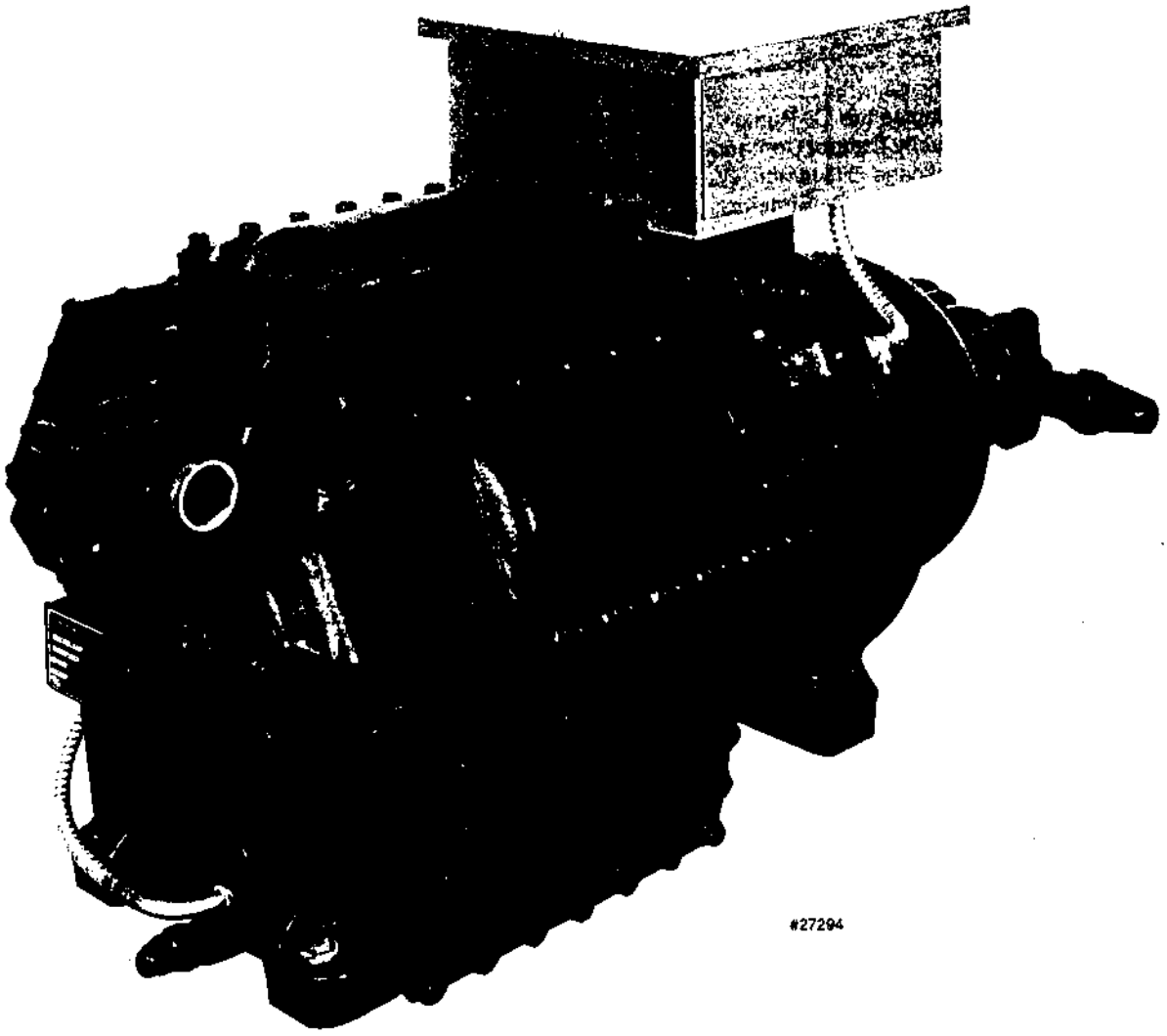
YORK®

MODEL Z - STYLE B HERMETIC COMPRESSORS

MAINTENANCE | Supersedes: 180.45-M2 (594) | FORM 180.45-M2 (396)

MODELS
ZB4H, ZB4J, ZB4K, ZB4M
ZB6N, ZB6R, ZB6S, ZB6W, ZB6AE

(See Page 3 for Complete Model Nomenclature)



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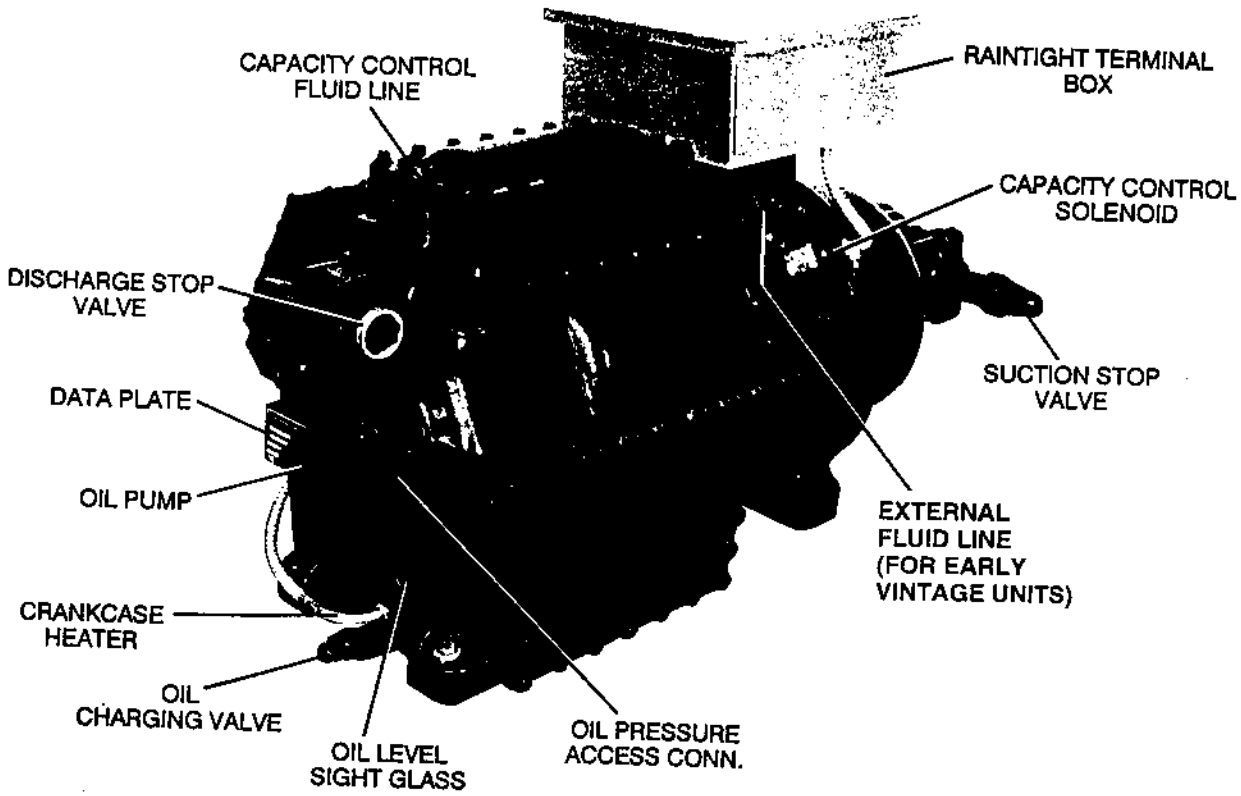


FIG. 1 - COMPRESSOR

SECTION I - GENERAL

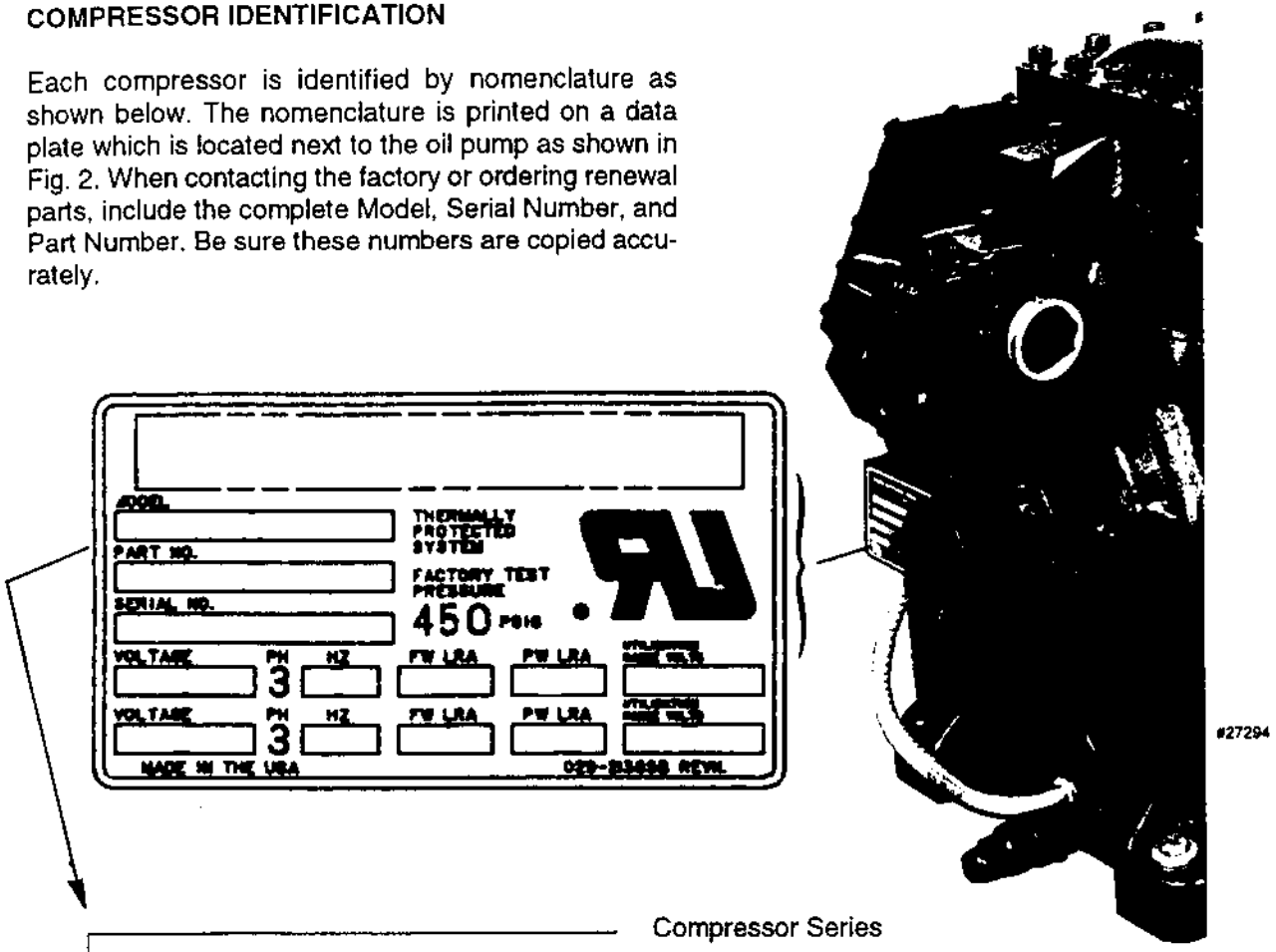
GENERAL DESCRIPTION

YORK Model Z Hermetic Compressors are designed to meet air conditioning and most refrigeration requirements. They are available in 4 or 6 cylinder models in various displacements (See NOMENCLATURE). Varying steps of capacity are available utilizing solenoid valves. (Control of solenoid valves must be made by external device.) Nominal compressor speeds are 1740 RPM (60 Hz) and 1450 RPM (50 Hz).

NOMENCLATURE

COMPRESSOR IDENTIFICATION

Each compressor is identified by nomenclature as shown below. The nomenclature is printed on a data plate which is located next to the oil pump as shown in Fig. 2. When contacting the factory or ordering renewal parts, include the complete Model, Serial Number, and Part Number. Be sure these numbers are copied accurately.



B 6 W 2 - E 46 S

- Compressor Series
- Style B
- Number of Cylinders (4 or 6)
- Displacement Code (See Physical Data, page 4)
- Number of Steps of Unloading (0, 1 or 2)
- Motor Size Code (See PHYSICAL DATA, page 4)
- Electrical Voltage Code (See ELECTRICAL DATA, page 5)
- Motor Vendor: S = A.O. Smith

OMPRESSOR DATA PLATE

PHYSICAL DATA

COMPRESSOR MODEL ZB		4H	4J	4K	4M	6N	6R	6S	6W	6AE
NO. OF CYLINDERS		4	4	4	4	6	6	6	6	6
BORE (Inches)		2.7165	2.9135	2.7165	2.9135	2.7165	2.9135	2.7165	2.9135	3.1495
STROKE (Inches)		2.4	2.4	3	3	2.4	2.4	3	3	3
DISPLACEMENT (CFM)	60 HZ	56.03	64.45	70.03	80.56	84.04	96.67	105.05	120.84	141.21
	50 HZ	46.69	53.71	58.36	67.13	70.03	80.56	87.54	100.70	117.67
SUCTION CONN. (ODS)		1-5/8	1-5/8	2-1/8	2-1/8	2-1/8	2-5/8	2-5/8	3-1/8	3-1/8
DISCHARGE CONN. (ODS)		1-3/8	1-3/8	1-5/8	1-5/8	1-5/8	1-5/8	1-5/8	1-5/8	1-5/8
OIL CHARGE (Gals.)		1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
WEIGHT (Lbs.)		720	740	780	800	860	920	940	960	960

LIMITATIONS

VOLTAGE LIMITATIONS

The following voltage limitations are absolute and operation beyond these limits may cause serious damage to the compressor or motor.

VOLTAGE CODE	NAMEPLATE VOLTAGE	MINIMUM VOLTAGE	MAXIMUM VOLTAGE
-17	200-3-60	180	220
-28	230-3-60	207	253
-36	363-3-50	327	399
-40	380-3-60	342	418
-43	440-3-50	396	484
-46	460-3-60	414	506
-50	380/415-3-50	342	457
-58	575-3-60	517	632
-59	190-3-50	171	209
-63	220-3-50	198	242
-64	346-3-50	311	381
-70	500-3-50	450	550

COMPRESSOR OPERATING LIMITATIONS

Maximum Compression Ratio	9.5:1
Maximum Operating Differential	330 PSI
Maximum Suction Pressure	120 PSIG
Maximum Discharge Temp.	275 °F
Superheat (Nominal) (At Compressor)	20 °F
Minimum Oil Pressure (above suction pressure)	25 PSI
Maximum Oil Temperature [1]	160°F
Maximum Sat. Discharge Temp. [2]	155°F
Maximum Ambient	130°F
Minimum Ambient	0°F

NOTE:
1. Measured externally on pump shown in Fig. 3.
2. Motor selection and operating conditions may limit maximum saturated discharge temperature to lower values.

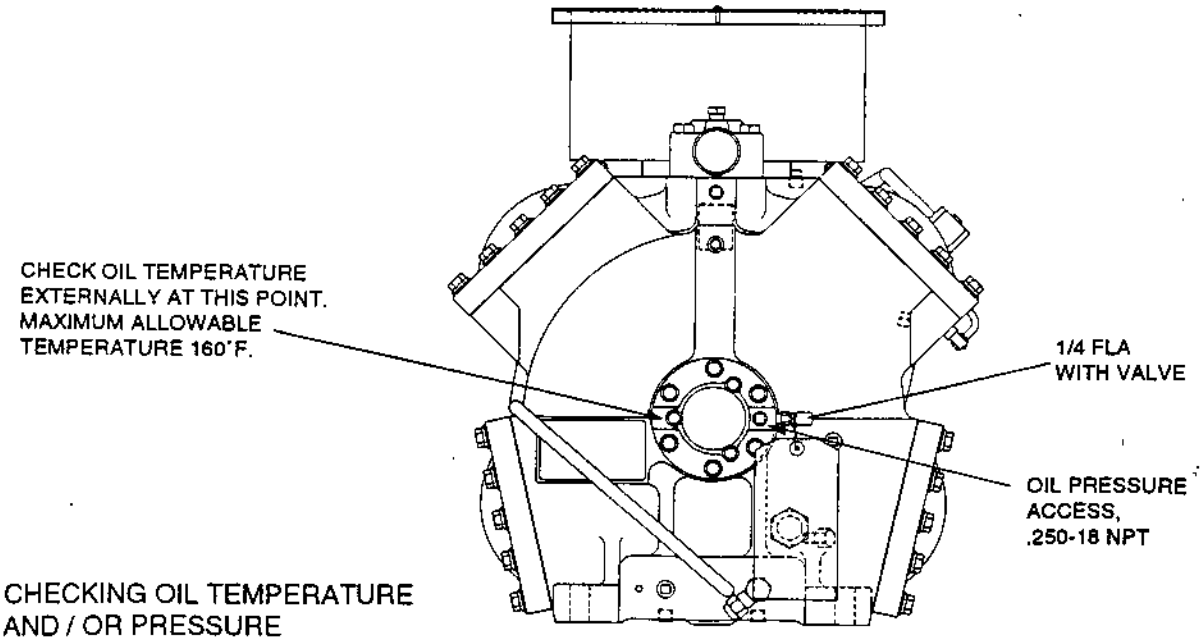


FIG. 3 - CHECKING OIL TEMPERATURE AND / OR PRESSURE

ELECTRICAL DATA

MOTOR SIZE CODE [1]	VOLTAGE CODE [2]	VOLTAGE	PHASE	HZ	LOCKED ROTOR AMPS	
					FW	PW
A	17	200	3	60	511	311
	28	230	3	60	444	270
	59	190	3	50	422	254
	40	380	3	60	257	156
	64	346	3	50	256	155
	46	460	3	60	222	135
	50	380/415	3	50	222	134
	58	575	3	60	178	108
	70	500	3	50	178	107
	63	220	3	50	404	244
	43	440	3	50	202	122
B	17	200	3	60	582	368
	28	230	3	60	506	320
	36	363	3	50	286	174
	59	190	3	50	486	296
	40	380	3	60	299	189
	64	346	3	50	295	180
	46	460	3	60	253	160
	50	380/415	3	50	256	256
	58	575	3	60	230	145
	70	500	3	50	233	142
	63	220	3	50	465	284
	43	440	3	50	205	125
C	17	200	3	60	674	414
	28	230	3	60	586	360
	59	190	3	50	558	338
	40	380	3	60	338	252
	64	346	3	50	339	206
	46	460	3	60	293	180
	50	380/415	3	50	294	178
	58	575	3	60	234	144
	70	500	3	50	235	142
	63	220	3	50	534	324
	43	440	3	50	267	162
D	17	200	3	60	835	683
	28	230	3	60	726	594
	36	363	3	50	405	324
	59	190	3	50	696	556
	40	380	3	60	439	360
	64	346	3	50	423	339
	46	460	3	60	363	297
	50	380/415	3	50	366	293
	58	575	3	60	290	238
	70	500	3	50	302	234
	63	220	3	50	601	480
	43	440	3	50	301	240
E	17	200	3	60	1072	858
	28	230	3	60	932	746
	59	190	3	50	902	692
	40	380	3	60	564	452
	64	346	3	50	532	408
	46	460	3	60	466	373
	50	380/415	3	50	475	364
	58	575	3	60	373	298
	70	500	3	50	380	291
	63	220	3	50	779	598
	43	440	3	50	390	299

NOTES:
1. First character in NOMENCLATURE following the hyphen (-). (See page 3)
2. Second and third characters in NOMENCLATURE following the hyphen (-). (See page 3)

THREADED FASTENER TORQUES AND SEQUENCE

When assembling a compressor or compressor parts, it is essential to tighten all nuts and cap screws to their proper torque, using an accurate torque wrench. Table 1 shows the recommended torques for the Model Z compressors. All cap screws or bolts should be oiled lightly unless they are intended for use with a sealing compound. Insert all cap screws and tighten them lightly. Then, using the torque wrench, tighten each to its proper torque.

NOTE: It is advisable to "double-check" the torque on all screws before starting the compressor.

When tightening the screws on the access covers and terminal block, it is important that the screws be tightened in the proper sequence. This will help to eliminate leaks and/or damage to the parts or gaskets. Figures 4 and 5 show the recommended tightening sequence.

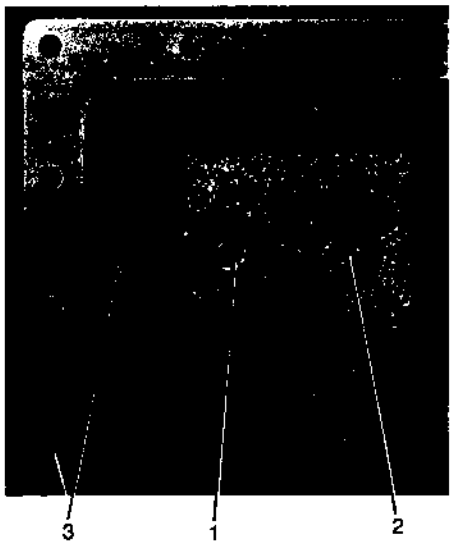


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FIG. 5 - STATOR LOCKING SCREWS AND TIGHTENING SEQUENCE

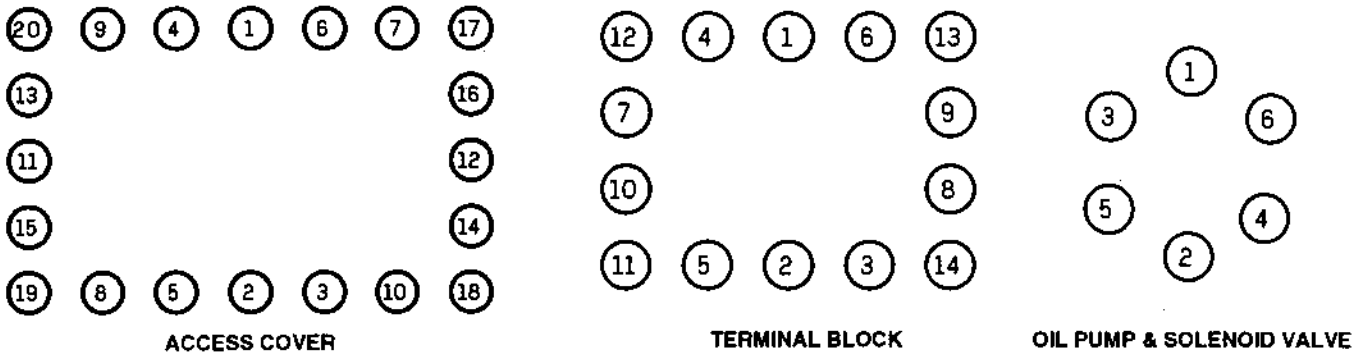
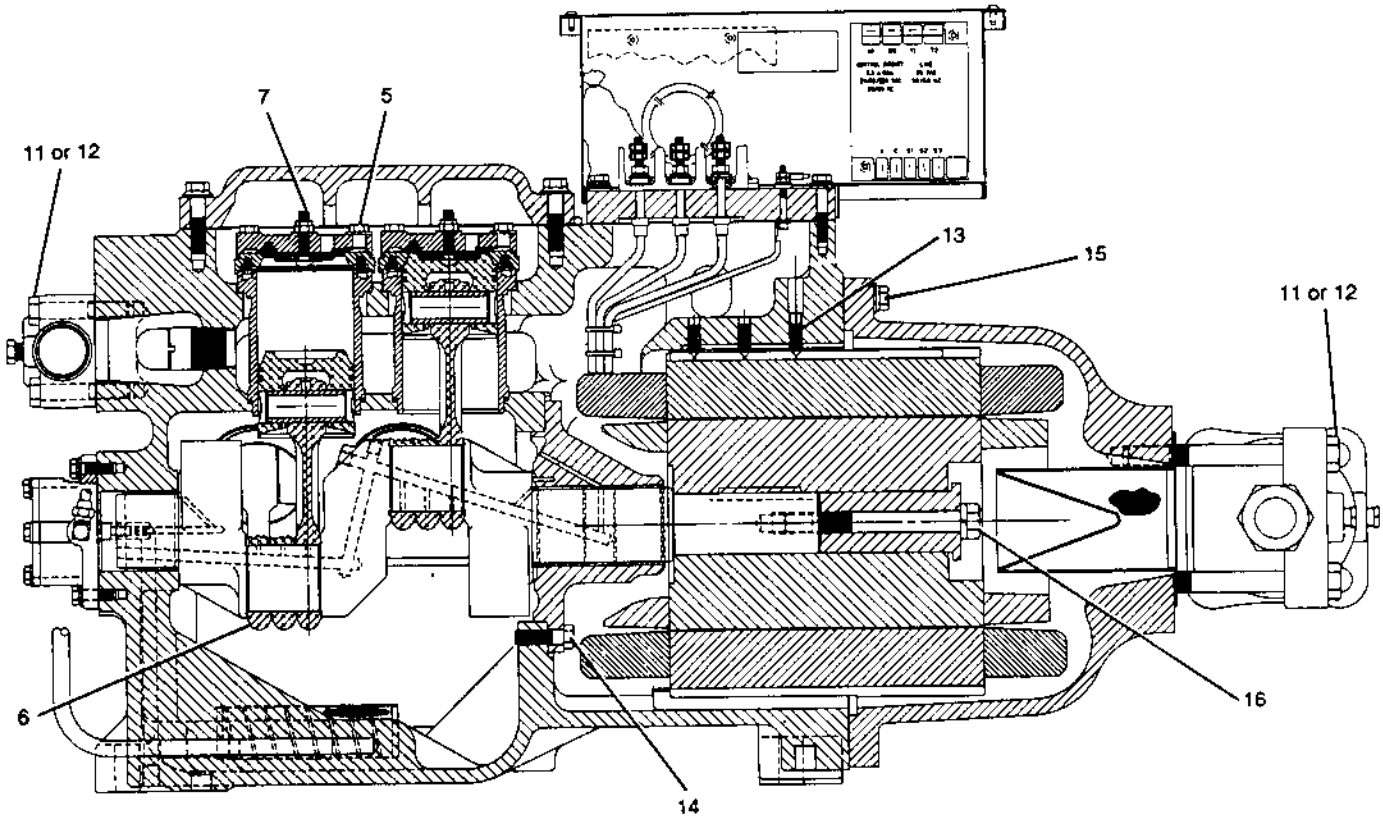


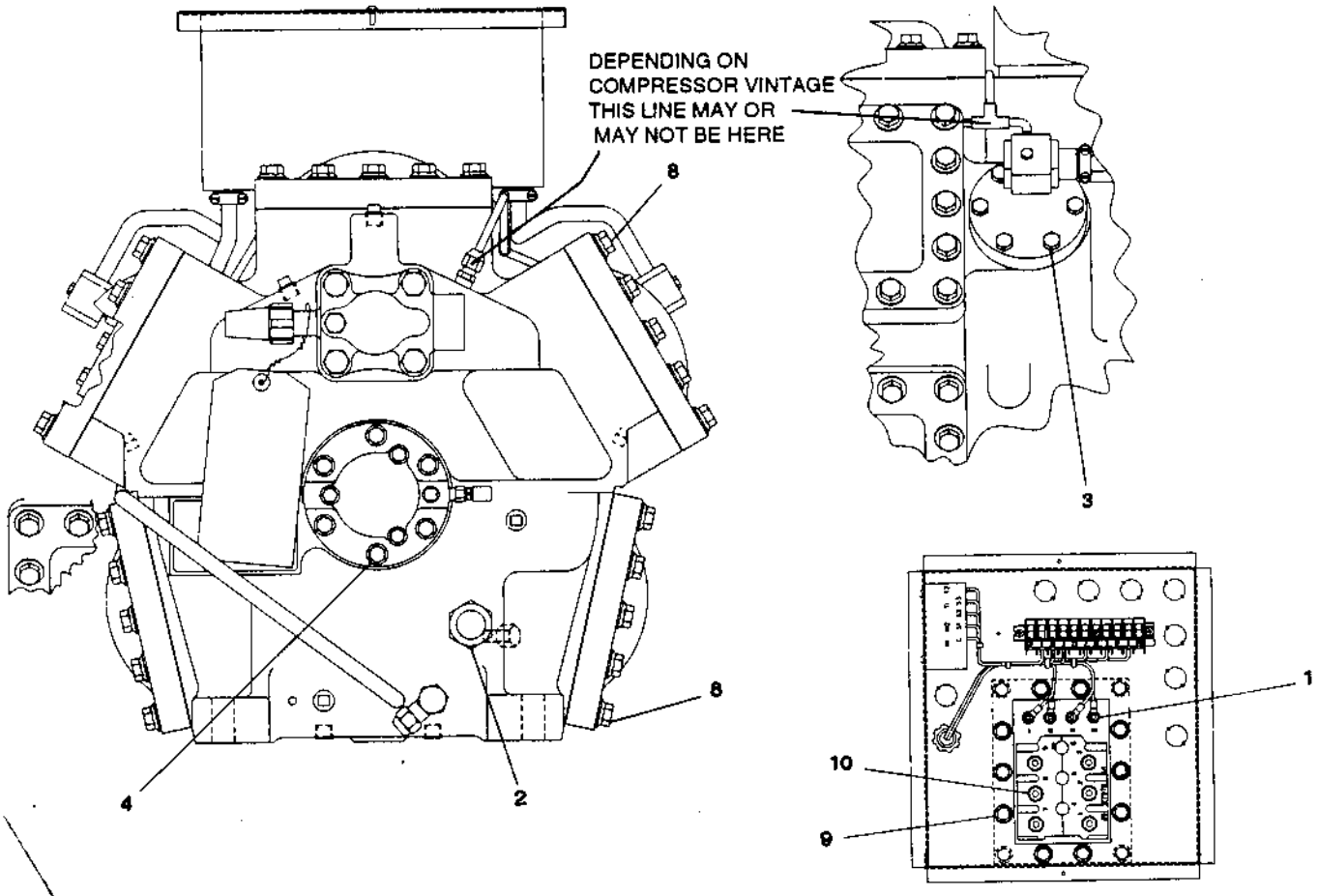
FIG. 4 - SCREW TIGHTENING SEQUENCE

TABLE 1 – THREADED FASTENER TORQUE

LOCATION	THREAD	GRADE	TORQUE		REF. KEY (See page 7)
			LB. - IN.	LB. - FT.	
Protector Terminal Screw	No. 8-32 UNC	-	30	-	1
Sight Glass	1-11-1/2 NPT	-	-	95-100	2
Solenoid Valve	5/16-18 UNC	8	-	27-31	3
Oil Pump	5/16-18 UNC	8	-	27-31	4
Valve Cage / Valve Plate	5/16-18 UNC	5	-	19-22	5
Connecting Rod	5/16-18 UNC	5	-	19-21	6
Discharge Valve Disk	5/16-24 UNF	8	-	29-34	7
Access Cover	7/16-14 UNC	5	-	55-64	8
Terminal Block	5/16-18 UNC	5	-	19-22	9
Power Terminal Stud (NUT) [2]	1/4-28 UNF	-	60-70	-	10
Service Valve	5/8-11 UNC	2	-	107-123	11
Service Valve	1/2-13 UNC	2	-	54-62	12
Stator Locking Screws [1]	3/8-16 UNC	8	-	20-23	13
Bearing Head	7/16-14UNC	5	-	55-64	14
Motor Cover	7/16-14 UNC	8	-	78-90	15
Motor Rotor	5/8-11 UNC	5	-	169-195	16

NOTE: 1. On Z compressors with 88 frame motors there will be only 2 stator locking screws. These can be tightened in any sequence.
2. Threads must be oiled.





THREADED FASTENER LOCATIONS
(SEE TABLE 1)

GASKETS AND "O" RINGS

NOTE: Gaskets are not interchangeable between Style A and Style B Compressors. Ensure that part numbers for gaskets and/or "O" rings are correct before re-assembly.

It is recommended that new gaskets and/or "O" rings be installed each time a compressor part is removed or the compressor is dis-assembled. This will assure that the compressor will function properly when returned to operation. Use care when installing gaskets so that they are installed properly. Be sure that any holes in the gasket for oil passage etc. are aligned with the matching hole in the related part or parts. Also, check that "O" rings are not cut or damaged in any way. Gaskets and "O" rings should be coated LIGHTLY with YORK oil. *Do not soak gaskets or "O" rings in oil.* Also, do not apply oil to the mating surfaces. Grease must never be applied to gaskets or "O" rings.

HANDLING COMPRESSOR PARTS

Internal machined parts of the compressor such as valves, pistons, connecting rods, etc. must be protected from damage. They should be coated with oil, wrapped in clean, tough paper and stored in a safe, dry place.

Before re-assembling any compressor part, it should be thoroughly cleaned by immersing or flushing it with an approved safety solvent and allowing it to dry in air without touching any wear or contact surfaces. After it is cleaned, each part should be carefully examined to be sure it is free from cracks, flaws, bumps, burrs, or distortion. New, clean oil should be applied to the wear surfaces of any part just before it is installed.

RIGGING THE COMPRESSOR

When it becomes necessary to remove a compressor 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. Do not attempt to lift a compressor with eye bolts threaded into tapped holes in the compressor housing. Instead, use approved and well maintained slings as illustrated in Fig. 6. Be sure slings are of adequate strength to safely lift the compressor. Compressor weights are shown in PHYSICAL DATA, page 4. The use of chains or cables is not recommended.

COMPRESSOR OIL SYSTEM

The function of the oil system is to lubricate all moving parts.

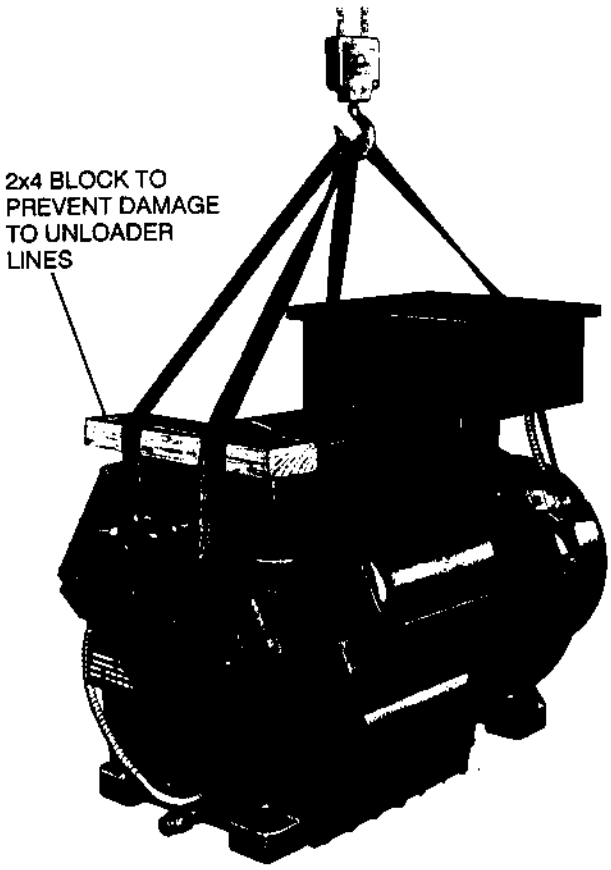


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FIG. 6 - RIGGING THE COMPRESSOR

LUBRICATION SYSTEM - See Fig. 7 - The compressor oil supply is contained in the crankcase which is provided with an oil sight glass (located in the pump end of the compressor) to permit a visual check of the oil level.

THE OIL LEVEL IN THE COMPRESSOR IS CORRECT WHEN OIL CAN BE SEEN IN THE SIGHT GLASS DURING ALL OPERATING CONDITIONS. YORK REFRIGERATION OIL OF THE APPROPRIATE TYPE FOR THE REFRIGERANT SHOULD ALWAYS BE USED IN THESE COMPRESSORS.

The Gerotor type oil pump, which is designed to operate with either clockwise or counter-clockwise compressor rotation, is directly connected to the crankshaft and is located externally on the compressor housing.

Internal passages in the compressor housing connect to an internal suction tube which in turn connects to the oil strainer. The oil strainer consists of a large area wire mesh cylinder with sheet metal ends and an internal spring to prevent collapse of the strainer screen if it should become coated with foreign material.

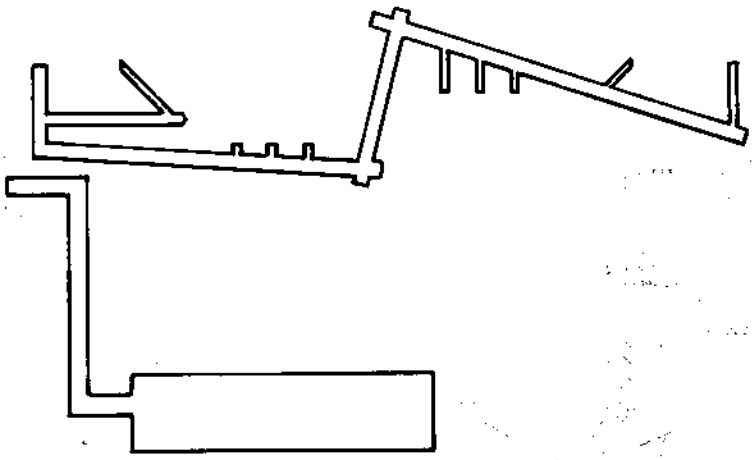
.TION, MAIN BEARINGS, OIL PUMP END
OTOR END - Oil under pressure leaves the oil
and flows internally through the pump housing to
icate the pump end bearing.

Simultaneously, oil is fed through internal oilways in the crankshaft to supply oil to the thrust collar and motor end bearings.

The thrust collar positions the crankshaft longitudinally in the compressor housing and takes the thrust forces imposed upon the shaft. Radial grooves for oil are provided on the inner or thrust surface which is in contact with the crankshaft shoulder.

LUBRICATION, CYLINDER WALLS, CONNECTING ROD AND PISTON PIN BEARINGS - Oil under pressure is conducted through drilled oilways in the crankshaft to the crankpins. The crankpin is provided with one radially drilled hole (which connects with the drilled oilway in the crankshaft) for each connecting rod bearing.

Lubrication of the cylinder walls and piston pins is accomplished by the spray from the spaces between the connecting rod faces and between these faces and the cheeks of the crankpin as the pressurized oil leaves the connecting rod / crankpin bearings.



'OMPRESSOR LUBRICATION SYSTEM

CAPACITY CONTROL SYSTEM

Capacity of the YORK Model Z style "B" compressor is controlled automatically. Externally mounted solenoids, controlled by a signal from a remote device, provide reliable response to system load.

Capacity is reduced by unloading one or more banks of cylinders. Some cylinder banks are not equipped with unloaders. This prevents the possibility of overheating, since a definite minimum volume of cool refrigerant gas flows through the compressor at all times during operation regardless of load conditions.

Unloading is accomplished by preventing (blocking) the suction gas from entering one or more of the suction plenums of the compressor.

Fluid supplies the working pressure to the unloader mechanism which is mounted next to the associated bank of cylinders. The unloader mechanism consists of a solenoid valve integrally mounted on the outside of compressor housing and internal piston.

There are two different types of unloading piston. The one in your unit depends on the age of the compressor. The earlier of the two is recognized by the external fluid lines that run from the discharge manifold to the unloading solenoid. These compressors have the steel piston with the unloader spring. The later compressors have the unloading pistons made from aluminum and have no spring. Because stocks of old steel pistons will be depleted soon it is necessary to update the unloading system to the later style whenever the capacity control system requires servicing.

UNLOADING

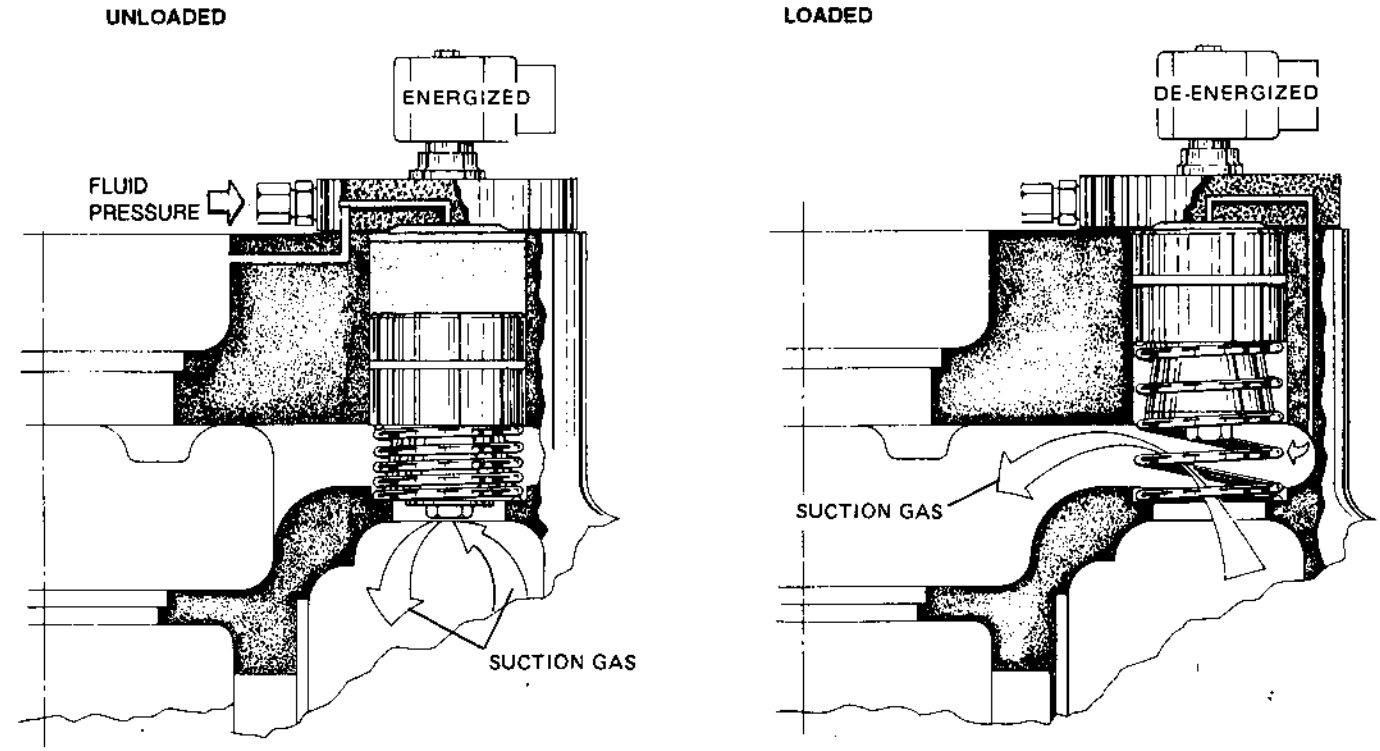
When the solenoid valve is energized, fluid pressure is applied to the top of the unloader piston, forcing it down. The bottom end of the piston seats against the recessed opening to the suction plenum, effectively blocking the flow of gas into the cylinders. The cylinders are now unloaded.

LOADING

When the solenoid valve is de-energized, fluid pressure on the top of the unloader piston is relieved to the suction plenum. On early vintage units, a spring pushes the piston upward and restores the flow of refrigerant gas through the cylinder. On current vintage compressors, the compressed refrigerant gas pushes the piston upward and restores the gas flow through the cylinder.

SUMMARY OF OPERATION

UNLOADED	LOADED
Solenoid Energized	Solenoid De-energized
Fluid Pressure Applied To Unloader Piston	Fluid Pressure Relieved To Suction Plenum
Unloader Piston Seated (DOWN)	Unloader Piston Unseated (UP)



NOTE: A line (cast into the compressor housing) connected to the high pressure area of the compressor housing supplies high pressure gas to the unloader mechanism. Also, the return passage to the suction plenum is fitted with a restrictor orifice.

FIG. 8 - CAPACITY CONTROL OPERATION - (INITIAL PRODUCTION)

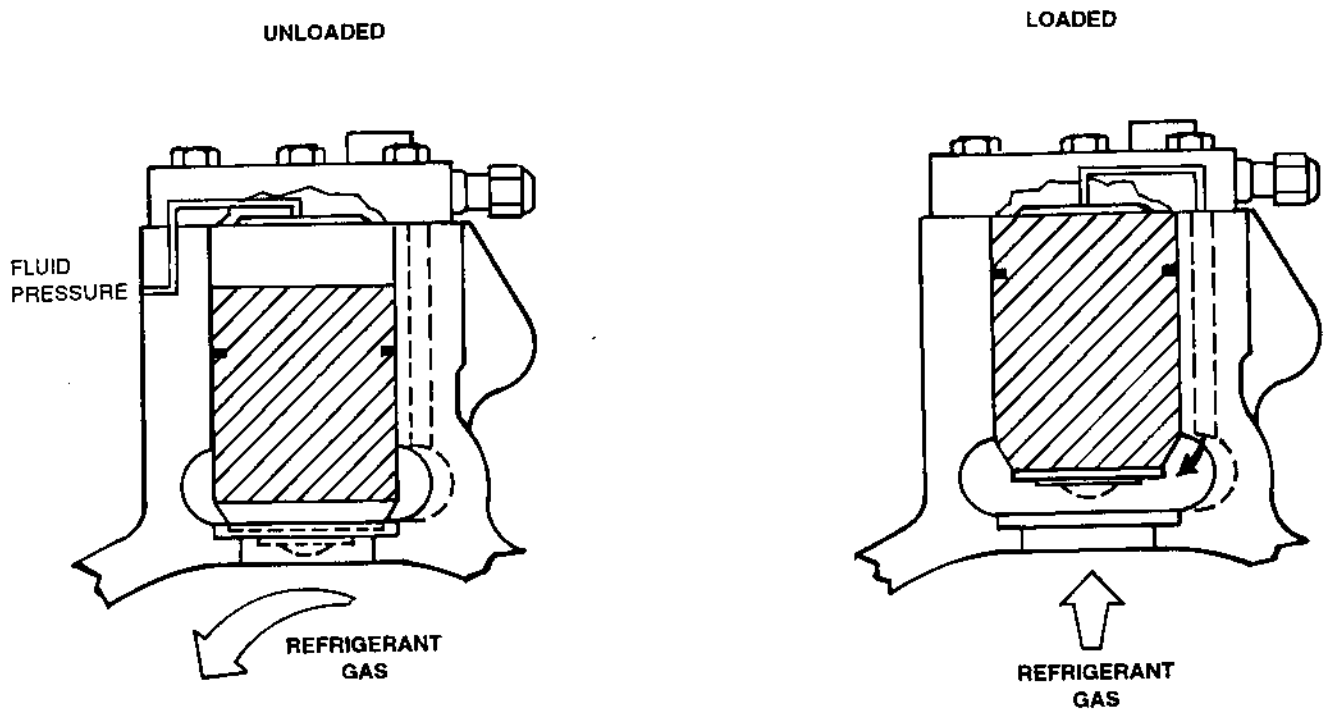
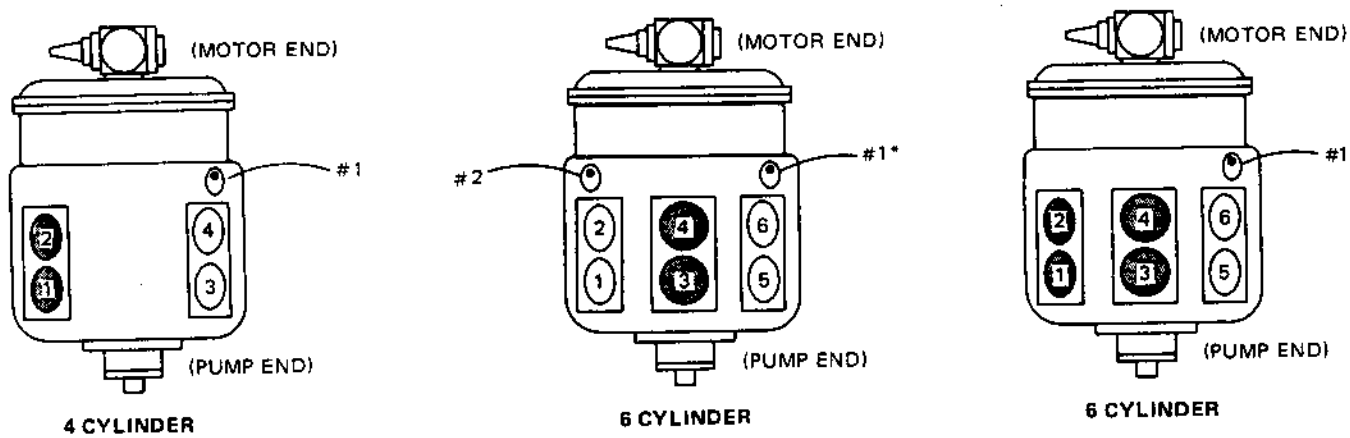


FIG. 9 - CAPACITY CONTROL OPERATION - (CURRENT PRODUCTION)

OPTIONAL



*Solenoid #1 should be energized (cylinders unloaded) first

NUMBER OF CYLINDERS	CAPACITY REDUCTION STEPS (%)
4	100, 50
6	100, 67, 33

- CYLINDER UNLOADING STEPS

ERNATIONAL

ORDERING RENEWAL PARTS

All compressor parts are designed and manufactured for a specific application. They are selected to withstand the pressures normally associated with compressor operation. The substitution of non-standard parts is not authorized as these parts could cause serious damage to the compressor or operator. Parts should be replaced with genuine YORK Renewal Parts. The Renewal Parts Manual Form 180.45-RP2 lists replacement parts for these compressors. When ordering parts be sure to follow all instructions included in the Renewal Parts Manual.

ANALYSIS OF FAULTY COMPRESSOR VALVE OPERATION

The operator soon becomes accustomed to the sound of the compressor when it is running under normal conditions. As long as the compressor runs normally, and the sound does not change, it can safely be assumed that the compressor is operating properly. Any unusual noise within the compressor should be investigated immediately.

External indications of trouble within the compressor are as follows:

1. When operating on suction pressure control, long "on" cycles with short "off" periods may indicate leaking or broken compressor valves, piston rings or both.
2. A definite rise in temperature of the discharge gas may indicate defective suction or discharge valves, or a leaking relief valve, or both.
3. Failure to pull down is a possible indication of a broken suction or discharge valve, or both.
4. Unusual pressure gauge readings.
5. The operator should feel the heads periodically to check for hot spots or one particular head which is running hot. If this condition occurs, it is an indication of broken or leaking valves within that bank cylinders.

If leaking or broken valves are suspected, the heads should be removed and the valves should be examined for breakage. YORK recommends that valves be replaced annually or every 5,000 hours of running time.

TABLE 2 - MANUFACTURING AND WEAR LIMITS (INCHES)

PART	MANUFACTURING TOLERANCE	ALLOWABLE WORN SIZE
TOP DEAD CENTER CLEARANCE (PISTON TO DISCHARGE VALVE)	.019 - .043	–
THRUST CLEARANCE	.013 - .027	–
CRANKPIN DIA.	1.9995 - 2.0000	1.9975
CONNECTING ROD - CRANK END	2.0024 - 2.0031	2.0045
CONNECTING ROD - PISTON END	.9900 - .9903	.9918
WRIST PIN DIA.	.9894 - .9896	.9889
PISTON WRIST PIN BORE	.9903 - .9899	.9918
69 mm PISTON DIA.	2.7105 - 2.7115	2.709
74 mm PISTON DIA.	2.907 - 2.908	2.905
80 mm PISTON DIA.	3.143 - 3.144	3.141
69 mm CYL. SLEEVE BORE	2.716 - 2.717	2.7185
74 mm CYL. SLEEVE BORE	2.913 - 2.914	2.9155
80 mm CYL. SLEEVE BORE	3.149 - 3.150	3.1515

SECTION II - DIS-ASSEMBLY & RE-ASSEMBLY

‹ERAL

Service on these compressors should be performed only by qualified service personnel, trained in the service of this type of equipment, and equipped with the proper tools and familiar with their use.

Before opening a compressor for repairs, the following paragraphs should be thoroughly read and checked to aid in locating and correcting the trouble:

1. Check the compressor oil level. (See page 8)
2. Check the refrigerant charge to be sure the system is fully charged. The unit sight glass should be clean and dry.
3. Be sure the faulty operation of the unit is caused by the compressor and not some other part of the unit. Unit safety and operating controls should be checked for proper operation as explained in the SERVICE INSTRUCTION included with the unit.
4. The voltage at the compressor motor must be within the limits shown on the unit data plate and page 4.
5. Check for a burnout in the motor windings. This may be evidenced by discoloration of the compressor oil. A further check for motor burnout would be to use an ohmmeter and check if the windings are grounded, or check for an open circuit between motor terminals 1, 2, 3 or 7, 8, 9. These are an indication of motor burnout.
6. Check the resistance of each thermistor in the protector circuit. This resistance must be between 500 and 2600 ohms at room temperature. The measurement of this resistance shall be made with a meter which applies NO MORE THAN ONE VOLT ACROSS THE THERMISTOR.
7. Dismantle only the part of the hermetic compressor necessary to correct the fault.
8. Never open any part of a hermetic compressor which is under vacuum; be sure there is some pressure inside the compressor. If the compressor is opened while under a vacuum, moisture laden air may be drawn into the system and rapid corrosion of internal machined parts may result. The refrigerant is an excellent cleaning agent and will remove any protective coating from the iron or steel, leaving the raw metal exposed.
9. Internal machined parts of the compressor such as valves, pistons and connecting rods must be immediately protected as they are removed from the compressor. See HANDLING COMPRESSOR PARTS, page 8.
10. When assembling a compressor or compressor parts, it its essential to draw all nuts and cap screws to their proper torque, using an accurate torque wrench. See THREADED FASTENER TORQUES AND SEQUENCE, page 6.

WARNING

Before dis-assembling any part of the compressor, be sure the following Safety Precautions are read and observed. Do not attempt to service any part of the compressor that is not covered in this instruction.

DISCONNECT ELECTRICAL POWER

Before attempting any service on the compressor, all disconnect switches must be locked out and tagged to prevent accidental starting of the compressor and/or electrical shock.

VENTING THE COMPRESSOR BEFORE REPAIRS

Before opening the compressor for repairs, the pressure within the compressor must be relieved. Close the suction and discharge stop valves, loosen the pressure tap next to the adjusting stem on the suction stop valve, and ‹ent the compressor to an approved refrigerant re-'aimer.

'NDLING

performing service on the compressor it may be ‹ient to remove it from the unit base. If so, refer to 'G THE COMPRESSOR, page 8.

EVACUATION AFTER REPAIRS

During the compressor repair procedure, the crankcase and oil should be examined for the presence of metal particles. This may indicate wearing of parts within the compressor. New oil should be charged into the compressor using the oil charging valve. (See PHYSICAL DATA)

The compressor should be given a thorough leak test as explained in instruction Form 55.05-NM.

If the compressor was open for only a few hours, it should be evacuated to a vacuum of 300 microns using a quality vacuum pump and following the procedure outlined in instruction Form 55.05-NM.

If the compressor was open for more than 24 hours, the compressor should be completely dehydrated; then evacuated to a vacuum of 300 microns following the procedures outlined in Form 55.05-NM.

REPLACING THE OIL PUMP

If it becomes necessary to replace the oil pump, a complete new pump assembly should be installed. To replace the oil pump, refer to Fig. 11 and proceed as follows:

1. Remove the oil pump housing cap screws and pull the pump assembly out of the bearing head.

2. Install the new oil pump assembly using a new gasket. Be sure that the holes in the gasket are aligned with the holes in the housing. Be sure that the flat end of the pump drive shaft engages the slot in the end of the compressor crankshaft. Check that the valve core is installed under the seal cap of the valve.

NOTE: The bolt hole pattern is irregular so that the pump can only be installed in the correct position.

3. Tighten the pump housing cap screws evenly by drawing down opposite and alternate pairs. (See page 6 for pattern and torque values.)

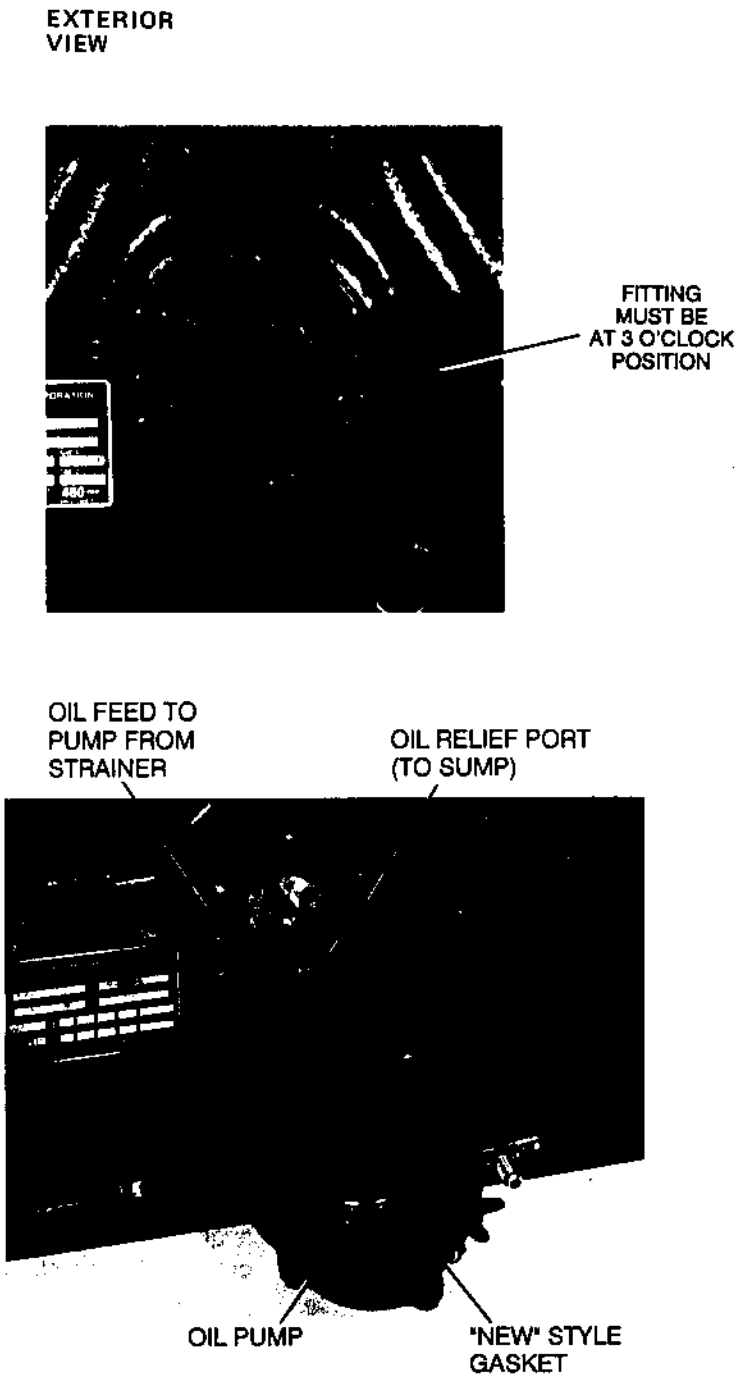


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FIG. 11 - COMPRESSOR OIL PUMP

,Y CONTROL COMPONENTS
,G. 12A AND 12B)

,enoid Coil

Normally, the coil is the only part of the solenoid valve that requires replacement. To replace the coil, proceed as follows:

1. Remove the leads and conduit of the coil from the compressor terminal box; then remove the conduit from the leads.
2. Remove the screw from the top center of the valve and remove the coil.
3. Install the new coil. Reconnect the wires and the conduit.

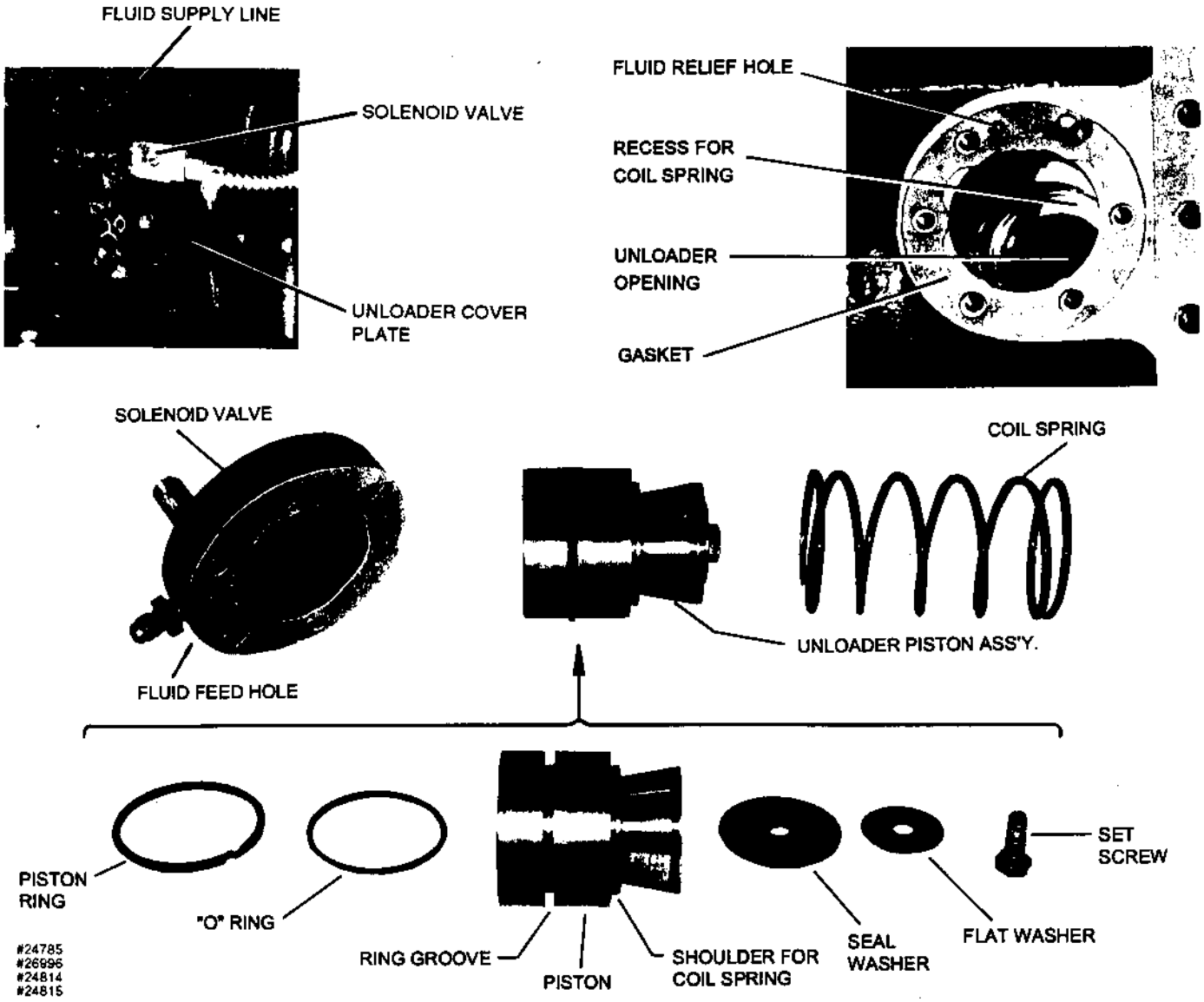
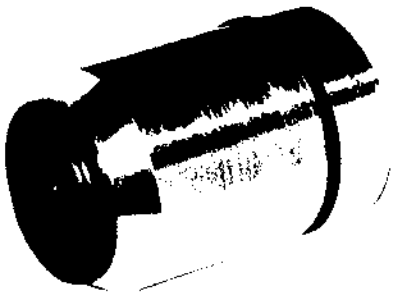


FIG. 12A - CAPACITY CONTROL COMPONENTS (EARLY VINTAGE)



PACITY CONTROL COMPONENTS (CURRENT VINTAGE)

UNLOADER ASSEMBLY FOR EARLY VINTAGE COMPRESSORS

Unloader Solenoid Valve

The unloader solenoid valve is mounted on the compressor housing. If the valve becomes defective, the valve must be replaced. To replace the solenoid valve, proceed as follows:

1. Remove the screw holding the solenoid holding to the solenoid valve. Remove the coil from the valve.
2. Disconnect the fluid line from the side of the solenoid valve. Cover exposed line to prevent dirt from getting into the compressor.
3. Loosen the cap screws holding the solenoid to the compressor housing. The valve should come free due to the unloader spring. Remove the cap screws, the unloader solenoid valve, and the gasket. Be sure the unloader piston moves freely.
4. Install a new solenoid valve and gasket. Be sure the fluid passages in the solenoid valve and gasket align with the matching holes in the compressor housing.
5. Reconnect the fluid supply tubing.
6. Reinstall the solenoid coil and its mounting screw.

Unloader Piston Assembly

The unloader piston assembly can be removed for inspection and/or service as follows:

1. Remove the solenoid valve as described above.
2. Remove the unloader piston and coil spring.
3. Disassemble the components of the unloader piston. Clean and examine all parts for signs of wear and replace parts as necessary. if repalcement is necessary, installation of the new style of unloader piston is required. (See below) If all components are within specification, reinstall the piston after having turned the seal washer over to the other side. Apply Loctite (YORK P/N 013-01671) to the threads of the cap screw. Install a new compression ring assembly (YORK P/N 029-20215) in the piston groove: then carefully fit the piston ring over it. DO NOT SUBSTITUTE any other "O" ring or a malfunction may result.
4. Installation is the reverse of removal.

UNLOADER ASSEMBLY FOR CURRENT VINTAGE COMPRESSORS

Unloader Solenoid Valve

The unloader solenoid valve is mounted on the compressor housing. If the valve becomes defective, the valve must be replaced. To replace the solenoid valve, proceed as follows:

1. Remove the screw holding the solenoid valve. Remove the coil from the valve.
2. Loosen the cap screws holding the solenoid to the compressor housing. The valve should come free due to the unloader spring. Remove the cap screws, the unloader solenoid valve, and the gasket.
3. Install a new solenoid valve and gasket. Be sure the fluid passages in the solenoid valve and gasket align with the matching holes in the compressor housing.
4. Reinstall the solenoid coil and its mounting screw.

Unloader Piston Assembly

The unloader piston assembly can be removed for inspection and/or replacement as follows:

1. Remove the solenoid valve as described above.
2. Remove the unloader piston by inserting a 5/16-18 UNC screw into the hole at the top. Pull the piston straight out.
3. Disassemble the components of the unloader piston. Clean and examine all parts for signs of wear and replace parts as necessary.
4. Installation is the reverse of removal. Lightly oil the piston prior to installation to prevent damage to the piston, bore, or "O" ring.

CRANKCASE OIL HEATER

The crankcase heater is located on the oil pump end of the compressor. The heater is located within a well in the compressor housing; it is not in direct contact with the refrigerant or oil. To replace the heater, remove the heater wires and conduit from the compressor terminal box. Pull the heater from the compressor. (See Fig. 13)

When installing the new heater, coat it with heat conductive compound. (YORK Part No. 013-00898)

OIL STRAINER

The one-piece line between the strainer and the compressor crankcase is rolled into a hole in the compressor crankcase and therefore is not readily removable in the field.

REMOVING THE SUCTION STRAINER

The compressor suction strainer is located in the motor housing cover just under the suction stop valve. (See

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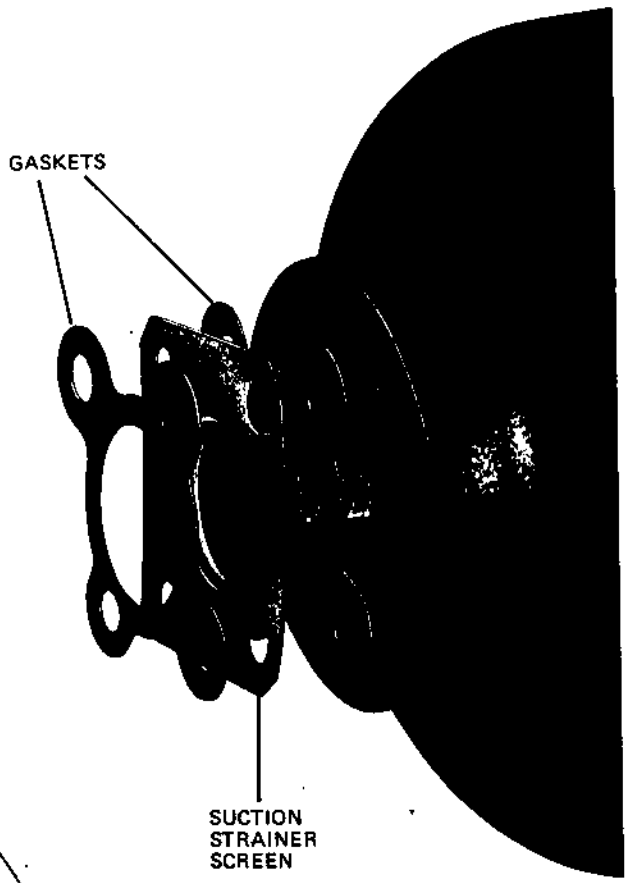
FIG. 13 - CRANKCASE HEATER & SIGHT GLASS



COMPRESSOR SUCTION STRAINER

Fig. 14) To clean or replace the suction strainer proceed as follows:

1. Remove the four bolts which hold the suction stop valve to the motor housing cover.
2. Pull the suction strainer out of the housing and clean with an approved safety solvent or install a new strainer if required.
3. Replace the suction strainer using new gaskets. Note that two gaskets are used; one between the suction stop valve and the suction strainer, the other between the suction strainer and the compressor housing.
4. Bolt the suction valve in place, making sure that it seats squarely.

REPLACING THE OIL SIGHT GLASS

Compressors are equipped with a plug type sight glass located on the pump end of the compressor. (See Fig. 13) If it becomes broken or damaged in any way, it must be replaced. Proceed as follows:

1. Drain the oil level below the sight glass.
2. Remove the damaged sight glass.
3. Clean the threads in the housing and on the new sight glass with an approved safety solvent.
4. Apply Loctite to the threads of the sight glass and screw it into the compressor housing using a socket wrench. Do not over-tighten as this may crack the sight glass (See Table 1)
5. Fill the crankcase with clean oil.

HIGH PRESSURE RELIEF VALVE

The high pressure relief valve is screwed into the compressor housing beneath the discharge stop valve. (See Fig. 15) It is factory set at 375 psi to relieve abnormally high discharge pressure back to the suction side of the compressor. If leakage of the valve is suspected, proceed as follows:

1. Disconnect and remove the discharge stop valve.
2. Unscrew the leaking relief valve and install a new relief valve in its place. Do not use thread sealing compound.
3. Re-connect the discharge stop valve.

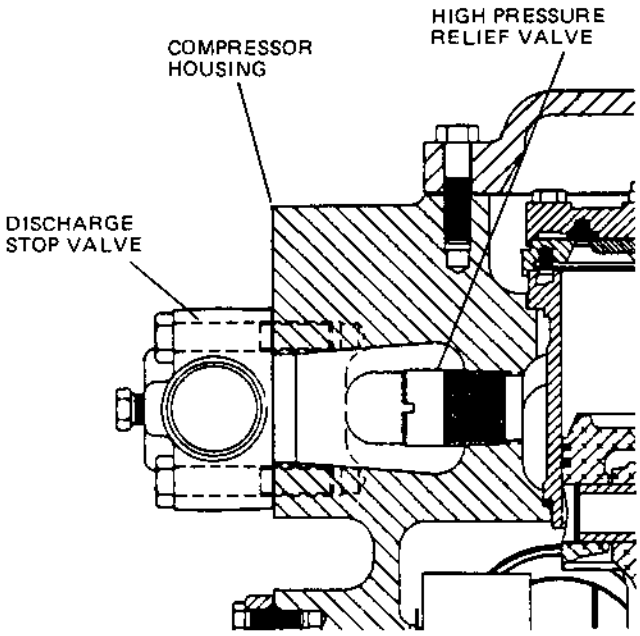


FIG. 15 - LOCATION OF HIGH PRESSURE RELIEF VALVE - 6 Cylinder Compressor Shown

REMOVING THE DISCHARGE VALVES, SUCTION VALVES AND CYLINDER SLEEVES

To remove the discharge valves, suction valves and cylinder sleeves, proceed as follows:

1. Remove the compressor access cover(s). The use of guide pins is recommended to prevent damage to the compressor and/or injury to service personnel. (See Figs. 16 & 17)

2. Remove the four cap screws that hold the discharge valve cage assembly to the housing and lift this assembly out of the compressor. The inner discharge valve plate, the discharge valve, and the discharge valve springs will come out with the cage as an assembly. (See Fig. 18)

3. Slip the fingers inside the suction valve plate and under the suction valve. Lift off the suction valve plate, the suction valve, and suction valve springs.

4. Remove the cylinder sleeve(s). On unloading type cylinders, use of the tools similar to those shown in Fig. 19 may be useful since the cylinder sleeve is seated with an "O" ring at the bottom and is a rather tight fit in the compressor. Use care that the piston is not damaged by striking the compressor housing. Remove the "O" ring from the compressor housing if it did not come out with the cylinder sleeve. (Unloading cylinders only) (See Fig. 20)

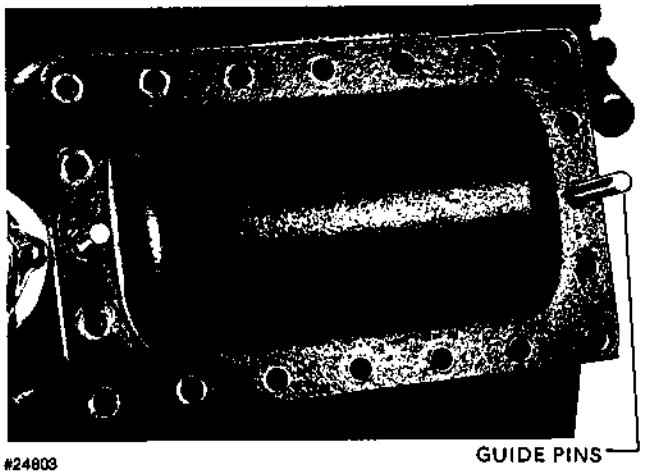


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FIG. 16 - ACCESS COVER REMOVAL

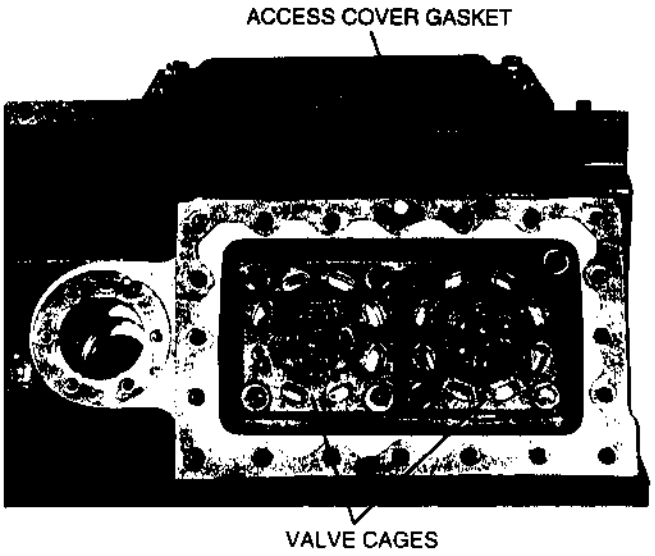

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FIG. 17 - ACCESS COVER REMOVED

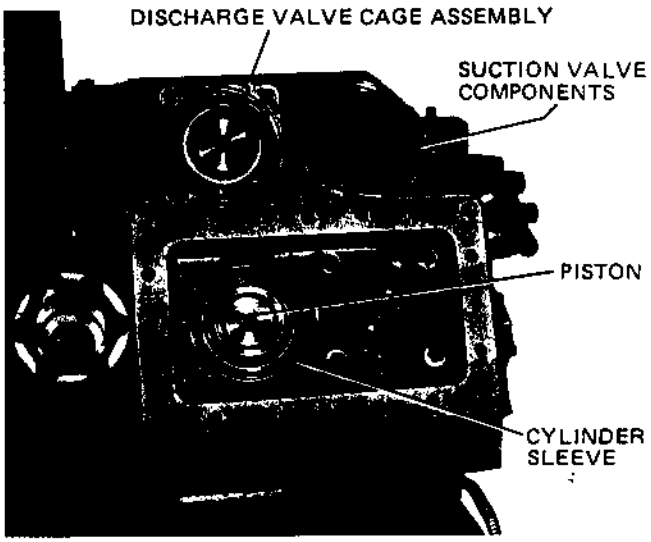

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FIG. 18 - DISCHARGE AND SUCTION VALVES REMOVED

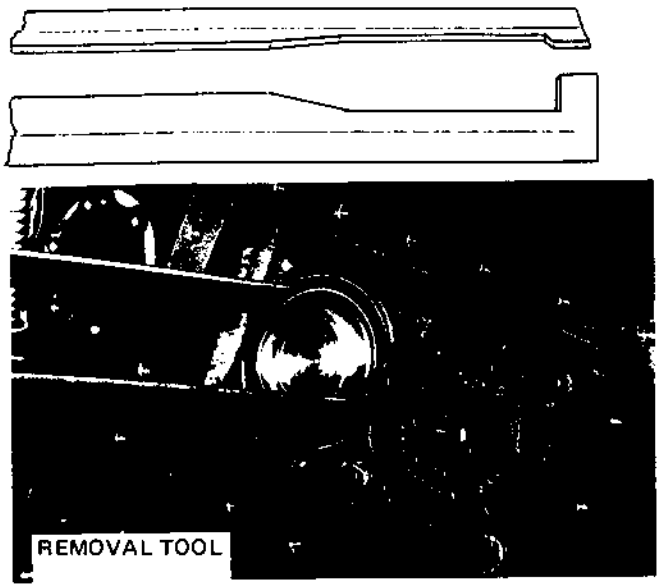

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FIG. 19 - REMOVING CYLINDER SLEEVE

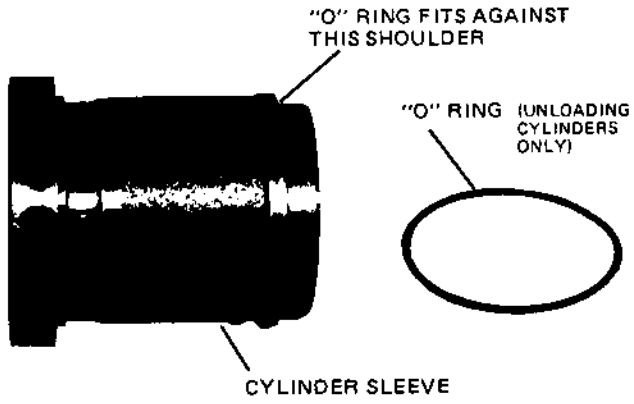

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FIG. 20 - CYLINDER SLEEVE

5. Dis-assemble the discharge valve cage assembly. Remove the locking nut from the screw. Then lift off the inner discharge valve disk, discharge valve and springs.

6. Clean, dry and inspect all parts. Replace all parts that show wear or damage.

INSTALLING CYLINDER SLEEVES

Install a new "O" ring on the bottom of the cylinder sleeve. (Unloading type cylinders only)

CAUTION: Never rotate the crankshaft when one or more piston & connecting rod assemblies are in place unless the related cylinder sleeve(s) are secured in their proper position in the compressor housing. If this caution is not observed, serious damage may occur.

2. Oil the inside of the cylinder sleeve.

3. Carefully lower the cylinder sleeve over the piston and into the compressor housing. Push the cylinder sleeve down until it enters the hole in the lower compressor deck. The bottom end of the cylinder sleeve is chamfered to facilitate compressing the piston rings and entering the compressor deck. Enter the sleeve squarely into the housing and rotate it as it is being lowered. Be sure that the "O" ring enters the recess in the compressor deck without binding or being damaged in any way. (Unloading type cylinders only)

INSTALLING SUCTION AND DISCHARGE VALVES

When re-installing valves, install as originally removed, matching the seats; do not turn over.

To install the suction and discharge valves, refer to Figs. 21 and 22 and proceed as follows:

1. With the spring pocket side of the suction valve plate up, assemble the suction valve springs in their pockets and set the suction valve in place. Expanded coil is to be located in the bottom of the spring pocket.

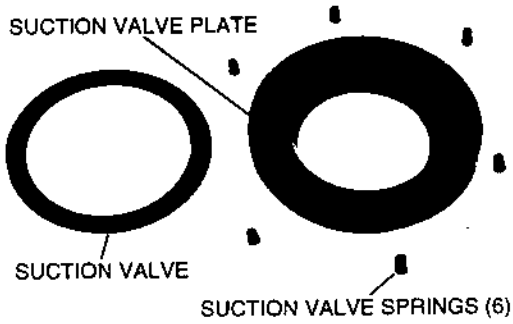

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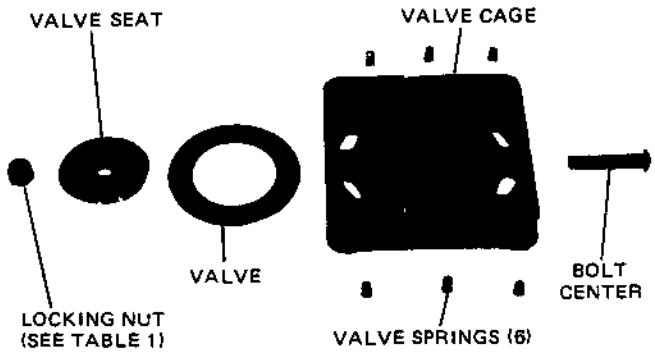
FIG. 21 - SUCTION VALVE ASSEMBLY



#24813

FIG. 22 - DISCHARGE VALVE ASSEMBLY

Push spring gently into hole until the expanded coil snaps to retain the spring.

2. To hold the suction valve and springs firmly in place during installation, two sheet metal clips should be placed over the suction valve plate and suction valve. These clips may be ordered from the Factory - YORK Part No. 064-37274.

3. Assemble the discharge valve cage assembly.

   a. Insert the discharge valve springs in their recesses in the valve cage and set the discharge valve in place.

   b. Insert the discharge valve screw through the inner discharge valve disk and the discharge valve cage. Then bolt the assembly together, using the self locking nut. Check that the discharge valve operates freely. (See Table 1)

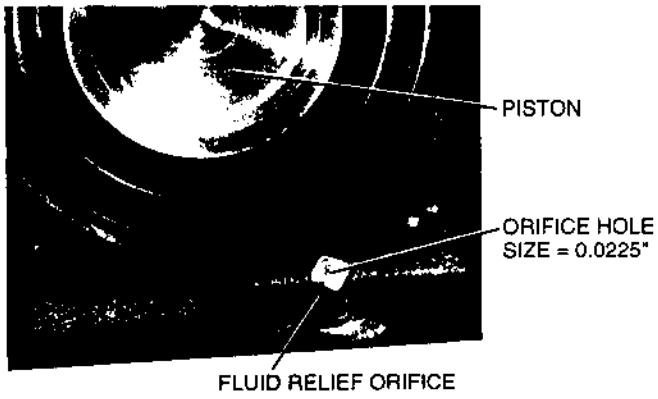


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FIG. 23 - FLUID RELIEF ORIFICE

4. Place the suction valve plate, with suction valve clipped in place, on the cylinder sleeve. Using one hand, hold the suction valve plate firmly against the cylinder sleeve. With your free hand remove the valve clips. A distinct click will be heard as the clips are removed, if the valve is seated properly.

5. Holding the suction valve plate in place on top of the cylinder sleeve, place the discharge valve gage assembly on top of the suction valve plate. Insert two cap screws through the holes in diagonally opposite corners of the discharge valve cage and tighten them "finger-tight". Insert remaining cap screws and tighten all cap screws to their proper torque.

6. Before replacing the top heads on the compressor, check to be sure that the fluid relief orifice is clear. (Unloading type cylinder decks only). The orifice hole size is 0.0225". Run a smaller diameter wire through the hole and clean out any foreign matter that may have plugged it up. (See Fig. 23)

7. Using new gaskets if required, install the compressor access covers.

REMOVING PISTONS AND CONNECTING RODS

To remove the pistons and connecting rods, refer to Fig. 24 and 25 and proceed as follows:

NOTE: The width of the connecting rods at their large end is greater than the inside diameter of the cylinder sleeve. Before a piston and connecting rod assembly can be removed from the compressor housing, the cylinder sleeve must be removed. Then the piston and connecting rod assembly can be pulled outward from the compressor.

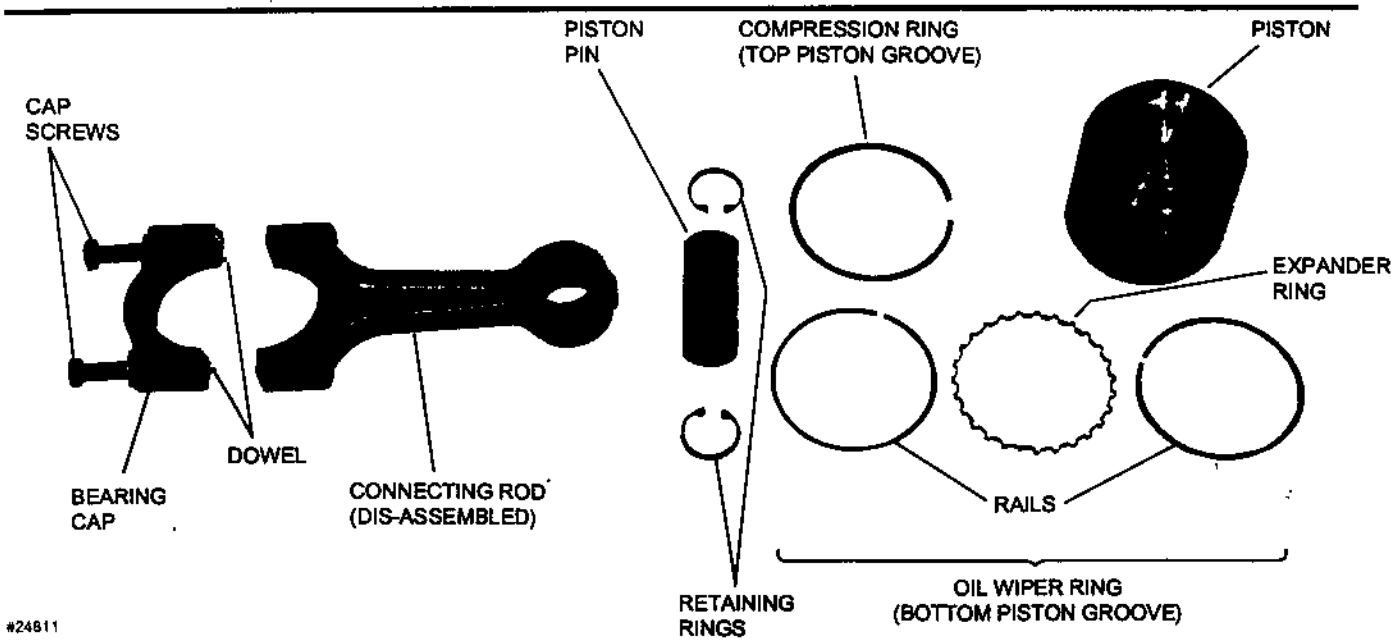

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FIG. 24 - PISTON AND CONNECTING ROD COMPONENTS FOR ALL EXCEPT ZB6AE

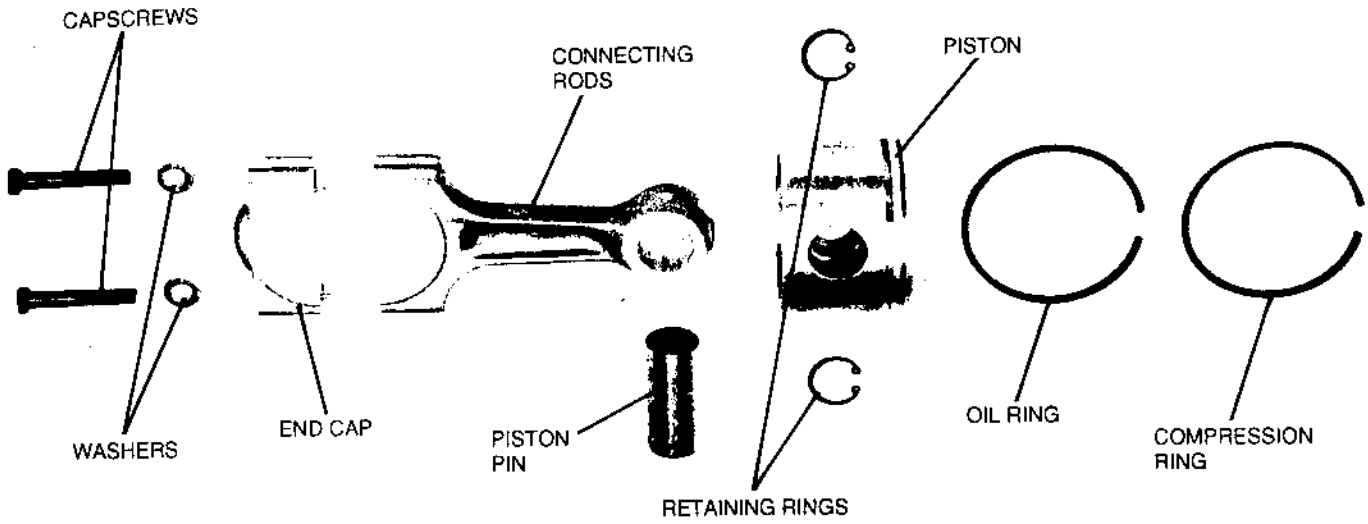

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FIG. 25 - PISTON AND CONNECTING ROD COMPONENTS FOR ZB6AE

1. Remove the suction and discharge valve assemblies following procedures outlined previously. Allow the cylinder sleeve to remain in place in the housing.

2. Remove the crankcase access cover(s).

   CAUTION: Never rotate the crankshaft when one or more piston and connecting rod assemblies are in place unless the related cylinder sleeve(s) are secured in their proper position in the compressor housing. If this caution is not observed, serious damage could occur. Make certain also that when the bottom half of the rod bearing has been removed and it is necessary to rotate the crankshaft, that the upper half of the rod bearing does not leave its proper place on its crankpin.

3. With the cylinder sleeves in place, rotate the crankshaft to a position that will permit ready access to the connecting rod bolts to be removed. Loosen the cap screws and remove the lower half of the connecting rod bearing. Note the identification number stamped on the half-bearing just removed.

4. Using care to make certain that the upper half of the connecting rod bearing remains in place on its crankpin, rotate the crankshaft to the point where the piston is very near the top of its stroke.

5. Remove the cylinder sleeve. Use care that the piston is not damaged by striking the compressor housing.

6. Lift out the piston and its connecting rod. Note that the identification number stamped on the upper and lower half of the rod bearing, matches the number on the lower half of the rod bearing. These numbers should ALWAYS match. If they do not match, replace connecting rod.

7. Remove piston assemblies ONE AT A TIME, repeating the above steps 3 - 6 for each piston assembly.

   NOTE: Only a small amount of clearance between the piston pin and its holes in the connecting rod and the bosses of the piston is permissible. (See TABLE 2) When the piston and connecting rod assembly is removed from the compressor, this clearance may be checked by holding the top of the piston downward against a flat, solid surface to keep the piston stationary, and sliding the connecting rod back and forth on its piston pin. When the clearance is correct, the rod can be moved back and forth freely from one piston boss to the other with no "rocking" or angular movement. If such movement exists, wear is indicated and the piston, piston pin, and connecting rod should be checked and replaced if necessary.

8. Remove the piston pin retaining rings.

9. Push the piston pin out of the piston.

10. Remove the piston rings.

11. Clean, inspect, dry and oil all parts.

INSTALLING PISTONS AND CONNECTING RODS

To install the piston and connecting rod assemblies, refer to Figs. 24-30 and proceed as follows: Each piston is equipped with the following rings:

1. A compression ring which fits into the top groove of the piston.
2. In all pistons EXCEPT the ZB6AE (3.1495" diameter) piston, an oil ring which fits into the bottom groove of the piston. This oil ring consists of three components; a top rail, an expander spacer, and a bottom rail.
3. For ZB6AE (3.1495" diameter) pistons, a single oil ring, with a special step, fits into the bottom groove.

It is important that all rings be installed properly to insure that the compressor operates satisfactorily. Check the piston ring grooves to see that they are clean and free of burrs.

1. Install compression ring onto the piston. The compression ring is installed the same for all Z "B" compressors.
2. Use the following instructions for all pistons EXCEPT the ZB6AE piston. Place the expander spacer in the **bottom** piston groove. The ends of the expander must butt or lock as shown in Fig. 26.
3. Install the top rail over the expander ring in the direction shown in Fig. 27. The gaps in the expander sleeve and top rail should be staggered approximately 90°.
4. Install the bottom rail over the expander ring in the direction shown in Fig. 28. This gap should be staggered approximately 180° from the gap in the top rail.
5. Install the compression ring in the **top** groove of the piston. Note that this ring is tapered and must be installed correctly. The wider part of the ring must be down (toward the bottom of the piston). The top surface of the ring is stamped with a dot. (See Fig. 29)
6. For ZB6AE pistons, install the single oil ring into the bottom groove first. Be sure that the "step" on the ring is facing down. Install the top ring after the bottom ring is installed. (See Fig. 30)
7. With the top of the piston placed downward on a clean surface, insert the piston pin into one of the holes in the piston and push it inward using thumb or hand pressure until it just protrudes from the boss on the inside of the piston.
8. Place a few drops of oil on the bearing surface in the small end of the connecting rod, insert this end of the rod in the piston and push the pin through the rod bearing and into the remaining piston pin boss. Center the piston pin locking springs.

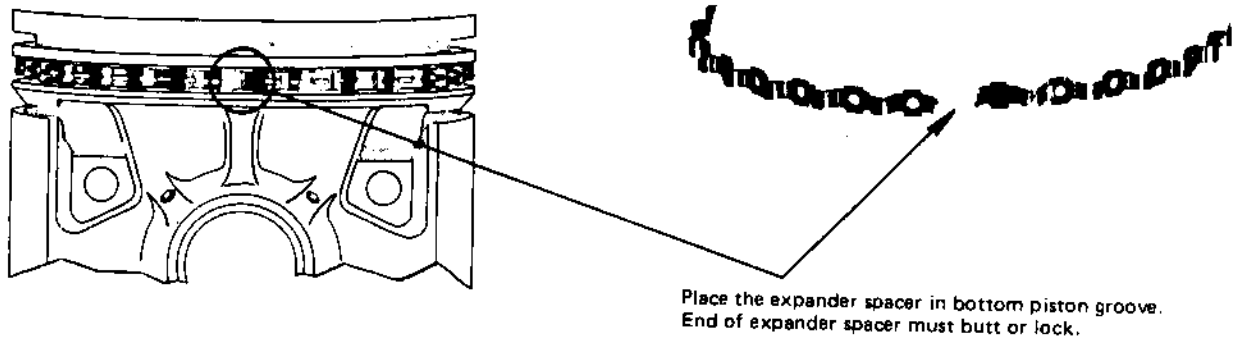

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FIG. 26 - INSTALLING EXPANDER SPACER (ALL EXCEPT ZB6AE)

(ALL EXCEPT ZB6AE)

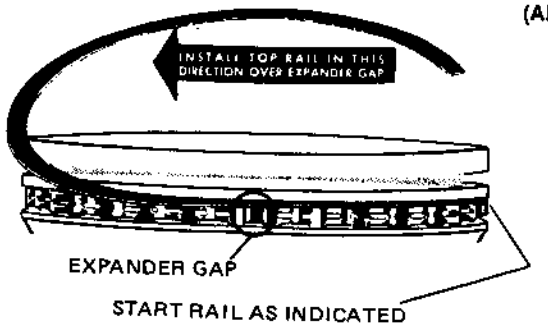


FIG. 27 - INSTALLING TOP RAIL

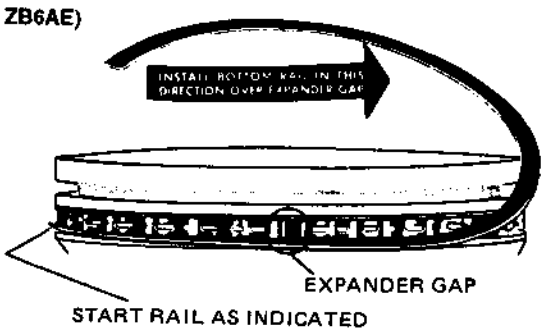


FIG. 28 - INSTALLING BOTTOM RAIL

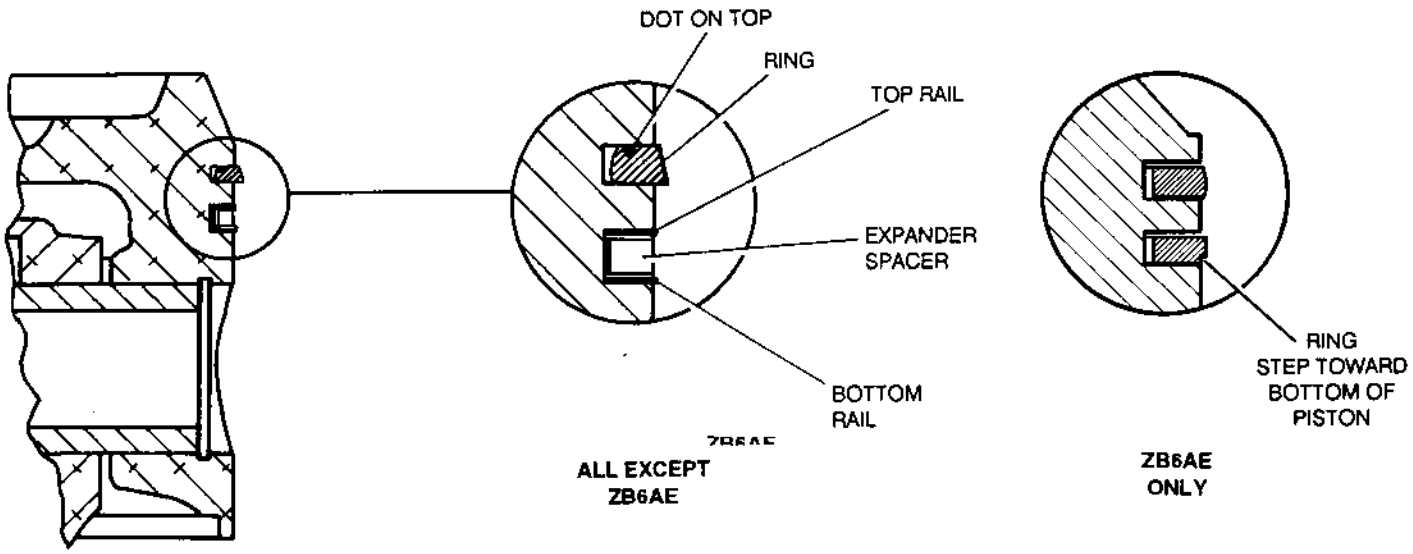
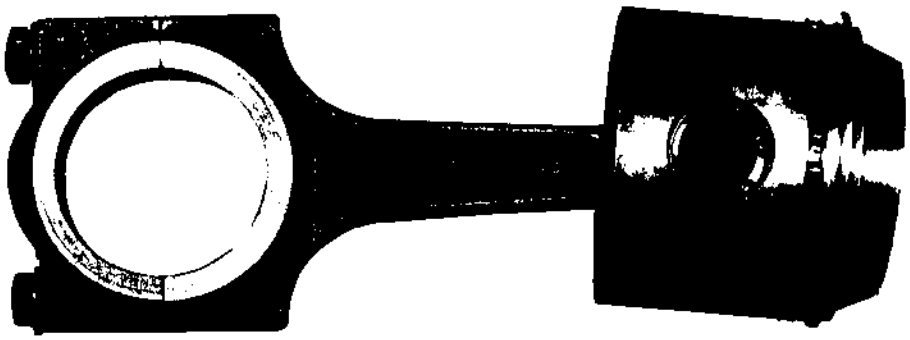


FIG. 29 - INSTALLING COMPRESSION RING



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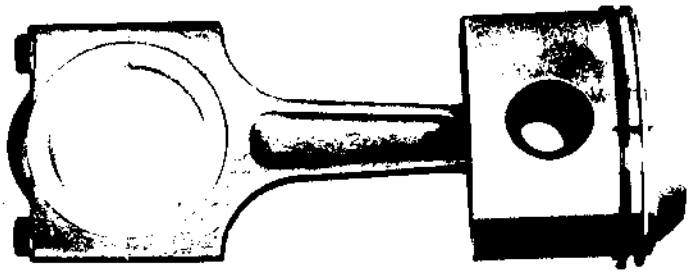
ALL EXCEPT ZB6AE



ZB6AE ONLY

PISTON/CONNECTING ROD ASSEMBLY

MOTOR ROTOR AND STATOR REMOVAL AND INSTALLATION

To remove the motor rotor and stator proceed as follows and refer to Figures 31-35:

1. Remove compressor from unit and place it where it can be worked on safely.
2. Remove the terminal box cover. Disconnect heater wires from terminal. Disconnect heater wire conduit from terminal box. Disconnect solenoid valve wiring from terminal box. Remove terminal box.
3. Remove the terminal nuts from terminals and gently push terminals down through the terminal block.
4. Remove terminal block from the compressor housing.
5. Remove 16 of the 20 screws from the motor cover. Place 4 guide pins into the empty screw holes at 90° intervals. Remove 4 remaining screws and slide motor cover and its gasket off. Throw old gasket away. (See Fig. 31)
6. Move the terminals and their associated wires away from the stator securing screws (See Fig. 32). Heat each of the screws briefly with a torch to soften the anaerobic thread sealant. Remove the stator securing screws from the housing.
7. Pull the stator securing key from the compressor housing (See Fig. 33).
8. Remove the stator from the compressor housing (See Fig. 34).
9. Remove the rotor mounting bolt and lockwasher from the rotor. Remove rotor sleeve and rotor from crankshaft. Remove key from crankshaft. Examine for wear or damage. Replacing if necessary.

   NOTE: The rotor will go on the crankshaft only one way. Attempts to force it on incorrectly will result in damage to both the rotor and crankshaft.
10. Installation is the reverse of the removal. During installation of components, it is important to remember to carefully pull the motor leads through the housing to prevent them from being pinched and/or damaged during reassembly. Also, be sure to coat the stator securing screws with anaerobic thread sealant, YORK part no. 013-01671 only, to ensure proper fastening. See THREADED FASTENER TORQUES & SEQUENCE, page 6.

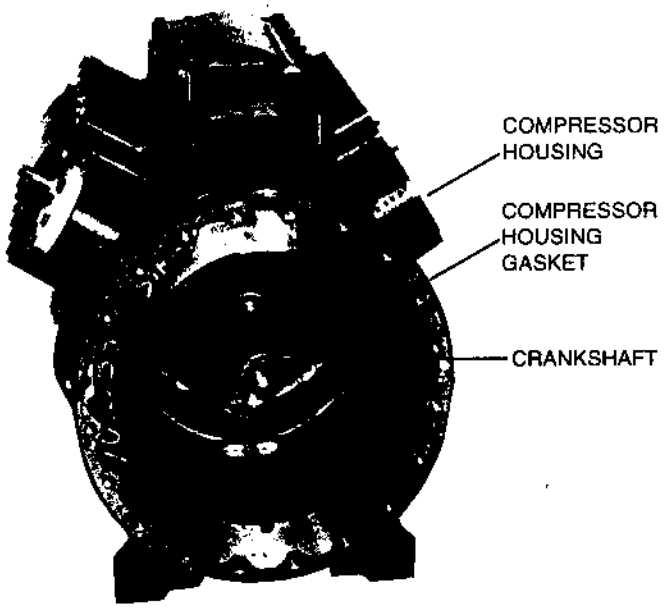


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FIG. 31 - COMPRESSOR HOUSING

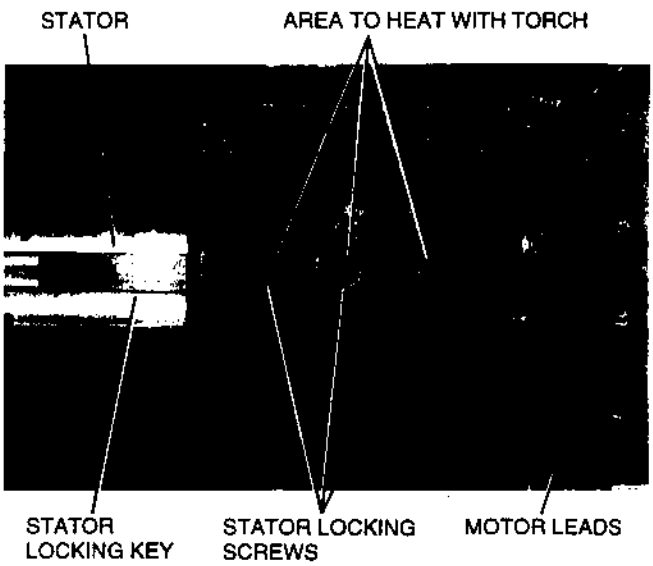

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FIG. 32 - 6 CYCLINDER WITH 106 FRAME MOTOR

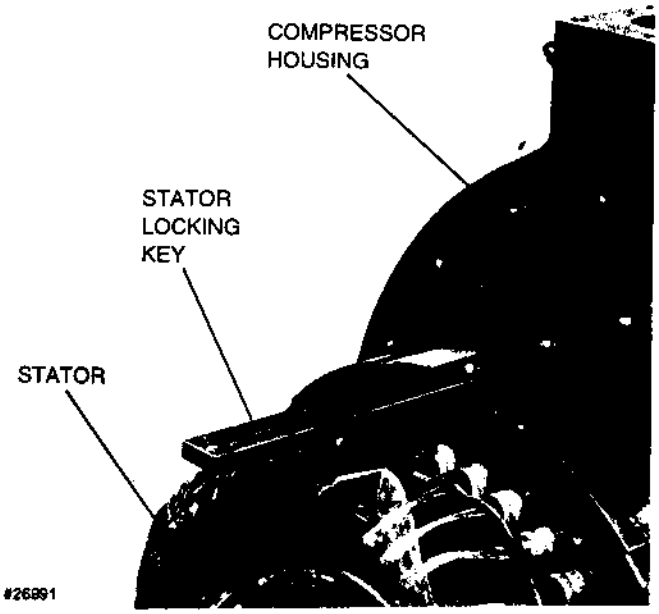

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FIG. 33 - STATOR KEY

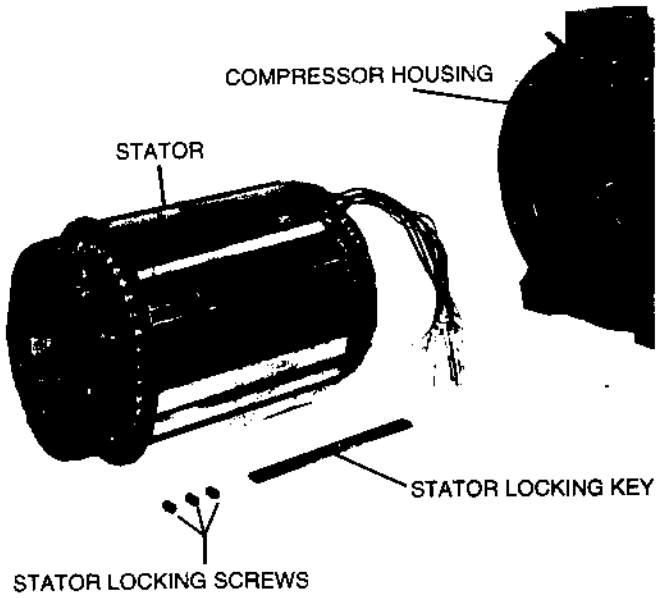

FIG. 34 - STATOR

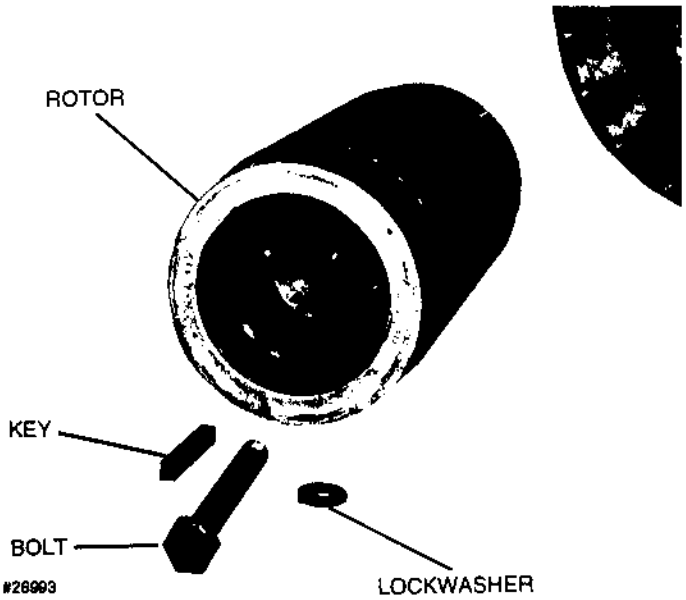

FIG. 35 - ROTOR

REMOVING BEARINGS AND CRANKSHAFT

Motor End Bearing

To remove the motor end bearings, refer to Fig. 36 and proceed as follows:

1. Drain the oil from the compressor and remove the crankcase cover plates, the motor cover, connecting rods and pistons, and the motor rotor and stator, following procedures described in the applicable sections of this manual.

2. Using suitable timber, support the crankshaft inside the crankcase.

3. Remove the motor end bearing head by removing capscrews building it to the compressor housing. (See Fig. 37)

4. The motor end thrust collar should come out with the bearing head. If it does not, pull it off the crankshaft. A roll pin prevents the thrust collar from turning with the crankshaft. Examine the thrust collar and replace if it shows signs of excessive wear.

5. Using the bearing removal tool as shown in Fig. 36, Detail A, remove the old bearings from the housing. Bearings are removed one at a time in a similar manner from opposite ends of the bearing head.

6. To install new bearings, apply clean oil to the outside surface of the new bearings and to the inside portions of the bearing head into which the bearings are to be pressed.

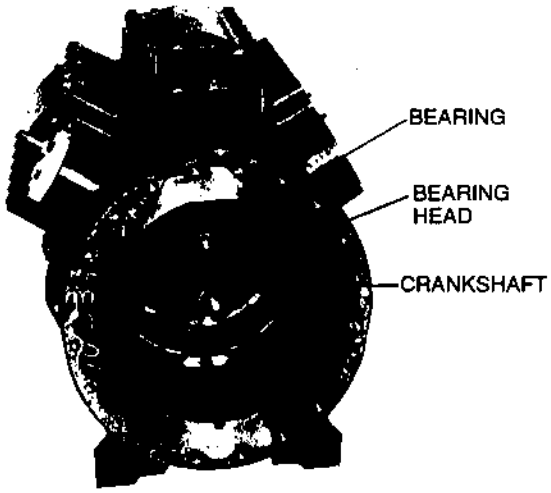

FIG. 36 - MOTOR END BEARING ASSEMBLY

7. Using the bearing removal tool as shown in Fig. 36, Detail B, pull the bearings into the bearing head one at a time from opposite ends, taking care that the bearings enter the bearing head squarely. Note that the "split" in one bearing should be at the top; the "split" in the second bearing should be turned 90° to either side. Continue to pull the bearings into the head until they are .03" below the end surfaces of the bearing head.

8. Reassemble the compressor by following steps 1, 2, 3, 4 and 5 above in reverse order. Be sure that the relief valve is at the bottom of the compressor.

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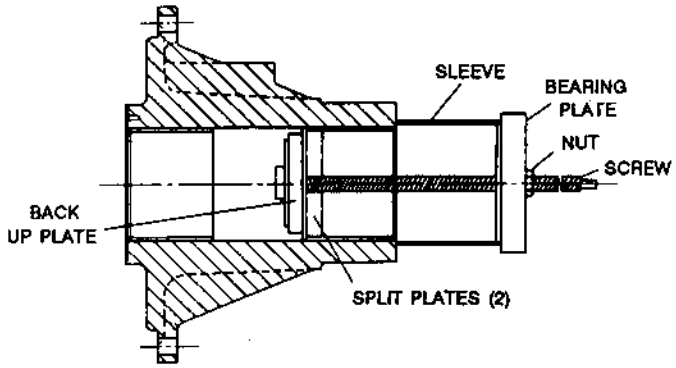
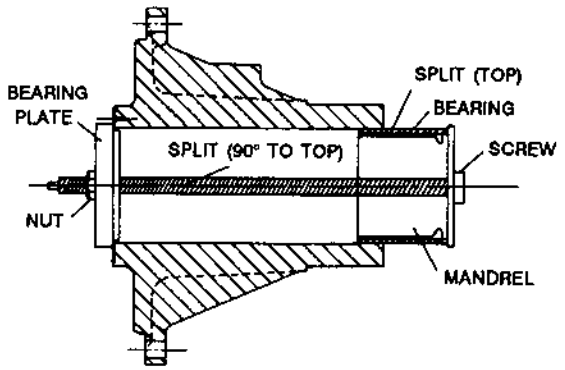
FIG. 37 - MOTOR END BEARING



DETAIL A – MOTOR END BEARING (REMOVAL)



DETAIL B – MOTOR END BEARING (INSTALLATION)

FIG. 38 - MOTOR END BEARINGS

CRANKSHAFT

The compressor crankshaft can be removed from the motor end only. To remove the crankshaft (See Fig. 39), proceed as follows:

1. Drain the oil from the compressor. Remove the crankcase cover plates, access covers, suction and discharge valve assemblies, pistons and connecting rods, motor cover, and motor rotor and stator as previously detailed.
2. Using suitable timber, support the crankshaft solidly inside the crankcase.
3. Remove the motor end bearing from the compressor housing.
4. Using two men, carefully remove the crankshaft from the compressor.
5. Installation is the reverse of removal. Inspect motor rotor keyway for burrs or damage. Repair as necessary. Be sure that oil pump drive shaft properly engages the appropriate slot on the pump end of the crankshaft.

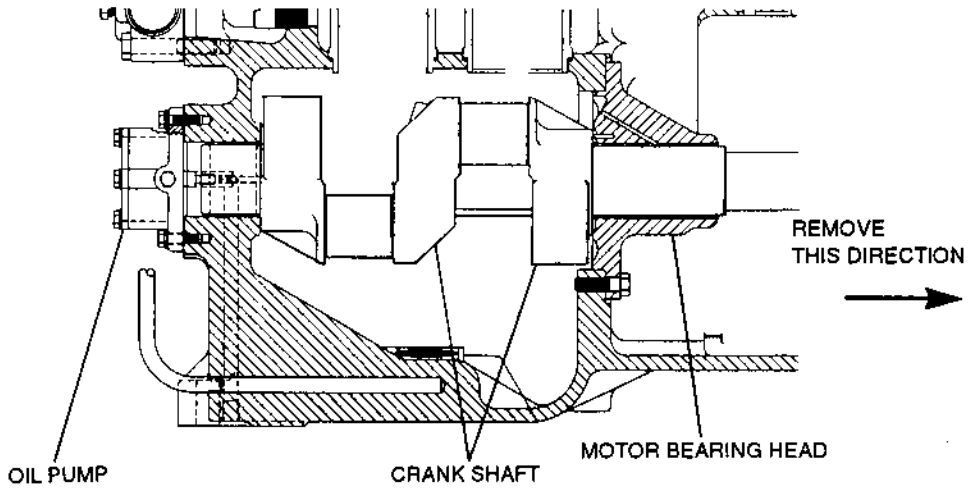


FIG. 39 - CRANKSHAFT REMOVAL

Pump End Bearing

To remove the pump end bearing, refer to Fig. 40 and proceed as follows:

1. Drain the compressor of oil. Remove crankcase cover plates, access covers, suction and discharge valve assemblies, pistons and connecting rods, motor cover, motor rotor and stator, motor bearing head, and crankshaft as previously detailed.
2. Remove the cap screws holding oil pump to compressor. Remove oil pump.
3. Using YORK Bearing Removal Tool (P/N 364-37260) as shown in Fig. 40, pull the old bearing from the compressor housing. Note that the back-up plate and the split plate must be installed as shown in Fig. 41, Detail A.
4. Apply clean oil to the outside surface of the new bearing and to the inside portion of the housing into which the bearing is going to be pressed.
5. Using the bearing removal tool as shown in Fig. 41, Detail B, pull the bearing into the compressor housing. Take care to ensure the bearing enters the compressor housings squarely. Continue to pull the bearing into the housing until the bearing is .08" to .14" below the inside end of the housing.
6. Re-install the oil pump using a new gasket. Be sure the gasket and oil pump are properly aligned with the oil passages on the compressor housing. Tighten the cap screws to the proper torque. (See page 6).

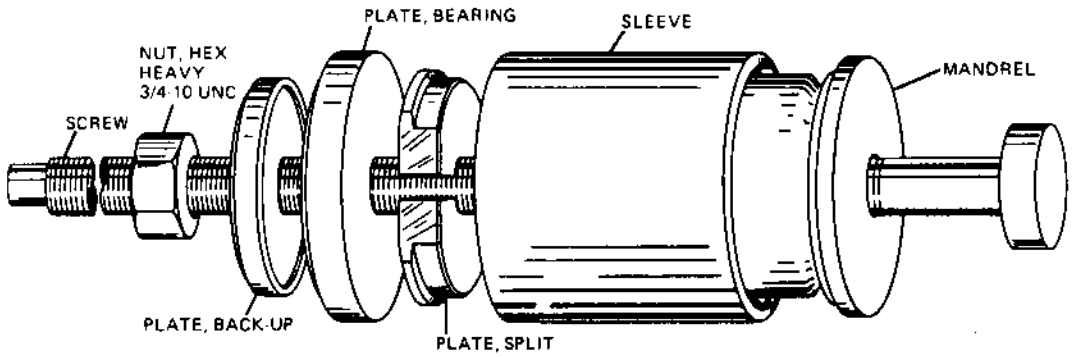
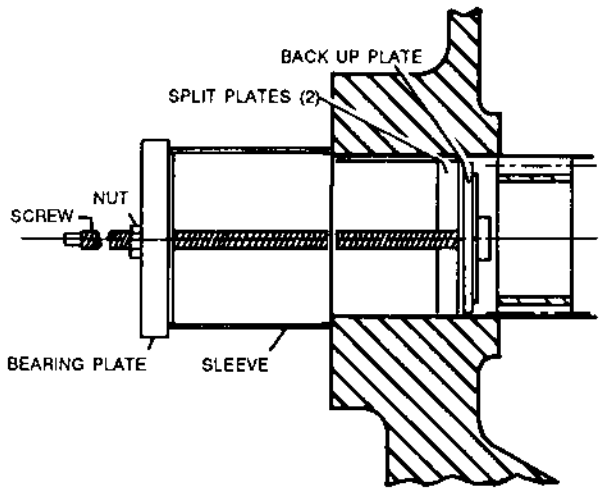
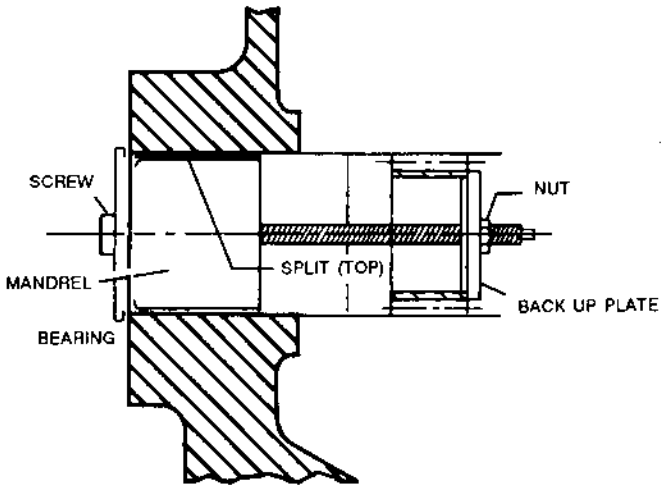


FIG. 40 - BEARING REMOVAL TOOL



DETAIL A - Pump End Bearing (Removal)



DETAIL B - Pump End Bearing (Installation)

FIG. 41 - PUMP END BEARING

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