Carrier
HEATING & COOLING

06D,07D
Compressors and Condensing Units

Installation, Start-Up and Service Instructions

Hermetic, Water-Cooled

CONTENTS

	Page
SAFETY CONSIDERATIONS	1
BEFORE INSTALLATION	1
Check Shipment	1
Unit Location Considerations	1
INSTALLATION	1-6
Mount Unit	1
Make Piping Connections	1
Make Electrical Connections	4
Limitations	6
Refrigerant Charging	6
INITIAL START-UP	6
To Start Compressor	6
CHECKING OPERATION	6,7
Oil Charge	6
Dual Pressurestat	6
Time Guard® Control	6
CAPACITY CONTROL	7,8
Control Set Point	7
To Regulate Control Set Point	7
Pressure Differential Adjustment	7
Capacity Control Pressure	8
CONDENSER MAINTENANCE	9
REMOVING, INSPECTING AND REPLACING COMPONENTS	9-15
Service Notes	9
Testing Oil Pump	10
Cylinder Heads	12
Service Replacement Compressors	12
Suction and Discharge Valve Plate Assembly	13
Test	13
Cleaning Suction Strainer	13
Motor Replacement	13
Terminal Plate Assembly	14
Compressor Running Gear Removal	14
Compressor Running Gear Replacement	15
COMPRESSOR MOTOR BURNOUT	15
Clean-Up Procedure	15
TROUBLESHOOTING	16

SAFETY CONSIDERATIONS

Installing, starting up and servicing this equipment can be hazardous due to system pressures, electrical components and equipment location (roofs, elevated structures, etc.). Only trained, qualified installers and service mechanics should install, start up and service this equipment.

When working on the equipment, observe precautions in the literature, tags, stickers and labels attached to the equipment and any other safety precautions that apply. Follow all safety codes. Wear safety glasses and work gloves. Use care in handling, rigging and setting bulky equipment.

⚠ WARNING

Electrical shock can cause personal injury and even death. Be sure power to equipment is shut off before installing or servicing this equipment. There may be more than one disconnect. Tag disconnect(s) to alert others not to turn power on until work is completed.

BEFORE INSTALLATION

Check Shipment — File claim with shipping company if shipment is damaged or incomplete.

Unit Location Considerations — Locate unit on floor in a well-ventilated area. Position it to allow sufficient space for refrigerant and water connections and to service compressor. Place unit so suction and discharge valves can be easily reached and oil level checked. Do not install condensing unit where temperature will fall below freezing.

Local water can cause excessive fouling or sealing of condenser tubes. If such conditions are anticipated, a water treatment analysis is recommended. Refer to Carrier System Design Manual, Part 5, for general water conditioning information.

Make provision in piping layout to drain and vent condenser if system is to be shut down in winter.

INSTALLATION

Mount Unit — Level unit and bolt it firmly to foundation. Remove compressor holddown bolts. Check compressor to see that it floats freely on its mounting springs.

Make Piping Connections — Attach water supply and return lines to connections indicated on condenser unit (Fig. 1). Water leaving condenser should not be connected directly into sewer lines. Check local codes.

Attach refrigerant liquid and suction lines to condensing units (Fig. 1); suction and discharge to compressor unit (Fig. 2). When soldering or brazing piping to valves, disassemble valve or wrap it in a wet cloth to prevent heat damage. Allow flexibility in suction line so compressor suction valve may be moved aside for access to suction strainer.

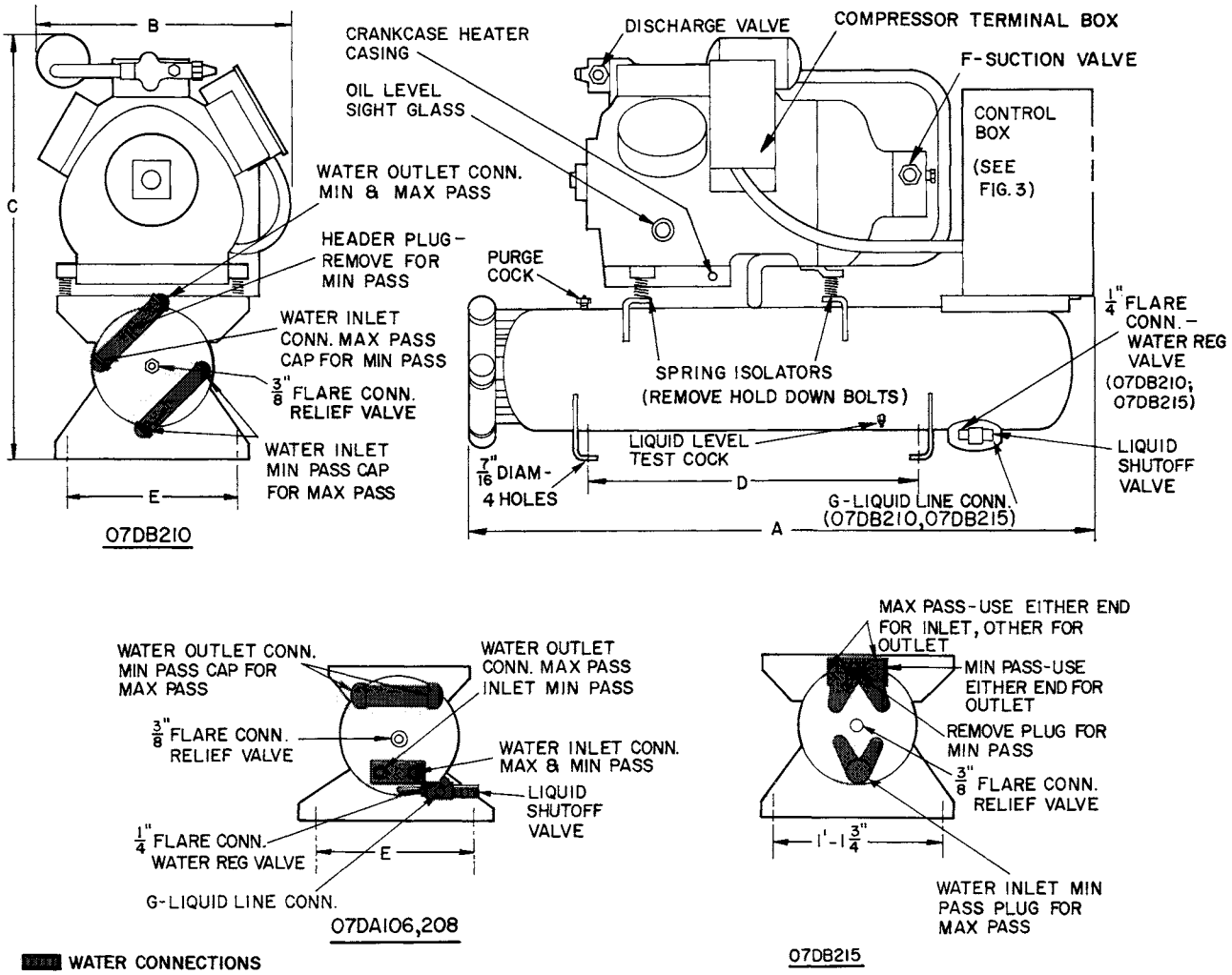


Fig. 1 – 07D Condensing Unit Dimensions and Connections (Table 1)

Table 1 – Condensing Unit Installation Data (Fig. 1)

COND UNIT 07D-		A106	A208	B210	B215
OPERATING WT (lb)		295	330	475	590
DIMENSIONS (ft-in.)	A	3- 0⅝	3- 7⅛	3-6¾	3-10⅜
	B	1- 2½	1- 2½	1-4½	1- 6⅛
	C	2- 4¼	2- 4¼	2-7¼	2- 8⅜
	D	1-4	1-10	1-6¼	1- 6¼
	E	0-10¾	0-10¾	1-1¾	1- 1¾-
WATER CONN. (in.) FPT					
MPT					
Max Pass*, Inlet, Outlet		½	¾	1½	1½
Min Pass†, Inlet (2)...Outlet (2)		½...1	¾...1	1½...1½**	2**...1½**
REFRIG CONN (in. ODF)					
F (Suct)		1⅛	1⅛	1⅜	1⅜
G (Liq)		½	½	⅝	⅝

*Max pass (6 passes; 1 circuit) recommended for city water applications.
†Min pass (3 passes; 2 circuits) for cooling tower applications.
**One water outlet connection on 07DB210; one water inlet connection on 07DB215.

Table 2 – Compressor Unit Installation Data (Fig. 2)

COMPR 06D-		A818	E824	E537
OPERATING WT (lb)		225	270	285
DIMENSIONS (ft-in.)	A	1-10½	1-11⅞	2-0½
	B	1- 2½	1- 4¾	1-4¾
	C	1- 4½	1- 3⅝	1-4⅞
	D	1- 3⅛	1- 2¾	1-3
	E	0- 7½	0- 8⅝	0-8⅞
	F	—	0-2	0-2⅜
	G	0-8	0- 7¼	0-7¼
REFRIG CONN. (in.)				
Suction (ODF)	H	1⅛	1⅛	1⅜
Discharge (ODF)	J	⅞	⅞	1⅛
POWER OPENING (in.)	K	⅞ 1⅛	1⅛ 1⅜ + 1¾	1⅜ 1¾

Alternate knockouts provided.

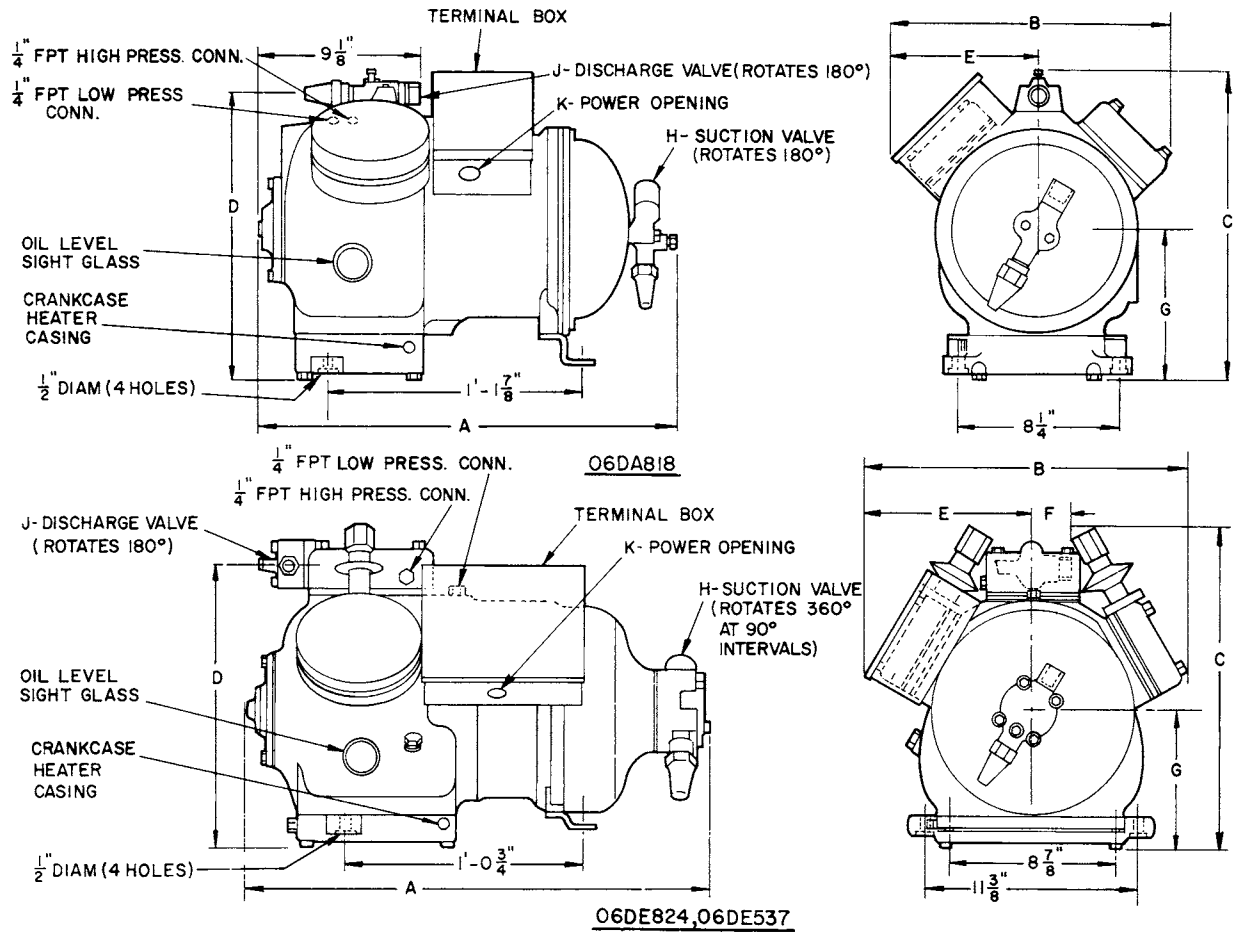
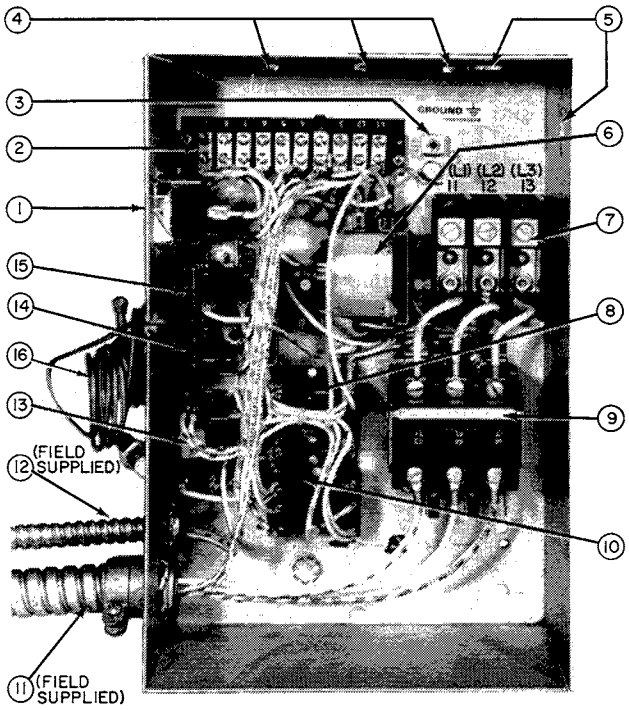


Fig. 2 — 06D Compressor Unit Dimensions and Connections (Table 2) (Includes compressor shown above and control box shown in Fig. 3)



DIMENSIONS (IN.)- 13 1/4 L x 11 1/4 W x 5 1/2 H

1 — ON-OFF Switch (SW)
2 — Main Terminal Strip (TB2)
3 — Equipment Ground Lug
4 — Three 7/8-in. diameter holes for field wiring connections. (Two additional 7/8-in. diameter knockouts provided.)
5 — 1 1/8-in. diam holes (or alternate 1 3/4-in. diameter concentric knockouts) for line power connection. Top or side entrance optional.
6 — Timer Motor (TM)
7 — Unit power terminal block (TB1)
8 — Timer Relay (TR)
9 — Contactor (C)
10 — Control Relay (CR)
11 — Compressor Power Cable. Box has 1 1/8-in. diameter hole or alternate 1 3/4-in. diameter concentric knockout.
12 — Crankcase Heater Cable. Box has 7/8-in. diameter hole.
13 — Pumpout Relay (POR)
14 — High Pressure Switch (HPS)
15 — Low Pressure Switch (LPS)
16 — HPS and LPS capillary (36" long)

NOTE: 06D compressor units must have control box mounted vertically in any convenient location. Dual pressure switch capillaries should be extended in the field if necessary. Capillary terminates in 1/4 SAE flare long nut. Control box is factory mounted on 07D condensing unit.

Fig. 3 — Control Box Components and Connections (3-Phase)

Install a solenoid valve (field supplied) in liquid line directly before expansion valve. Solenoid valve is necessary for single pumpout control used on 06D, 07D units. Refrigerant filter drier and moisture indicator are shipped with 07D condensing units for field installation. Install in liquid line according to manufacturer's instructions.

Relief valve located on front of condenser (07D units) will open to relieve excessive pressure, allowing refrigerant to escape. Most local codes require piping from safety device to outdoors.

Refer to Carrier System Design Manual, Part 3, for standard piping techniques.

COMPRESSOR UNITS — Connect high- and low-pressure switch capillary tubes from control box to compressor, Fig. 2.

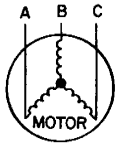
Install discharge line muffler (accessory) in discharge line as close to compressor shutoff valve as possible.

Make Electrical Connections

UNBALANCED 3-PHASE SUPPLY VOLTAGE — *Never operate a motor where a phase imbalance in supply voltage is greater than 2%.* Use the following formula to determine the % voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 230-3-60



AB = 236 volts
BC = 229 volts
AC = 234 volts

$$\text{Average Voltage} = \frac{236 + 229 + 234}{3} = 233 \text{ volts}$$

Determine maximum deviation from average voltage:
(AB) 236 − 233 = 3 volts
(BC) 233 − 229 = 4 volts
(AC) 234 − 233 = 1 volt

Maximum deviation is 4 volts. Determine % voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{4}{233} = 1.7\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable of 2%.

> IMPORTANT: If the supply voltage phase imbalance is more than 2%. contact your local electric utility company immediately.

ELECTRICAL DATA NOTES

1. All 06D and 07D units are across-the-line start.
2. Wire sizes are based on TW type copper wire. Maximum wire lengths based on data from Table 3 will result in a 1% voltage drop to compressor. Where up to 3% voltage drop is allowed, the run length can be increased to 3 times the length calculated from data in Table 3.
3. The 06D compressor unit electrical data shown in Table 3 does not apply for 06D compressors used as an integral part of other Carrier equipment. See proper installation book for electrical information.

WIRING — Power supply must correspond with unit nameplate electrical characteristics (units are internally wired at factory for nameplate voltage). Field wiring must comply with local and national codes.

Install a branch circuit fused disconnect of adequate size to handle starting current.

LINE POWER is brought into control center through indicated opening (Fig. 1 and 3). Connect line power to terminal block TB1 as indicated on unit label diagram, i.e., L1 to terminal 11, L2 to terminal 12 and L3 to terminal 13.

Compressor Unit Connections — Extend power leads from control center (contactor terminals) to compressor terminal box and make connections as shown in Fig. 4.

Terminals 8 and 9 on motor terminal plate are for internal protector connections. As shown in Fig. 4, run a wire from terminal 9 to terminal 6 on TB2 in control center and a wire from terminal 1 on OL2 to terminal 2 on HPS in control center.

Run crankcase heater power wiring into control center through indicated opening (Fig. 3). Connect leads to terminal 5 on pumpout relay and terminal 3 on terminal block TB2.

Affix power warning label supplied in the installer's packet to fused disconnect which energizes crankcase heater (see unit label diagram).

CONTROL WIRING — Control circuit power is 115 volts, energized from an external source or from unit voltage through field-supplied transformer. Transformer size required is 100 va for all units except 07DB215, 06DE824, and 06DE537 which require 150 va. External control power source must be supplied through a 15-amp fused disconnect. Connect control circuit power leads to terminal block TB2, terminals L1 and L2. Terminal L2 is neutral potential (ground).

Compressor Protection — 06D and 07D units are factory wired for *single-pumpout control.* Field addition and wiring of line voltage remote control and liquid line solenoid valve is required. (See unit label diagram and Fig. 5). Remote control minimum contact rating must be 25 va. Solenoid valve must have a maximum load rating of 50 va holding; 200 va inrush. For applications with cooling tower, air-cooled or evaporative condensers, add necessary auxiliary contacts in line between compressor contactor and terminal A1 on timer. Insert desired interlocks and overloads between terminals 5 and 9 on terminal block TB2.

(Continued on page 6)

Table 3 — Electrical Data (3 Ph, 60-Hz)

VOLTS	Nameplate		208-230 or 200					460					575†				
	Supply Range*		187-253 or 180-229					414-508					518-632				
COMPRESSOR UNIT		kW	RLA	LRA	MTA	MCA	MFA	RLA	LRA	MTA	MCA	MFA	RLA	LRA	MTA	MCA	MFA
06D	A818	10.8	35	137	49	44	70	16	62	22	20	35	13	50	18	17	25
	E824	14.1	45	170	62	57	100	20	77	28	25	45	16	62	22	20	35
	E537	20.7	64	266	89	80	125	29	120	40	37	60	23	96	32	29	50
CONDENSING UNIT																	
07D	A106	6.6	20	95	27	25	45	9	43	12	12	20	7	34	10	9	15
	A208	10.8	35	137	49	44	70	16	62	22	20	35	13	50	18	17	25
	B210	10.8	35	137	49	44	70	16	62	22	20	35	13	50	18	17	25
	B215	20.7	64	266	89	80	125	29	120	40	37	60	23	96	32	29	50

	RLA	LRA	MTA	MCA	MFA
A106. For 230V:	17	86	24	22	35

Supply Range for 230V: 207-264

*Units are suitable for use on electrical systems where voltage supplied to the unit terminals is not below or above the listed range limits.

†Units for 575-volt application are available on special order.

kW — Maximum Power Input
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing). Complies with NEC.
MFA — Maximum Fuse Amps (Max Overcurrent Protective Device Amps).
MTA — Must Trip Amps (Compressor Overloads)

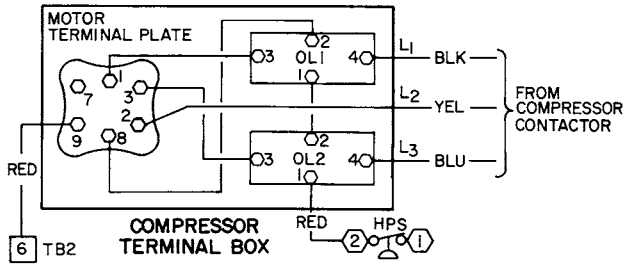


Fig. 4 — Compressor Terminal Diagram

LEGEND (Fig. 4 and 5)

AUX — Auxiliary
C — Contactor
CR — Control Relay
HPS — High-Pressure Switch
LLS — Liquid Line Solenoid Valve
LPS — Low-Pressure Switch
M3 — Evaporator Fan or Chilled Water Pump
M4 — Cooling Tower Pump, Air-Cooled or Evaporative Condenser Fan
M5 — Cooling Tower Fan or Evaporative Condenser Pump
OL — Overload Relays
POR — Pumpout Relay
SW — Switch
TB — Terminal Block
TR — Timer Relay
——— Factory Wiring
- - - - Field Wiring
*Optional

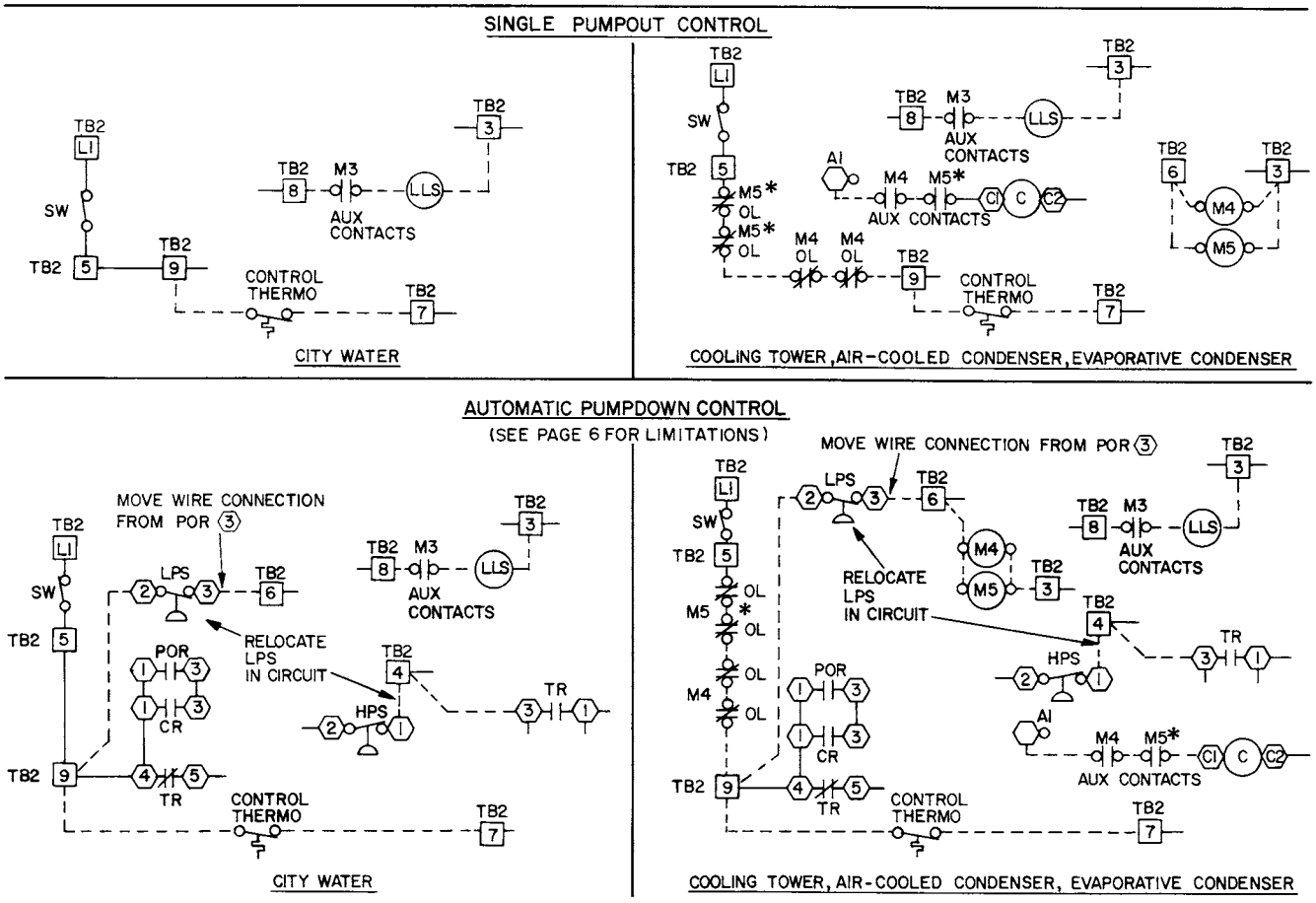


Fig. 5 — Recommended Field Wiring

Control wiring may be modified as shown in Fig. 5 for *automatic pumpdown control;* remove low-pressure switch between timer relay and terminal 4 on TB2. Wire low-pressure switch between terminals 9 and 6 on TB2. Add necessary auxiliary contacts between compressor contactor and terminal A1 on timer. Remove wire between terminal 6 on TB2 and terminal 3 on pumpout relay. Insert required interlocks and overloads between terminals 5 and 9 on TB2.

Limitations — Do not use automatic pumpdown control on dry expansion cooler applications or when compressors are equipped with pressure-type unloader valves. Pressure unloader valves have built-in high to low passage which allows compressor to cycle with automatic pumpdown.

Refrigerant Charging

⚠ CAUTION

When charging, or when removing charge, circulate water through water-cooled condenser(s) and cooler continuously to prevent freezing. Freezing damage is considered abuse and is not covered by Carrier warranty.

EVACUATE, DEHYDRATE AND LEAK TEST entire refrigerant system by methods described in Carrier Standard Service Techniques Manual, Chapter 1, Sections 1-6 and 1-7. Use sight glass method to charge system. See Section 1-8 of manual for details.

CHARGE THE SYSTEM to a clear sight glass while holding saturated condensing pressure constant at 125 F (air-cooled systems) or 105 F (water-cooled systems). Add additional refrigerant to fill condenser subcooler coils, where applicable.

07D Condensing Units — After clear sight glass is obtained, add charge until liquid refrigerant reaches condenser liquid level test cock (Fig. 1).

06D Compressor Units — See condenser data for additional charge required to fill subcooler after clear sight glass is obtained.

INITIAL START-UP

Crankcase heater should be energized a minimum of 24 hours before starting unit. *Do not permit crankcase heaters to be de-energized during normal shutdown periods.*

Check to see that oil level is ⅓ to ⅔ up on compressor sight glass.

Open water supply valve and allow water to reach condenser. Open pressure line valve of water regulating valve, if used. (Turn condenser fan on when the compressor unit is applied with air-cooled condenser.)

Backseat (open) the compressor suction and discharge shutoff valves; open liquid line valve at receiver.

Start evaporator fan or chilled water pump.

To Start Compressor — Close main power switch, control power switch, and unit ON-OFF switch. Time Guard® control circuit causes a short delay before compressor starts.

Recheck oil level and check oil pressure. See Lubrication System for details.

With unit operating, voltage at compressor terminals must be within limits shown on nameplate. Phases must be balanced within 2% of voltage (see page 4). Contact local power company for correction of improper line voltage or phase imbalance. Operation of unit on improper line voltage or with excessive phase imbalance constitutes abuse and is not covered by Carrier Warranty.

NOTE: *06D, 07D unit safety controls are of the automatic-reset type. If compressor is shut off by a safety control, do not permit control to reset more than once before determining cause of shutdown.*

CHECKING OPERATION

Refer to Carrier Standard Service Techniques Manual, Chapter 2 for complete instructions on checking electrical components.

Oil Charge (See Table 4) — Check oil level in compressor sight glass after 15 to 20 minutes of operation. If oil level is low, add oil according to methods described in Carrier Standard Service Techniques Manual, Chapter 1 (Section 1-11). Add oil through suction manifold connection on 4-cylinder compressors, and oil port on 6-cylinder compressors.

The preferred method for a complete recharge is to ½ sight glass with compressor shut down.

When additional oil, or a complete charge, is required, use only Carrier-approved compressor oil.

Approved oils are:

Witco . . . . . .Suniso 3GS
Texaco, Inc. . . . . .Capella WF-32

IMPORTANT: Do not reuse drained oil and do not use oil that has been exposed to atmosphere.

Dual Pressurestat (Fig. 6) — High-pressure safety switch is checked by throttling condenser water or blocking airflow on air-cooled units, allowing head pressure to rise gradually. Check discharge pressure constantly throughout procedure. Compressor should shut off within 10 psi of values shown in Table 4.

Check low-pressure switch by slowly closing suction shutoff valve or by completely closing liquid line shutoff valve. A decrease of suction pressure will follow. Compressor should shut off within 4 psi of values shown in Table 4.

Time Guard® Control provides a delay of approximately 5 minutes before restarting compressor after shutdown for any reason. On starting, the Time Guard control timer causes a delay of 15 seconds after thermostat closes before compressor will start.

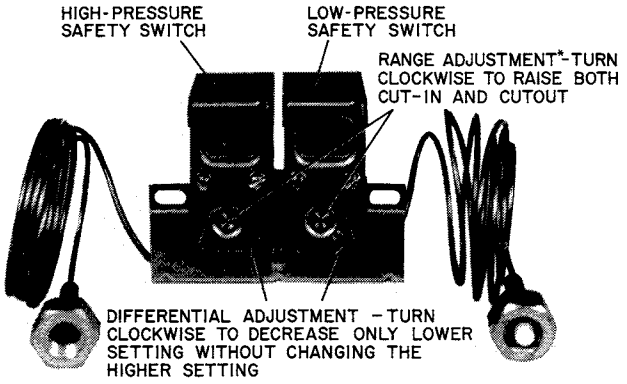


Fig. 6 — Dual Pressurestat Adjustment

Table 4 — Physical Data

COMPR UNIT 06D-	—	A818	E824	E537
COND 07D-	A106	A208	B210	B215
REFRIGERANT	R-12, -22, -500, -502			
	R-12, -500	R-12, -22, -500, -502		
COMPRESSOR 06D*	—	A818	J824	J537
	A718	A818	J724	J537
No. of Cylinders	4	4	6	6
No. of Unloaders	—	—	2	2
Cap. Control Steps	—	—	3	3
Oil Charge (pt)	See Note		8	8
Normal Oil Pressure	12-20 psig†			
High-Pressure Switch Cutout Range	230 to 400 psig (adj)			
	230 to 340 psig (adj)			
Diff (Cutout - Cut-in.)	80 ± 10 psi (fixed)			
Factory Settings** Cutout	370 ± 7 psig			
	280 ± 7 psig			
Cut-In	290 ± 7 psig			
	200 ± 7 psig			
High Side Max Press.**	450 psig			
Low-Pressure Switch Cutout Range	20 in. Hg vac to 70 psig (adj)			
Diff (Cutout - Cut-in.)	31 psig (adj 13 to 50)			
Factory Settings Cutout	36 ± 4 psig			
Cut-In	67 ± 4 psig			
Low Side Max Pressure	245 psig			
CONDENSER	6D47	6D48	6D68	6D73
Max. Refrigerant Storage Cap.†† R-12	36.5	49.7	69.4	84.9
Max. Refrigerant Storage Cap.†† R-500	32.2	43.8	61.2	74.8
Max. Refrigerant Storage Cap.†† R-22	—	45.0	63.0	76.9
Max. Refrigerant Storage Cap.†† R-502	—	46.8	65.4	79.8
Min. Refrigerant Oper Chg‖ R-12	2.11	3.00	3.56	4.78
Min. Refrigerant Oper Chg‖ R-500	1.85	2.64	3.12	4.20
Min. Refrigerant Oper Chg‖ R-22	—	2.70	3.20	4.30
Min. Refrigerant Oper Chg‖ R-502	—	2.80	3.32	4.36
Max Oper Pressure Refrig Side	385 psig			
Max Oper Pressure Water Side	150 psig			

07D Condensing Unit Data.

*Prefix: A = no unloader; J = 2 pressure-type unloaders (suction cutoff).

†Pressures shown are above operating suction pressure; i.e., pressure differential between suction pressure and discharge pressure of oil pump.

**Pressure switch settings shown are for R-22. When using other refrigerants, reset high- and low-pressure switch settings corresponding to saturation temperatures indicated by the above pressures.

††Condenser storage capacity with 80% liquid refrigerant at 90 F.

‖All 06D and 07D units are shipped without refrigerant charge.

NOTE: (4-cylinder compressor): with cast cover = 5.5; with stamped cover = 4.5.

CAPACITY CONTROL (Suction Cutoff Type)

Control Set Point (cylinder load point) is adjustable from 0 to 86 psig. Pressure differential between cylinder load-up point and cylinder unload point is adjustable from 7 to 19 psi.

To Regulate Control Set Point — Refer to Fig. 7. Turn adjustment nut clockwise to its bottom stop (with nut in this position, set point is 86 psig). Control set point is then regulated to desired pressure by turning adjustment nut counterclockwise. Every full turn decreases set point by 7.2 psi. Approximately 12 turns in counterclockwise direction will decrease control set point to 0 psig. Table 5 shows steps of control for the compressor and condensing unit.

Pressure Differential Adjustment — Turn differential adjusting screw counterclockwise to its back-stop position (differential in this position is 7 psi). Pressure differential is set by turning adjustment screw clockwise. Every full turn increases differential by 1.2 psi. Approximately 10 turns in clockwise direction will increase pressure differential to 19 psi.

Table 5 — Capacity Control Reduction Steps

COMPR UNIT	STEPS								
	1			2			3		
COND UNIT	No. Cyl	% Cap.	% Kw	No. Cyl	% Cap.	% Kw	No. Cyl	% Cap.	% Kw
06DE824,537	6	100	100	4	66⅔	76	2	33⅓	48
07DB210,215	6	100	100	4	66⅔	76	2	33⅓	48

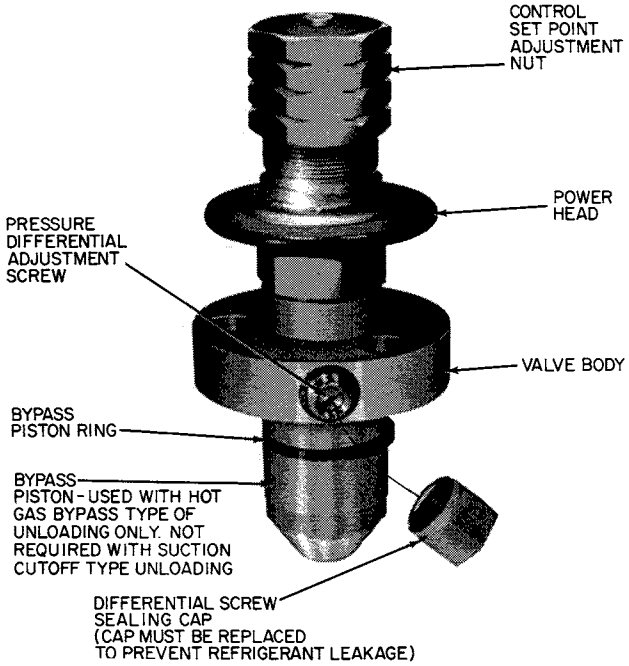


Fig. 7 — Capacity Control Valve (Pressure Type)

Capacity Control Pressure (Fig. 8)

LOADED OPERATION — Pressure-operated control valve is controlled by suction pressure and actuated by discharge pressure. Each valve controls 2 cylinders (one bank). On start-up, controlled cylinders do not load up until differential between suction and discharge pressures is approximately 25 psi.

When suction pressure rises high enough to overcome control set point spring, the diaphragm snaps to the left and relieves pressure against the poppet valve. The drive spring moves the poppet valve to left and it seats in the closed position.

With poppet valve closed, discharge gas is directed into the unloader-piston chamber and pressure builds up against the piston. When pressure against unloader piston is high enough to overcome the unloader valve spring, piston moves valve to the right, opening suction port. Suction gas can now be drawn into the cylinders and the bank is running fully loaded.

UNLOADED OPERATION — As suction pressure drops below set point, control spring expands, snapping diaphragm to right. This forces poppet valve open and allows gas from discharge manifold to vent through base of control valve to suction side. Loss of full discharge pressure against unloaded piston allows unloader valve spring to move valve left to closed position. The suction port is blocked, isolating the cylinder bank from the suction manifold. The cylinder bank is now unloaded.

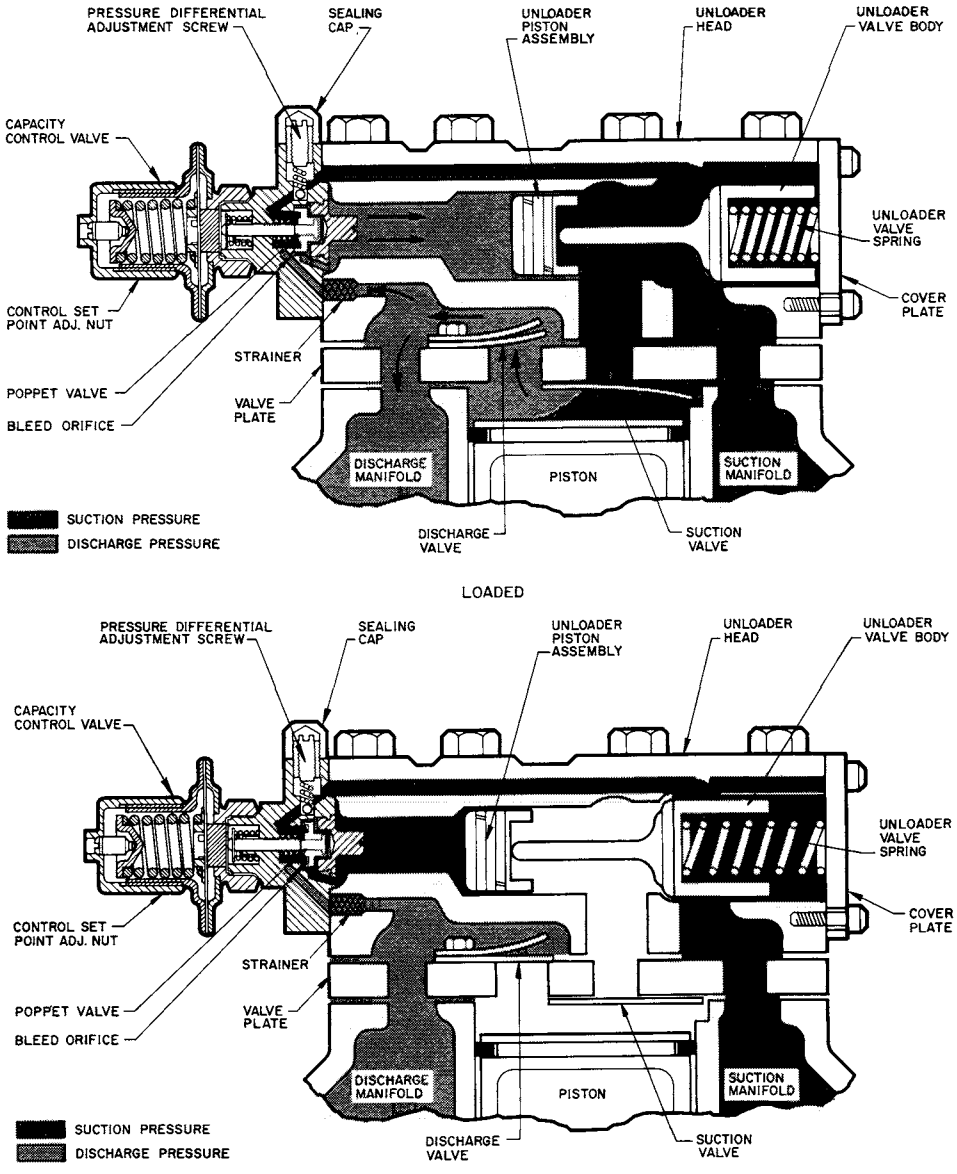


Fig. 8 — Capacity Control Valve Operation

CONDENSER MAINTENANCE

Clean shell and coil condensers chemically using inhibited hydrochloric acid solution (OAKITE 32). Handle acid with caution.

Shut off water supply and disconnect inlet and outlet piping. Clean condenser with acid solution by gravity (Fig. 9) or forced circulation (Fig. 10). For average scale deposits, allow acid solution to remain in condenser overnight; for heavy deposits, allow 24 hours. Drain condenser and flush with clean water.

NOTE: *Protect condenser from freezing when ambient is below 32 F by draining water from system or adding antifreeze to water (expect a slight capacity reduction with the addition of antifreeze solution).*

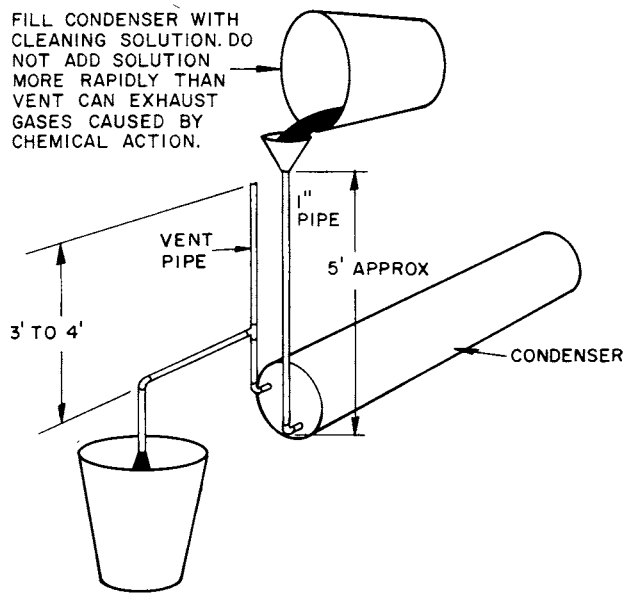


Fig. 9 — Gravity Circulation

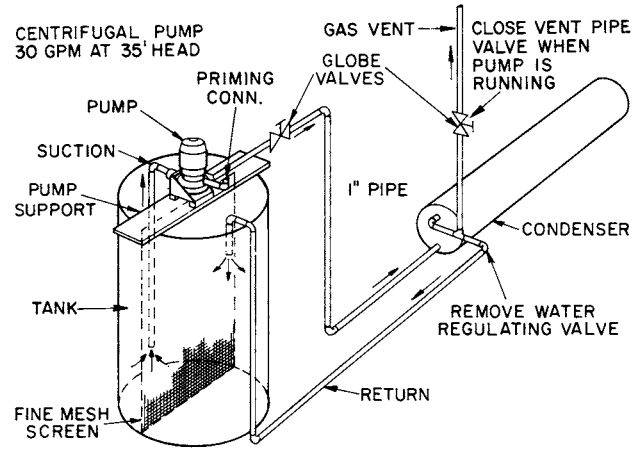


Fig. 10 — Forced Circulation

REMOVING, INSPECTING AND REPLACING COMPONENTS

Service Notes

1. Where compressor components are shown, they are in normal order of removal from compressor.
2. For replacement items, use Carrier specified parts. See Carrier 06D Specified Parts list for compressor part interchangeability.
3. Before compressor is opened, the refrigerant must be removed from it by the Pumpdown method.
   a. Start compressor, close suction shutoff valve, and reduce crankcase pressure to 2 psig (bypass low pressurestat with jumper).
   b. Stop compressor and isolate from system by closing discharge shutoff valve.
   c. Bleed any residual refrigerant. Drain oil if necessary.
4. After disassembly, clean all parts with solvent. Use mineral spirits, white gasoline or naphtha.
5. Before assembly, coat all parts with compressor oil and clean and inspect all gasket surfaces. Replace all gaskets with new standard specified gaskets, coated with compressor oil. See Table 6 for typical torque values.
6. After reassembly, evacuate compressor and open suction and discharge valves. Restart compressor and adjust refrigerant charge.

Table 6 — Torque Values

SIZE DIAM (in.)	THREADS PER IN.	TORQUE RANGE (lb-ft)	USAGE
1/16	27 (pipe)	8-12	Pipe Plug — Crankshaft
1/8	20 (pipe)	6-10	Oil Return Check Valve — Crankcase
1/4	20 (pipe)	20-25	Pipe Plug — Press. Gage Conn.
1/4	20	10-12	Connecting Rod Capscrew
1/4	28	12-15 12-15 12-15 12-15	Baffle Plate — Crankcase Side Shield Oil Pump Drive Segment Unloader Valve
5/16	18	16-20 16-20 20-25 20-25	Cover Plate — Pump End Bearing Head Terminal Block Cap Screws Suction Service Valve Discharge Service Valve
3/8	16	30-35 30-35 30-35 30-35 30-35	Pump End Bearing Head Bottom Plate — Crankcase Compressor Foot Cylinder Head Motor End Cover — Crankcase
7/16	14	55-60	Motor End Cover — Crankcase
1/2	13	80-90	Suction Service Valve
5/8	11	25-30	Crankshaft Spinner Tube
No. 10	32	4-6	Oil Pump Drive Segment
1 1/2	18 NEF	35-45	Oil Level Sight Glass

NEF — National Extra Fine

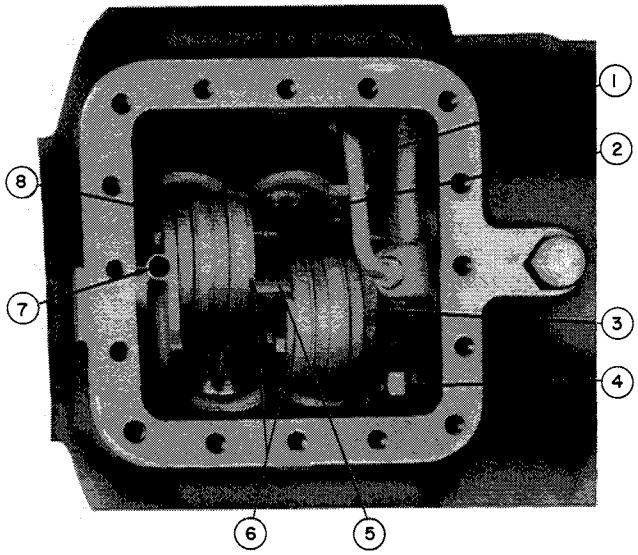
Testing Oil Pump — Observe oil level sight glass. The oil pressure relief valve line is positioned to discharge oil against sight glass. When oil does not discharge from this line, it is an indication of low oil pump pressure.

If oil pump pressure is low, remove and check oil filter screen, oil pressure regulator and oil return check valve.

OIL PRESSURE RELIEF VALVE (Fig. 11) — Unscrew relief valve assembly from motor partition plate, and be sure assembly is not clogged or the plunger is not stuck.

OIL RETURN CHECK VALVE (Fig. 11) — Unscrew check valve from motor partition plate. Be sure flutter valve is not sticking and that it seats tightly.

OIL FILTER SCREEN (Fig. 12) is accessible through bottom cover plate. Remove and inspect strainer for holes and dirt. Clean it with solvent and replace.



LEGEND

1 — Oil Pressure Relief Valve
2 — Piston and Eccentric Strap Assembly
3 — Motor End Counterweight
4 — Oil Return Check Valve
5 — Eccentric Shaft
6 — Eccentric Strap Side Shield
7 — Oil Suction Tube
8 — Pump End Counterweight

Fig. 11 — Compressor (Bottom Plate Removed)

OIL PUMP AND BEARING HEAD (Fig. 12) — The oil pump assembly is contained in the pump end bearing head aluminum casting. The pump end main bearing is a machined part of this casting. An insert bearing is not required.

REMOVE bearing head assembly from crankcase.

Remove in sequence (refer to Fig. 12 and 13): oil pump cover, oil feed guide retaining spring, oil feed guide, pump drive segment. If damage to the oil pump or main bearing is found, a new pump end bearing head assembly should be installed.

REPLACE (Refer to Fig. 12 and 13). For torque values, refer to Table 6:

1. Bolt bearing head to crankcase. Place pump drive segment into position and secure to end of crankshaft with cap screws and lock washers that were removed (see Fig. 13).
2. Insert oil feed guide with large diameter inward and place guide retainer spring over small diameter of guide.
3. Install gasket and oil pump cover.

LEGEND (Fig. 12)

1 — Motor Cover Gasket
2 — Motor End Cover
3 — Discharge Manifold Connection
4 — Valve Plate Gasket
5 — Valve Plate Assembly
6 — Cylinder Head Gasket
7 — Cylinder Head
8 — Cylinder Head Washer and Cap Screw
9 — Suction Manifold Connection*
10 — Suction Valve Positioning Spring
11 — Suction Strainer
12 — Bearing Head Gasket
13 — Oil Pump Inlet Passage
14 — Bearing Head Washer and Cap Screw
15 — Oil Pump Cover
16 — Pump End Bearing Head
17 — Oil Drain Plug
18 — Crankcase
19 — Bottom Plate Gasket
20 — Bottom Plate
21 — Bottom Plate Washer and Cap Screw
22 — Oil Filter Screen
23 — Oil Return Check Valve
24 — Oil Level Sight Glass
25 — Motor Terminal Plate
26 — Dowel Pins (For Suction Valve Positioning)
27 — Equalizing Tube and Lock Screw Assembly
28 — Lockwasher
29 — Rotor Lockwasher
30 — Rotor Drive Key
31 — Piston Pin Lock Ring
32 — Piston Pin
33 — Piston
34 — Oil Ring
35 — Compression Rings
36 — Eccentric Strap
37 — Eccentric Strap Side Shield
38 — Pump End Counterweight
39 — Oil Pump Drive Segment
40 — Drive Segment Cap Screws and Lockwashers
41 — Oil Feed Guide
42 — Oil Feed Guide Retainer Spring
43 — Cover Gasket
44 — Pump Cover Cap Screw and Washer
45 — Counterweight Bolt
46 — Eccentric Strap Side Shield
47 — Motor End Counterweight
48 — Locknut
49 — Eccentric Shaft (or Crankshaft)

*Use to add compressor oil.

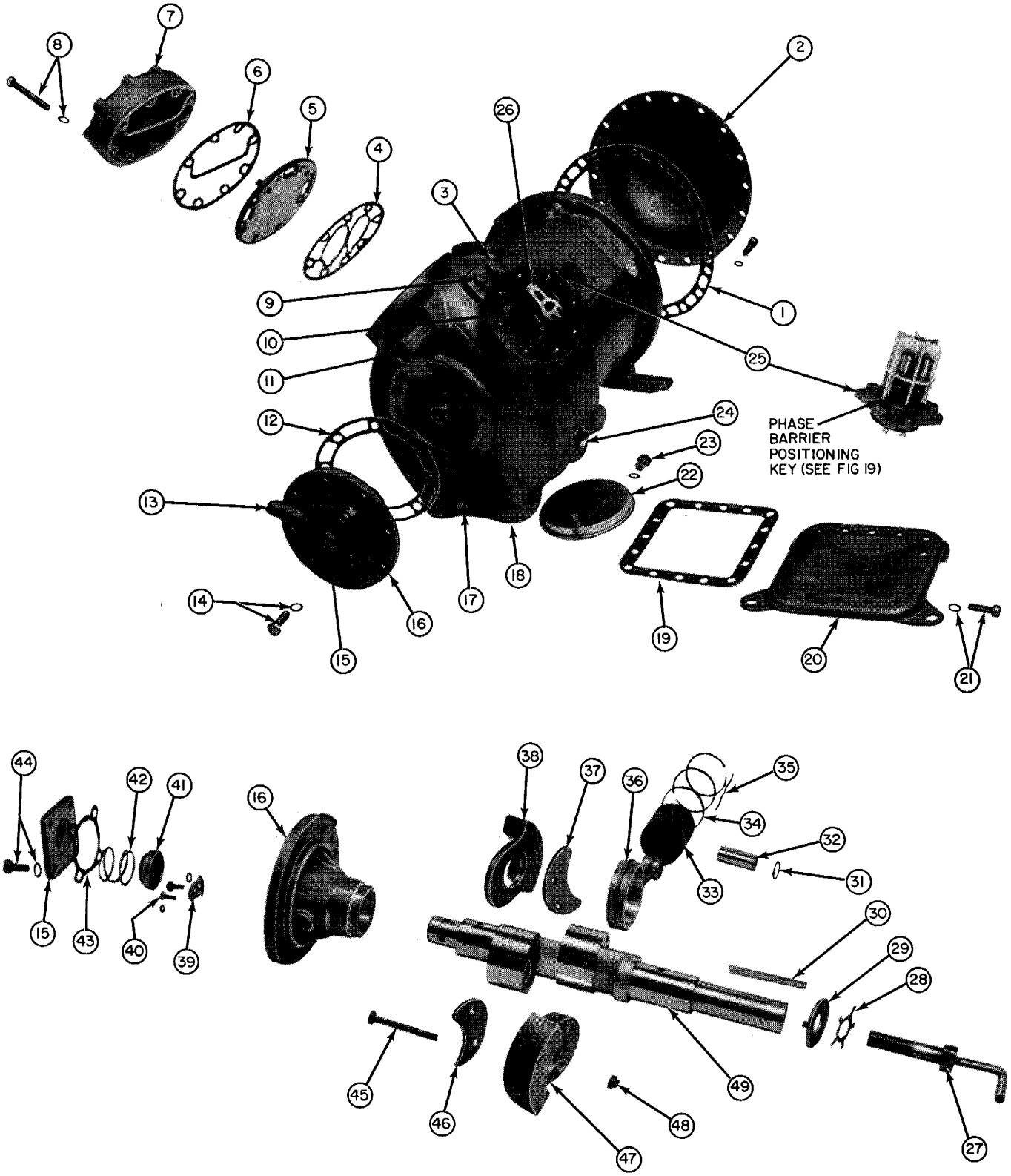


Fig. 12 — 06D Compressor Components (4-Cylinder with Eccentric Shaft)

Table 7 — Compressor Wear Limits (Factory Tolerances) (in.)

COMPRESSOR PART		UNIT			Max* Allow Wear
		06DA818 07DA106 07DA208	06DE824 07DB210	06DE537 07DB215	
MOTOR END					
Main Brg Diam	Max	1.3755	1.6260		.002
Journal Diam	Min	1.3735	1.6233		.002
PUMP END					
Main Brg Diam	Max	1.3755			.002
Journal Diam	Min	1.3735			.002
CRANKPIN DIAM	Min	1.3735	2.2030	1.3735	.0025
THROW	Max	1.4374	1.250	1.9396	—
	Min	1.4334	1.246	—	—
THRUST-WASHER	Max	—	.157		.025
	Min	—	.155		.025
ECCENTRIC					
Eccentric Diam	Max	—	2.2053	—	.002
Conn. Rod Diam	Max	1.3755	—	1.3755	.002
Piston Pin Brg	Min	6.878			.001
CYLINDERS					
Bore	Max	2.0005			.002
Piston Diam	Min	1.996			.002
Piston Pin Diam	Min	.6873			.001
Piston Pin Brg		Press Fit			—
Piston Ring Gap	Max	.013			.025
	Min	.005			.025
Piston Ring Side Clearance	Max	.002			.002
	Min	.001			.002

*Maximum allowable wear above maximum or below minimum factory tolerances shown. For example: difference between pump end main diameter and journal diameter is .002 in. (1.3755 — 1.3735) per factory tolerances. Maximum allowable difference is .004 in. (.002 + .002).

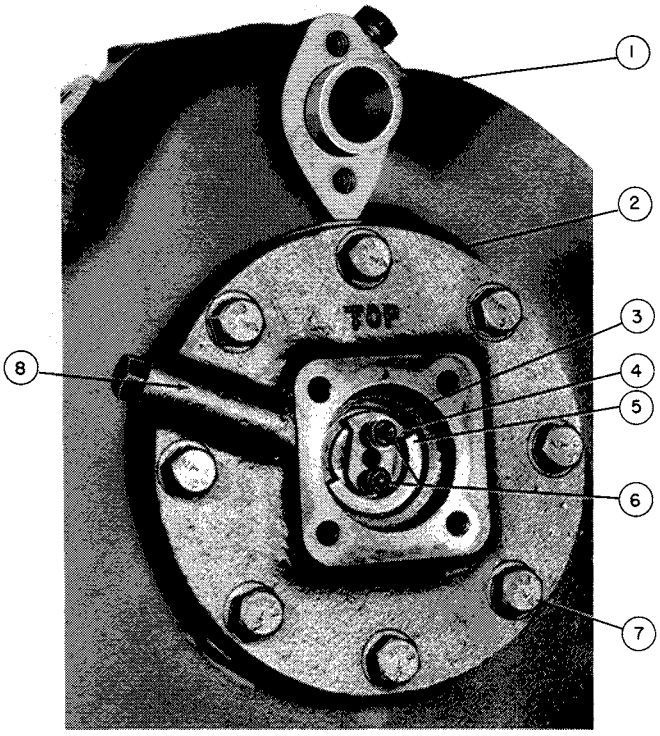
Cylinder Heads — Disassemble cylinder heads by removing cap screws and prying up on side *between cylinder head and valve plate* to break heads loose from valve plate. *Do not strike cylinder heads to break loose.*

Check heads for warping, cracks and damage to gasket surfaces. When replacing cylinder head, torque cap screws 30 to 35 lb-ft to prevent high to low side leak in center portion of cylinder head gasket.

Service Replacement Compressors are not equipped with control valves. One or both side bank cylinder head(s) is plugged with a spring loaded plug piston assembly. Compressor will run fully loaded with piston plug(s) in place.

Transfer original capacity control valve(s) to replacement compressor (ensures proper valves are used with correct setting). For sealing purposes, install a plug piston assembly into each cylinder head of original compressor from which a control valve was removed.

Three Allen head cap screws hold capacity control valve in place (Fig. 14). Remove screws using a cut-down 3/16-in. Allen wrench, and pull valve from cylinder head.



LEGEND

1 — Suction Strainer Assembly
2 — Oil Pump Bearing Head Assembly
3 — Rotor Retaining Ring
4 — Oil Pump Drive Segment
5 — Oil Pump Rotor
6 — Drive Segment Cap Screws
7 — Bearing Head Cap Screws
8 — Oil Pump Inlet Passage

Fig. 13 — Removing Pump End Bearing Head

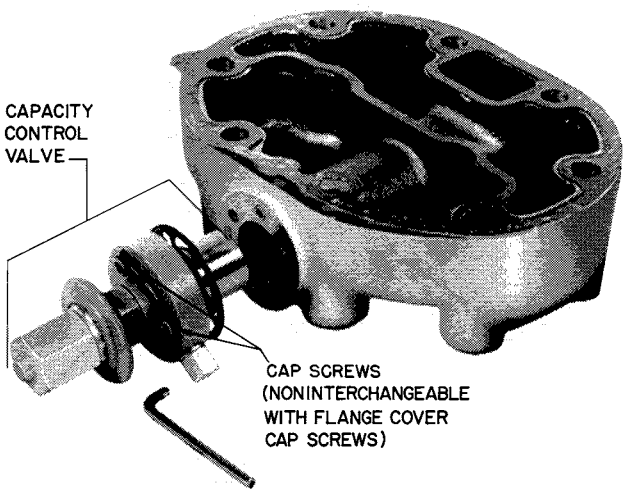


Fig. 14 — Removal of Capacity Control Valve

Remove same number of piston plugs from replacement compressor as number of unloaders supplied with original compressors. Three Allen head cap screws hold piston plug assembly in place. Remove flange cover, gasket, spring and bypass piston plug (Fig. 15). A tapped hole is provided in piston to allow it to be pulled out. Hole has same thread diameter as cap screws removed above.

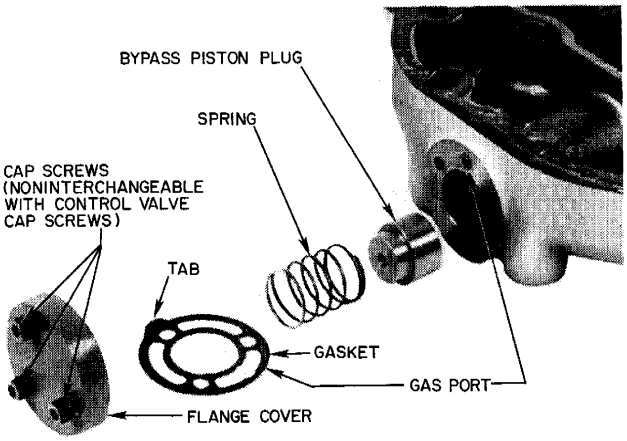


Fig. 15 – Removal of Bypass Piston Plug

Suction and Discharge Valve Plate Assembly (Fig. 16)

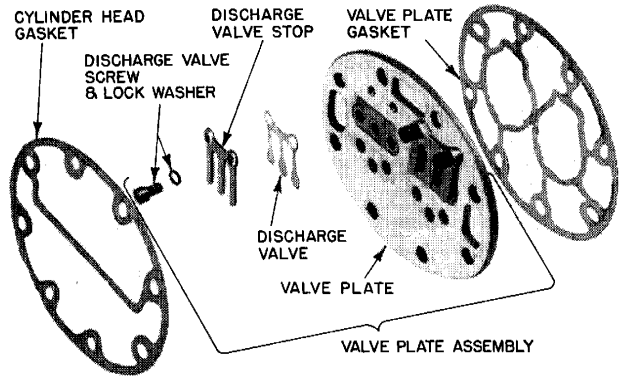


Fig. 16 – Valve Plate Assembly

Test for leaking discharge valves by pumping compressor down and observing suction and discharge pressure equalization. If a discharge valve is leaking, the pressures will equalize rapidly. Maximum allowable discharge pressure drop is 3 psi per minute after an initial drop of 10 to 15 psi in the first half minute.

If there is an indicated loss of capacity and discharge valves check properly, remove suction and discharge valve plate assembly and inspect suction valves.

IMPORTANT: This test procedure is not applicable to compressors equipped with pressure actuated or solenoid unloader valves due to rapid pressure equalization rate. Check suction and discharge valves by disassembling valve plate (see below).

DISASSEMBLY – Remove cylinder head.

1. Remove discharge valve assembly: cap screws, valve stops, valve stop supports and valves.
2. Pry up on side of valve plate, between valve plate and cylinder deck, to remove valve plate and expose suction valves. Remove suction valves and suction valve positioning springs from dowel pins.

Inspect valves and valve seats for wear and damage (see Compressor Wear Limits, Table 7). Check cylinder deck valve stops for uneven wear. Replace valves if cracked or worn. If valve seats are worn, replace complete valve plate assembly. If cylinder deck valve stops are worn, replace compressor.

REASSEMBLY – Do not interchange valves. Install suction valve positioning springs on dowel pins. Assemble positioning springs with spring ends bearing against cylinder deck (Fig. 17). Springs bow upward. Place suction valves on dowel pins, over positioning springs. Place valve plate on cylinder deck, and reinstall discharge valve plate assembly. Retorque discharge valve stop cap screws to 16 lb-ft. Replace cylinder head. Be sure cylinder head gasket is lined up correctly with cylinder head and valve plate.

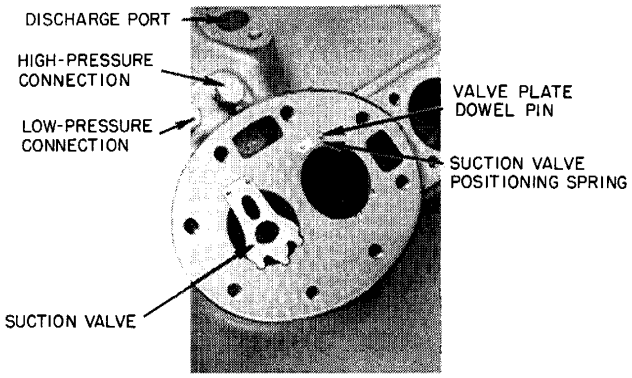


Fig. 17 – Suction Valve and Positioning Springs in Place

Cleaning Suction Strainer

1. Pump down compressor.
2. Remove motor end cover and screws holding disc type strainer (Fig. 18) to cover.
3. Clean strainer with solvent or replace if broken or corroded.
4. Replace strainer and motor end cover. Purge or evacuate compressor before starting.

Motor Replacement – Stator and rotor are not field replaceable. Stator is a press fit into motor housing. If compressor motor is damaged, replace compressor.

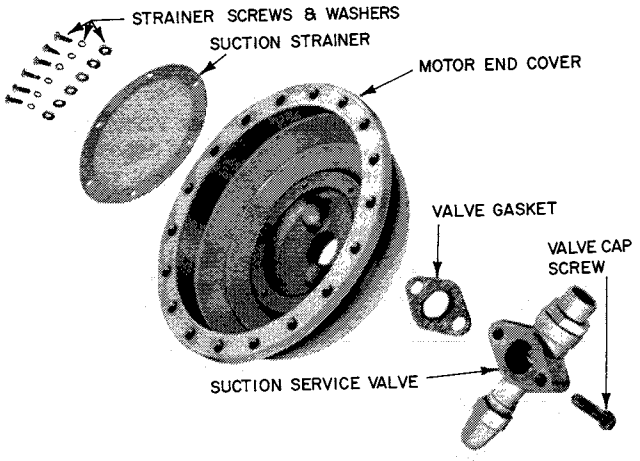
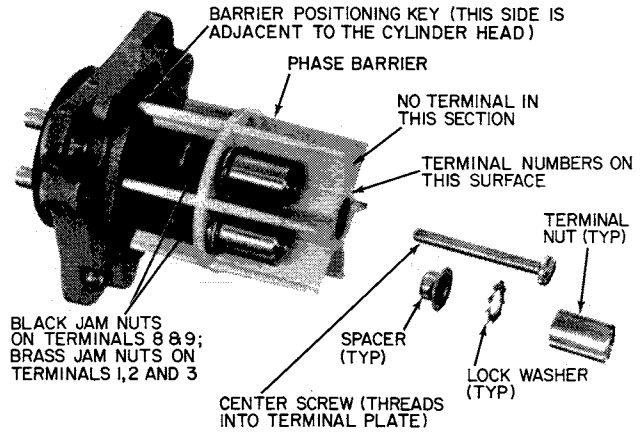


Fig. 18 — Motor End Cover Assembly

Terminal Plate Assembly — The terminal plate assembly is shown in Fig. 19. Do not disassemble for any reason except to replace the phase barrier, which may become damaged. *If refrigerant leakage or a ground short occurs, the entire terminal plate assembly must be replaced.*



ACROSS-THE-LINE APPLICATION (5 TERMINALS)

Fig. 19 — Terminal Plate Assembly

If it becomes necessary to remove the phase barrier, proceed as follows:

1. Loosen and remove all terminal nuts.
2. Remove lock washers and wire terminals.
3. Loosen and disengage the center screw. (Do not try to remove the screw.)
4. Lift the phase barrier off the terminal screws (the spacers and the center screw are removed with the phase barrier).

IMPORTANT: Do not disturb the jam nuts on which the phase barrier rests.

Procedure for reassembling the phase barrier:

1. Place phase barrier over the terminal screws. *Be sure positioning key is in the recess in the terminal plate before proceeding further.*
2. Place the spacers and wire terminals on the terminal screws.
3. Place the lock washers and terminal nuts over the wire terminals and tighten to specified torque (18-30 lb-in.).
4. Install the center screw through the phase barrier and tighten to the specified torque (15-25 lb-in.).

NOTE: *The design allows for clearance between the center screw head and the phase barrier. Thus, the torque limit may be reached before the screw head contacts the phase barrier. This condition is acceptable.*

Compressor Running Gear Removal

1. Remove pump end bearing head.
2. Remove motor end cover carefully to prevent damage to stator. Support cover and lift off horizontally until it clears windings.
3. Remove bottom cover plate.
4. Remove equalizer tube assembly from motor end of crankshaft (or eccentric shaft). If shaft turns, preventing tube assembly from being loosened, block shaft with a piece of wood.
5. Remove rotor using a jackbolt. Insert a brass plug into rotor hole to protect end of crankshaft from jackbolt. Support rotor while it is being removed to prevent stator damage.
6. a. Remove connection rod caps from compressors using connecting rods and crankshafts. *Label caps and rods so they may be reinstalled in same plate on crankshaft.*
   b. Remove bolts holding counterweights and eccentric strap side shields to eccentric shaft. Remove eccentric strap side shields. Remove pump end counterweight through pump end bearing head opening. Motor end counterweight will remain on eccentric shaft until shaft is removed.
7. Pull eccentric shaft or crankshaft out through pump end opening. Guide eccentric straps from eccentric shaft during removal process. Rotate shaft and tap it lightly to prevent straps from jamming.
8. Remove eccentric straps or connecting rods and pistons through bottom cover plate opening.
9. Disassemble connecting rods or eccentric straps from pistons by removing lock ring(s) and piston pins. Remove oil and compression rings from piston. *Keep each piston assembly together for proper reassembly.*

Check all parts for wear and tolerances shown in Table 7. Check crankshaft (eccentric shaft) oil passages and clean if clogged.

PUMP END MAIN BEARING is a machined part of the new aluminum oil pump and bearing head casting. Disassemble bearing head. If bearing is scored or worn, replace complete bearing head.

CRANKCASE AND MOTOR END MAIN BEARINGS are not field replaceable. If bearings are worn or damaged, replace compressor.

Compressor Running Gear Replacement

CRANKSHAFT — Install crankshaft through pump end, carefully guiding it through main bearings. Replace rotor. Attach equalizer tube assembly to motor end of shaft.

Eccentric shafts must be installed after piston assemblies. Place motor end counterweight on shaft before inserting shaft into compressor. See Piston Assembly Replacement.

PISTON ASSEMBLY — Attach connecting rods or eccentric straps to pistons with piston pins and lock in place with piston pin lock rings. Place lock rings with gap on the side. They should be tight enough so they cannot be rotated by finger pressure.

RINGS

1. Check ring gap by inserting each ring separately in cylinder, approximately ⅜ in. from top. Ring gap should be between .013 and .005 inch.
2. Install compression rings in top piston grooves with side marked "Top" toward piston head. Install oil ring below compression ring with notched end on bottom. Stagger ring gaps around piston.
3. Measure side clearance between ring and piston (Table 7). Check for free action.

PISTON ASSEMBLY REPLACEMENT

Compressors Using Crankshafts — Install connecting rod and piston assemblies into cylinders. Place chamfered sides of connecting rods against radius of crankpins. Install connecting rod caps to matching connecting rods through bottom of crankcase. Be sure chamfered sides of caps are against radius of crankpins. Caps are locked in place with cap screws. Use 8 to 10 lb-ft to tighten cap screws.

Compressors Using Eccentric Shafts — Install eccentric strap and piston assemblies into cylinders. Install eccentric shaft through pump end, carefully guiding it through eccentric straps and main bearings. Install pump end counterweight to eccentric shaft and replace eccentric strap side shields.

Turn crankshaft or eccentric shaft to be sure there is no binding between bearing surfaces and journals. Replace oil screen, bottom cover plate, valve plates and cylinder heads.

COMPRESSOR MOTOR BURNOUT

Clean-Up Procedure — If a hermetic motor burns out, the stator winding decomposes, forming carbon, water and acid which contaminate refrigerant systems. Remove these contaminants from system to prevent repeat motor failures.

1. Close compressor suction and discharge service valves, and bleed refrigerant from compressor. Save remaining refrigerant in system.
2. Check control box for welded contactor contacts, welded overload contacts or burned out heater elements. Check terminal plate for burned or damaged terminals, insulation, and shorted or grounded terminals. Repair or replace where necessary.
3. Remove suction and discharge shutoff valve bolts and all other connections to damaged compressor. Remove damaged compressor and replace with new compressor. Replace liquid line filter drier with a drier of one size larger.
4. Purge new compressor. Triple-evacuate, using the following procedure:
   Step 1. Evacuate to 5000 microns.
   Step 2. Break vacuum with system refrigerant. Pressurize to 15 psig. Wait 20 minutes to remove moisture.
   Step 3. Re-evacuate to 5000 microns.
   Step 4. Repeat Step 2.
   Step 5. Evacuate to 1000 microns or below if possible.
5. Place compressor in operation. After 2 to 4 hours of operation, check compressor oil for signs of discoloration and/or acidity. If oil shows signs of contamination, replace oil charge, filter driers, and clean suction strainer with solvent. Repeat this procedure until oil stays clean and acid free for 48 hours of operation.

TROUBLESHOOTING

COMPRESSOR DOES NOT RUN

Main power line open — *replace fuse or reset circuit breaker.*

Safety thermostat tripped — *reset thermostat.*

Condenser water pump not running — power off — *restart;* pump binding — *free pump;* incorrect wiring — *rewire;* motor burned out — *replace.*

Control stuck open — *replace control.*

Loose terminal connection — *check connections.*

Improperly wired controls — *check wiring and rewire.*

Low line voltage — *check line voltage — determine location of voltage drop.*

Compressor motor defective — *check motor winding for open or short. Replace compressor if necessary.*

Seized compressor — *replace compressor.*

COMPRESSOR CYCLES ON LOW-PRESSURE CONTROL

Low-pressure control erratic in action — *raise differential setting, check capillary for pinches, replace control.*

Suction shutoff valve partially closed — *open valve.*

Low refrigerant charge — *add refrigerant.*

Plugged suction strainer — *clean strainer.*

Defective TXV — *replace.*

COMPRESSOR CYCLES ON HIGH-PRESSURE CONTROL

High-pressure control erratic in action — *check capillary tube for pinches. Set control as required.*

Discharge valve partially closed — *open valve.*

Air in system — *purge.*

Condenser scaled (or airflow restricted) — *clean condenser.*

Receiver not properly vented, refrigerant backs up into evap condenser — *repipe as required.*

Condenser water pump or fans not operating — *start pump or fans.*

Refrigerant overcharge — purge.

INSUFFICIENT CAPACITY

Low refrigerant charge — *add refrigerant.*

Control set too high — *reset control.*

Expansion valve plugged — *clean or replace.*

Inefficient compressor — *check valves and pistons.*

Expansion valve setting too high — *lower setting.*

Iced or dirty evaporator — *defrost or clean.*

Evaporator too small — *add surface or replace.*

Condensing unit too small — *add unit or replace.*

Expansion valve too small — *raise suction pressure with larger valve.*

Restricted or small gas lines — *clear restriction or increase line size.*

UNIT OPERATES LONG OR CONTINUOUSLY

Low refrigerant charge — *add refrigerant.*

Control contacts fused — *replace control.*

Air in system — *purge.*

Partially plugged or plugged expansion valve or strainer — *clean or replace.*

Defective insulation — *replace or repair.*

Service load — *keep doors and windows closed.*

Inefficient compressor — *check valves.*

Condenser scaled — *clean condenser.*

Restricted evaporator air — *defrost coil, clean filters and ductwork.*

SYSTEM NOISES

Piping vibration — *support piping as required, check for loose pipe connectors.*

Expansion valve hissing — *add refrigerant, check for plugged liquid line strainer.*

Compressor noisy — *check valve plates for valve noise, replace compressor (worn bearings), check for loose compressor holddown bolts.*

Insufficient compressor oil — *add oil.*

COMPRESSOR LOSES OIL

Leak in system — *repair leak.*

Plugged or stuck compressor oil return check valve — *repair or replace.*

Oil trapping in line — *check piping for oil traps.*

Crankcase heaters not energized during shutdown — *replace heaters.*

FROSTED SUCTION LINE

Expansion valve admitting excess refrigerant — *adjust expansion valve.*

HOT LIQUID LINE

Shortage of refrigerant — *repair leak and recharge.*

FROSTED LIQUID LINE

Receiver shutoff valve partially closed or restricted — *open valve or remove restriction, restricted catchall — replace.*

Restricted strainer drier — *replace.*

FROSTED EXPANSION VALVE

Ice plugging TXV orifice — *apply hot wet cloth to TXV. Moisture indicated by increase in suction pressure. Install drier.*

Plugged TXV strainer — *clean strainer or replace TXV.*