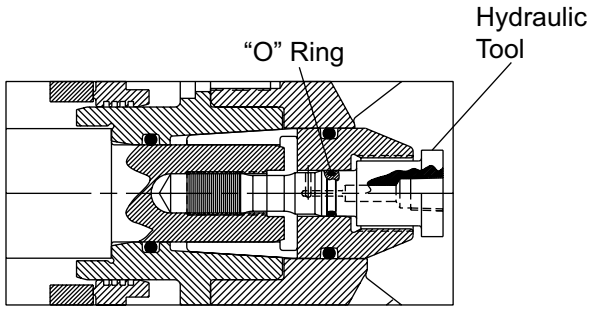

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FIGURE 23 - REMOVING THE IMPELLER (IMPELLER SIZES 36 AND 41)

2. Install the gear locking tool on the low-speed shaft. (See *Figure 44 on page 28*)
3. Remove the cap screw from the impeller. Install Puller Plate and Puller Tool, found in the tool kit, onto the impeller. Apply a wrench to the puller to remove the impeller clamping color.

NOTE

Considerable torque will have to be applied to the wrench in order to remove the impeller-clamping collar.

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 the to diffuser plate. (See *Figure 24 on page 22* and *Figure 26 on page 22*)
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. (*Figure 25 on page 22*) Insert jacking screws into holes 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 o-ring from back of diffuser plate.

NOTE

Original design balance piston seal on HA, HB, and HD style compressors were equipped with (8) coil springs. Current design on these compressors use (16) coil springs. On the HF style compressor the balance piston seal uses a flat spring washer in place of the coil springs. (See Figure 22 - HF style Balance Piston Seal Assembly)

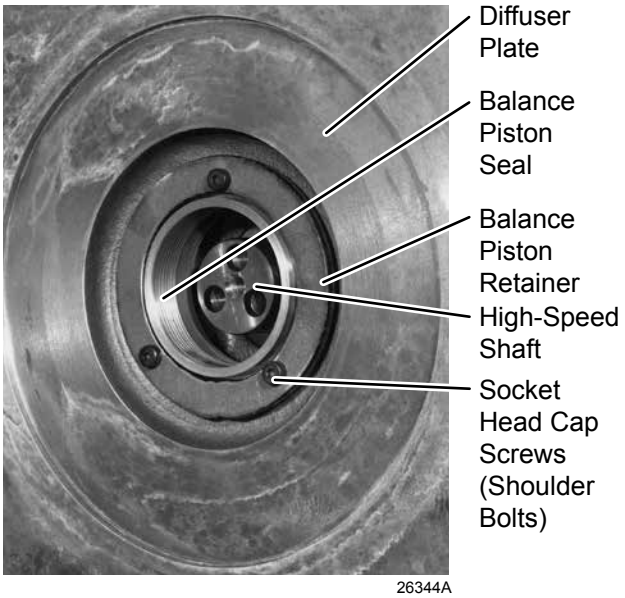


FIGURE 24 - BALANCE PISTON SEAL

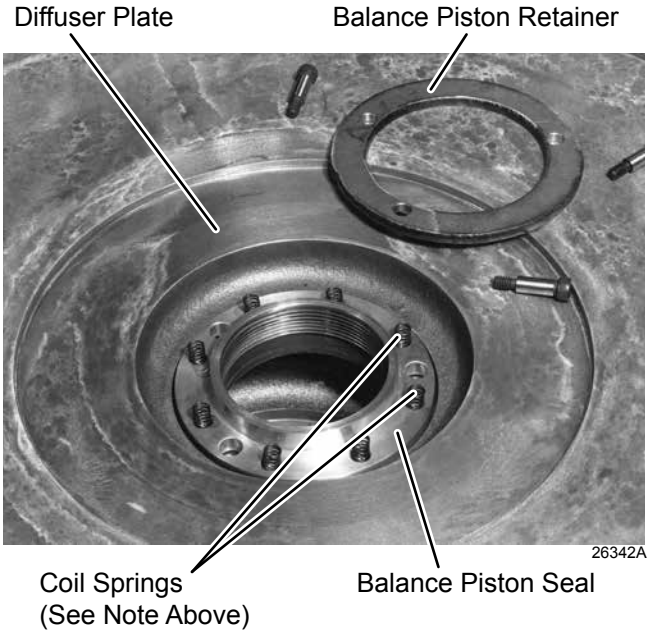


FIGURE 26 - BALANCE PISTON SEAL (DISASSEMBLED)

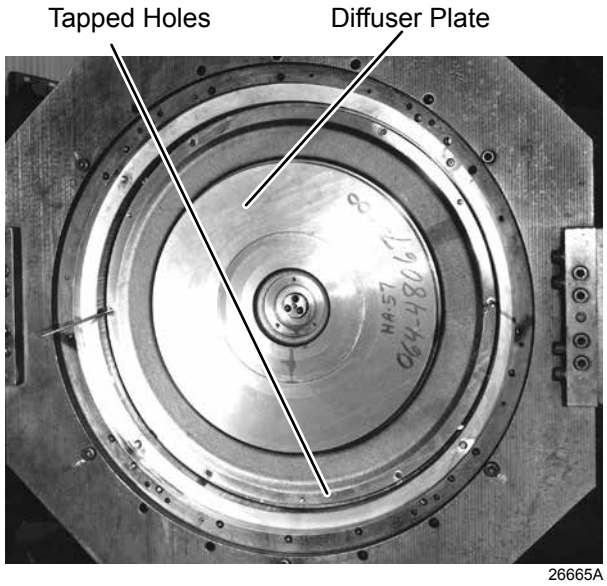


FIGURE 25 - REMOVING DIFFUSER PLATE

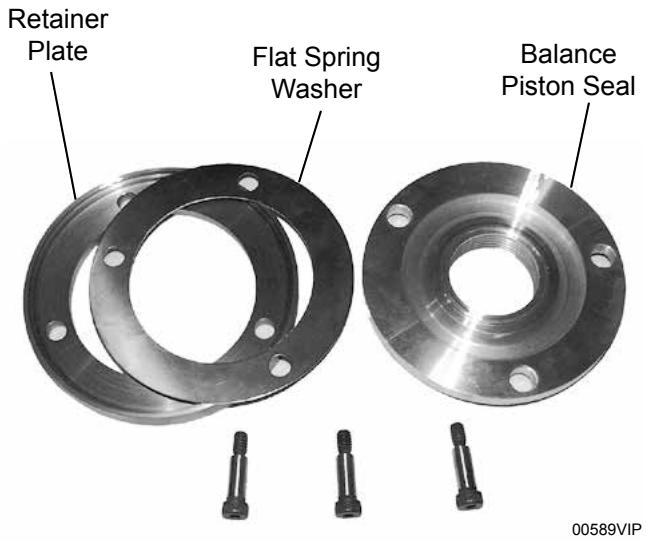


FIGURE 27 - HF BALANCE PISTON SEAL ASSEMBLY

REMOVING FRONT LOW-SPEED BEARINGS

(See *Figure 28 on page 23*)

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 29 on page 23* and *Figure 30 on page 23*)
2. Before removing the low-speed thrust collar, mount an indicator as shown in *Figure 31 on page 24* 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 socket head cap screws that hold the low-speed thrust collar to the low-speed shaft, and remove the thrust collar. (*Figure 32 on page 24*) Use care when handling so that surfaces are not damaged.
4. To remove the low-speed bearing, use (2) hook tools as shown in *Figure 33 on page 24*. Carefully pull the bearing out of the bearing housing. Note the position of roll pin. (See *Figure 34 on page 24*)

NOTE

On the HF style compressors all low and high speed bearings use o-rings on the outside diameter of the bearing. These o-rings should be discarded and new o-rings installed when reassembling compressor.

REMOVING FRONT HIGH-SPEED BEARINGS

(See *Figure 28 on page 23*)

1. Remove the cap screw and retainer clip. (*Figure 34 on page 24*)
2. Using (2) 1/4" puller rods as shown in *Figure 35 on page 24*, pull the high-speed bearing out of the bearing housing.

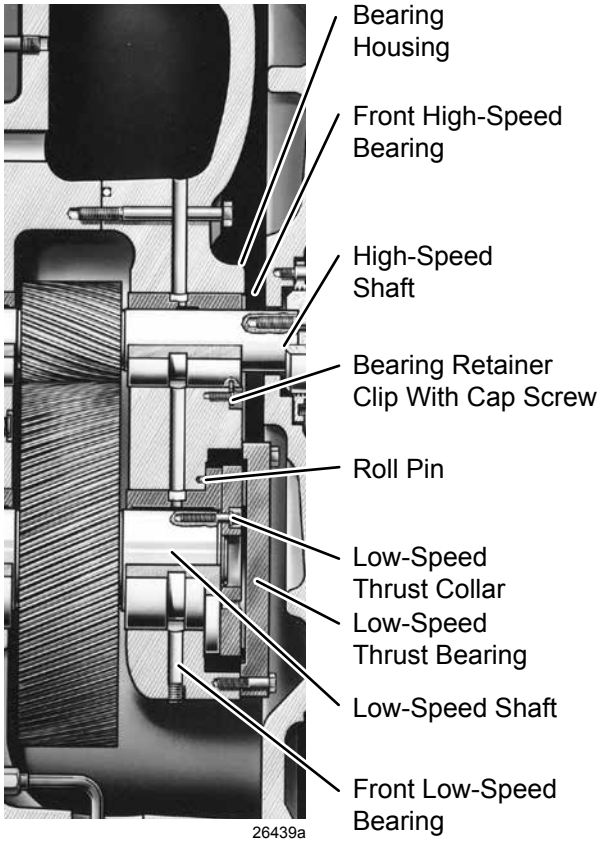


FIGURE 28 - FRONT BEARING COMPONENTS

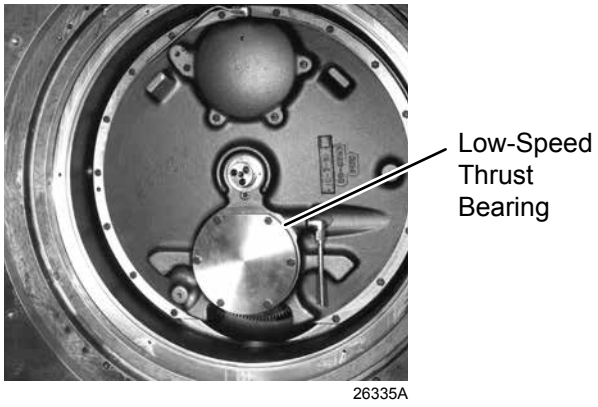


FIGURE 29 - LOW-SPEED THRUST BEARING

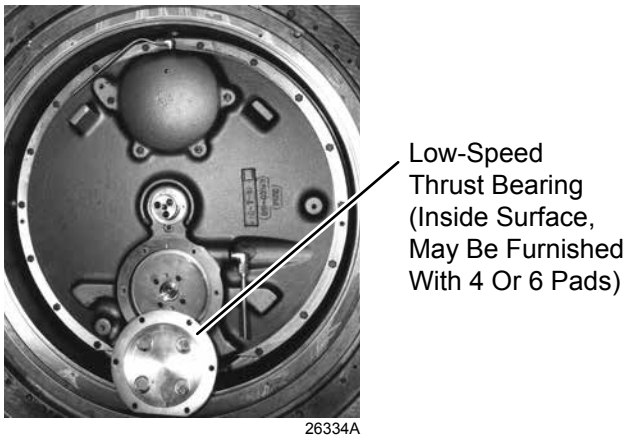


FIGURE 30 - LOW-SPEED THRUST BEARING REMOVED

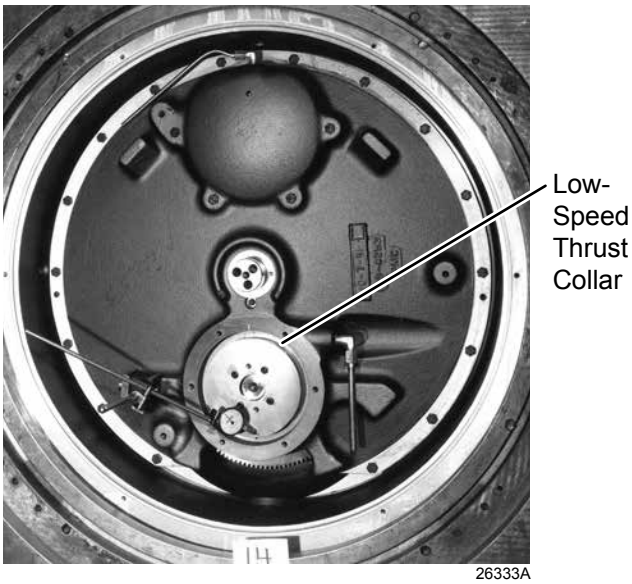


FIGURE 31 - CHECKING LOW-SPEED THRUST RUNOUT

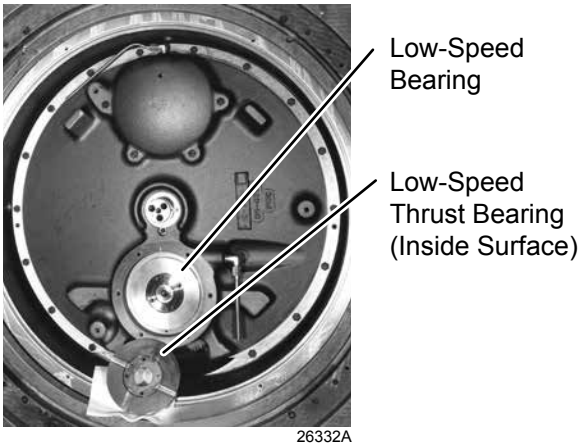


FIGURE 32 - LOW-SPEED THRUST COLLAR REMOVED

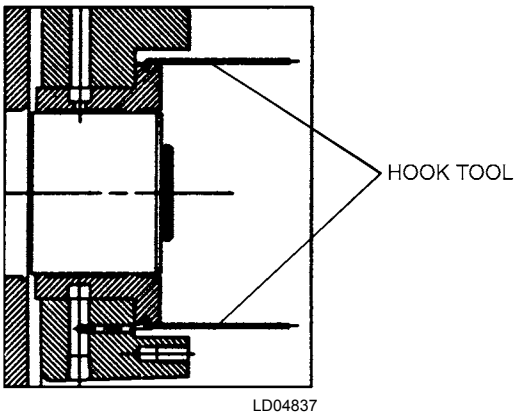


FIGURE 33 - FRONT LOW-SPEED BEARING REMOVAL

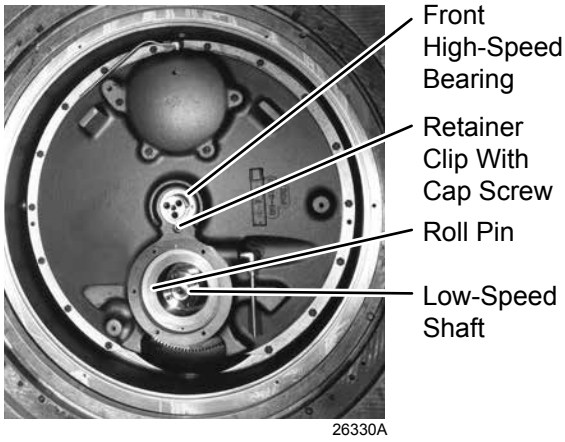


FIGURE 34 - LOW-SPEED BEARING REMOVED WITH HIGH-SPEED BEARING IN PLACE

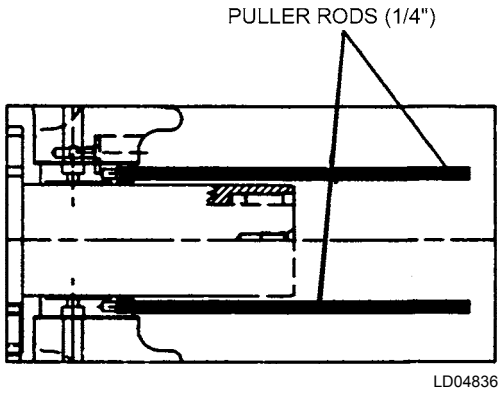


FIGURE 35 - FRONT HIGH-SPEED BEARING REMOVAL

FIGURE 36 - ALL FRONT END BEARING REMOVED

REMOVING BEARING HOUSING AND GEARS

Bearing Housing

1. Remove (2) of the cap screws that hold the bearing housing to the rotor support and insert (2) 3/8" guide pins as shown in *Figure 37 on page 25*. Also insert (3) 3/8" eyebolts as shown. On the HF style compressors, the (2) 1/2" cap screws shown in *Figure 38 on page 25* are used to secure the dowel pins which align the bearing housing with rotor support. Remove dowel pins.
2. Attach proper rigging, and 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. Rotate the high-speed gear as necessary to free the gear teeth while pulling the gear from the rotor support.
5. To remove the low-speed gear, 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 7*. Discard "O" rings and replace with new.

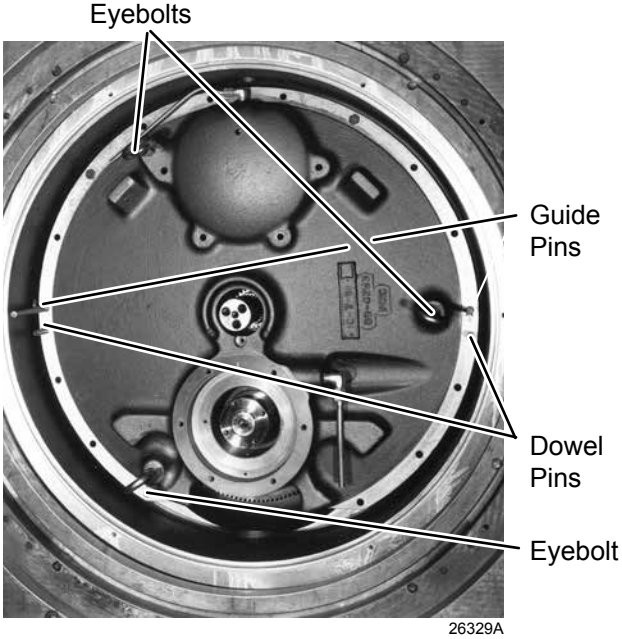


FIGURE 37 - REMOVING BEARING HOUSING

REAR LOW-SPEED BEARING

(See *Figure 39 on page 26*)

Removal

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

1. Remove the compressor coupling spool as described on previous pages under **Motor Removal And Replacement**. Also remove the compressor hub from the compressor shaft.
2. Remove the compressor shaft seal as described on previous pages.
3. Remove the screw holding the retainer clip to the compressor.
4. Using the (2) 1/4" puller rods as shown in *Figure 40 on page 26*, remove the bearing from the compressor.
5. Inspect the bearing. See *Cleaning and Checking Wearing Parts on page 7*. Replace with new bearing if necessary.

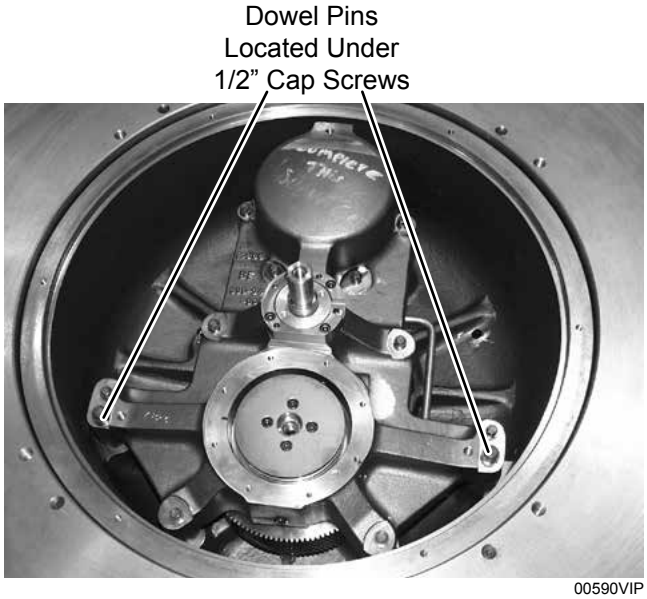
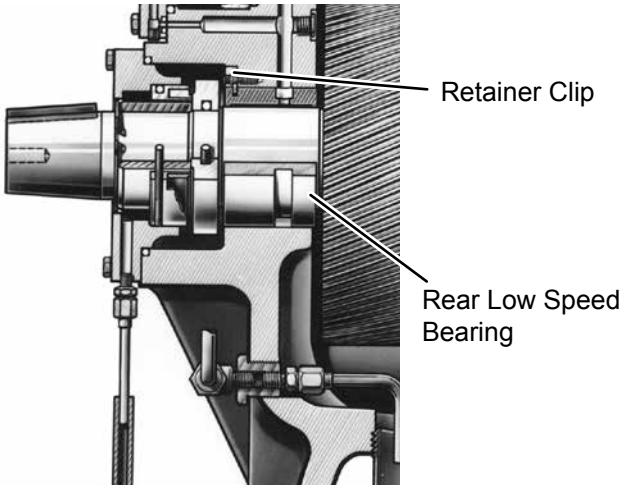


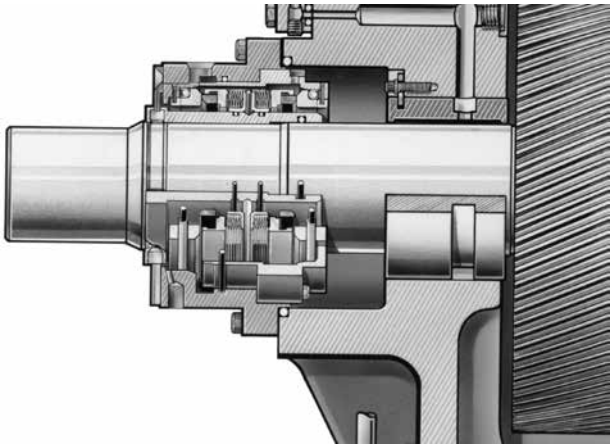
FIGURE 38 - HF BEARING HOUSING DOWEL PINS

Installation

1. Inspect the bearing surface of the drive shaft, and be sure the drive shaft is absolutely clean.
2. Apply a light coat of oil and Molykote to the crankshaft 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 39 on page 26*)
4. Install the retainer clip and cap screw.
5. Install the shaft seal and coupling following procedures outlined previously in this manual.



CARTRIDGE TYPE SEAL



BELLOWS TYPE SEAL

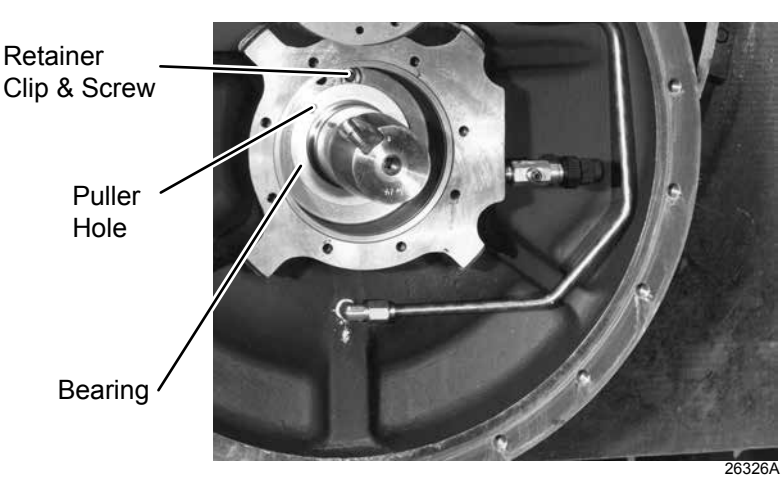


FIGURE 39 - REAR LOW-SPEED BEARING

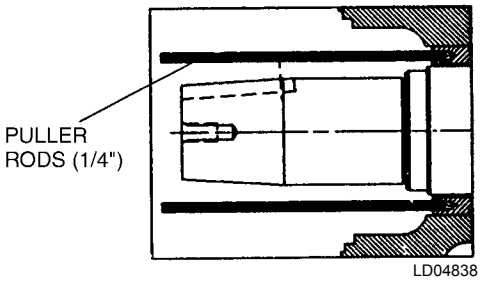


FIGURE 40 - LOW-SPEED REAR BEARING REMOVAL

REAR HIGH-SPEED BEARING COMPONENTS

NOTE

Rear High-Speed Bearings are of 2 slightly different designs.

- ***The original design, shown in Figure 41 on page 27, is applicable to G, HA and HB compressors.***
- ***The second design shown in Figure 51 on page 29 is applicable to HD and HF design levels.***
- ***(Refer to Compressor Codes in table on front cover, and Nomenclature on page 5).***

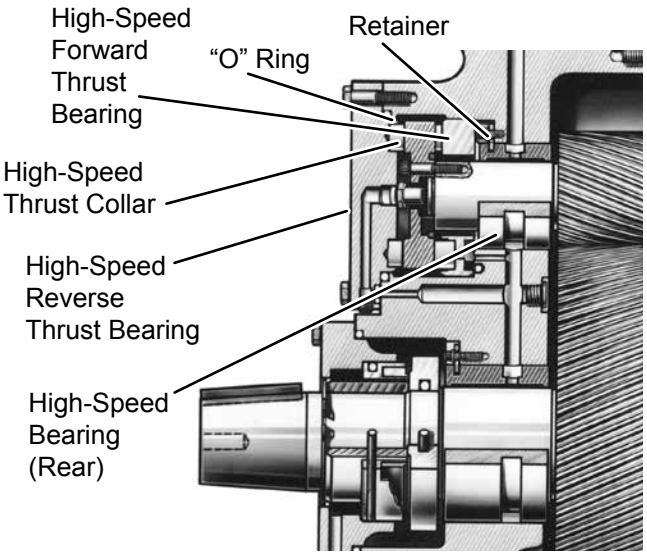


FIGURE 41 - HIGH-SPEED BEARING COMPONENTS - REAR (H COMPRESSORS - DESIGN LEVELS A, B, & C; J COMPRESSORS)

To remove/replace any of the components shown in *Figure 41 on page 27*, proceed as follows:

1. Remove the Proximity Probe.
2. Remove the cap screws holding the high-speed reverse thrust bearing and remove the bearing. (See *Figure 42 on page 27*). Note alignment of oil passages.
3. Before removing the high-speed thrust collar, it is advisable to measure the run-out on the collar face. Mount a dial indicator as shown in *Figure 43 on page 28* and rotate the compressor shaft to record run-out. Maximum 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. (See *Figure 44 on page 28*)
5. Remove the cap screws that hold the high-speed thrust collar to the high-speed shaft. (See *Figure 45 on page 28*). Remove the thrust collar. (1/4"-20 puller holes are provided for convenience.)
6. Remove the high-speed forward thrust bearing. (See *Figure 46 on page 28*). #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. (See *Figure 47 on page 28*)
7. Remove the cap screw holding the high-speed bearing retainer clip to the casing. (See *Figure 48 on page 28*). Using items from the tool kit as shown in *Figure 49 on page 29*, remove the bearing from the compressor.
8. Inspect all parts removed above. See *Cleaning and Checking Wearing Parts on page 7*. Replace with new parts as necessary.

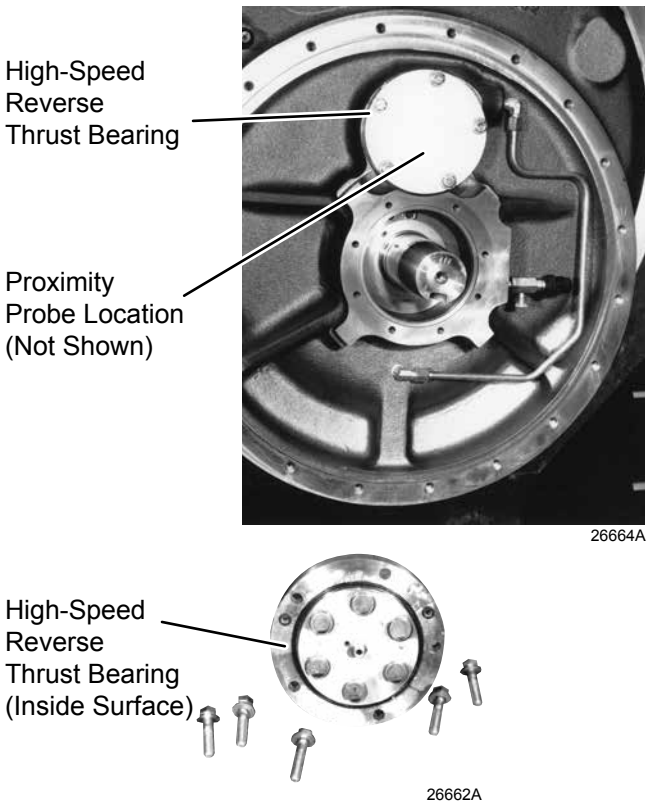


FIGURE 42 - HIGH-SPEED REVERSE THRUST BEARING

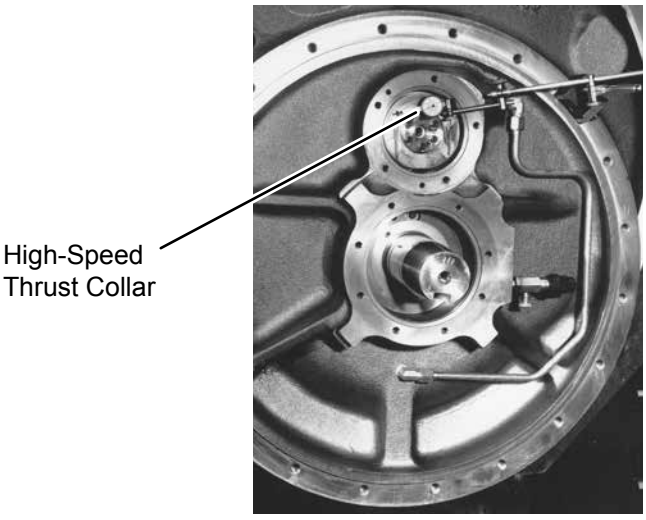


FIGURE 43 - CHECKING HIGH-SPEED THRUST COLLAR RUN-OUT

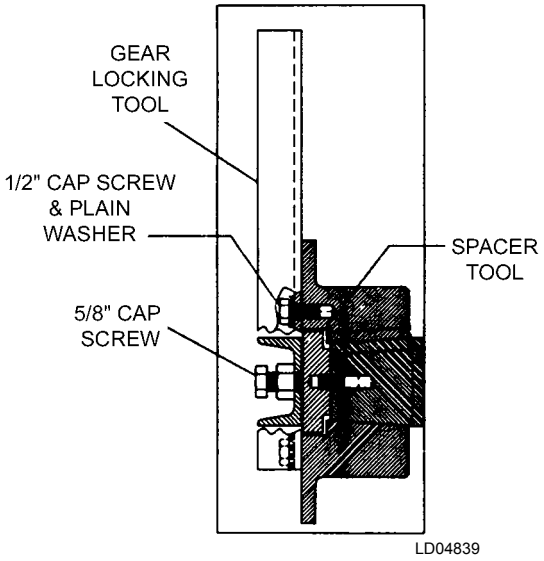


FIGURE 44 - GEAR LOCKING

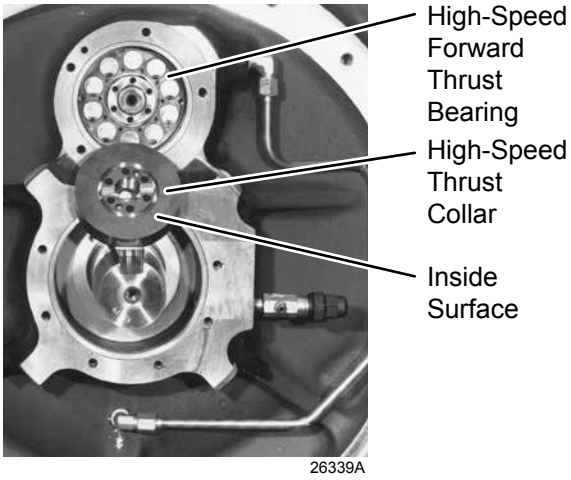


FIGURE 45 - HIGH-SPEED THRUST COLLAR REMOVED

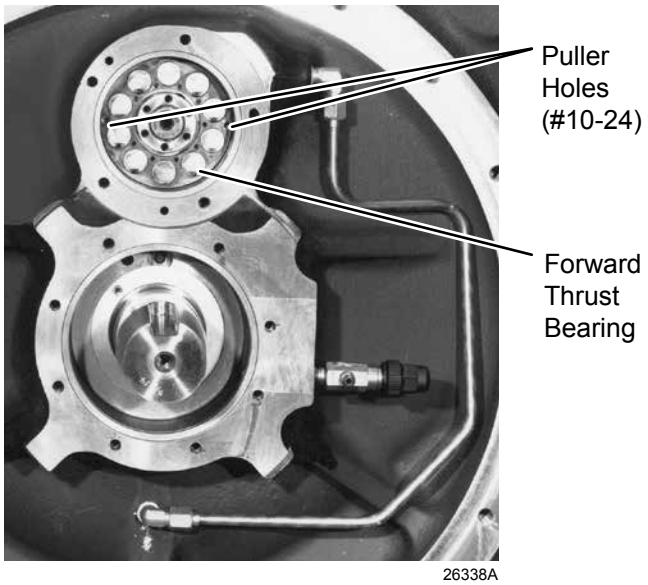


FIGURE 46 - HIGH-SPEED FORWARD THRUST BEARING

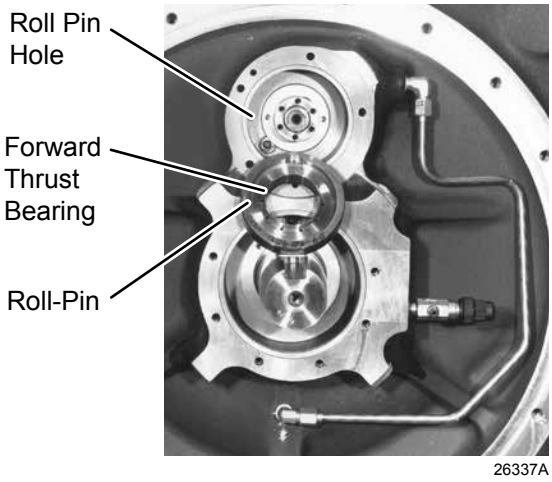


FIGURE 47 - FORWARD THRUST BEARING REMOVED

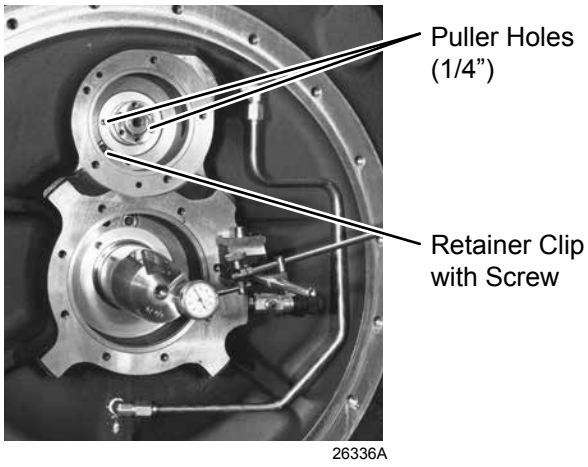


FIGURE 48 - REAR HIGH-SPEED JOURNAL BEARING

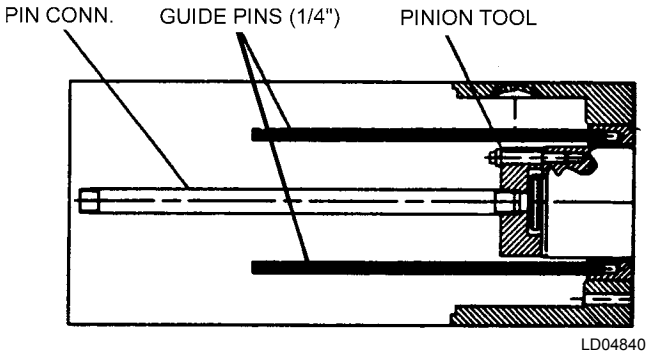


FIGURE 49 - HIGH-SPEED REAR BEARING REMOVAL

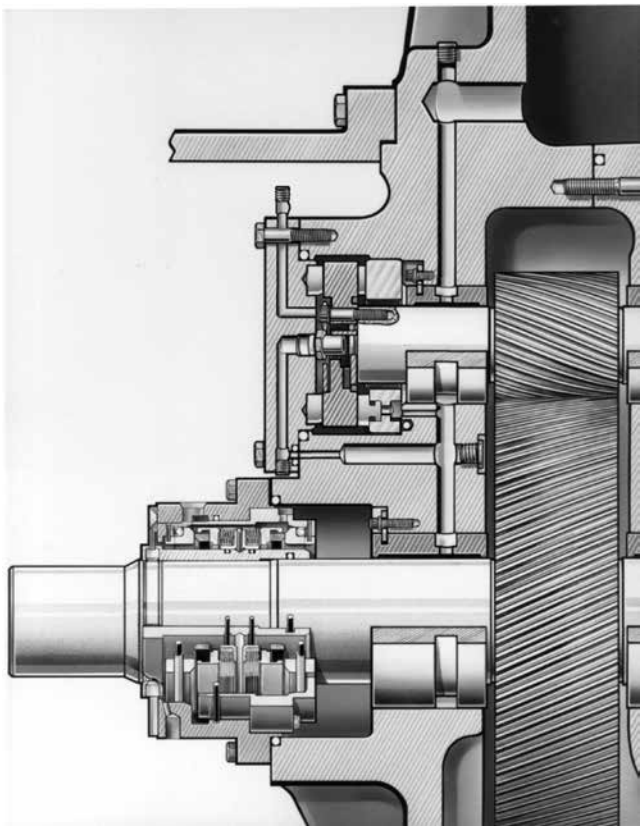


FIGURE 50 - HIGH-SPEED BEARING COMPONENTS - REAR (G, HA & HB COMPRESSORS)

Rear High-Speed Bearings Removal – HD and HF Compressors

To remove/replace any of the components shown in *Figure 51 on page 29*, proceed as follows:

1. Remove the Proximity Probe or Pressure Switch assembly.

NOTE

On HF style compressors the Proximity Probe has been replace with a pressure switch. (See Figure 52 on page 30). This pressure switch is installed on a brass tube that has its tip protruding into a groove on the High Speed Thrust Collar. If the thrust tolerance exceeds a determined distance, the sacrificial brass tip will wear through, pressurize the tube with oil and trip the pressure switch to shut down the chiller.

2. Remove the cap screws holding the high-speed reverse thrust bearing and remove the bearing. (See *Figure 42 on page 27*). Note alignment of oil passages.
3. Before removing the high-speed thrust collar, it is advisable to measure the run-out on the collar face. Mount a dial indicator as shown in *Figure 43 on page 28* and rotate the compressor shaft to record run-out. Maximum 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. (See *Figure 44 on page 28*)

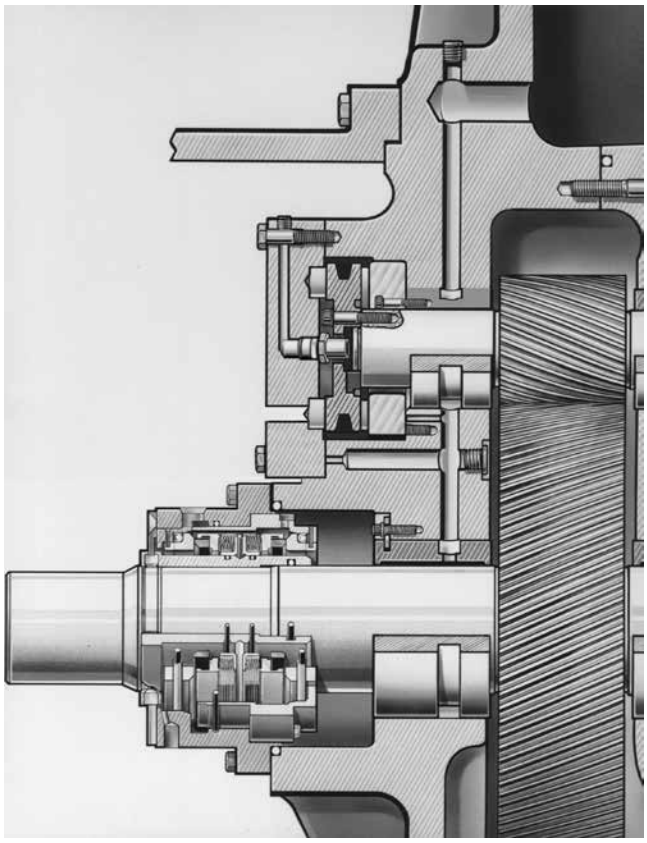


FIGURE 51 - HIGH-SPEED BEARING COMPONENTS - REAR (HD & HF COMPRESSORS)

5. Remove the cap screws that hold the high-speed thrust collar to the high-speed shaft. (See *Figure 45 on page 28*). Remove the thrust collar. (1/4" – 20 puller holes are provide for convenience)
6. Loosen but do not remove the (3) hex socket 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 7*. Replace with new parts as necessary.

Rear High-Speed Bearings Installation – G and H Compressor design levels A, B, &C and all J Compressors

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 rear high-speed bearing.
3. Carefully slide the high-speed bearing with the bearing retainer clip into position. Insert cap screw into the retainer clip and tighten.
4. Apply a light coating of oil and Molykote to the inside diameter and pads of the forward thrust bearing. Reinstall the forward thrust bearing taking care that the roll pin enters the hole in the compressor casing. (See *Figure 47 on page 28*)

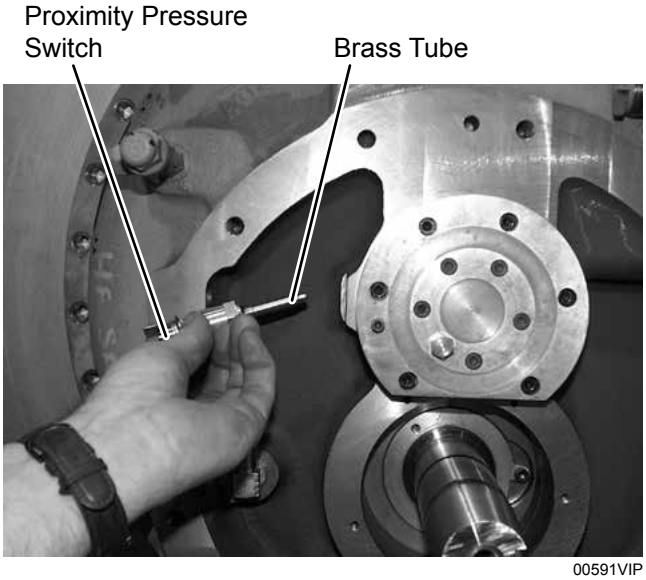


FIGURE 52 - HF PROXIMITY SWITCH

5. Apply a light coating of oil and Molykote to both sides of the thrust collar. Install the thrust collar and tighten (4) hex socket cap screws to the high-speed shaft. Check run-out of shaft collar. Maximum run-out is .001".
6. Apply a light coating 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.
7. Re-install the Proximity Probe.

After reinstalling the Proximity Probe, a Calibration Procedure, as outlined in Form 160.49-M2, must be performed before restarting the compressor.

Rear High-Speed Bearings Installation – HD and HF Compressors

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 rear high-speed bearing. On HF style compressors install new o-ring on high-speed bearing.
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 slide the high-speed bearing and high-speed forward thrust bearing into position. Be sure the roll pin on the forward thrust bearing enters the hole in the compressor casing. Tighten the (3) cap screws that secure the forward thrust bearing to the high-speed bearing.
6. Apply a light coating of oil and Molykote to both sides of the thrust collar. Install the thrust collar and tighten the (4) hex socket cap screws to the high-speed shaft. Check run-out of shaft collar. Maximum run-out is .001".
7. Apply a light coating 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 or Pressure Switch assembly.

After reinstalling the Proximity Probe on the HD style compressor, a Calibration Procedure, as outlined in Form 160.49-M2, must be performed before restarting.

INSTALLING GEARS

1. Oil the bearing surfaces 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 on 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 gear 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 53 on page 31*) Coat the o-ring with a suitable o-ring lubricant to hold it in the groove.
2. Insert (2) guide pins 180 degrees apart into the rotor support.
3. Lift the bearing housing and carefully push in place over the guide pins. Note location of dowel pins.

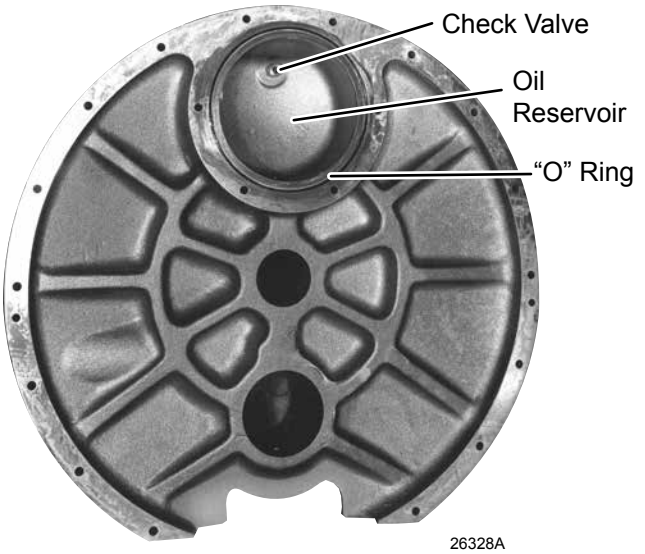


FIGURE 53 - BEARING HOUSING

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 3 on page 8*. On HF style compressors install the (2) ½” cap screws used to secure the dowel pins as shown in *Figure 34 on page 24*.

INSTALLING FRONT HIGH-SPEED BEARINGS

(See *Figure 28 on page 23*)

1. Apply a coating of oil and Molykote to the bearing surfaces 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.

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.
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 34 on page 24*)
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 proper torque. (See *Table 3 on page 8*)
6. Mount a dial indicator as shown in *Figure 31 on page 24* and check the run-out of the thrust collar. (It will be necessary to remove the shaft locking tool 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 Department 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 on the diffuser plate.
2. Insert (2) ¼" diameter 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 25 on page 22*)
4. Insert (4) of the bolts before removing rigging and guide pins; then insert remaining bolts and tighten.
5. On the HF style compressor, install that flat spring onto the balance piston seal. On all other style compressors, install the (8) or (16) helical springs, large end first, into the balance piston seal. Rotate each spring to lock it into place. (See *Figure 26 on page 22*)
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 screw, check that the balance piston seal is free to "float".

INSTALLING THE IMPELLER

Impeller Sizes 46 and Larger

1. Re-install the shaft locking tool.
2. Apply a light coating of oil and Molykote to the inside diameter of the balance piston seal.
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. Refer to *Figure 54 on page 32* for sequence of tightening screws.

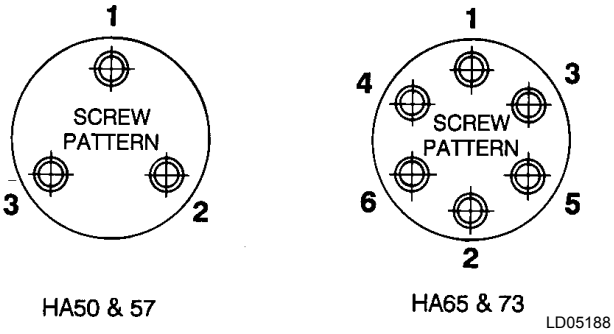


FIGURE 54 - IMPELLER MOUNTING SCREWS TIGHTENING SEQUENCE

6. Remove the shaft locking tool and check rim and eye radial runout using a dial indicator. (See *Figure 19 on page 20*). Maximum runout on rim is .003" and runout on eye is .002". If T.I.R. deviates from specification, increase torque to 150 ft. lbs. Maximum 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".
8. Check low-speed thrust clearance. Acceptable thrust tolerance is between .011" to .019" Note that this measurement must be taken with the shaft seal installed.

TABLE 9 - PERMISSIBLE RUNOUT OF IMPELLER

IMPELLER DIA. (INCHES)	RIM RADIAL	EYE RADIAL
11.30, 10.00	.003	.002

Impeller for HA36 and HA41

1. Re-install the shaft locking tool.
2. Apply a light coating of oil and Molykote to the inside diameter of the balance piston seal.
3. Install O-ring in impeller and install on the high-speed shaft using care not to damage the balance piston seal.
4. Install O-ring on impeller clamping collar and install in impeller bore over high-speed shaft. MAKE ABSOLUTELY CERTAIN THAT O-RINGS ARE IN PLACE PRIOR TO INSTALLING AND TORQUING CAP SCREW.
5. Torque cap screw to 120 ft. lbs.
6. Remove the shaft locking tool and check rim and eye radial runout using a dial indicator. (See *Fig-*

ure 19 on page 20). Maximum runout on rim is .003" and runout on eye is .002".

7. Check high-speed thrust clearance. Acceptable thrust tolerance is between .008" to .021".
8. Check low-speed thrust clearance. Acceptable thrust tolerance is between .011" to .019". Note that this measurement must be taken with the shaft seal installed.

Impeller for HF Compressors

1. Re-install the shaft locking tool.
2. Apply a light coating of oil and Molykote to the inside diameter of the balance piston seal.
3. Install impeller and clamping collar on high-speed shaft.
4. Torque cap screw to 90 ft. lbs.
5. Remove the shaft locking tool and check rim and eye radial runout using a dial indicator. (See *Figure 19 on page 20*). Maximum runout on rim is .003" and runout on eye is .002".
6. Check high-speed thrust clearance. Acceptable thrust tolerance is between .009" to .020".
7. Check low-speed thrust clearance. Acceptable thrust tolerance is between .011" to .019". Note that this measurement must 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 that fasten the suction and discharge connections 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.
5. Carefully remove the rotor scroll from the unit base and rest it on the end of the suction housing. Be sure the rotor scroll is resting solidly – block if necessary. (See *Figure 55 on page 33*)

REMOVING THE NOZZLE BASE PLATE

1. Remove the (6) cap screws that hold the nozzle base plate to the rotor scroll housing. Note that (2) of these holes, spaced 180 degrees apart, are tapped for 5/16" eyebolts.
2. Using eyebolts as shown in *Figure 56 on page 34*, lift nozzle base plate from the rotor scroll housing.
3. It will be necessary to turn the nozzle base plate over to remove the impeller eye seal components.

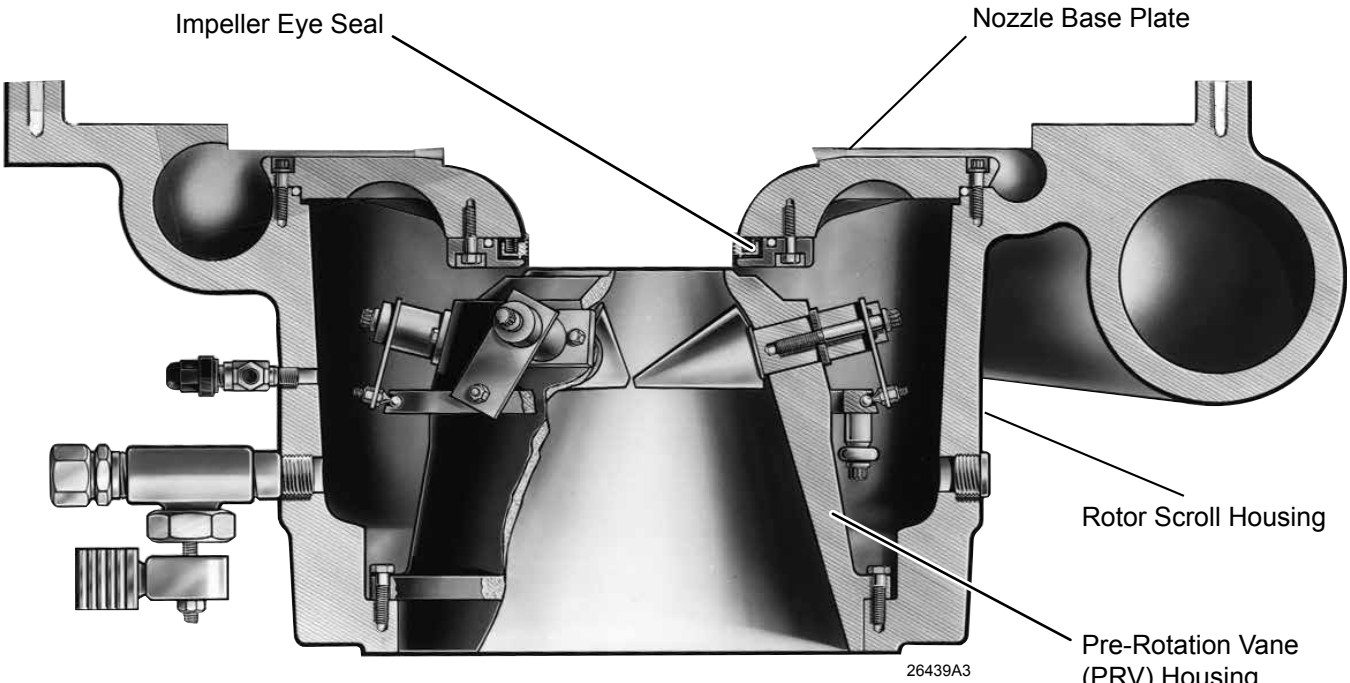


FIGURE 55 - ROTOR SCROLL

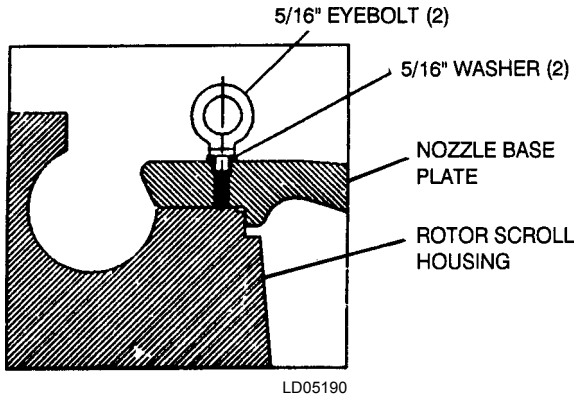


FIGURE 56 - LIFTING NOZZLE BASE PLATE

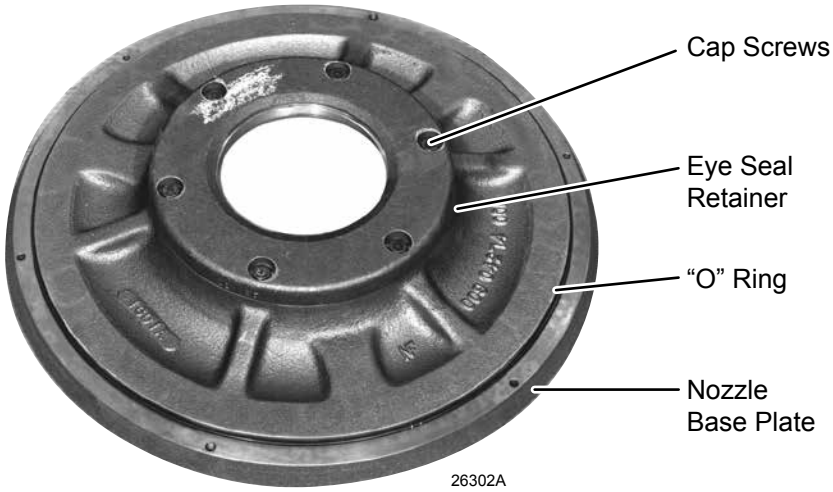


FIGURE 57 - NOZZLE BASE PLATE WITH IMPELLER EYE SEAL IN PLACE

REMOVING THE IMPELLER EYE SEAL

1. Remove the cap screws that hold the eye seal retainer to the nozzle base plate. (See *Figure 57 on page 34*)
2. Remove the eye seal retainer and the eye seal ring from the nozzle base plate. (See *Figure 58 on page 34*)

NOTE

The Pre-Rotation Vane Assembly cannot be removed from the suction connection side of the compressor on the HA, HB and HD style compressors. It must be removed from the inside of the rotor scroll housing AFTER the nozzle base plate is removed. If disassembly of the PRV housing is anticipated on these compressors, proceed to Removing the Pre-Rotation Vane Housing on page 36. Otherwise, proceed with re-assembly of the compressor as follows.

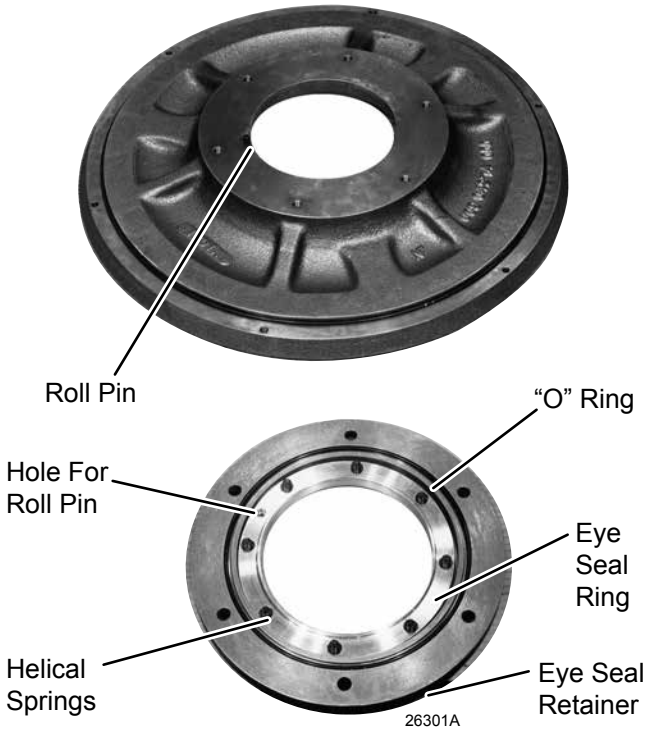


FIGURE 58 - EYE SEAL COMPONENTS

RE-ASSEMBLY OF THE EYE SEAL

(HA, HB, HD Style Compressors)

1. Inspect all parts before re-assembly. See *Cleaning and Checking Wearing Parts on page 7*. Replace with new parts as necessary.
2. Be sure the helical springs are securely locked in pockets. Give each spring a clockwise twist to lock it into place. Install a new o-ring in the eye seal retainer.
3. Place the eye seal ring and retainer into position on the nozzle base plate. Be sure the hole in the eye seal ring fits over the roll pin in the nozzle base plate. (See *Figure 58 on page 34*). Insert cap screws and tighten. Check that the seal ring is free to "float".

(HF Style Compressors)

NOTE

This style compressor uses a flat spring washer instead of the helical springs used on the HA, HB, and HD style compressors. (See Figure 57 on page 34 – HF Eye Seal)

1. Inspect all parts before re-assembly. See *Cleaning and Checking Wearing Parts on page 7*. Replace with new parts as necessary.
2. Place flat spring washer into retainer and position eye seal over spring washer.
3. Take complete eye seal assembly and position on nozzle base plate. Insert cap screws and tighten. Check that seal ring is free to "float".

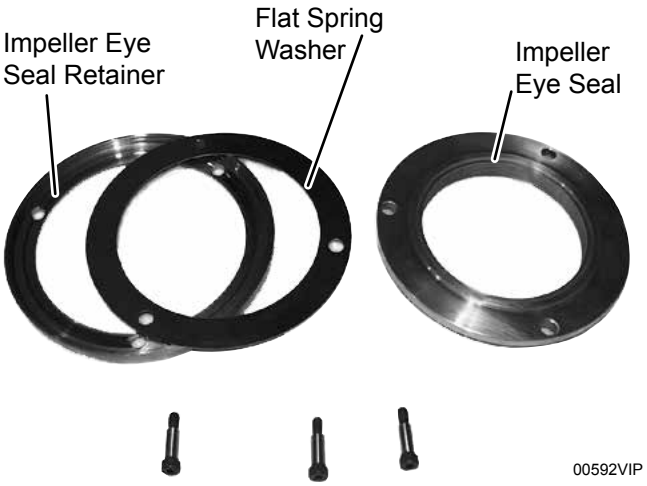


FIGURE 59 - HF EYE SEAL

RE-ASSEMBLY OF NOZZLE BASE PLATE

1. Install a new o-ring on the nozzle base plate. (See *Figure 57 on page 34*)
2. Carefully turn the nozzle base plate over and insert eyebolts into the (2) tapped holes.
3. Insert guide pins into (2) of the holes in the scroll housing.
4. Using proper rigging methods, lower the nozzle base plate over the guide pins and into position in the scroll housing. Remove eyebolts and guide pins; insert cap screws and tighten to specified torque in *Table 3 on page 8*.

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 gasket. Note that the gasket contains three holes to clear the jacking screws in the rotor support. Be sure gasket is installed correctly. (See *Figure 60 on page 35*). Coat gasket with a mixture of oil and graphite.

NOTE

On the HF style compressors this sealing surface uses an o-ring instead of a gasket. Coat the o-ring with a suitable o-ring lubricant to secure o-ring into groove during assembly.

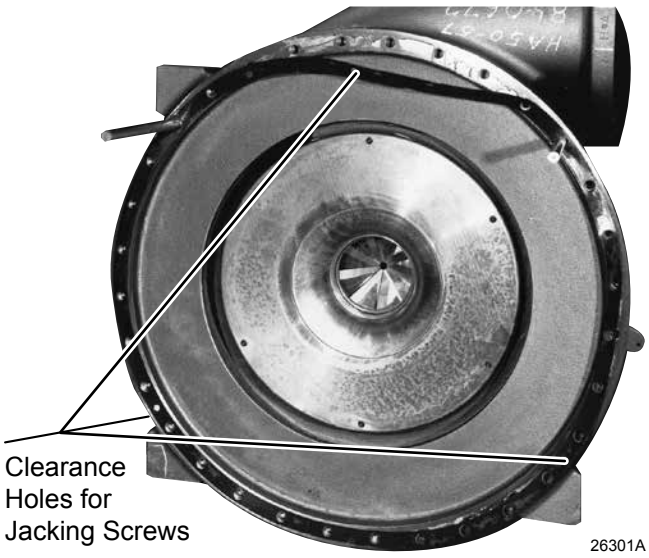


FIGURE 60 - SCROLL HOUSING READY FOR RE-ASSEMBLY TO MOTOR SUPPORT

4. Apply a light coating of oil and Molykote onto the eye of 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.
7. Insert the cap screws and tighten to the proper torque. (See *Table 3 on page 8*)
8. Re-install the compressor coupling.
9. Bolt the motor to the motor adaptor.
10. Re-connect all external piping.

REMOVING THE PRE-ROTATION VANE HOUSING

The Pre-Rotation Vane Assembly cannot be removed from the suction connection side of the compressor on the HA, HB and HD style compressors. The rotor support must first be removed from the rotor scroll and the rotor scroll dissembled as described previously.

On the HF style compressor, access to the PRV assembly can be made by removing the suction piping and removing the cap screws that secure the PRV plate support to the rotor scroll. Insert proper guide pins and using proper rigging methods, remove PRV support plate from compressor scroll to gain access to the PRV assembly. (See *Figure 61 on page 36*)

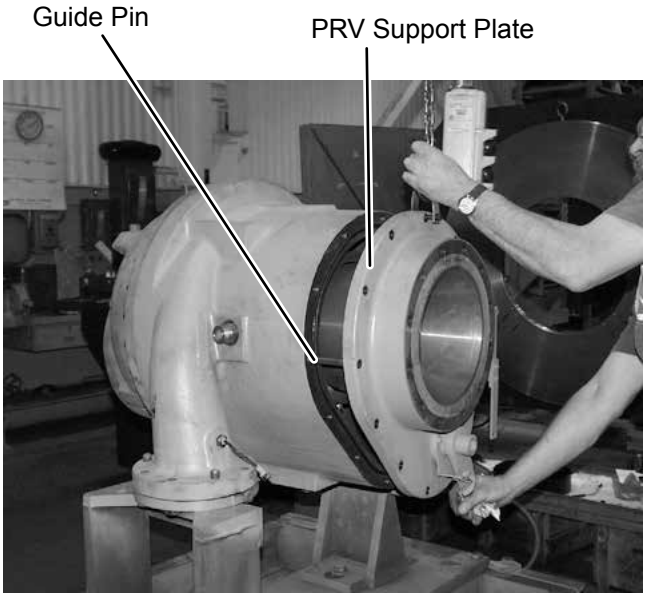


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FIGURE 61 - REMOVING HF PRV SUPPORT PLATE

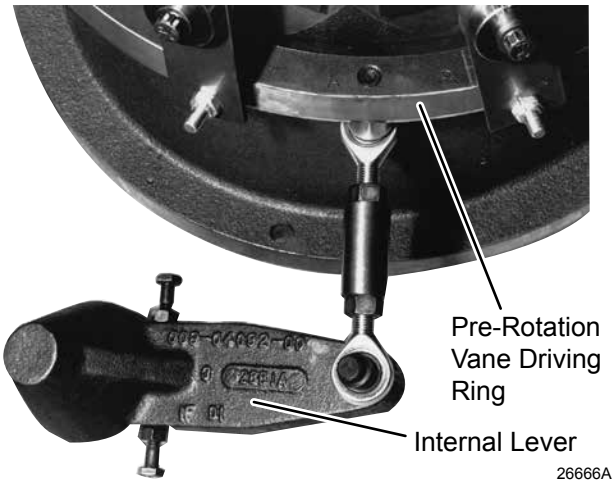

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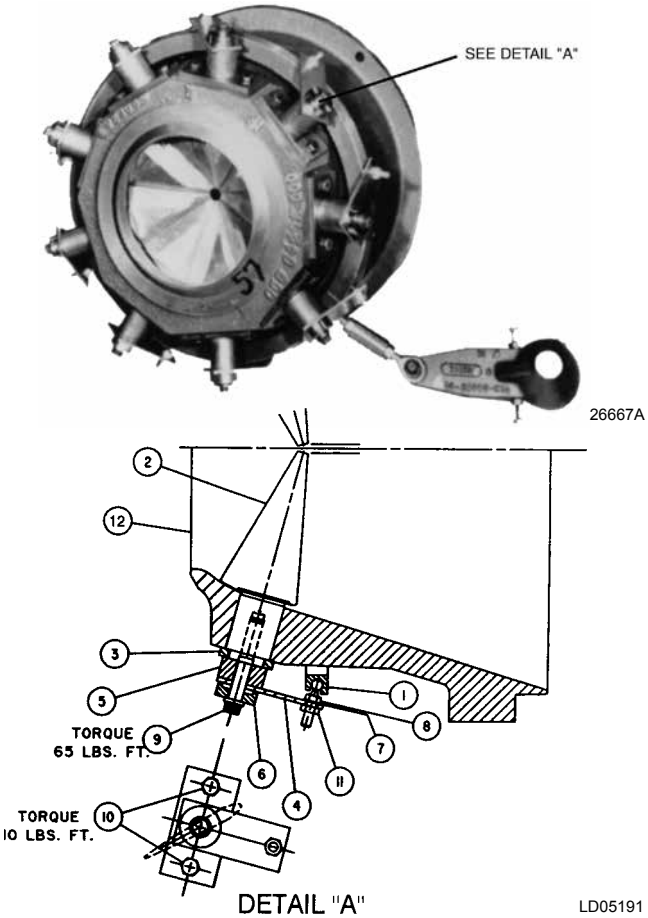
FIGURE 62 - INTERNAL PARTS - PRE-ROTATION VANE ASSEMBLY



ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Ring, Driving	1	7	Washer	10
2	Vane	9	8	Stud, Ball	9
3	Retainer	9	9	Screw – 12 pt.	9
4	Arm, Vane	9	10	Screw – Hex HD	18
5	Spacer, Arm	9	11	Nut, Self-Locking	9
6	Washer	9	12	Housing	1

FIGURE 63 - PRE-ROTATION VANE HOUSING ASSEMBLY

After access is made to the PRV assembly proceed as follows:

1. Remove the 12 pt. Hd. cap screw and fill piece to disconnect the adjustable bearing rod from the vane driving ring. (See *Figure 62 on page 36*)
2. Remove the (2) hex hd. cap screws at approximately 180 degrees apart. Replace these screws with (2) guide pins from the tool kit. Then remove the remaining screws from around the perimeter of the PRV assembly. Hook a lifting device to the assembly and carefully pull off the guide studs and place on a work bench to replace any parts.
3. The PRV vanes are actuated by a rotating vane drive 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. (Refer to *Figure 63 on page 36*)
4. If any of the individual vanes were removed or replaced, refer to *Figure 63 on page 36* and *Figure 64 on page 37*. The vane cap screw must be tightened to the torque as indicated in *Table 3 on page 8*.
5. Re-assembly the PRV assembly and the nozzle base plate together in reverse order. Torque all screws in accordance with *Table 3 on page 8*.

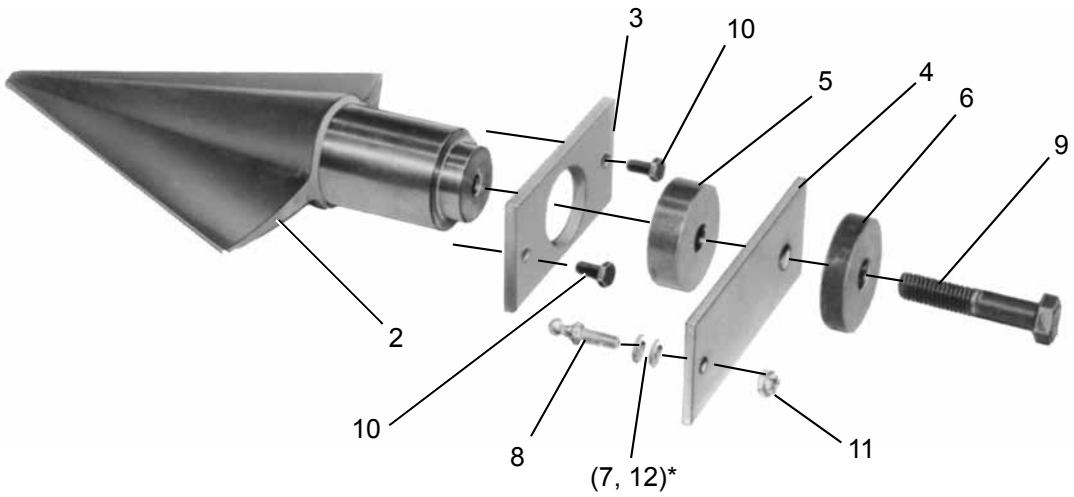


FIGURE 64 - PRE-ROTATION VANE ASSEMBLY

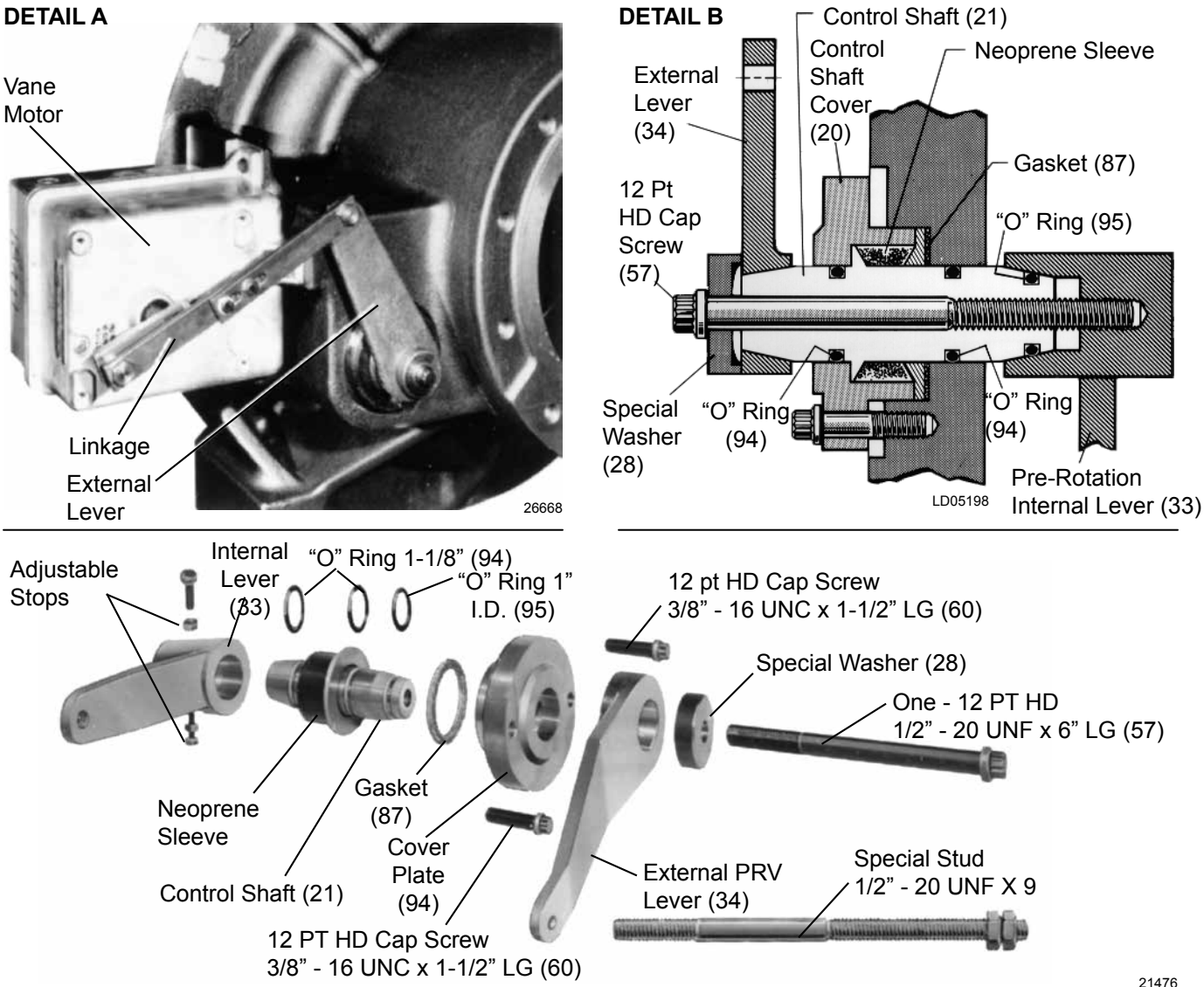


FIGURE 65 - REPLACING CONTROL SHAFT ASSEMBLY

REPLACING CONTROL SHAFT ASSEMBLY

The external and internal levers are secured to the control shaft by means of a single 12 pt. Hd. cap screw threaded into the internal lever. (Refer to *Figure 65 on page 38*). 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. These stops are set about 1/32" away from the rotor scroll casting walls when the vanes are in their extreme position, and will prevent over travel from damaging the internal vane mechanism. A friction-producing compound (Thread Locker 242, YORK Part No. 013-01678) 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.

If it becomes necessary to replace the control shafts on these compressors, only the following parts are required:

To replace control shafts, refer to *Figure 55 on page 33* 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 38*, Detail A)
3. Loosen and remove the 12 pt. hd. cap screw and washer. (Refer to *Figure 65 on page 38*, Detail B)
4. Insert the special stud (See *Special Tools on page 9*) through the hole in the external lever and control shaft, and screw the stud into the internal

lever. Be sure to put a nut on the outside end of the special stud. (Refer to *Figure 65 on page 38*, Detail B)

5. 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.
6. Remove the cover plate cap screws.
7. Slide the external level from control shaft and cover plate from the control shaft.
8. Remove the external lever and the control shaft cover from the control shaft.
9. Replace the existing gasket with a new one.
10. Install the two new “O” rings and one “O” ring in their respective grooves in the new control shaft - small ring in groove in taper. Liberally coat the control shaft (“O” rings and neoprene sleeve) and the inside of the cover plate with YORK Valve Stem Lubricant. DO NOT lubricate the tapered surfaces of the shaft.
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 on the lever aligns with the closed “C” mark on the housing. Push external lever arm slightly to seat on taper.
15. Remove the nut and stud.
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 bolt to a torque of 75 ft. lbs.
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.

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 they were set at the factory. Also, the angular position of the motor shaft must be as it came from the factory.

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SECTION 3 - OIL PUMP SERVICE

OIL PUMP

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

REMOVING OIL PUMP FROM THE OIL SUMP

1. De-energize 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 in right side of shell.
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 (16) 5/8" hex nuts from the oil sump cover. (See *Figure 68 on page 43*)
5. After all nuts are removed, pull the oil sump cover loose and remove the cover and oil pump assembly. (See *Figure 68 on page 43*)

DISASSEMBLING THE OIL PUMP

Before disassembling the pump, notice the location of the match marks on the pump cover and housing. The match marks must line up when reassembling the pump.

To remove the oil pump, proceed as follows:

1. Remove the eight cap screws (four long screws marked "X" and four short screws marked "Y") from the face of the oil pump cover. (Refer to *Figure 66 on page 42*)
2. Remove the drive gear assembly by screwing the inner pump gear puller screw (10-24 UNC x 1-1/2 lg.) supplied with the pump kit, into the tapped hole in the drive gear. (Refer to *Figure 66 on page 42* and *Figure 67 on page 42*). After the screw is in place, hold screw and gently pull the gear from the key and hold the shaft.
3. Remove the key from the shaft. (Refer to *Figure 65 on page 38*, Detail B)
4. To remove the pump housing, pull loose from the motor and slide over the motor shaft.

REASSEMBLY OF OIL PUMP

1. Clean all parts of pump with approved safety solvent, using great care to eliminate all dirt. Lubricate all parts with clean YORK refrigerant oil. To reassemble, proceed as follows:
2. Lubricate the motor shaft with refrigerant oil. Position housing in place over the motor shaft and against the motor housing. The pump housing match mark must be on one side of the motor. Line the pump housing screw holes up with the screw holes in the motor housing.
3. Lubricate the shaft key and place it in the keyway on the shaft.
4. Lubricate the drive gear. Slide the gear over the shaft, line up the keyway with the key and drive gear. Push the drive gear into place.
5. Lubricate the drive gear and place it into the cavity of the oil pump housing.
6. Lubricate the face and the Teflon-coated shaft bearing of the cover assembly. Locate the cover as shown in *Figure 70 on page 45* and gently slide onto the end of the shaft. Line up holes and place "X" long screws and "Y" short screws in their proper holes according to *Figure 52 on page 30*. Tighten the "X" long screws in a 1, 3, 2, 4 sequence. Tighten the "Y" short screws in a 5, 7, 6, 8 sequence. Torque screws to 15 ft. lbs., using

the alternating tightening method.

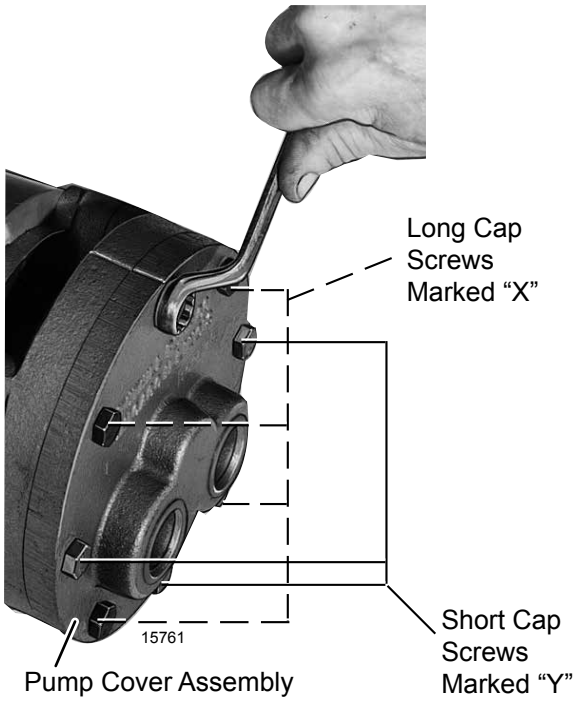


FIGURE 66 - REMOVING OR REPLACING PUMP COVER CAP SCREWS

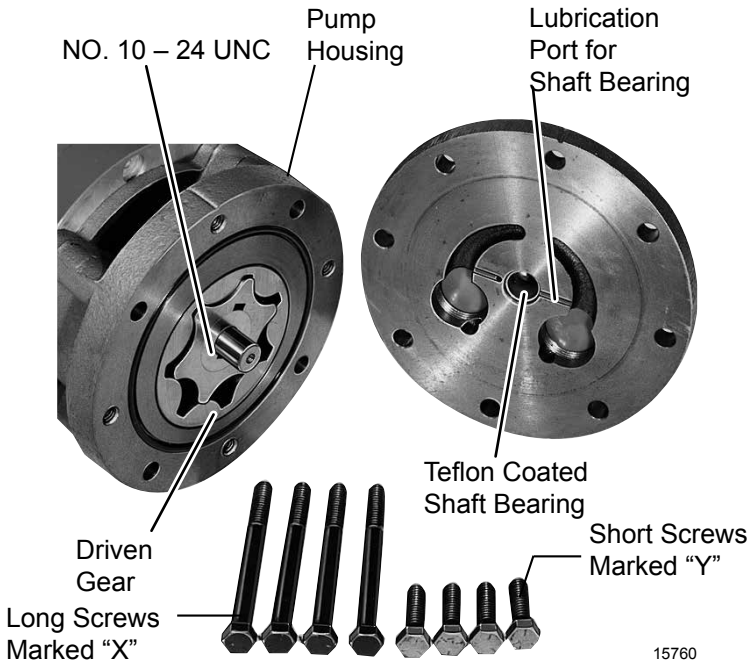
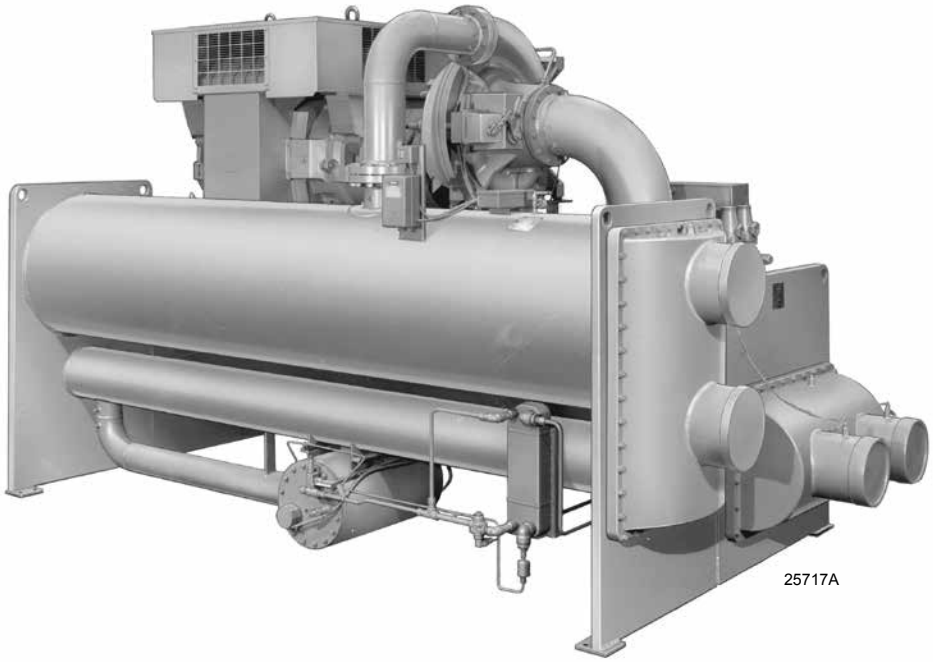
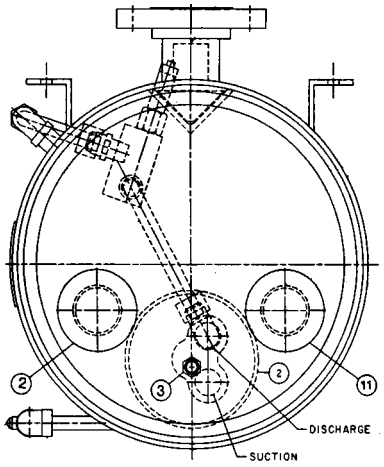


FIGURE 67 - SCREWS AND COVER ASSEMBLY





ITEM	DESCRIPTION	QTY.
1	Oil Pump With Motor	1
2	Heater	1
3	Sensor, Temp.	1
4	Valve, Relief	1
5	Valve, Stop Angle, 3/8”	2
6	Box, Electrical	1
7	Cover, Electrical Box	1
8	Sightglass	2
9	Gasket, Cover Plate	1
10	Valve, Stop Angle, 1/4”	1
11	Heater	1

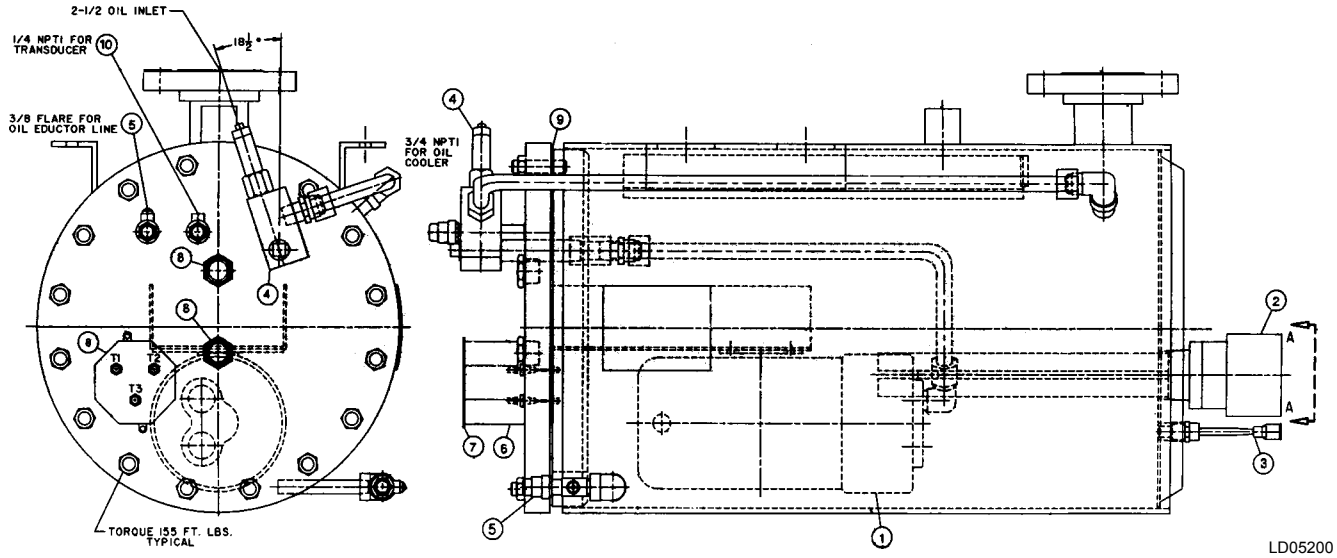
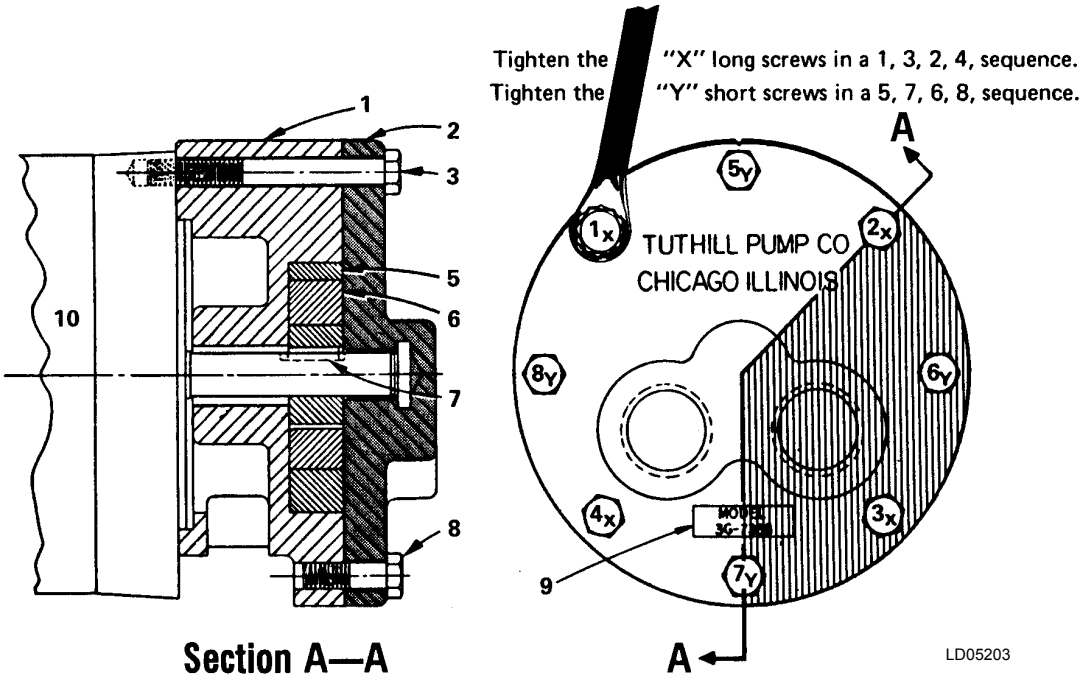


FIGURE 68 - OIL RESERVOIR ASSEMBLY



ITEM	DESCRIPTION	QTY
1	Housing	1
2	Cover Assembly	1
3	Hex. Hd. Cap Screw	4
4	—	—
5	Driven Gear	1
6	Drive Gear	1
7	Square Key	1
8	Hex Hd. Cap Screw	4
9	Model Number Identification	1
10	Motor	1

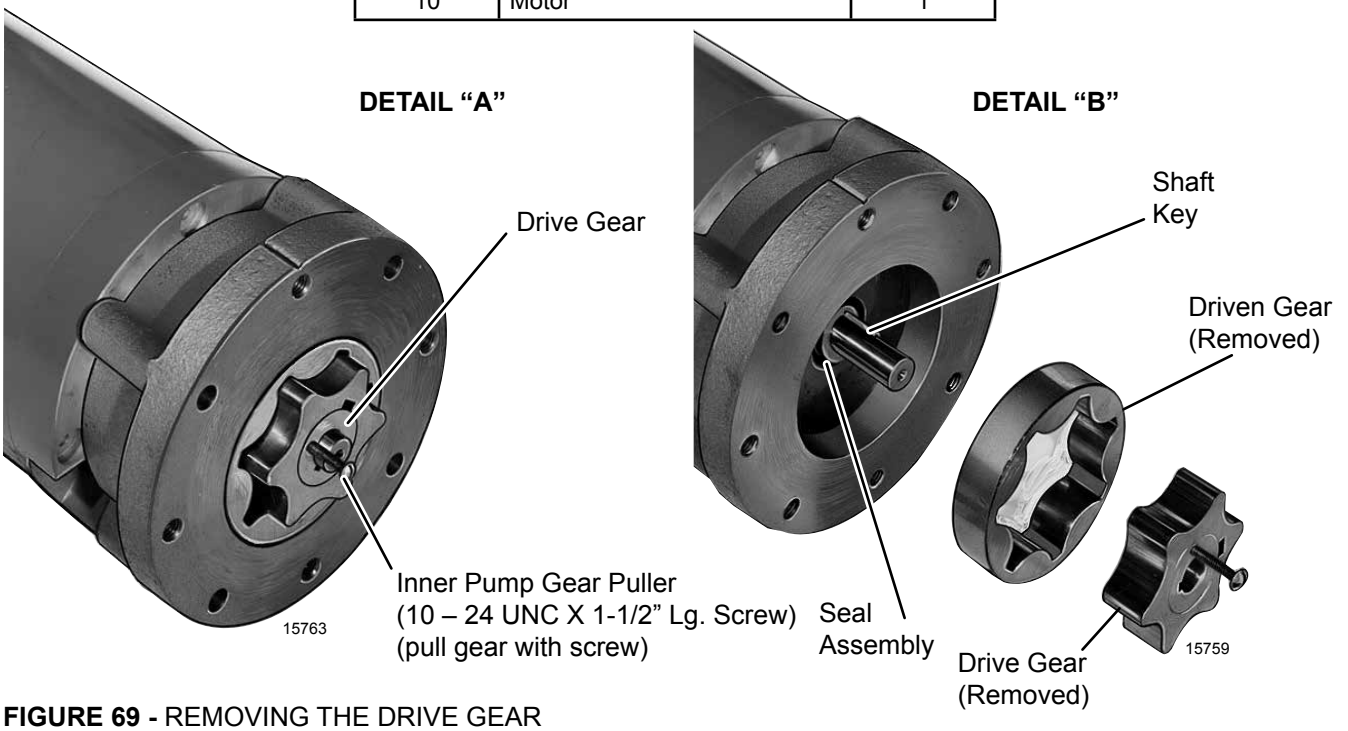


FIGURE 69 - REMOVING THE DRIVE GEAR

REASSEMBLING OIL PUMP ASSEMBLY INTO OIL SUMP

(Refer to *Figure 68 on page 43*)

Before assembling oil pump into oil sump pump, clean the oil sump with 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 (16) 5/8" hex nuts. Tighten nuts using the alternating tightening method. Torque to 155 ft. lbs.
3. Reconnect all electrical leads to fusite connection on sump cover. Reconnect oil lines. Reconnect transducers.
4. Charge oil into oil sump. Refer to *Operating Instructions (Form 160.49-O1)*. Be sure oil is compatible with refrigerant being used.
5. Make sure there are no leaks around the cover and connections.

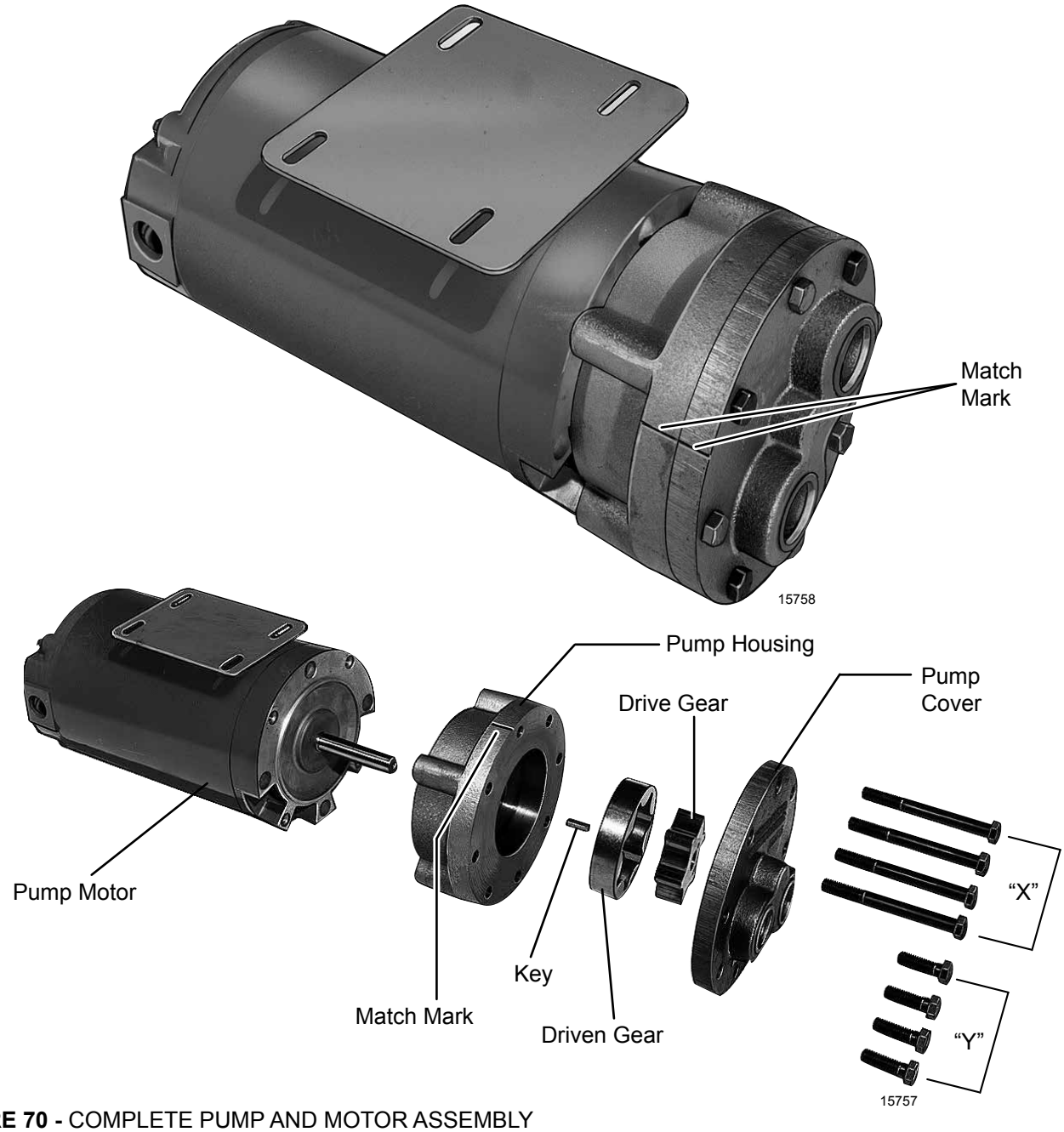


FIGURE 70 - COMPLETE PUMP AND MOTOR ASSEMBLY

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