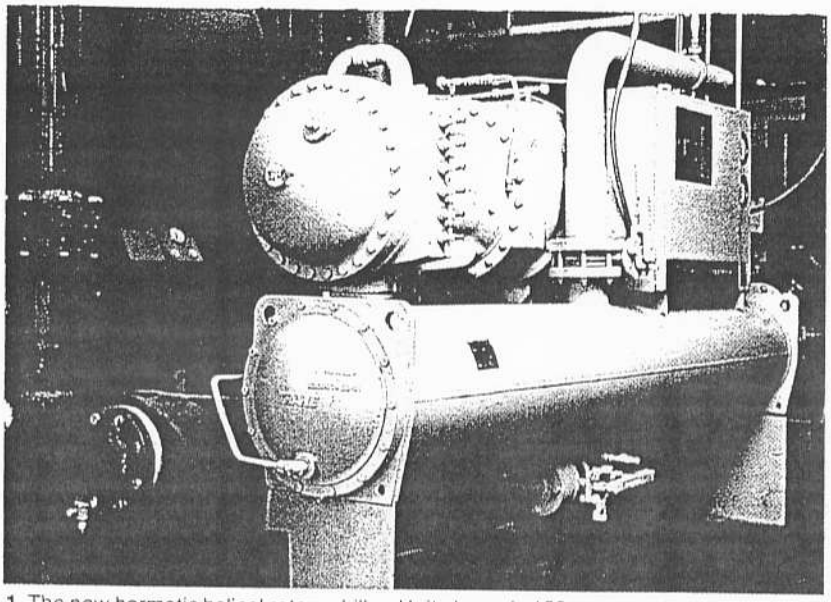
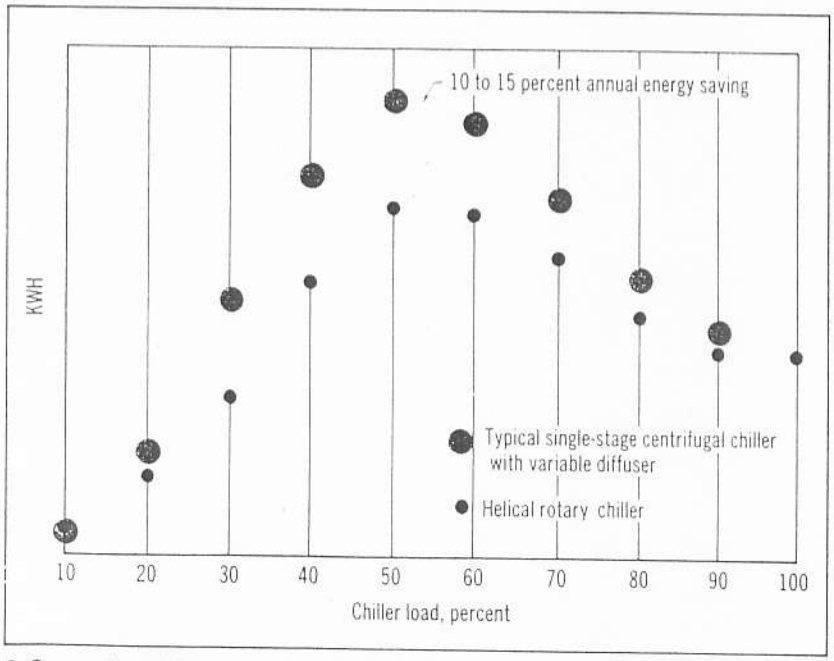
TRANE SCREWS

New technology and the helical rotary compressor

New helical rotary compressor optimized for air conditioning applications meets needs of both new construction and renovation projects



1 The new hermetic helical rotary chiller. Unit shown is 150 ton capacity with sizes ranging from 100 to 300 tons.



2 Comparison of helical rotary chiller and single-stage centrifugal chiller at part load.

By **FREDERICK BESELER,**
Marketing Communications,
Commercial Systems Group,
The Trane Company,
La Crosse, Wis.

Beautiful to behold, but what makes the sculptured steel rotors of the newest helical rotary compressor a technological breakthrough? And what does the compressor offer owners?

We believe the compressor and its new chiller series (Fig. 1) meet definite market needs for both new construction and renovation projects. Recent progress in computerized design, manufacturing, and coordinate measuring technology make it possible to bring to the market a simple, compact, highly reliable and efficient helical rotary compressor optimized for air conditioning applications.

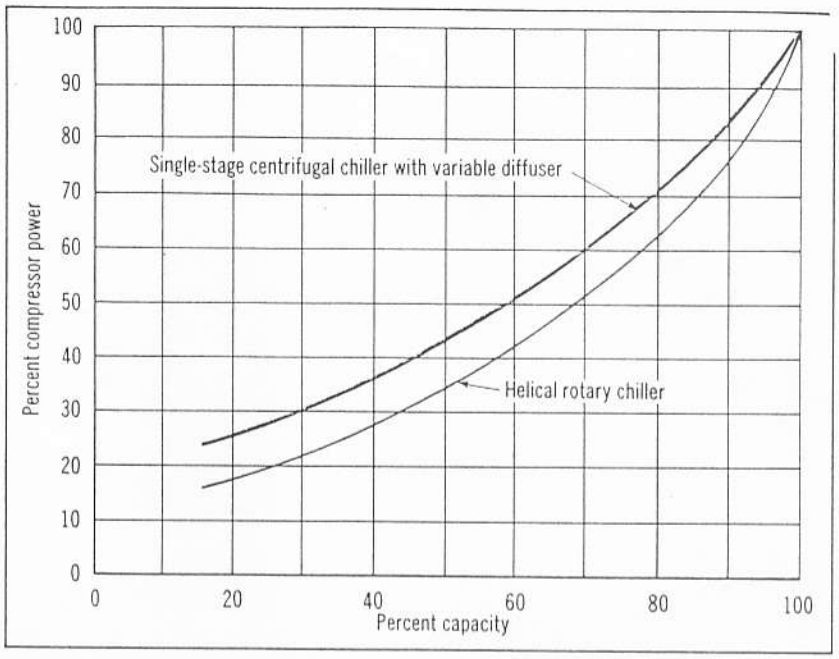
Efficiency of the latest generation of compressors is 10 to 20 percent greater than that of helical rotary designs that have been in use since the 1960s. Full load efficiency of these helical rotary compressors is equal to that of today's single stage centrifugals while part load efficiency has proven to be clearly superior (Fig. 2). Since chillers operate a majority of the time at part load, helical rotary chiller owners can realize substantial energy savings (Fig. 3).

The helical rotary compressor is not new, having been invented in 1878. The compressor developed slowly over the last 100 years, mainly because of its manufacturing complexity. Svenska Rotor Maskiner (SRM), a Swedish com-

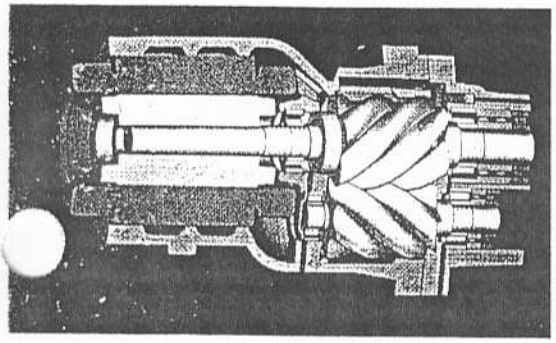
pany, has done a great deal of research and development with helical rotary compressors, particularly in air compressor applications, and owns many patents associated with the compressor. Its work began in the early 1900s.

Development work

We first considered the helical rotary compressor in 1946 when we commissioned an independent laboratory to do development work on the concept. The thinking at the time was that, theoretically, the machine could work well as a refrigerant compressor. To provide proper rotor sealing for acceptable efficiency, however, a very high precision machine tool would be required. Final machining of rotors and housings with the machine tools that did exist at that time was very difficult and labor intensive. Acceptable final fit, for reliability of rotor pairs, could only be achieved by hand lapping the parts. And efficiency of the compressor was not at all acceptable relative to centrifugal chillers. It should be noted, however, that some manufacturers were building helical rotary compressors primarily as replacements for reciprocating compressors.



3 Energy saving possible with helical rotary chiller vs. single-stage centrifugal chiller.



4 Powerful computer modeling allows optimized compressor design.

5 Accurately machined compressor rotors and drive motor.

As a result, we concluded that the helical rotary compressor was not yet efficient enough for air conditioning use nor economically manufacturable with the technology available in the late 1940s.

Enter the computer, CAD/CAM, and the coordinate measuring machine (CMM) technology of the 1980s.

Within the last five years, SRM developed computer software for generating what is known as the "D" profile for rotor lobes. Using this profile as a basis, we developed and refined software to optimize the compressor for air conditioning applications by increasing efficiency and enhancing reliability (Fig 4).

With powerful computer simulation, engineers can optimize rotor designs for virtually any specific air conditioning application and job site condition, with the knowledge that the design can be machined accurately and economically (Fig. 5).

The computer makes thorough, scientific analysis of rotor design possible. Granted, thousands of helical rotary compressors have been built since 1878. But only recently have designers been able to manipulate the many compressor design variables to optimize the compressor for air conditioning applications. These variables include:

- Rotor length to diameter ratio.
- Ratio of male to female lobes.
- Wrap angle of the lobes.
- Lobe profile.
- Intake and discharge port geometry.
- Unloading mechanisms.
- Oil injection for sealing and lubrication.
- Tip speed.
- Clearances.
- "Blow hole" area.
- Operating pressures and

temperatures.

Most previous designs were successful and did the job reasonably well, but now helical rotary compressor design is a precise operation giving the owner a much more efficient and reliable compressor.

The optimized rotor designs and compressor assemblies are buildable too. Only recently have ultra-high precision machine tools become available that can accurately and economically machine the rotors being designed for high efficiency.

The design and construction of the rotor housing is equally important for best efficiency and reliability. Very accurate machining is necessary to locate the rotors precisely relative to each other and the housing surfaces. Accurate machining provides 3 to 4 percent more efficiency compared to compressors that are only hand inspected for fit and clearance.

We use a Swiss built horizontal machining center considered the most accurate in the world. This machine can bore holes in a housing within a 0.0005 in. diameter target area. In comparison, the diameter of a human hair is about 0.003 in.

To assure that rotors and housings are machined according to specifications, the world's most accurate coordinate measuring machine (CMM), also Swiss built, is used. This machine is capable of linear measuring accuracies of under 0.00005 in. and volumetric measuring accuracies of under 0.0001 in. This capability confirms machine tool accuracy during production.

Both the machine tool and the CMM are located in a temperature and humidity controlled room. This room is equal to or better than such facilities found at aerospace manufacturers.

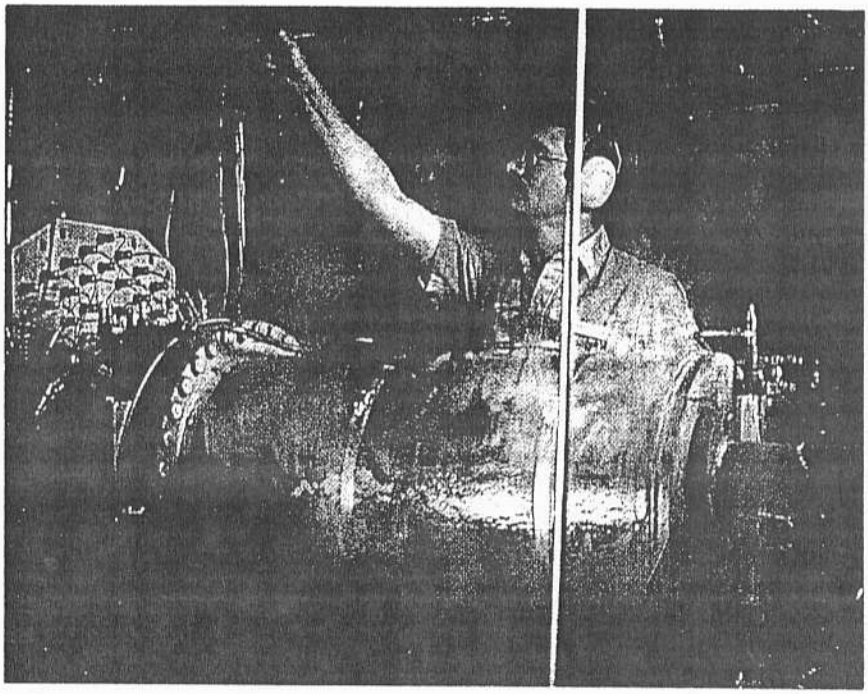
Computerized design, manufacturing, and measuring means helical rotary compressors can be built with the precise clearances necessary for high efficiency while maintaining reliability. Computers have solved the efficiency vs. reliability paradox. To achieve the efficiency levels necessary to meet market demands, rotor clearance must be close to minimize gas leakage in the compressor. Previously, these small clearances were unmanageable and could not be used since reliability would suffer, a result of undeveloped manufacturing and measuring capability. Thus, until now, efficiency was not optimized.

True mass production of helical rotary compressors is achieved by using such accurate machine tools. Until now, helical rotary compressors, especially the rotors, required careful hand fit and assembly. Now rotors can be machined exactly to drawing specifications with the assurance that the parts will fit correctly.

Owner benefits

Efficiency has been improved to meet market needs and has been proven to be superior to that of reciprocating and single stage centrifugal compressors.

Reliability is improved over earlier designs through precise machine work and manufacturing techniques. The new design has been tested for more than 22,000 hr in the laboratory and in actual job site conditions, proving to be very rugged and reliable (Fig. 6). Because it is a positive displacement compressor, the helical rotary compressor cannot encounter surge problems. The inherently smooth operation of the new design compressor generates very little noise. This makes equipment room placement and insulation less critical.



6 Rigorous testing has shown the new helical rotary compressor to be very rugged under extreme operating conditions. In this accelerated life test, ice forms on the suction line while paint on the compressor discharge begins to smoke.

The compact size of the helical rotary compressor has always been an advantage. Chillers up to 150 tons will fit through a standard 36 in. wide door. Larger chillers will easily fit through double width doors. Compact size makes these chillers especially attractive for replacement and renovation work.

Delivery of the new helical rotary compressors with the chillers will begin early this year. Ω

TRANE

General Service Bulletin

N°	L61 SB 003 E 0496
Date	APRIL. 1998
Product	RT/AA-AB-WA-UA-RA-XA
B.U	Europe Chiller Manufacturing
Page	1 OF 4
Prepared by	V.LOUVIOT
Supersedes	NOTHING

SUBJECT : HELICAL ROTARY COMPRESSORS INSULATION RESISTANCE TESTING

INTRODUCTION :

The purpose of this Service Bulletin is to discuss the use and interpretation of motor insulation resistance testing of semi-hermetic helical rotary compressors.

DISCUSSION :

Megger testing of helical rotary compressor motors can provide results which are subjective and may be misleading. Any one of the factors listed below can make a perfectly good compressor motor appear to have marginal insulation.

There are many factors that contribute to low megger readings which include :

- Type and amount of system contaminates (moisture, acid, dirt, etc).
- Condition of oil in the system.
- Cleanliness of the compressor terminal board, both inside and out.
- The amount of oil or refrigerant liquid in the compressor (high levels may cause the leads to be saturated and lower the reading).
- Condition of the terminal studs and insulators.
- Windings temperature (insulation resistance of most materials varies inversely with temperature).

(This bulletin is informational only and does not authorize any parts or labor)

RECOMMENDED PRACTICE :

Generally, a 500 volt DC megohm insulation tester is recommended for all resistance testing of helical rotary compressor motor windings. The use of a megger with a voltage output of more than 500 volts is not approved.

Compressor terminal board must be clean and dry before a megohm insulation test. To minimize the effect of the temperature the megger testing shoud be performed when the windings are at ambient temperature (compressor stopped for at least an hour).

High potential testing should not be conducted on motors in the field. High potential testing involves applying twice the motor rated voltage plus 1000 volts and then measuring the leakage to ground. This check is intended to verify integrity of windings during the assembly process. This test is not intended for field use and can be destructive to the motor.

The following information is intended to assist the field service technicians in determining if a motor is suitable for operation.

1. Any reading above 2 megohms is considered safe.

2. If a reading below 2 megohms is measured (leads removed), the compressor should be isolated and evacuated down to 0.5 mbar to insure complete dehydration. Brought back to atmospheric pressure with refrigerant and remegged.

3. If the meg reading does not improve to the point of being acceptable, the compressor terminal board will have to be removed and the motor remegged at the windings terminal studs (ambient air).

   Regardless of the result for point 2 and 3, an oil sample should be taken to determine if the moisture and acid content of the system could be the cause of the low reading. Filter dryers have to be installed and the oil should be changed. The compressor should then be remegged after the unit has been run for 24 hours (actual running time) to see if the megohm reading has risen. This may have to be done several times to clean out the system and bring the megohm reading up to an acceptable value.

4. If the meg reading is still not acceptable, the motor will have to be removed and replaced.

CAUTION :
DO NOT ATTEMPT TO MEASURE MOTOR INSULATION RESISTANCE ON A UNIT UNDER A VACUUM, THE UNIT MUST BE CHARGED WITH REFRIGERANT OR A NITROGEN HOLDING CHARGE, OR BE OPEN TO THE ATMOSPHERE BEFORE A MEGOHM INSULATION TEST CAN BE PERFORMED. MEGGING A MOTOR UNDER A DEEP VACUUM COULD RESULT IN A SPARK-OVER TO GROUND, EVEN WITH EXTREMELY LOW APPLIED VOLTAGE, WHICH CAN CAUSE CARBON TRACKING AND DAMAGE TO THE MOTOR WINDINGS. WHEN THIS OCCURS, REAPPLICATION OF NORMAL MOTOR VOLTAGES COULD CAUSE A LEAKAGE PATH TO GROUND WHICH COULD RESULT IN SEVERE MOTOR DAMAGE.

WARNING :
SINCE THE MOTOR ACTS LIKE A CAPACITOR WHEN VOLTAGE IS APPLIED, THE MOTOR WINDING TERMINAL STUDS SHOULD BE GROUNDED TO THE MOTOR FRAME AFTER TESTING HAS BEEN COMPLETED. THIS WILL DECREASE ANY RESIDUAL VOLTAGE IN THE MOTOR THAT COULD RESULT IN SEVERE ELECTRICAL SHOCK.

INSULATION RESISTANCE TEST REPORT

rev. 01

Report prepared by :	

GENERAL INFORMATION

Job name :	
Location :	Unit model :
Starter type :	Compressor model :
Order n° :	Unit serial n° :
Refrigerant :	Motor serial n° :

1st MEASURE

Date :	Time :

Insulation resistance readings :

P-W	Ground	4-5-6
1-2-3	MΩ	MΩ
Ground		MΩ

Y-Δ	1	2	3
Ground	MΩ	MΩ	MΩ
1		MΩ	MΩ
2			MΩ

Method - Instrument :

Condition for measuring insulation resistance : (refer to L61 SB 003 E)

Comp startup date :	Hours of operation :	Nbs of starts :

2nd MEASURE

Date :	Time :

Insulation resistance readings :

P-W	Ground	4-5-6
1-2-3	MΩ	MΩ
Ground		MΩ

Y-Δ	1	2	3
Ground	MΩ	MΩ	MΩ
1		MΩ	MΩ
2			MΩ

Method - Instrument :

Condition for measuring insulation resistance : (refer to L61 SB 003 E)

Comp startup date :	Hours of operation :	Nbs of starts :

3rd MEASURE

Date :	Time :

Insulation resistance readings :

P-W	Ground	4-5-6
1-2-3	MΩ	MΩ
Ground	[illegible]	MΩ

Y-Δ	1	2	3
Ground	MΩ	MΩ	MΩ
1	[illegible]	MΩ	MΩ
2	[illegible]	[illegible]	MΩ

Method - Instrument :

Condition for measuring insulation resistance : (refer to L61 SB 003 E)

Comp startup date :	Hours of operation :	Nbs of starts :

4th MEASURE

Date :	Time :

Insulation resistance readings :

P-W	Ground	4-5-6
1-2-3	MΩ	MΩ
Ground	[illegible]	MΩ

Y-Δ	1	2	3
Ground	MΩ	MΩ	MΩ
1	[illegible]	MΩ	MΩ
2	[illegible]	[illegible]	MΩ

Method - Instrument :

Condition for measuring insulation resistance : (refer to L61 SB 003 E)

Comp startup date :	Hours of operation :	Nbs of starts :

th MEASURE

Date :	Time :

Insulation resistance readings :

P-W	Ground	4-5-6
1-2-3	MΩ	MΩ
Ground	[illegible]	MΩ

Y-Δ	1	2	3
Ground	MΩ	MΩ	MΩ
1	[illegible]	MΩ	MΩ
2	[illegible]	[illegible]	MΩ

Method - Instrument :

Condition for measuring insulation resistance : (refer to L61 SB 003 E)

Comp startup date :	Hours of operation :	Nbs of starts :

TRANE

General Service Bulletin

N°	L61 SB 002 E 0398
Date	MARCH, 1998
Product	RT/AA-AB-WA-UA-RA
B.U	Europe Chiller Manufacturing
Page	1 OF 5
Prepared by	V.LOUVIOT
Supersedes	NOTHING

SUBJECT : CHHB UNLOADING PISTON REPLACEMENT PROCEDURE

INTRODUCTION :

The purpose of this bulletin is to provide information to replace the CHHB unloading piston.

DISCUSSION :

CHHB 70, 85 and 100 ton helical rotary compressors include modulating slide valves that vary the capacity of the compressor. The slide valve is operated by a piston assembly. The piston assembly is powered by oil pressure that is regulated by two normaly closed solenoid valves.
Following the Service Bulletin "Slide valve operation and troubleshooting" C20 SB 001, replacement of the piston may be required. To do so, follow the attached procedure.

PARTS REQUIRED :

Compressor type	Service First part number
CHHB 70	KIT 2583
CHHB 85	KIT 2584
CHHB 100	KIT 2585

(This bulletin is informational only and does not authorize any parts or labor)

REPLACEMENT PROCEDURE :

1. Reclaim the all* unit refrigerant charge with appropriate equipment (*only if you do not have compressor isolation valves).

CAUTION :
WHEN RECOVERINGG REFRIGERANT, CHILLED WATER SHOULD ALWAYS BE FLOWING THROUGH THE CHILLER

2. Disconnect all electrical power.
3. Unscrew discharge flange ① from compressor.
4. Unscrew the four compressor holding screws to slightly shift the compressor.
5. Purge oil (possibly under pressure) in loading system from Schrader valve ②.
6. Remove compressor discharge cover ③ to gain access to the slide valve piston on the opposite side.
7. Unscrew the nut ⑦ to free piston ⑤ from the slide valve shaft ⑥ (note : nut ⑦ is held by loctite glue. Do not apply excessive torque during this operation, as the slide valve is only guided by a key).
8. If the piston is blocked in the mid stroke position, gently push the slide valve shaft to the fully loaded position and extract the piston with a specially made tool as shown in fig. 2. If it is blocked in the fully loaded position, pull the piston/slide valve assembly towards the unloaded position by means of threaded end of the shaft (fig. 3).
9. Inspect cylinder condition and clean it.
10. Place the new piston assembly previously immersed in refrigeration oil (same as the oil used by concerned system) and screw nut ⑦ by using Loctite 243 (torque 45 Nm).
11. Place discharge cover ③ on compressor with a new gasket ④ covered with refrigeration oil. Torque applied on bolts 193 Nm.
12. Put the compressor in its original position, fix it on the frame with holding screws and connect the discharge flange to the compressor with a new O' ring ⑧.
13. Perform a pressure test.
14. Evacuate to 0.5 mbar.
15. Recharge the refrigerant and perform the leak test before starting the unit.
16. When the unit is operating, ensure that the slide valve operation is correct by forcing to load and unload the compressor.

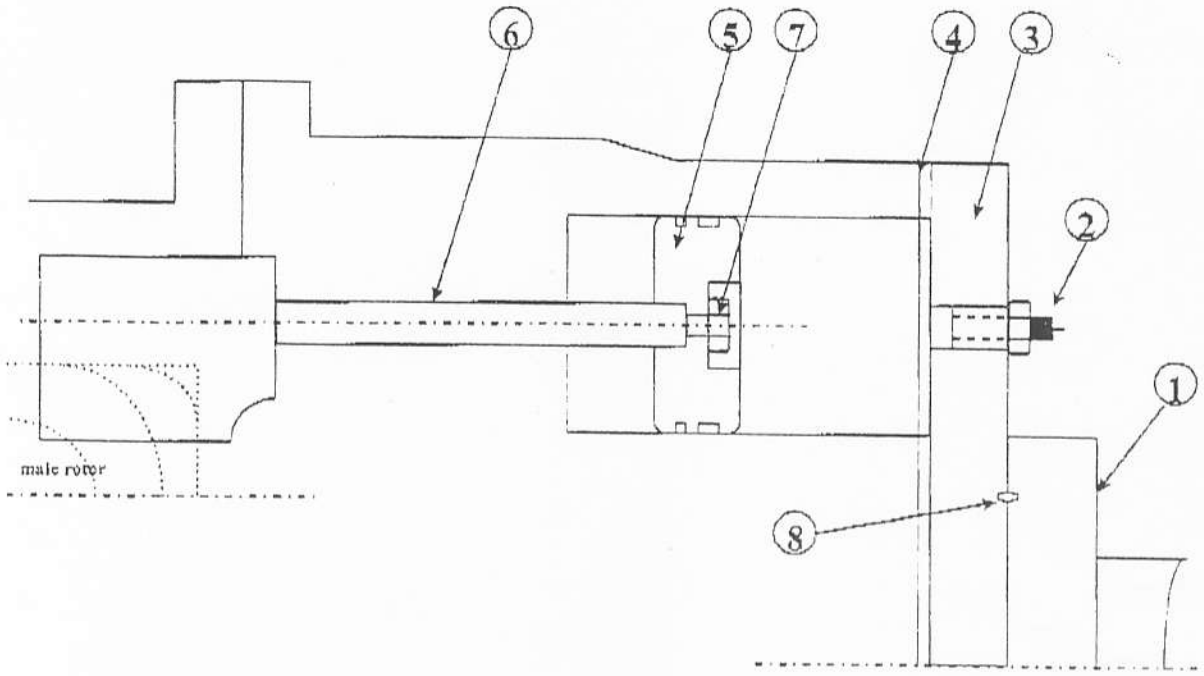


Fig 1 : GENERAL ASSEMBLY

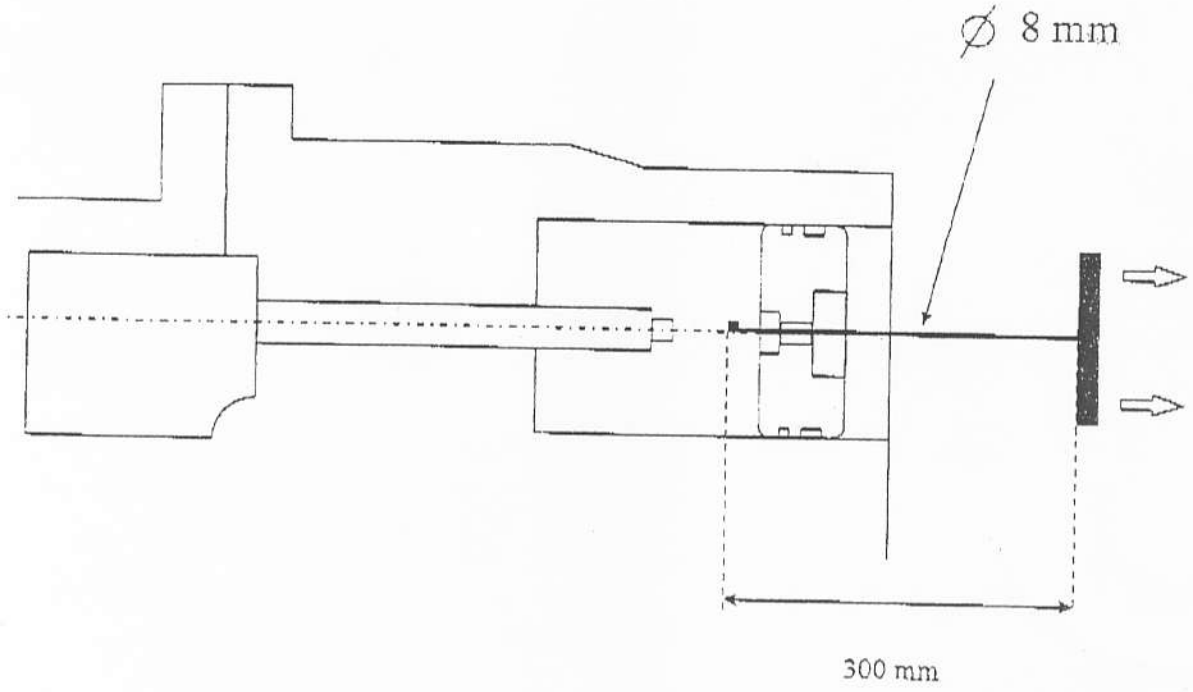
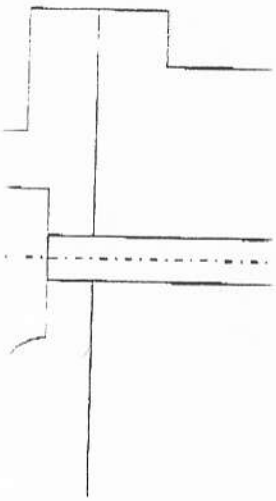
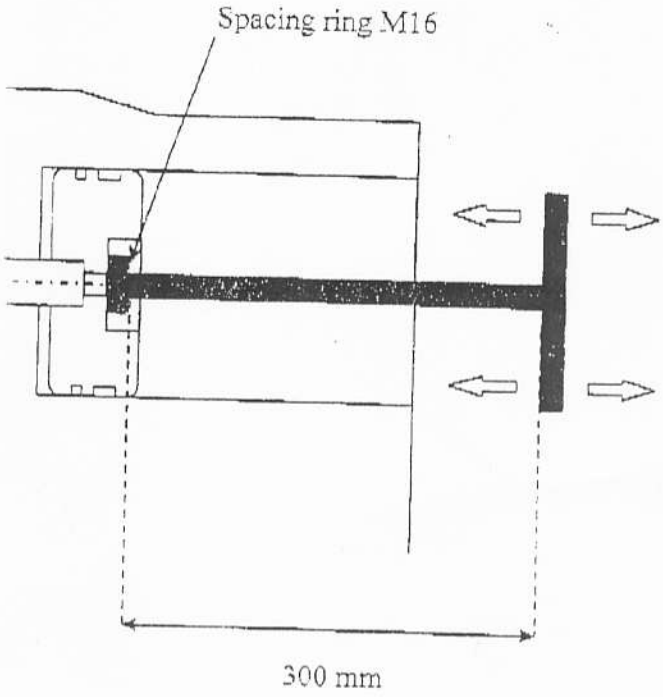


Fig 2 : HOW TO EXTRACT THE PISTON



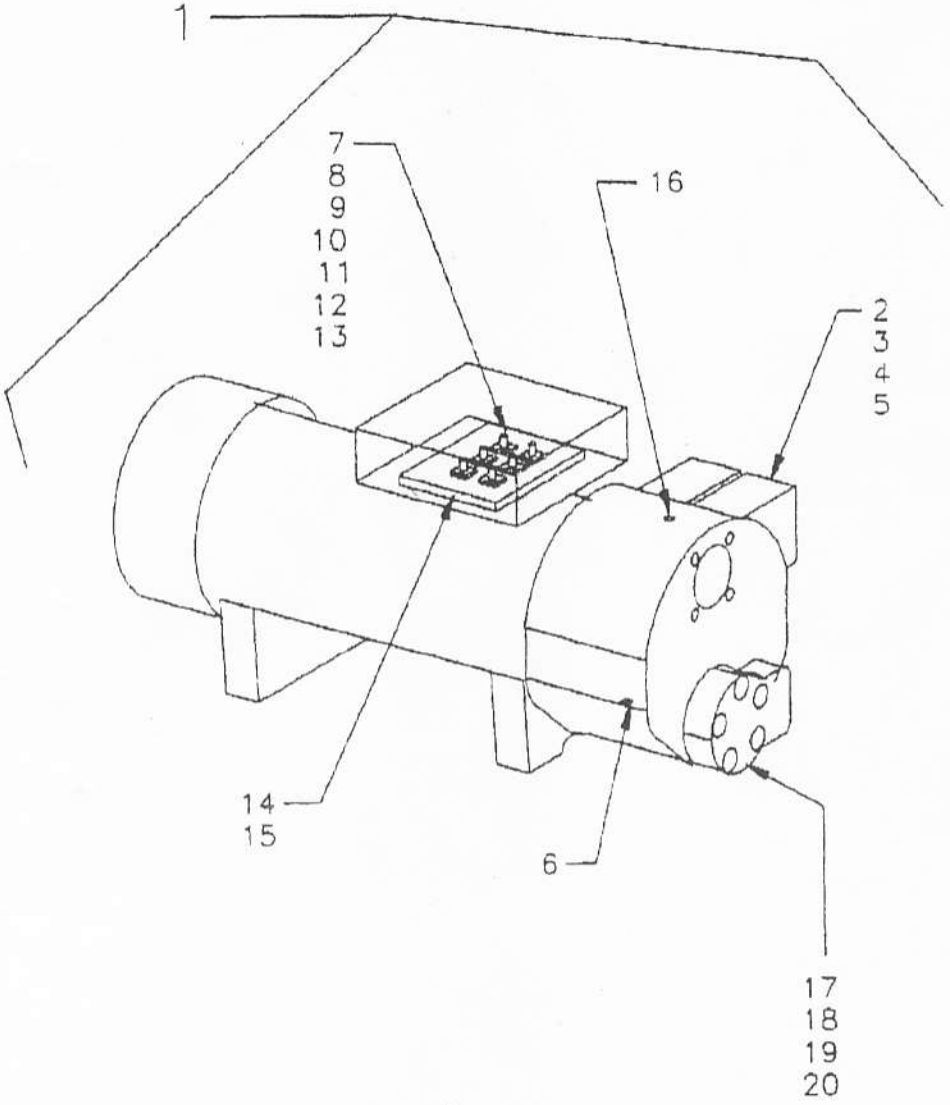


HOW TO MOV SLIDE VALVE

REPLACEMENT PARTS
Parts List Number: CHHNUP1
Model Number: CHHN040TKA0N50A

Compressor Assembly
Replaceable Components

75002164 REV A

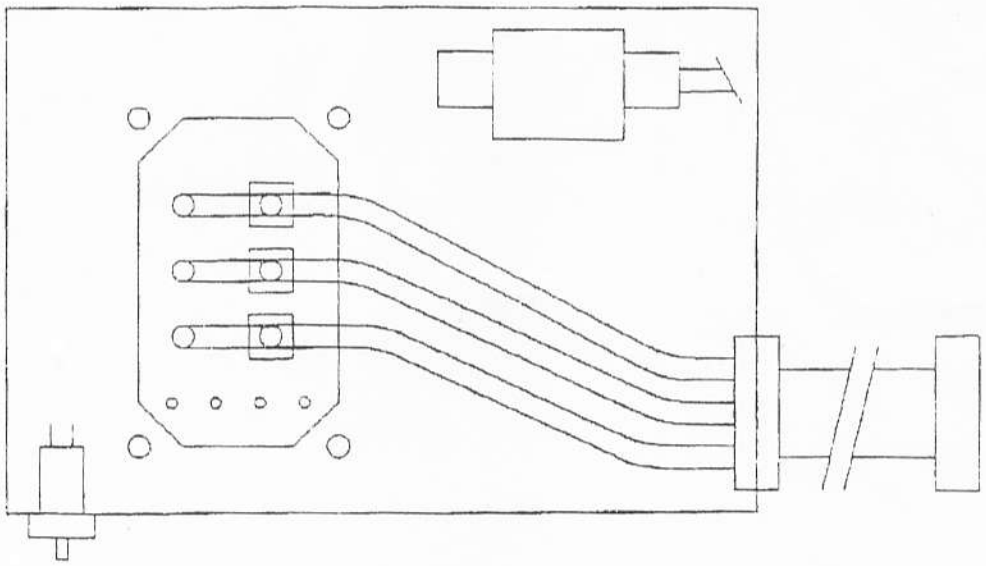


COMPRESSOR JUNCTION BOX
Parts List Number: CHHNUP1
Model Number: CHHN040TKA0N50A

Compressor Junction Box 75005748 REV A

X-Line

FOR COMPRESSOR JUNCTION BOX
REPLACEMENT PARTS SEE UNIT PARTS LIST.



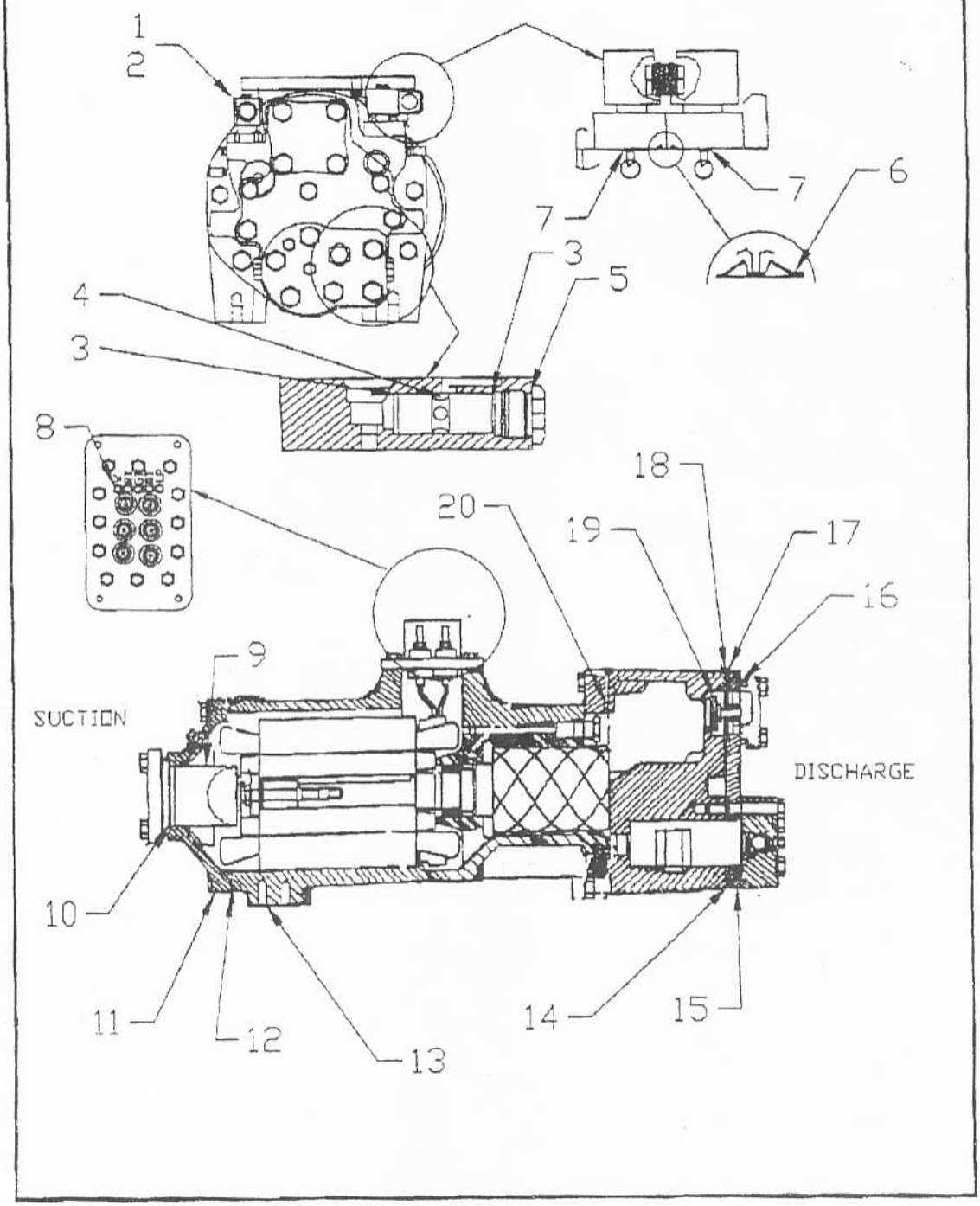
REPLACEMENT PARTS, Parts List Number CHHNUP1 Model Number CHHN040TKA0N5CA

	Ref #	Part Number	Description	Qty
1	*	BOX00602	BOX COMPRESSOR JUNCTION	1
2	*	COV02194	COVER COMPR JUNCTION BOX	1
3	*	SCR00900	SCREW M8 X 25MM CLASS 8.8 PLTD	4
4	*	SCR01255	SCREW 31-18 X .75	4
5	*	WAS00605	WASHER LOCK .38 ID	4
6	*	WAS00832	WASHER .44 ID X .88DSNPR	4
7	1	COM04292	COMPRESSOR 380 / 415 / 50 / 3 40 HP	1
8	2	VAL02843	VALVE,SOLENOID 1/4 NPTE, MALE UNLOADER	2
9	3	COL04723	COIL,SOLENOID VALVE 120V / 60 - 110V / 50 HZ	2
10	4	SCR00933	SCREW M6 X 35MM	8
11	5	GKT03002	GASKET SOLENOID VALVE	4
12	6	HTR02047	HEATER ELECTRIC 150 W 120V	1
13	7	KIT03909	KIT,INSULATOR RETROFIT FOR G.P. COMPRESSORS	1
14	8	RNG01401	O-RING .674ID X .103 RD	6
15	9	RNG01400	O-RING .362 ID X .103 RD	6
16	10	INS00200	INSULATION, EXTERNAL MOLDED PLASTIC	6
17	11	WAS00145	WASHER,FLAT,PLAIN,.40 ID X .81 OD X .65 THK, CARBON STL PLTD	6
18	12	NUT00079	NUT .38 - 16	6
19	13	STU00068	STUD TERMINAL "R" COMPRESSOR	6
20	14	PLT02084	PLATE TERMINAL	1
21	15	GKT03038	GASKET TERMINAL PLATE	1
22	16	ORF00980	ORFICE, OIL .030 DIA	1
23	17	FLR01353	FILTER,OIL,2.75OD X 6.35, 35-60T COMPR,INCLUDES GKT3057	1
24	18	GKT03057	GASKET FILTER COVER	1
25	19	WAS00826	WASHER,FLAT BRASS	1
26	20	COV02323	COVER, OIL FILTER CHHN	1

INTERNAL COMPRESSOR PARTS
Parts List Number: CHHNJP1
Model Number: CHHN040TKA0N50A

COMPRESSOR ASSEMBLY

75004833 REV B

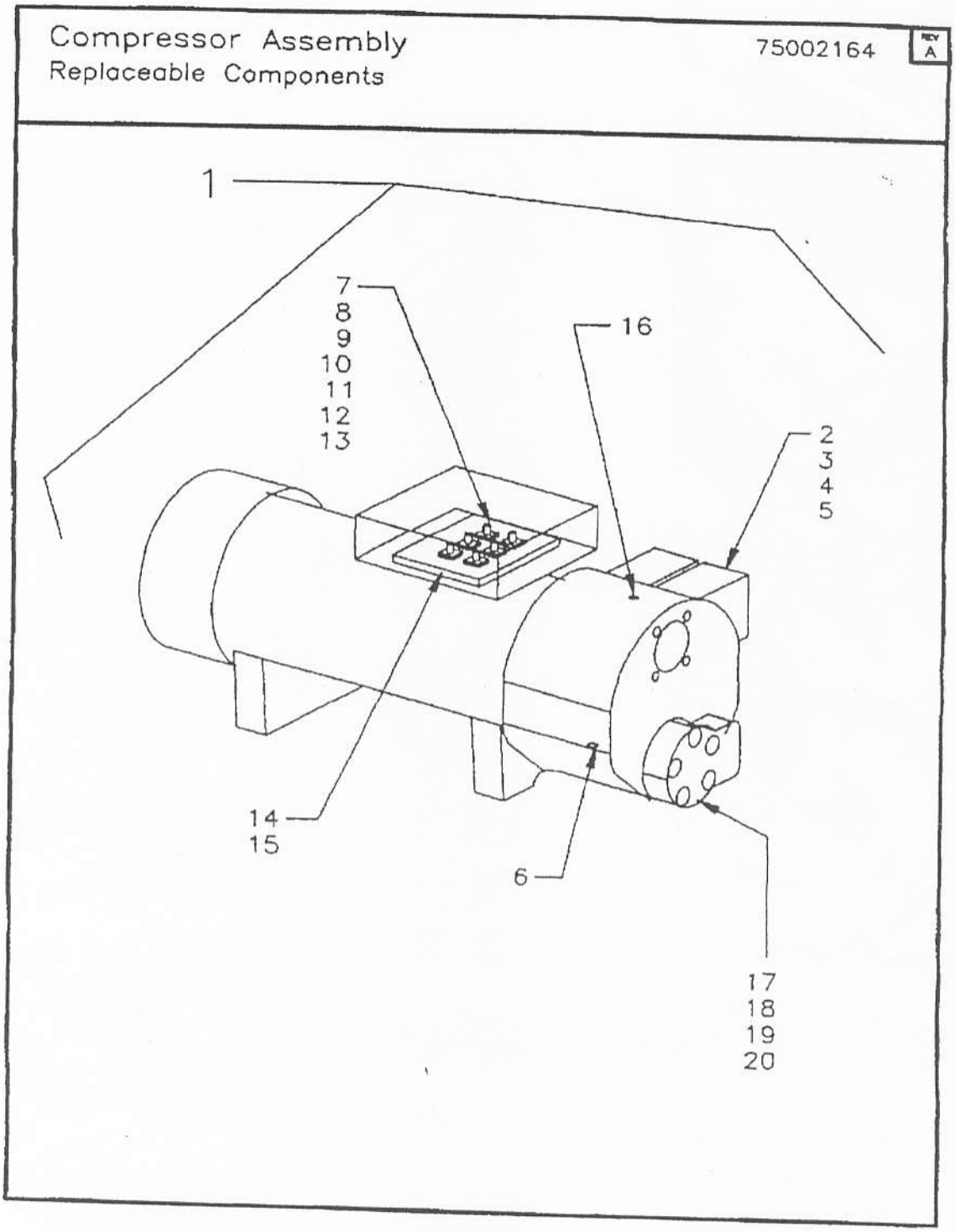


INTERNAL COMPRESSOR PARTS , Parts List # CHHNUP1

	Ref#	Part Number	Description	Qty
1	*	ADP00372	ADAPTER,.63 OD TUBE FOR OIL LINE CONNECTION,INCLUDES RINGS	1
2	*	COV02603	COVER SUCTION 35 / 40 TON CHHN (FACE)	1
3	*	KIT05249	KIT,GP COMPRESSOR REPLACEMENT (CHHN)	1
4	*	OIL00031	OIL COMPRESSOR, 300 SUS 1 GAL CONTAINER MINIMUM ORDER	AR
5	1	RNG01397	O-RING .364 ID X .070 RD	3
6	2	VAL05022	VALVE,SOLENOID 3 WAY 120 V FEMALE UNLOAD 120 V	1
7	3	RNG01399	O-RING 1.051 ID X .070 RD	2
8	4	VAL05018	VALVE, OIL CONTROL 1.000 D X 1.18 OD X 2.9 LG	1
9	5	RNG01441	O-RING 1.171 IUD X .116 RD	1
10	6	GKT01612	GASKET , SOLENOID VALVE 2.00 OD X .031 THICK	4
11	7	FLR01650	FILTER,PERMANENT .080 / .100T X .31 DIA BRONZE	2
12	8	TERE00008	TERMINAL, HERMETIC .035 X .25 W	4
13	9	SRA00064	STRAINER, SUCTION GAS	1
14	10	GKT02704	GASKET, SERVICE VALVE, NON ASBESTOS 3.22 OD X 2.53 ID R-123	1
15	11	COV02594	COVER , SUCTION 50 / 60 TON CHHN	1
16	12	GKT03271	GASKET, SUCTION COVER	1
17	13	RNG01484	O-RING, .644 ID X .087 RD , UNIFOREM SIZE # 909	3
18	14	PLT02831	PLATYE DISCHARGE	1
19	15	COV02604	COVER, DISCHARGE PLATE	1
20	16	GKT02704	GASKET, SERVICE VALVE NON ASBESTOS 3.22 OD X 2.53 ID R-123	1
21	17	GKT03269	GASKET COVER PLATE , DISCHARGE	1
22	18	GKT03270	GASKET, BEARING HOUSING PLATE	1
23	19	VVAL05769	VALVE, CHECK, DISCHARGE GAS	1
24	20	RNG01436	O-RING 9.475 X .210 RD	1

FOR MODEL NUMBER CHHN040TKA0N50A

REPLACEMENT PARTS
Parts List Number: CHHNUP1
Model Number: CHHN060AKA0N069A



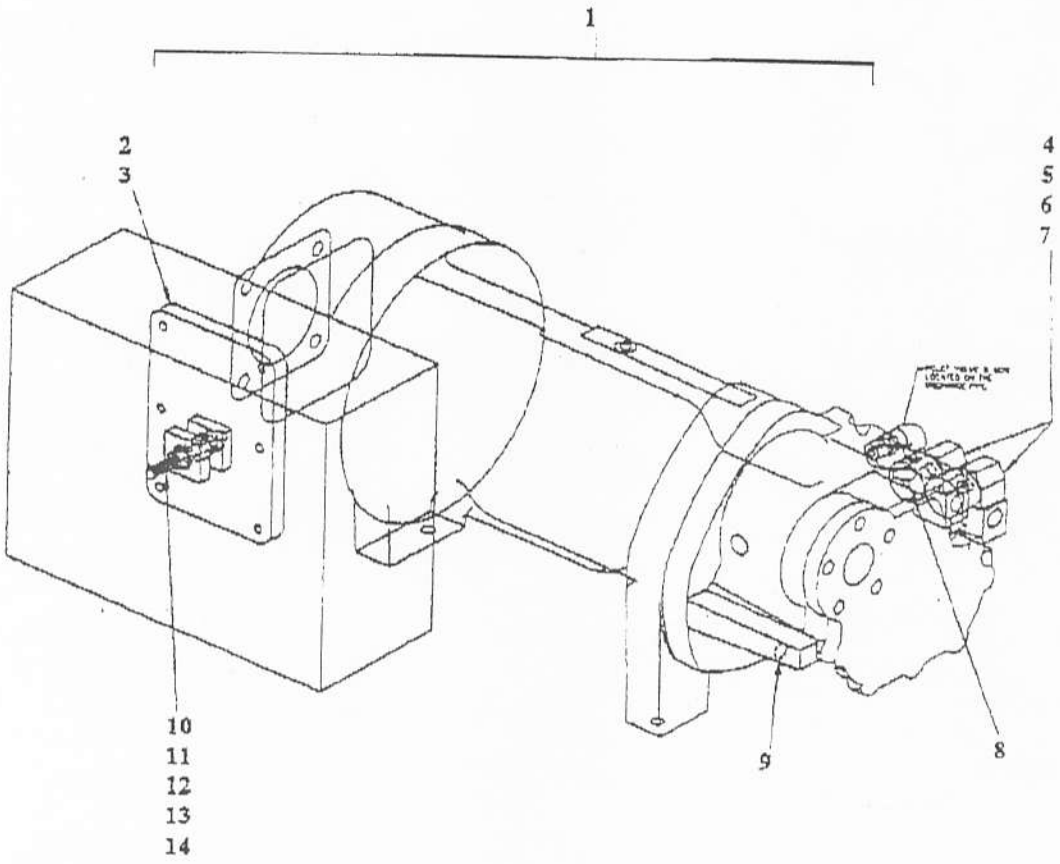
REPLACEMENT PARTS MODEL # CHHN 060 AKA 0N0 69A

	Ref #	Part Number	Description	Qty
1	*	GKT 2704	GASKET,SERVICE VALVE, NON ASBESTOS	1
2	*	GKT 2706	GASKET, SERVICE VALVE, NON ASBESTOS	1
3	*	OIL 00031	OIL-COMPRESSOR (RTHA) LOW TEMP AIR/PROCESS, ICE MAKING OPT, 300 SUS	AR
4	*	RNG 1397	O-RING .304 ID X .070 RD	3
5	*	SRA 0037	STRAINER,SUCTION GAS MODEL "R" 3.50 OD X 3.90 LONG	1
6	*	VAL 5022	VALVE, SOLENOID - 3 WAY, 120 V FEMALE UNLOAD	1
7	1	COM 4300	COMPRESSOR, 200 / 60 / 3 60 HP	1
8	2	VAL 2483	VALVE SOLENOID 1/4 NPTF	2
9	3	COL 4723	COIL, SOLENOID VALVE 120V / 60 - 110 / 50	2
10	4	SCR 0933	SCREW,M6 X 35 MM	8
11	5	GKT 3002	GASKET, SOLENOID VALVE	4
12	6	HTR 2047	HEATER. ELECTRIC 150 W 120 V	1
13	7	INS 0199	INSUTATOR, INTERNAL, MOLDED PLASTIC	6
14	8	RNG 1401	O-RING, .674 ID X .103 RD	6
15	9	RNG 1400	O-RING .362 ID X .103 RD	6
16	10	INS 0200	INSULATOR, EXTERNAL MOLDED PLASTIC	6
17	11	WAS 0145	WASHER,FLAT,PLAIN .40 ID X .81 OD , .065 THICK, CARBON STEEL PLATED	6
18	12	NUT 0079	NUT .3/8 - 16	6
19	13	STU 0068	STUD,TERMINAL "R" COMPRESSOR	6
20	14	PLT 2084	PLATE,TERMINAL	1
21	15	GKT 3038	GASKET,TERMINAL PLATE	1
22	16	ORF 0979	ORFICE, OIL .040 DIA	1
23	17	FLR 1353	FILTER,OIL 2.75 OD X 6.35 (35 - 60T COMPRESSOR) INCLUDES GKT 3057	1
24	18	GKT 3057	GASKET,FILTER COVER	1
25	19	WAS 0826	WASHER,FLAT BRASS	1
26	20	COV 2323	COVER,OIL FILTER (CHHN)	1

COMPRESSOR ASSEMBLY
Parts List Number: CHHBUP1
Model Number: CHHB100**G0A

COMPRESSOR ASSEMBLY

RTAA114



* NOT ILLUSTRATED

REPLACEMENT PARTS FOR CHHB 085 TNB 0N1 02A N

	Ref #	Part Number	Description	Qty
1	*	KIT 2131	KIT SLIDE VALVE REPAIR (85 - 100T)	1
2	*	KIT 2309	KIT,-REPAIR, CHECK VALVE INSIDE COMPRESSOR (85 - 100T)	1
3	*	OIL 0031	OIL CO MPRESSOR (RTHA) LOW TEMP AIR/PROCESS ICE MAKING OPT (300 SUS)	AR
4	*	SRA 0149	STRAINER,SUCTION GAS 4.50 OD X 4.00 LONG	1
5	1	COM 3130	COMPRESSOR 85 TON 460 VOLT INTERMEDIATE	1
6	2	PLT 1699	PLATE TERMINAL	1
7	3	GKT 1616	GASKET,TERMINAL PLATE	1
8	4	SCR 0933	SCREW, M6 X 35 MM	1
9	5	VAL 2843	VALVE SOLENOID 1/4 NPTE	1
10	6	GKT 1612	GASKET, SOLENOID VALVE 2.00 OD X .031 THICK	1
11	7	COL 4723	COIL,SOLENOID VALVE 120 / 60 - 110/ 50 HZ	2
12	8	ORF 0755	ORFICE	1
13	9	HTR 2047	HEATER ELECTRIC 150 W 120 V	2
14	10	INS 0288	INSULATOR TERMINAL STUD	6
15	11	SEL O412	SEAL, TERMINAL STUD	6
16	12	TER 0010	TERMINAL, STUD (E COMPRESSOR)	6
17	13	WAS 0101	WASHER,PLAIN, FLATY .50 ID X 1.00 OD , 1.25 THICK,CARBON STEEL, PLATED	6
18	14	NUT 0082	NUT,LOCK, HEX .50 - 13	6

FROM PARTS LIST # RTAA UP1B

REPLACEMENT PARTS FOR CHHB 100 TNB 0N1 119A N

	Ref #	Part Number	Description	Qty
1	*	KIT 2309	KIT,-REPAIR, CHECK VALVE INSIDE COMPRESSOR (85 - 100T)	1
2	*	OIL 0031	OIL CO MPRESSOR (RTHA) LOW TEMP AIR/PROCESS ICE MAKING OPT (300 SUS)	AR
3	*	SRA 0149	STRAINER,SUCTION GAS 4.50 OD X 4.00 LONG	1
4	1	COM 3131	COMPRESSOR, 100TON 460 VOLT INTERMEDIATE	1
5	2	PLT 1699	PLATE TERMINAL	1
6	3	GKT 1616	GASKET,TERMINAL PLATE	1
7	4	SCR 0933	SCREW, M6 X 35 MM	1
8	5	VAL 2843	VALVE SOLENOID 1/4 NPTE	1
9	6	GKT 1612	GASKET, SOLENOID VALVE 2.00 OD X .031 THICK	1
10	7	COL 4723	COIL,SOLENOID VALVE 120 / 60 - 110/ 50 HZ	2
11	8	ORF 0755	ORFICE	1
12	9	HTR 2047	HEATER ELECTRIC 150 W 120 V	2
13	10	INS 0288	INSULATOR TERMINAL STUD	6
14	11	SEL O412	SEAL, TERMINAL STUD	6
15	12	TER 0010	TERMINAL, STUD (E COMPRESSOR)	6
16	13	WAS 0101	WASHER,PLAIN, FLATY .50 ID X 1.00 OD , 1.25 THICK,CARBON STEEL, PLATED	6
17	14	NUT 0082	NUT,LOCK, HEX .50 - 13	6

FROM PARTS LIST # RTAA UP1B

REPLACEMENT PARTS FOR CHHB 100 TNB 0N1 119A N

	Ref #	Part Number	Description	Qty
1	*	GKT 02718	GASKET, .06 THICK X 5.12 OD X 4.38 ID (R123 COMPATIBLE LAKJK	1
2	*	KIT 02131	KIT,SLIDE VALVE REPAIR (85 - 100T)	1
3	*	KIT 2309	KIT,-REPAIR, CHECK VALVE INSIDE COMPRESSOR (85 - 100T)	1
4	*	OIL 0031	OIL CO MPRESSOR (RTHA) LOW TEMP AIR/PROCESS ICE MAKING OPT (300 SUS)	AR
5	*	SRA 0149	STRAINER,SUCTION GAS 4.50 OD X 4.00 LONG	1
6	2	PLT 1699	PLATE TERMINAL	1
7	3	GKT 1616	GASKET,TERMINAL PLATE	1
8	4	SCR 0933	SCREW, M6 X 35 MM	1
9	5	VAL 2843	VALVE SOLENOID 1/4 NPTE	1
10	6	GKT 1612	GASKET, SOLENOID VALVE 2.00 OD X .031 THICK	1
11	7	COL 4723	COIL,SOLENOID VALVE 120 / 60 - 110/ 50 HZ	2
12	8	ORF 0755	ORFICE	1
13	9	HTR 2047	HEATER ELECTRIC 150 W 120 V	2
14	10	INS 0288	INSULATOR TERMINAL STUD	6
15	11	SEL O412	SEAL, TERMINAL STUD	6
16	12	TER 0010	TERMINAL, STUD (E COMPRESSOR)	6
17	13	WAS 0101	WASHER,PLAIN, FLATY .50 ID X 1.00 OD , 1.25 THICK,CARBON STEEL, PLATED	6
18	14	NUT 0082	NUT,LOCK, HEX .50 - 13	6

FROM PARTS LIST # CHHB UP1

COMPRESSOR ASSEMBLY
Parts List Number: CHHAUP2
Model Number: CHHA170NA1CN14G

COMPRESSOR ASSEMBLY

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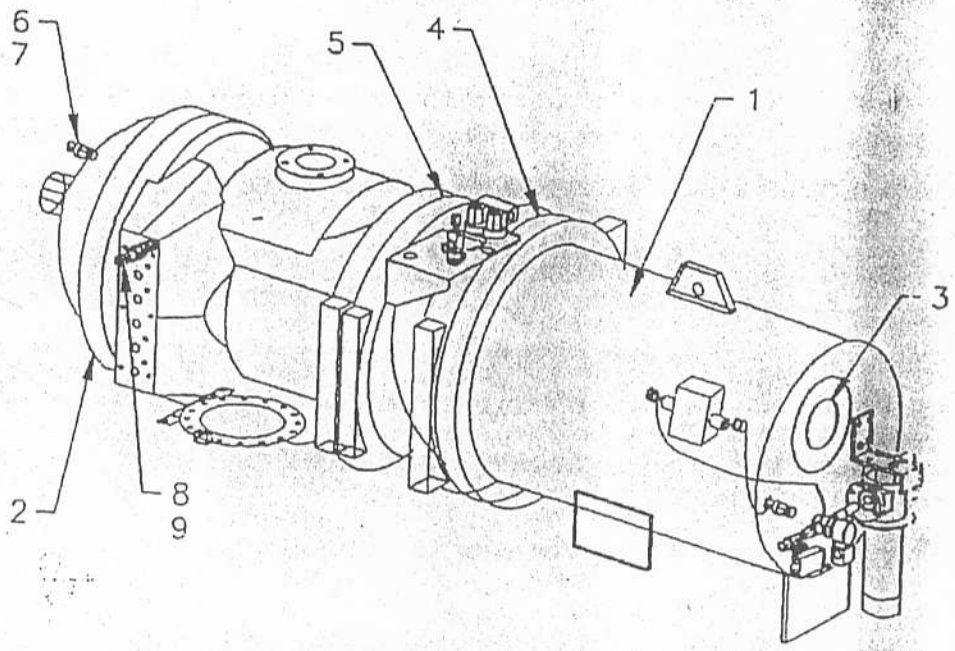

* NOT ILLUSTRATED

COMPRESSOR COMPONENTS
Parts List Number: CHHAUP2
Model Number: CHHA170NA1CN14G

COMPRESSOR COMPONENTS

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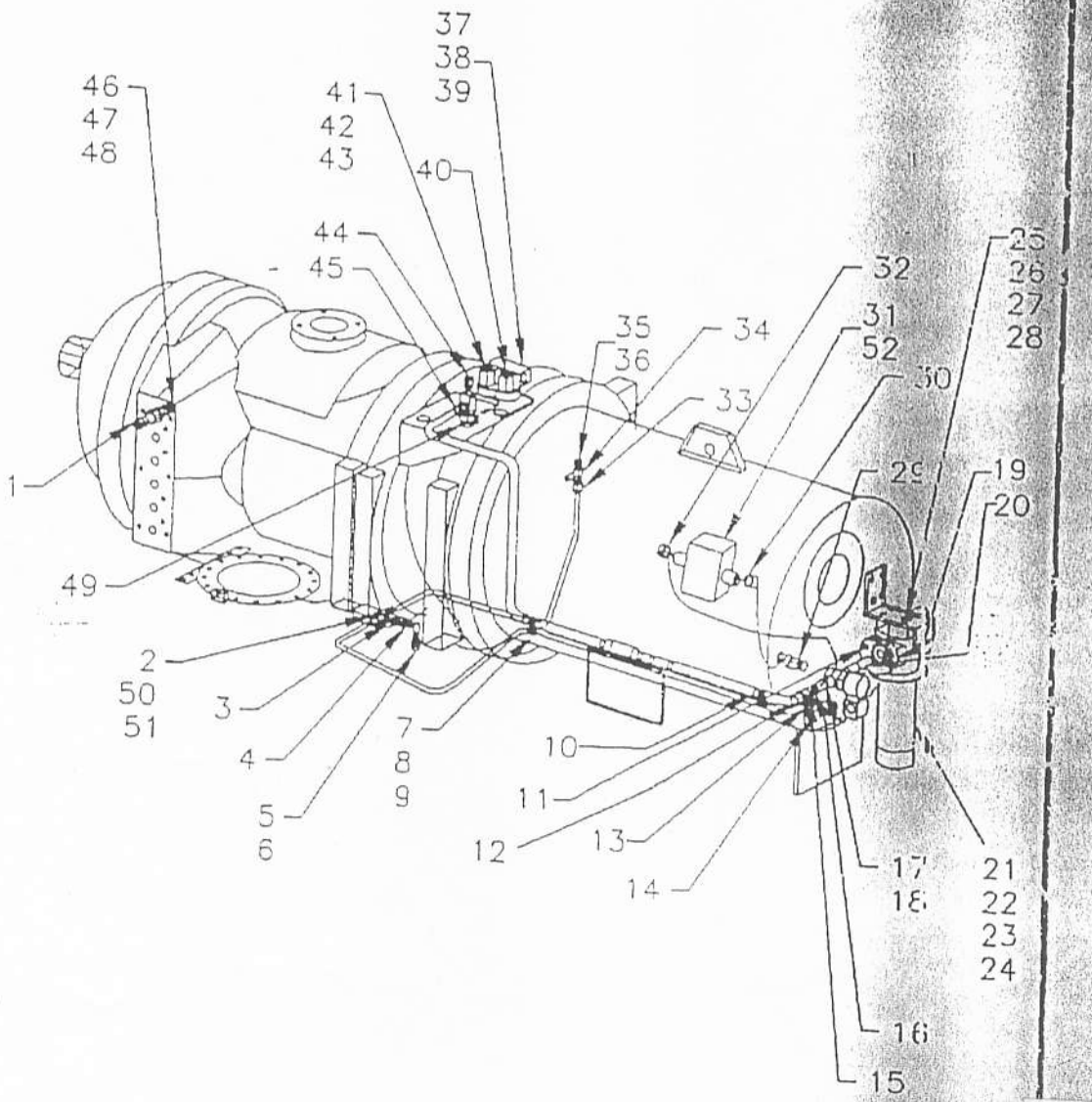

COMPRESSOR PARTS LIST FOR CHHA 170 TON

	Ref #	Part Number	Description	Qty
1	*	KIT 1349	KIT, COMPRESSOR CHANGE OUT GASKET O-RING RTHA180/215	1
2	*	KIT 2208	KIT,MOTOR TEMPERATURE SENSOR REPAIR	1
3			REQUIRES GKT 1642(FOR 130-215t) (GKT 1653 FOR 255-300t)	
4	*	OIL 0031	OIL, COMPRESSOR (RTHA) LOW TEMP AIR/PROCESS , ICE MAKING	
5			OPTION, 300 SSU 1 GAL CONTAINERS (6 PER CASE)	AR
6	2	GKT 1642	GASKET, MOTOR COVER	1
7	3	RNG 1423	O - RING 4.725 ID X .210 RD	2
8	4	RNG 1431	O - RING 20.455 ID X .275 RD	1
9	5	RNG 1428	O - RING 19.455 ID X .275 RD	1
10	6	VAL 0087	VALVE, REFRIGERANT 1/2 NPT X 1/2 FLARE	1
11	7	CAP 0220	CAP .50 FFL	AR
12	8	TER 0317	TERMINAL, MOTOR	6
13	9	GKT 2792	GASKET, .05 THICK X 1.38 OD (GASKET FOR TER 0317)	6

COMPRESSOR PARTS LIST FOR CHHA 170 TON

	Ref #	Part Number	Description	Qty
1	1	TER 0008	TERMINAL, HERMETIC .035 X .25W	4
2	2	TEE 0176	TEE, .50 FFL X .50 MFL X .50 MFL	1
3	3	FTG 0070	FITTING .50FFL X .50 FFL	1
4	4	BUS 0418	BUSHING- REDUCER .50MFL X .25FFL	4
5	5	VAL 0015	VALVE, 1/4 NPRE X 1/4 FLARE	1
6	6	ORF 0612	ORFICE, OIL	1
7	7	CMP 0293	CLAMP	2
8	8	SCR 1205	SCREW M8 X 20MM	2
9	9	WAS 0608	WASHER, 8MM ID X 14.8 MM OD	2
10	10	CMP 0260	CLAMP, TUBE DISCHARGE LINE	2
11	11	SCR 0267	SCREW HEX HEAD (1/2-12 X 1 1/4)	2
12	12	NUT 0571	NUT 1/2 OD	2
13	13	NUT 0049	NUT 1/ OD FLARE	1
14	14	HTR 1619	HEATER, OIL COMPRESSOR	2
15	15	VAL 3337	VALVE, CHECK .62 OD X .62 MFL	1
16	16	VAL 1483	VALVE, REFRIGERANT STEM ADAPTER .25 ODF	1
17	17	VAL 2771	VALVE SOLENOID	1
18	18	COL 4538	COIL,SOLENOID VALVE	1
19	19	RNG 1403	O-RING 1.859 ID X .139 RD	1
20	20	TUB 5352	TUBE, SOLENOID CHECK VALVE ASSY	1
21	21	FLR 0797	OIL FILTER ASSEMBLY,REPLACEABLE ELEMENT	1
22	22	FLR 0779	OIL FILTER ELEMENT ,(REQUIRES RNG 0006)	1
23	23	RNG 1410	O - RING 3.859 ID X .139 RD	1
24	24	IND 0025	INDICATOR, DIFFERENTIAL PRESSURE (REQUIRI	1
25	25	SUP 0948	SUPPORT OIL FILTER	1
26	26	SCR 0627	SCREW HEX HEAD (1/2 - 12 X 1 1/4)	AR
27	27	SCR 0930	SCREW M10 X 30MM	4
28	28	WAS 0617	WASHER 10MM ID X 30MM OD	4
29	29	VAL 0015	VALVE 1/4 NPTE X 1/4 FLARE	1
30	30	COL 7181	COIL - DP CONNECTOR , SHORT	1
31	31	CNT 1303	CONTROL, OIL DIFFERENTIAL PRESSURE	1
32	32	COL 7180	COIL-DP CONNECTOR LONG	1
33	33	NUT 0049	NUT, 1/2 OD FLARE	AR
34	34	BUS 0418	BUSHING-REDUCER .50 MFL X .25 FFL	1
35	35	VAL 0979	VALVE,OIL DRAIN, 1/4 NPTE X 1/4 FFL	1
36	36	ORF 0415	ORFICE, OIL	1
37	37	VAL 2843	VALVE, SOLENOID 1/4 NPTE	2
38	38	GKT 1612	GASKET, SOLENOID VALVE 2.00 OD X .031 THICK	2
39	39	COL 4723	COIL-SOLENOID VALVE 120V 60 - 110V 50 HZ	2
40	40	SCR 0933	SCREW M6 X 35MM	AR
41	41	NUT 0020	NUT, LOCK, CONDUIT .50 NCM	2
42	42	NIP 0025	NIPPLE. .50 NPS X 1.12 LONG	1
43	43	RNG 0178	O - RING , SEALIMG 1.16 OD X .18W	1
44	44	VAL 3338	VALVE, ANGLE RECEIVER	1
45	45	NUT 0571	NUT 1/2 OD	AR
46	46	NUT 0020	NUT, LOCK, CONDUIT .50 NOM	4
47	47	NIP 0025	NIPPLE, .50 NPS X 1 1/2 LONG	4
48	48	RNG 0178	O - RING, SEALING 1.16 OD X .18 W	4
49	49	SEL 0470	SEAL, .062 THICK X 1.00 OD	4
50	50	NUT 0049	NUT 1/2 OD FLARE	AR
51	51	NUT 0049	NUT 1/2 OD FLARE	AR
52	52	SCR 1117	SCREW .25 - 20 X .62	1

FROM PARTS LIST # CHHA UP2