Number One Air Conditioning Maker

Carrier

Division of Carrier Corporation

Carrier Parkway • Syracuse N Y 13221

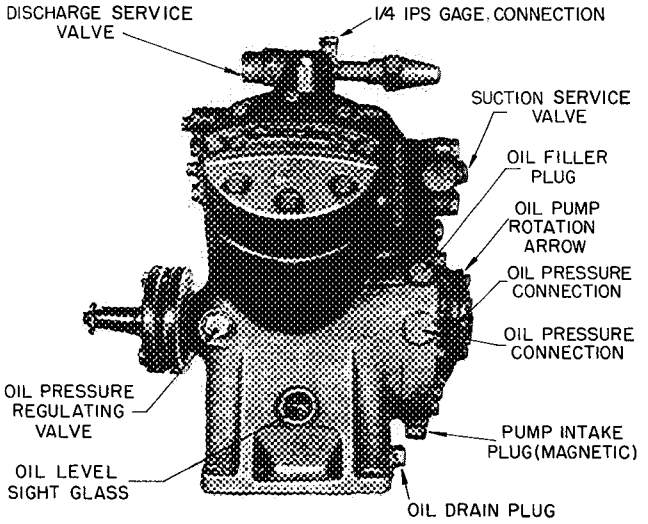
Installation, Start-Up and Service Instructions

5F,H

Compressors and Condensing Units

Open, Water-Cooled

CONTENTS



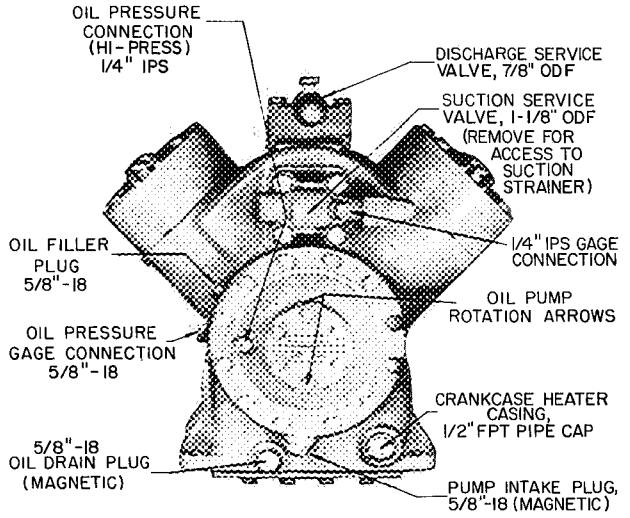


Fig. 1 — 5F20, 2-Cylinder Compressor

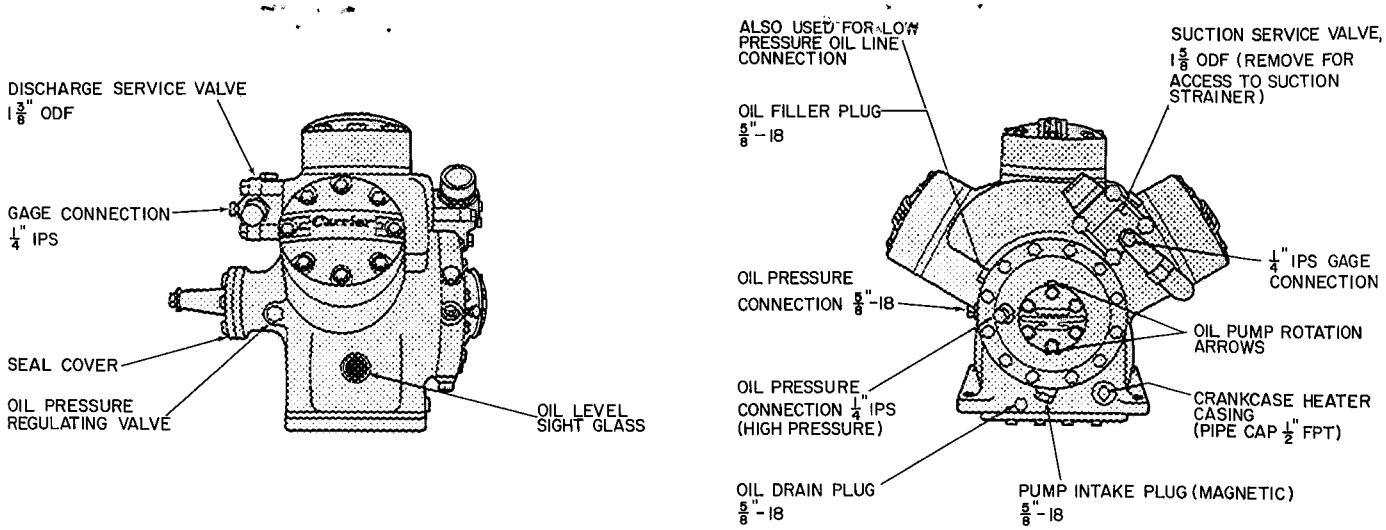


Fig. 2 — 5F30, 3-Cylinder Compressor

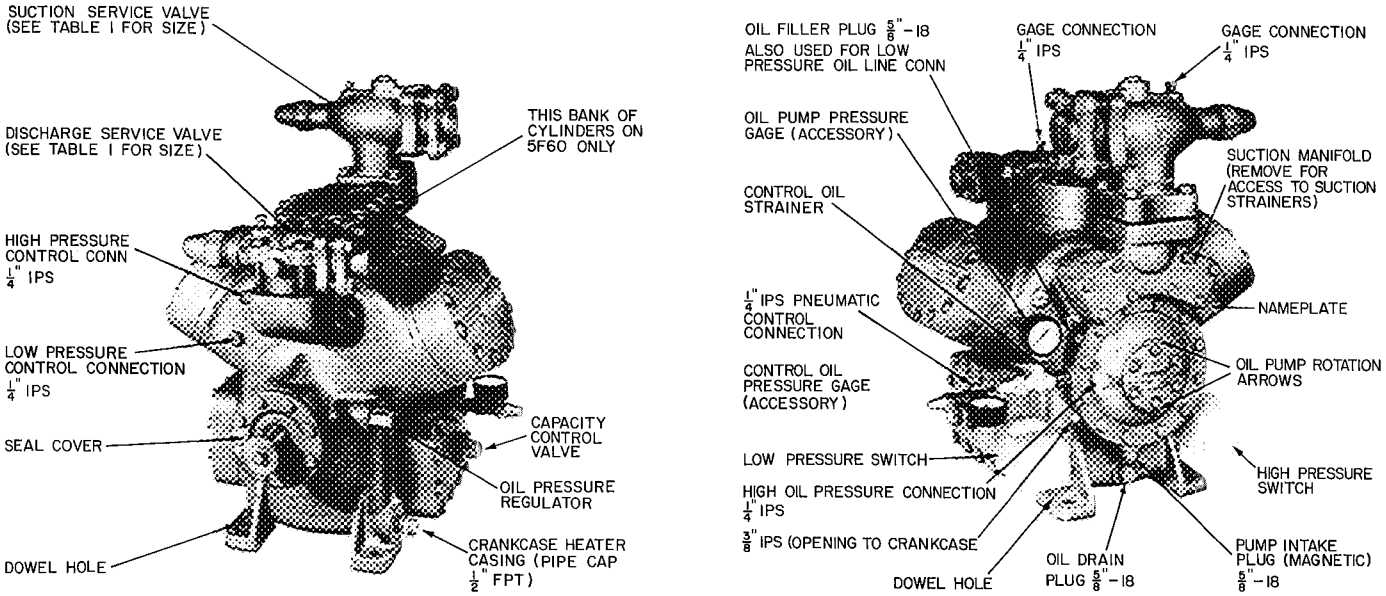


Fig. 3 — 5F40, 4-Cylinder and 5F60, 6-Cylinder Compressors

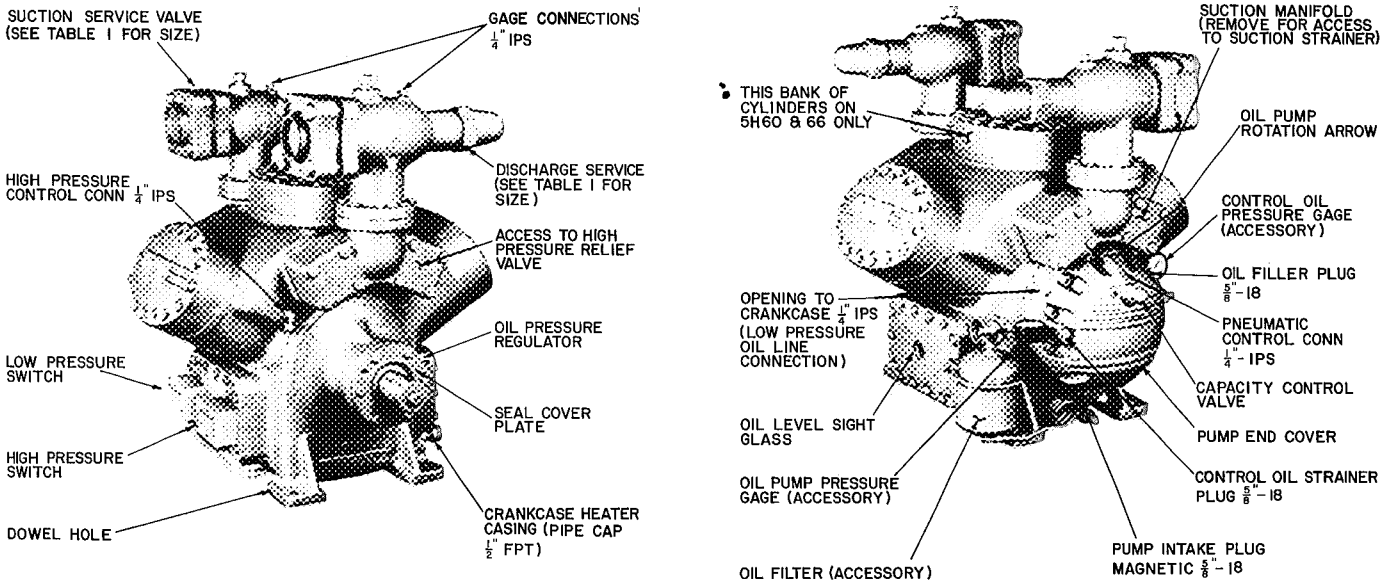


Fig. 4 — 5H40,46, 4-Cylinder; 5H60,66, 6-Cylinder and 5H80,86, 8-Cylinder Compressors

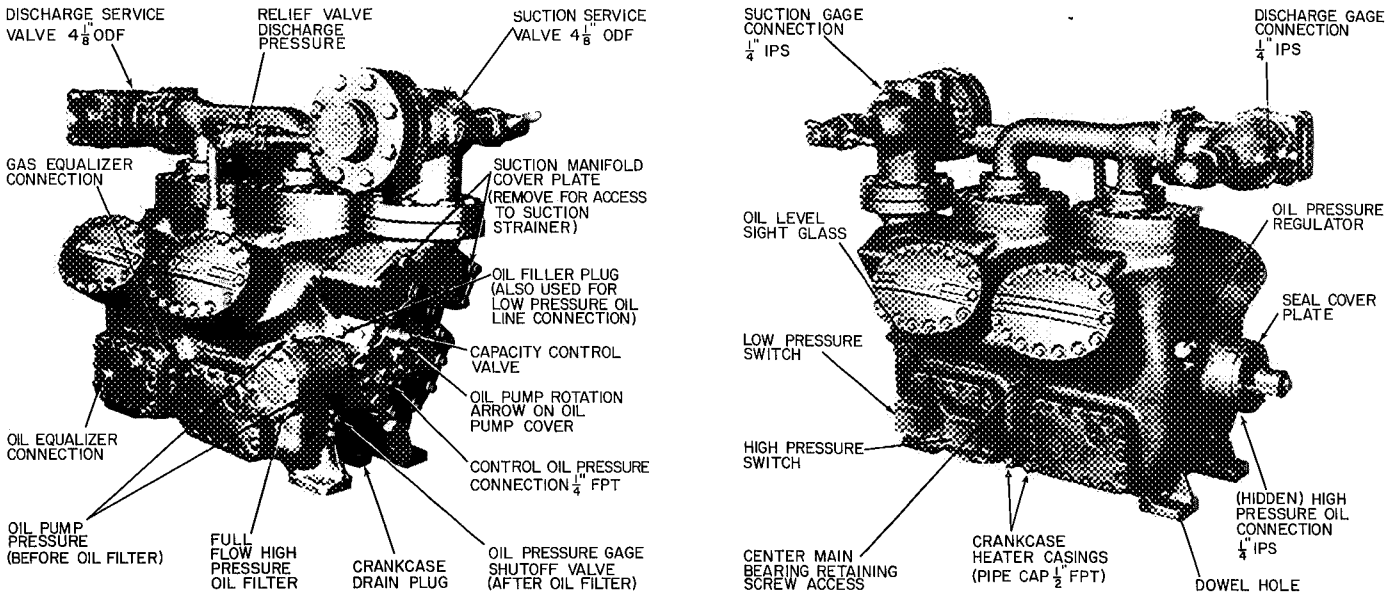


Fig. 5 — 5H120,126, 12-Cylinder Compressors

Table 1 — Compressor Connections

COMPRESSOR		5F				5H			
		20	30	40	60	40,46	60,66	80,86	120,126
CONN. (in. OD)	Suct	1⅛	1⅝	2⅛	2⅝	2⅝	3⅛	3⅛	4⅛
	Disch	⅞	1⅜	1⅝	2⅛	2⅛	3⅛	3⅛	4⅛

Table 2 — Minimum Rpm for Capacity Control and Lubrication

COMPRESSOR	RPM
5F20	600
5F30	700
5F40; 5H40,46; 5H40/60	800
5F60; 5H60,66,120,126; 5H120/120	900
5H80,86; 5H60/80,80/80,80/120	1100

INSTALLATION

Step 1 — Prepare for Installation

PREPARE EQUIPMENT ROOM

Select a site for compressor or condensing unit in a well ventilated area. If natural ventilation is inadequate, provide forced ventilation thru ductwork. Check applicable code requirements.

Provide freeze-up protection for water-cooled condensers, water lines and accessories if freezing temperatures can occur during winter shutdown periods.

Be sure there is sufficient clearance for removal of compressor cylinder heads and valve plates. Allow space on the oil pump end for crankshaft removal as follows:

5F20, 30, 40 and 60 compressors — 20 inches
5H40, 46, 60 and 66 compressors — 20 inches
5H80, 86, 120 and 126 compressors — 30 inches

Provide a space equal to the condenser length for tube removal and cleaning (see Dim. A, Fig. 10).

PREPARE FOUNDATION

The 5F and 5H compressors may be fastened to:

1. A steel base and vibration isolators on floor.
2. A steel base and condenser support stand.
3. A concrete base.

In each case, the foundation must be of sufficient strength for the expected load and should be resistant to vibration.

Floor Foundations — Locate the unit over joists or beams wherever possible.

Weak floors in old buildings must be reinforced with steel beams or timbers to support the heavy compressors or condensing unit. Use care in placing supports to avoid the transmission of objectionable vibrations to other areas.

Concrete Foundations — The foundation weight should be 1 to 2 times the weight of the machinery it is to support in order to absorb vibration. Refer to Fig. 12 for recommended dimensions.

Let the foundation set for approximately 3 days before installing compressor. Allow for 3/8- to 1/2-in. grout thickness after compressor has been installed.

Heavy aggregate concrete weighs about 150 pounds per cubic foot.

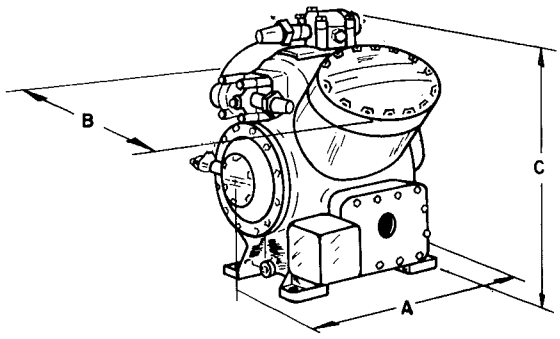
Step 2 — Receive Machine.

IDENTIFY UNIT

Check the unit nameplates, while still on shipping conveyance, against model and serial numbers recorded in your job data.

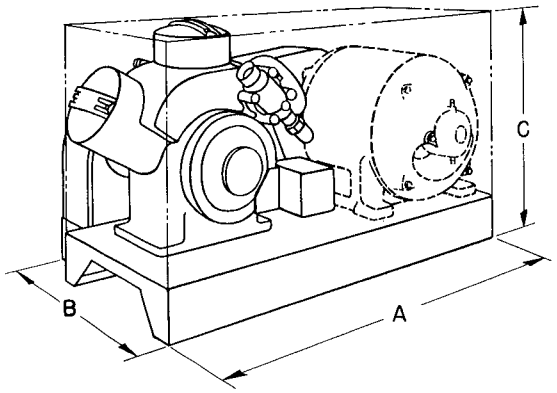
INSPECT FOR SHIPPING LOSS OR DAMAGE

Before unit is removed from conveyance, check all items against shipping list and examine items carefully for any shipping damage. If damage is found or if any major component has been torn loose from its anchorage, have it examined by transportation inspectors before removal. File claim immediately with shipping company for any loss or damage.



COMPR		5F				5H			
		20	30	40	60	40, 46	60, 66	80, 86	120, 126
WT (lb)		175	215	355	400	610	795	1115	1580
DIM. (ft-in.)	A	1-3⅝	1-5¾	1-9⅜	1-11½	2-6½	2-7½	3-7⅞	3-10¾
	B	1-6¾	1-8⅞	1-7	1- 9	2-0½	2-3¼	2-0½	2- 3⅜
	C	1-6¾	1-5⅞	1-7⅜	2- 0½	2-5	2-2½	2-8	2- 9¼

Fig. 6 — Bare Compressor Weights and Overall Dimensions



COMPR		5F				5H*			
		20	30	40	60	40	60	80	120
WT (lb)		260	300	515	600	915	1095	1650	2215
DIM. (ft-in.)	A	3-2	3-3	3-9⅜	3-9⅜	4-8¼	4- 9⅛	5-6¼	5- 7⅝
	B	1-9⅜	1-9⅜	2-2¼	2-2⅝	2-8⅜	2-10	3-9⅜	3-11⅝
	C	2-5	2-4¼	2-1¾	2-6¾	3-1¼	3- 2⅛	3-6⅝	3- 4¼

Compressor units (except 5H80) with slightly different dimensions and horsepower requirements are available to accommodate oversize condensers and motors See certified prints for dimensions

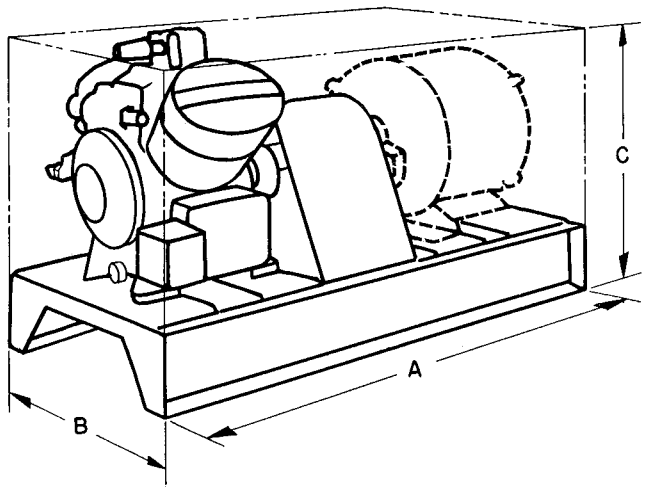
*Belt drive units not available for 5H46,66,86 and 126 sizes

Fig. 7 — Belt Drive Compressor Unit Weights and Overall Dimensions

Table 3 — Condenser Water Connections (in. FPT)

CONDENSER	MAX PASSES	MIN PASSES	
	In and Out	In*	Out
5F20	½	½	1†
5F30	¾	¾	1†
5F40,60	1¼	1¼	1½
09RH027	2	2	2½
09RH043,054,070	2	2	3
09RH084,097	2½‡	2½‡	4‡
09RH127	3‡	3‡	5‡

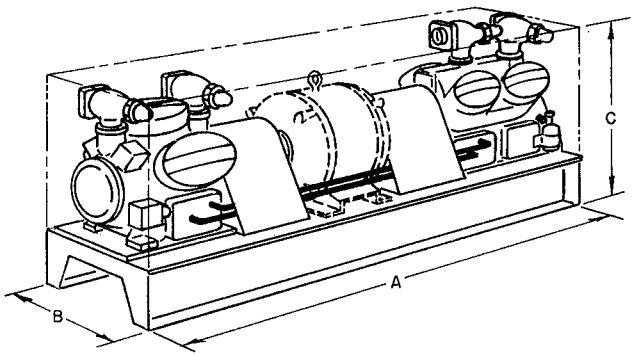
*Two connections required †MPT ‡IPS



COMPR		5F				5H			
		20	30	40	60	40, 46	60, 66	80, 86	120, 126
WT (lb)		–	–	480	565	880	1065	1710	2210
DIM. (ft-in.)	A	–	–	3-11⅜	4-0¼	4-9⅛	4-10⅛	6-4	6-7½
	B	–	–	1- 9½	1-9½	2-0½	2- 3¼	2-7½	2-7½
	C	–	–	2- 1½	2-6¾	3-1¼	3- 3⅛	3-7⅝	3-9⅛

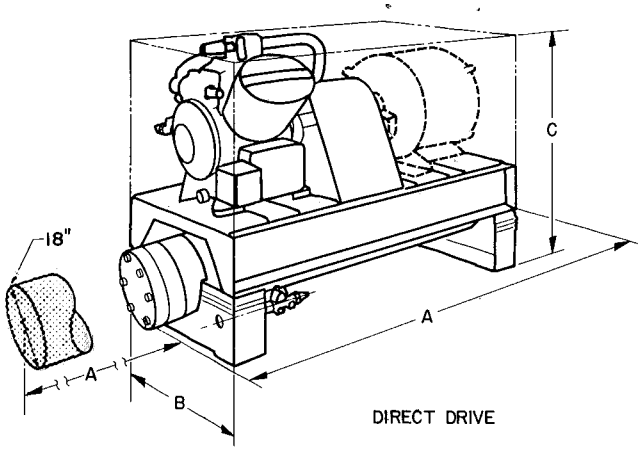
Compressor units (except 5H80) with slightly different dimensions and horsepower requirements are available to accommodate oversize condensers and motors See certified prints for dimensions

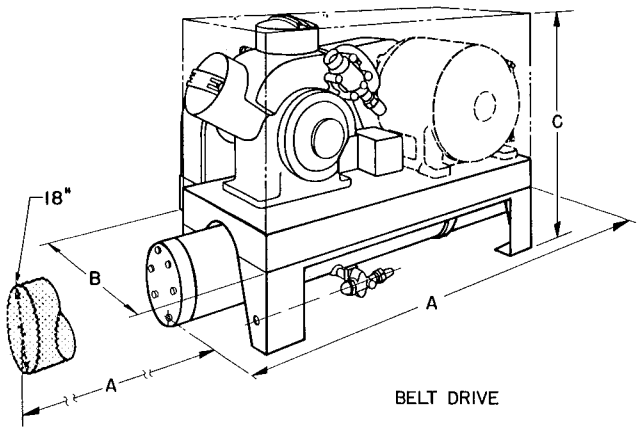
Fig. 8 — Direct Drive Compressor Unit Weights and Overall Dimensions



COMPR		5H DUPLEX				
		40/60	60/80	80/80	80/120	120/120
WT (lb)		2210	2713	3225	3840	4305
DIM. (ft-in.)	A	8-7⅛	9-2¼	10-10½	11-5¼	11-10¼
	B	2-8⅝	2-8⅝	2- 8⅝	2-8⅝	2- 8⅝
	C	3-4⅛	3-6¼	3- 6¼	3-9⅛	3- 9⅛

Fig. 9 — Duplex Compressor Unit Weights and Overall Dimensions (Available on Special Order)





Space for tube removal either end, except 5F20 & 5F30 Coils not removable

DRIVE		BELT														
COMPR		5F20		5F30			5F40			5F60		5H40			5H60	
COND		20	30	20	30	40*	30	40	60	40	60	60	027	043	027	043
WT (lb)		385	425	430	460	830	790	960	1050	1070	1230	1500	1715	1955	1925	2165
DIM. (ft-in.)	A	3- 2⅞	3-4⅛	3-2⅞	3- 4⅛	5- 3	4-3⅜	5-3	6- 2	5- 3	6-2	6-2	6- 5	6- 7¼	6- 5	6-7¼
	B	1- 9⅜		1-9⅜		2- 2¼		2- 2¼		2- 3⅝		2-8⅜			2-10⅛	
	C	2- 5		2-4¼		2- 9½		2-10⅛		3- 1⅝		3-8¾	3- 9¼	3-11¼	3-10⅛	4-0⅛

DRIVE		BELT												DIRECT		
COMPR		5H60			5H80					5H120				5F40		–
COND		054	054†	070	043	054	070	084	097	054	070	084	097	40	60	–
WT (lb)		2390	2650	2710	2845	2990	3050	3385	3690	3589	3664	3955	3240	880	970	–
DIM. (ft-in.)	A	7-11¼	7-11¼		6- 7¼	7-11¼		8-3⅜	10- 3⅛	7-11¼		8-3⅜	10-3⅛	5- 3	6- 2	–
	B	2-10⅛	3- 8¼			3-9⅜				3-11⅜				1- 9¾		–
	C	4- 0⅛	4- 3⅛			4-5⅝				4- 8⅛				2-10⅛		–

DRIVE		DIRECT														
COMPR		5F60		5H40		5H46			5H60				5H66			
COND		60	027	027	043	043	054	070	043	054	070	084	054	070	084	097
WT (lb)		1060	1385	1605	1890	1890	2025	2095	2025	2190	2740	2800	2190	2740	2800	3105
DIM. (ft-in.)	A	6- 2	6-5	6-5	6- 7¼	6- 7¼	7-11¼		6- 7¼	7-11¼		8-3⅜	7-11¼		8- 3⅜	10-3⅛
	B	1- 9¾	2-0¾	2-2		2- 2			2- 4⅝	2- 4⅝		2-7½	2- 4⅝		2- 7½	
	C	3- 2½	3-4¾	3-9¼	3-11¼	3-11¼			4- 0⅛	4- 0⅛		4-3⅛	4- 0⅛		4- 3⅛	4-4⅛

DRIVE		DIRECT														–
COMPR		5H80				5H86				5H120				5H126		–
COND		054	070	084	097	070	084	097	127	070	084	097	127	097	127	–
WT (lb)		2930	2990	3315	3620	2990	3315	3620	4230	3570	3870	4130	4740	4130	4740	–
DIM. (ft-in.)	A	7-11¼		8-3⅜	10- 3⅛	7-11¼	8-3⅜	10-3⅛	8- 4⅝	7-11¼	8-3⅜	10-3⅛	8- 4⅝	10- 3⅛	8- 4⅝	–
	B	2- 6⅞		2-9⅛		2- 6⅞	2-7¼		2-10½	2- 5⅜	2- 7½		2-10⅛	2- 7⅝	2-10⅛	–
	C	4-5⅜				4- 5⅜	4-3⅜	4-6⅜	4-10⅜	4- 8⅛	4- 8⅛		5- 0⅛	4- 8⅛	5- 0⅛	–

COMPR		5F20		5F30		5F40			5F60			5H40			–
COND		20	30	20	30	40	30	40	60	40	60	027	60	027	043	–
CONN.	Suct	1⅛		1⅝			1⅝			2⅛			2⅝			–
	Liq	½		½		⅞	½	⅞	1⅛	⅞	1⅛	1⅜	1⅛	1⅜		–

COMPR		5H46			5H60					5H66				5H80	
COND		043	054	070	027	043	054	054†	070	084	054	070	084	097	043	054
CONN.	Suct	2⅝				3⅛					3⅛				3⅝	
	Liq	1⅞	1⅝		1⅜	1⅝				2⅛	1⅝	2⅛			1⅜	1⅝

COMPR		5H80			5H86				5H120				5H126		–
COND		070	084	097	070	084	097	127	054	070	084	097	127	097	127	–
CONN.	Suct	3⅝			3⅝				4⅛					4⅛		–
	Liq	1⅝	2⅛		1⅝	2⅛			1⅝	2⅛				2⅛		–

5F Condenser No 09RH Condenser No *Special order only †For 60- and 75-hp motors

Fig. 10 — Condensing Unit Weights, Dimensions and Refrigerant Connections

RIG UNIT CAREFULLY

Be sure rigging equipment is capable of safely handling the equipment. Weights for compressors and condensing units are listed in Fig. 6, 7, 8, 9 and 10.

Rig and move the unit carefully to prevent damage to mounting brackets, refrigerant piping and connections.

Step 3 — Install Unit on Floor or Base

TO MOUNT COMPRESSOR UNIT ON FLOOR

The motor fastening set supplied with all compressor units except 5F20 and 30 includes motor blocks and shims for motor alignment; capscrews, plate washers and lock washers for fastening motor to base; taper dowel pins for securing motor position after alignment; and beveled washers for fastening the unit base to vibration isolators or floor.

Obtain isolators from accessory Vibration Isolator Package and attach to unit base as indicated in Fig. 11. To avoid overbalancing the unit, lift from end, not side, when attaching isolators to base.

With compressor and motor positioned on the base, check the height of the vibration isolators. Shim between the isolators and the floor as required to level the compressor base. When level, secure the vibration isolators to the floor. Be sure beveled washer (Fig. 11) is in place. If washer is omitted, the capscrew end may strike the floor and cause the isolator to rupture.

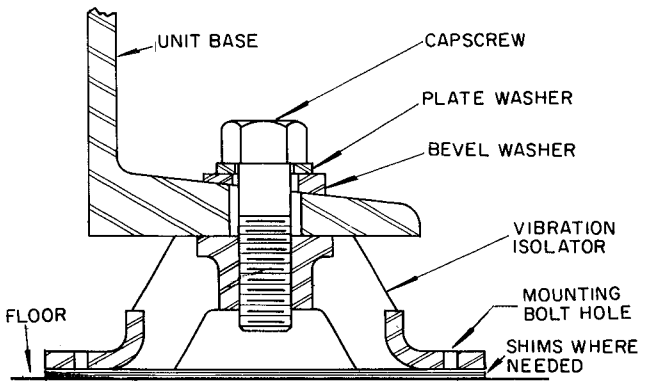


Fig. 11 — Typical Vibration Isolator Mounting

TO MOUNT COMPRESSOR ON CONCRETE BASE

With concrete foundation prepared as shown in Fig. 12 and described in Step 1, set the compressor on the foundation bolts and level in 2 directions. The compressor discharge shutoff valve can be removed and the face of the mounting flange can then be used as a leveling pad. Locate and level the motor slide rails. Provide clearance for 3/8- to 1/2-in. grout. Tighten the foundation bolts hand-tight. Do not use wrench.

Wet the top of the concrete, pour grout and tamp to fill all spaces between machinery and concrete. Allow grout to dry slightly and then trowel smooth.

A suggested mixture for the grout is 1 part Portland cement to 2 or 3 parts of sharp sand.

When grout has hardened for 24 to 36 hours, tighten the foundation bolts moderately. Over-tightening bolts can cause compressor misalignment.

TO MOUNT CONDENSER ON SUPPORT STANDS

Place the cast iron support stands in line and with the mounting hole spacing dimension C (Fig. 13) equal to the mounting hole spacing on the matching compressor base.

Bolt the lower support straps (Fig. 13) loosely to the underside of each support stand and place strips of Fabrica on the straps. Now position the condenser on the stands with the hot gas inlet (Fig. 13) at the top of the condenser and the liquid shutoff valve connection facing the compressor end of the base. Make sure that the condenser overhangs the support stands for the same distance on each end.

Remove the soldered shipping cap from the hot gas inlet. To prevent the solder from dripping into the inlet pipe, rotate the condenser until the pipe is below the horizontal position while unsoldering. Then return the inlet to the upright vertical position.

Tighten the lower support straps enough to lift the condenser off the stands. Place the upper straps loosely in position with a Fabrica strip between condenser and strap (5F20 and 5F30 units use lower strap only).

TO MOUNT COMPRESSOR BASE ON SUPPORT STANDS

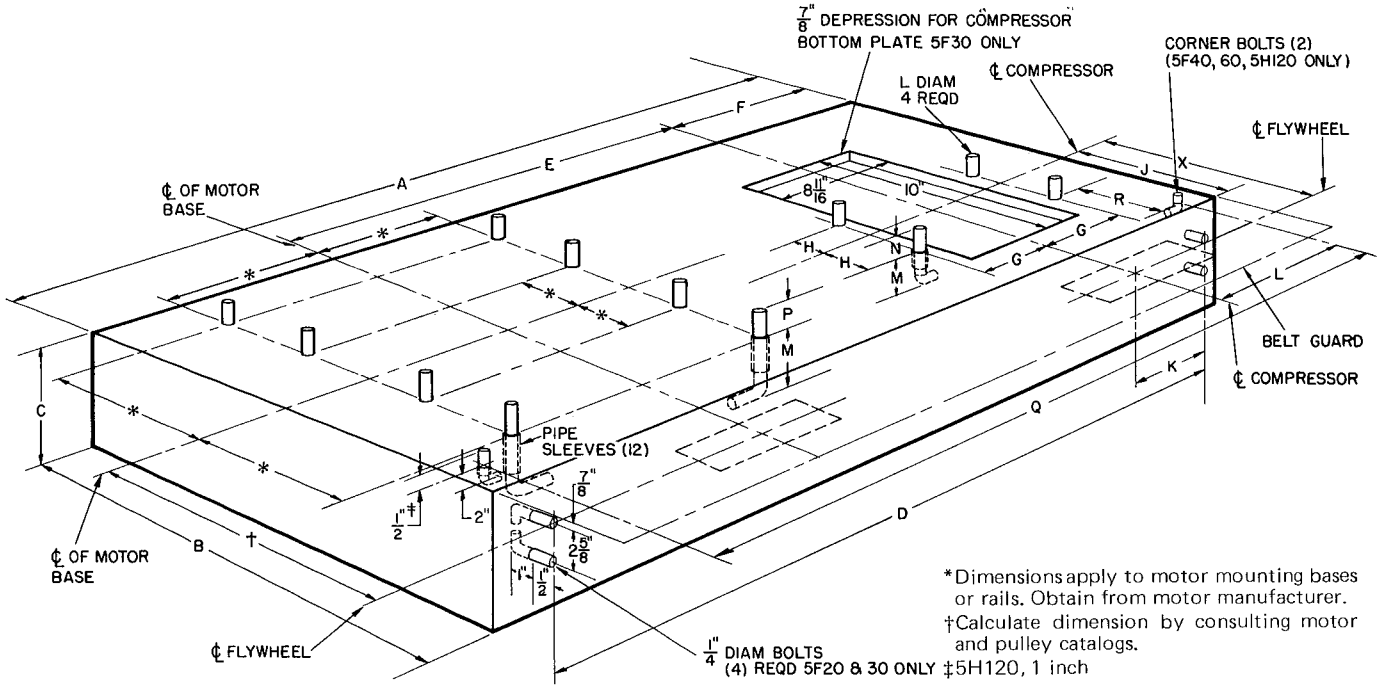
Place compressor base on support stands with the 2 extra strips of Fabrica between the top of the condenser and the base. Bolt the base in position with the capscrews and lockwashers provided.

Step 4 — Assemble Refrigerant Piping and Components

COMPRESSOR DISCHARGE PIPING

Loosely connect the compressor discharge line as shown in the piping arrangement drawing accompanying the Piping Package. Certain stock items for the discharge line may be field-supplied; check your individual package.

Adjust the condenser position so that the discharge line is aligned with the condenser inlet. Make sure that joints are not forced or stressed. If any joints are difficult to solder while in position, scribe and solder the joint before installing the complete line on the unit. Before completing soldering, try coupling or belt guard in position to ensure piping clearance.



DIMENSIONS

DIMEN (in.)	5F 20	5F 30	5F 40	5F 60	5H 40	5H 60	5H 80	5H 120
A	36		48		53	57	60	71
B	19		26		28	30	40	37
C	7	9	10		13	14	15	16
D	33⅛		45		–	–	–	66
E	20.2* 19.3†		25.5* 26.6†		30.7* 32.2†		38.2* 36 7†	
F	8		9		10		14½	
G	5		4		5½		5½	
H	2⅞		6	6 23/32	7¾	8½	14½	
J	5 1/32	6 15/16	9½	10½	11½	12	16½	18½
K	9 9/16		7⅛		–		–	12
L	½				⅝			
M	3		4				6	
N	1½				1¾		2½	2
P	2				2¼		2½	
Q	–		45		–	–	–	66
R	–		1¾	2	–	–	–	1¾
X	See Motor/Compressor Combination Table							

*1450 rpm
†1750 rpm

MOTOR/COMPRESSOR COMBINATIONS

COMPR SIZE	MOTOR HP	COMPR RPM	BELTS (No.) Size	DIMEN X (in.)
5F20	5,7½,10	1750 & 1450	(2) B	7 15/16
5F30	5	1450	(2) B	9 21/32
	7½	1750		
	7½	1450	(3) B	10 31/32
	10,15	1750 & 1450		
5F40	7½,10,15,20	1750 & 1450	(3) B	10¾
5F60	10,15,20	1750 & 1450	(3) B	11 7/16
	10,15,20,25	1750 & 1450	(4) B	11 13/16
5H40	20,25,30,40,50	1750 & 1450	(3) C	13⅜
	30,40,50	1450	(5) C	13¾
5H60	30	1750 & 1450	(3) C	14⅛
	30	1450	(5) C	14½
	40,50	1750 & 1450	(5) C	14½
	60,75	1750	(5) C	14½
5H80	40,50	1750	(5) C	20½
	40,50	1450	(6) C	18⅝
	60	1750 & 1450	(6) C	18⅝
	75	1750	(6) C	18⅝
	60,75	1450	(9) C	21⅜
	100	1750	(9) C	21⅜
5H120	60	1750	(9) C	20⅝
	60	1450	(9) C	21½
	75,100	1750 & 1450	(9) C	21½

Fig. 12 – Concrete Foundation Details – Sizes 5F20,30,40,60; 5H40,60,80,120

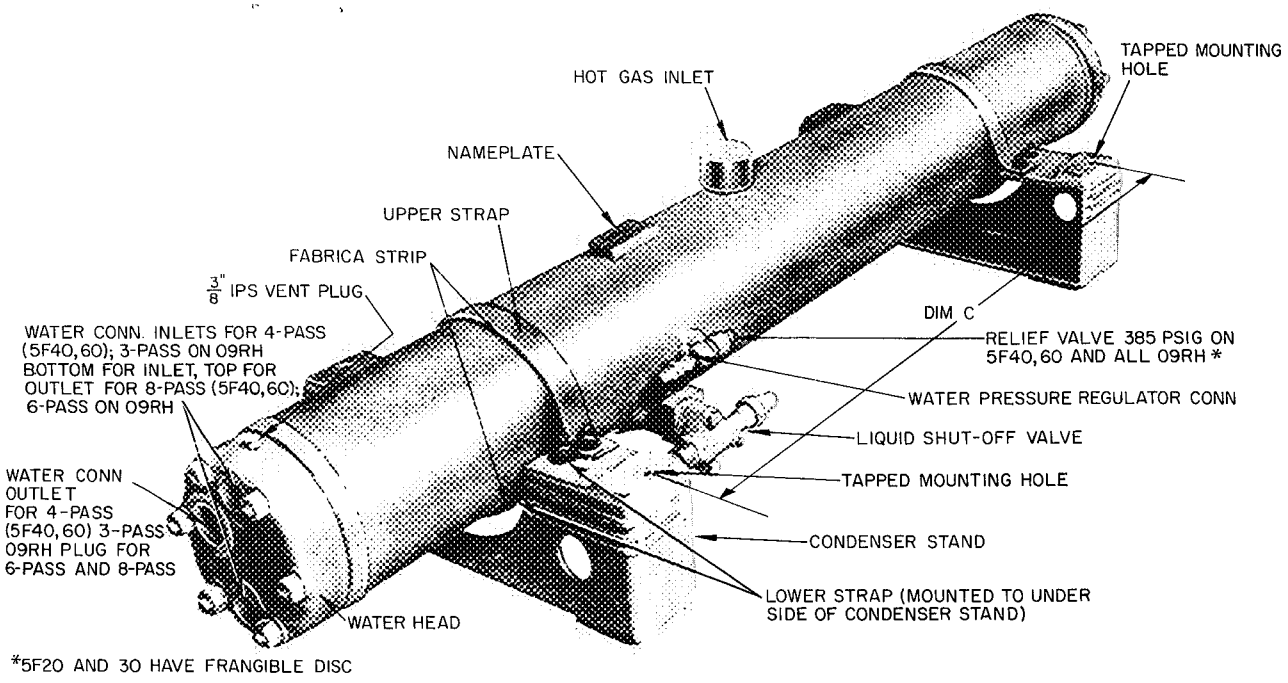
Compressor Muffler – Mufflers are included in the condenser piping packages of 5H condensing units. *They are a recommended option for all remote installations.* Mufflers may be installed in a horizontal position or vertically with refrigerant flow downward. An arrow on the muffler indicates the flow direction. In horizontal installation, place the offset outlet at the bottom to prevent trapping oil. Locate the muffler as near to the compressor as possible.

SUCTION AND LIQUID LINES

The connection sizes on the condensing-unit end of the suction and liquid lines are listed for all sizes in Fig. 10.

REFRIGERANT DRIER

A permanent drier is recommended for most systems and is essential on all low-temperature systems. The field-supplied drier should be mounted in the liquid line with shutoff valve that



*5F20 AND 30 HAVE FRANGIBLE DISC

COMPRESSOR	DIMENSION C (ft-in.)														
	5F					5H									
	20	30	40	60	60*	40	46	60	66	60*	66*	80	86	120	126
BELT DRIVE	2-8⅜	2-8⅜	3-7⅞	3-7⅞	–	4-2¾	–	4-2¾	–	–	–	4-7¾	–	4-7¾	–
DIRECT DRIVE	–	–	3-7⅞	3-7⅞	4-2¾	4-2¾	4-2¾	4-2¾	4-2¾	4-5½	4-5½	5-9¾	5-9¾	5-9¾	5-9¾

*Oversize base

Fig. 13 – Typical Assembled Condenser Package

allows isolation of the drier for servicing. (See Fig. 14)

A moisture indicator on the downstream side of the drier is a useful means for determining when drier cartridges need to be replaced.

FELT FILTER

The felt filter supplied with the compressor should be installed in the suction strainer (Fig. 1 thru 5). Remove the filter after 50 hours of operation. If clean, leave it out; if dirty, clean it with kerosene or neutral spirits and re-insert it for another 50 hours of operation. *Indicate on a tag that filter has been cleaned and reinstalled.*

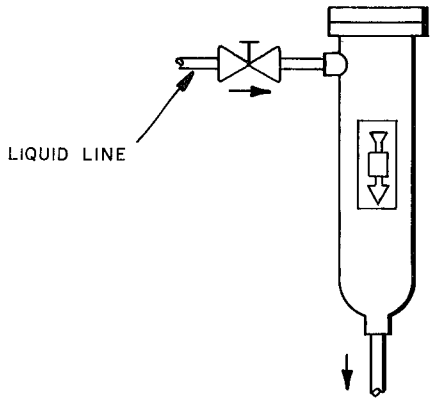


Fig. 14 – Refrigerant Drier and Shutoff Valve Arrangement

EQUALIZING LINES

Compressors operating in parallel require interconnecting lines for oil and gas pressure equalization. Special handhole cover plates, equipped with tapped holes for the equalizing lines, are available as options for Size 5F40 and 60, and Size 5H40, 46, 60, 66, 80 and 86 compressors.

5H120 and 126 Compessors are supplied with tapped cover plate as standard. On these compressors, use only the lower connection (Fig. 15) for oil equalization. Connect the gas equalizing line to the flange connection shown. The mating flange for the 1 1/8-in. line is Mueller Part No. A-5151; the gasket part number is A-5152.

5F20 and 30 Compressors have no special tapped cover plate. Use the opening for the oil sight glass (Fig. 16) to attach a 1 1/8-in. line for gas and oil equalization. If additional equalization is desired, run a 3/8-in. line to the oil filler plug connection (Fig. 1 and 2).

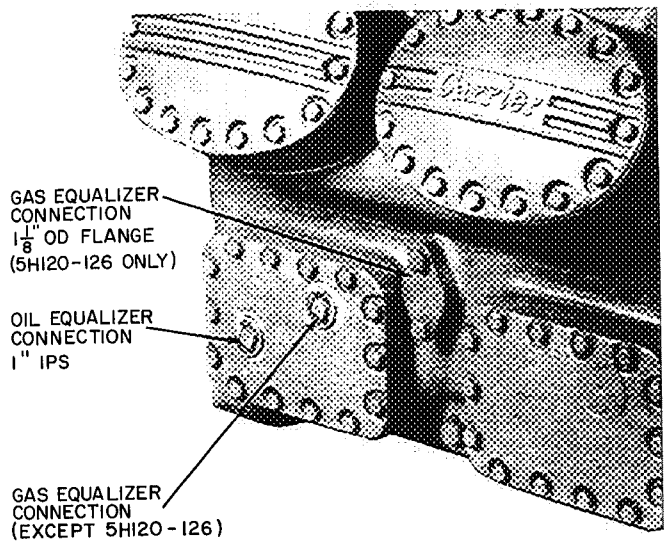


Fig. 15 – Special Handhole Cover and Equalizer Connections

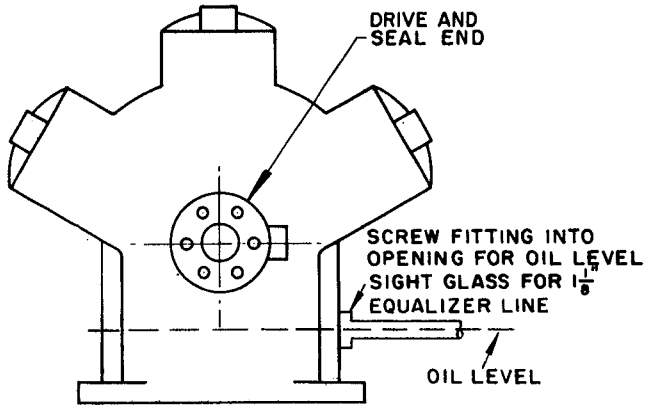


Fig. 16 – Equalizer Connections (5F20 and 5F30)

Step 5 – Make Electrical Connections

ATTACH POWER WIRES TO COMPRESSOR MOTOR

Attach power wires in accordance with motor manufacturer's instructions and in compliance with NEC and applicable local codes. Refer to Fig. 17.

CHECK MOTOR ROTATION

Before connecting the motor to the compressor, check the direction of motor rotation. Rotation must be in the same direction as that indicated by the arrow on the compressor pump cover (or on a plate attached near the pump-end bearing housing). If the direction is not the same, reverse the motor rotation by reversing any 2 power leads to the motor.

If it is desired to reverse the rotation of the compressor, the direction of the oil pump rotation must be reversed as follows:

All 5F Compressors and 5H120 and 126 – Remove 6 cap screws from the oil pump cover (Fig. 1, 2, 3 and 5). Be careful not to damage gasket. Rotate the cover 180° and replace. The arrow at the top of the oil pump cover will show the new direction of rotation.

5H40, 46, 60, 66, 80 and 86 Compressors – Drain the oil to below the level of the pump end cover (Fig. 4). Remove the pump end cover. This will expose the oil pump cover in the center of the main bearing housing. Rotate the oil pump cover 180° and replace it. Replace the pump end cover and reverse the external arrow to match the new direction of rotation. This will enable the operator to know the oil pump rotation without removing the pump end cover.

CAUTION: If the special gasket between the oil pump cover and oil pump is damaged, replace it with the correct gasket only. Check the oil pump rotor end clearance (.0015 to .0025). (See Table 14.) Check oil pressure immediately after starting compressor.

Table 4 – 5F,H Compressor Crankcase Heater Package

COMPRESSOR	ELECTRICAL CHARACTERISTICS		PACKAGE NO.
	Volts	Watts	
5F20,30,40,60	115	100	-5-F--20---381
	230	100	-5-F--20---391
5H40,46,60,66	115	200	-5-H--40---381
	230	200	-5-H--40---391
5H80,86,120,126	115	200	-5-J--40---291
	230	200	-5-J--40---291

Table 5 – Crankcase Heater Relay (60-Cycle)

CONTROL CIRCUIT VOLTAGE	PART NUMBER
115	HN61AJ-101
208/230	HN61AJ-108

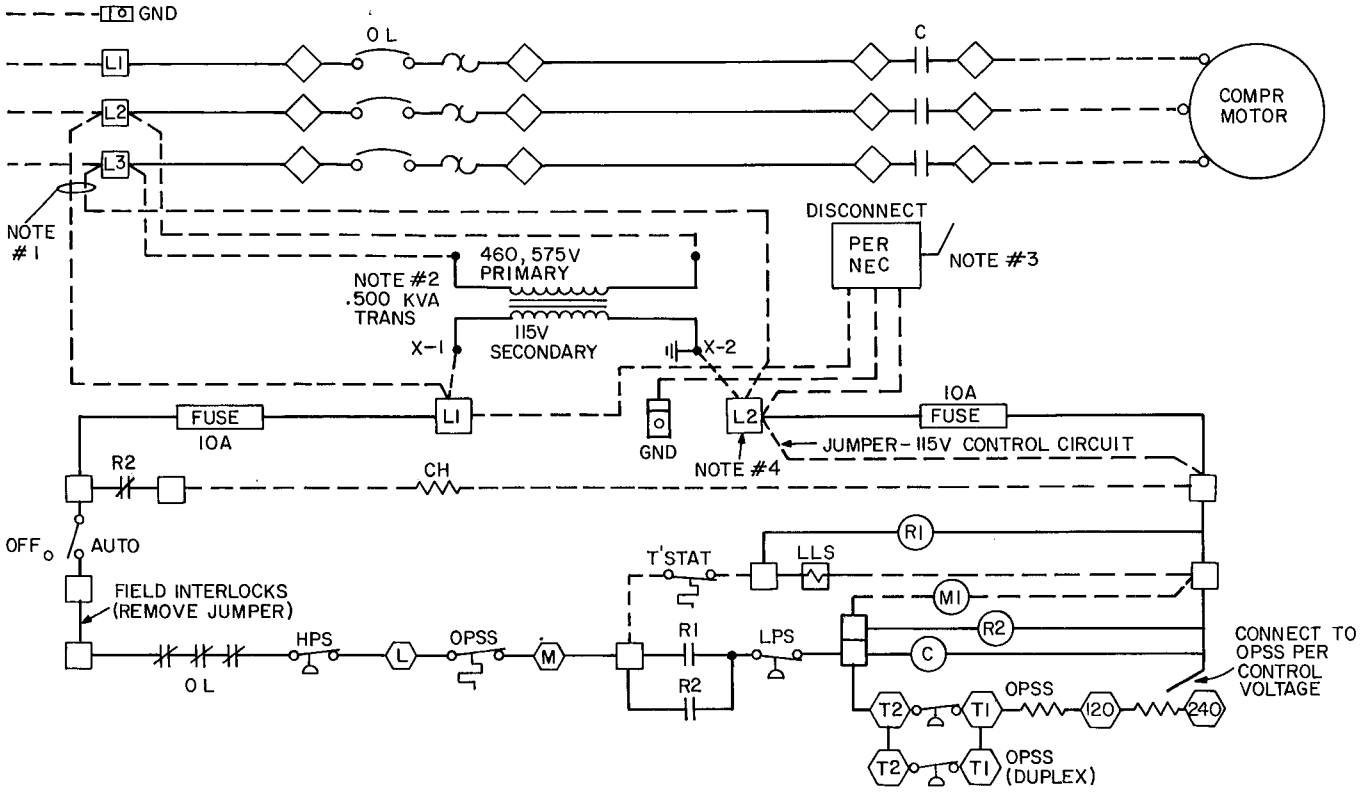
INSTALL CRANKCASE HEATER AND HEATER RELAY

Refer to Fig. 17. Wire the heater to a relay or set of normally closed contacts in the compressor starter so that it will be de-energized when the compressor is operating.

Remove the rubber plug from the crankcase heater casing (Fig. 1 thru 5), and insert the heater element entirely into casing. Element should fit snugly, not loosely. Wire in accordance with applicable electrical codes.

When crankcase heater is installed as shown in Fig. 17, the system can be operated on a single pumpout cycle.

Crankcase heater packages are listed in Table 4. The corresponding relay is found in Table 5. When 2 heaters are used on a 5H80 or 5H120 compressor, only one relay is required.



C	– Compressor Contactor	**R**	– Relay
CH	– Crankcase Heater	**TRANS**	– Transformer
GND	– Ground Terminal	**T'STAT**	– Thermostat
HPS	– High-Pressure Switch	□	Terminal Connection
LLS	– Liquid Line Solenoid	◇	Component Connection Unmarked
LPS	– Low-Pressure Switch	- - - -	Field Wiring
M1	– A/C Cond Fan Motor		
OL	– Overload		
OPSS	– Oil Pressure Safety Switch		

NOTES
1 Connect directly from 200-230 v power supply for control power
2 Install 500 KVA transformer when main power supply is 460 or 575 volts
3 Supply 115 v control power thru 15A fused disconnect (alternate to transformer)
4 For 115 v control, connect L2 to neutral or ground potential

Fig. 17 – Wiring Schematic, Single Pump Out Cycle

The relay coil voltage is determined by the control circuit voltage. This voltage must be specified when ordering relays.

Mount relays vertically.

INSTALL OIL SAFETY SWITCH

This safety switch is offered as an accessory package. Installation instructions are included in the Oil Safety Switch Package. A typical wiring arrangement for the oil safety switch is shown in Fig. 17.

Table 6 – Compressor Oil Charge

COMPR	5F20	5F30	5F40	5F60	5H40, 5H46	5H60, 5H66	5H80, 5H86	5H120, 5H126
OIL CHG (pt)	5	5½	12	13	18	21	41	81

Step 6 – Install and Align Drive

BELT DRIVE

Clean motor and compressor shafts, and the flywheel and motor pulley bores with fine emery cloth. Then install motor pulley, flywheel and keys tightly on shafts.

Slide the motor on rails towards the compressor to install belt. Line up flywheel and motor pulley with a straight edge (Fig. 18), string or by placing a round rod in the belt grooves. Slide the motor pulley on the shaft to correct any parallel misalignment. To correct any angular misalignment, loosen the motor hold-down bolts and turn motor frame as required.

When alignment is completed, move the motor away from the compressor with adjusting screws to tighten the belts. Tighten belts just enough to

prevent slippage. Belt tension can be checked by one of the following methods:

1. Loosen belts until they slip (belt squeals) when motor starts; then tighten enough to eliminate slippage. *Observe warning note below.* OR
2. Check the amount of deflection when belt is depressed at the center of the span. Heavier belts deflect approximately 1 in. for a 24-in. span; lighter belts or longer span deflect proportionately more.

WARNING: Do not operate motor and compressor without belt or coupling guard in place. Serious injury can result from contact with moving parts.

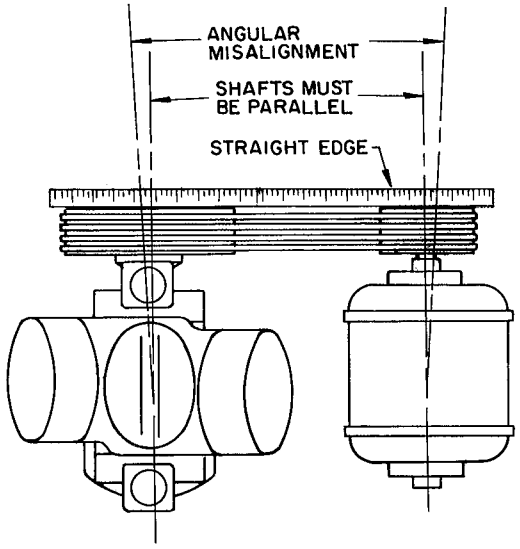


Fig. 18 – Correct Belt Alignment

DIRECT DRIVE

Install and align compressor, coupling and motor as described in the section entitled Direct Drive Flexible Couplings – Assembly and Alignment, page 35.

HOT CHECK AND DOWELING

To help maintain alignment, and to ensure exact repositioning of the motor after servicing, the motor and compressor must be doweled to the base.

Doweling should be performed only after motor/compressor alignment has been hot checked; i.e., checked after the compressor has warmed up to operating temperature after initial alignment.

After hot check and while the components are still at operating temperature, drill and ream 2 holes thru diagonally-opposite motor and compressor feet and the base. Use a 9/32-in. diam drill and a #6 taper reamer. Secure the motor and compressor to the base with the #6 x 2-1/2 in. taper dowel pins provided in the motor fastening set.

Fit the dowel so that 1/16 of taper is left above the motor foot. Coat the dowels with white lead or other lubricant to prevent rusting and tap the dowel lightly into position with a machinist's hammer.

Be sure that all dowels are tight and that they do not bottom.

Step 7 – Assemble Water Piping

CONDENSER WATER CIRCUIT

Use the piping arrangement that will provide maximum pass operation (Fig. 19) when ample water pressure is available. For low water pressure, or when a cooling tower is in the circuit, use minimum pass operation (Fig. 20). See Table 3 for connection sizes.

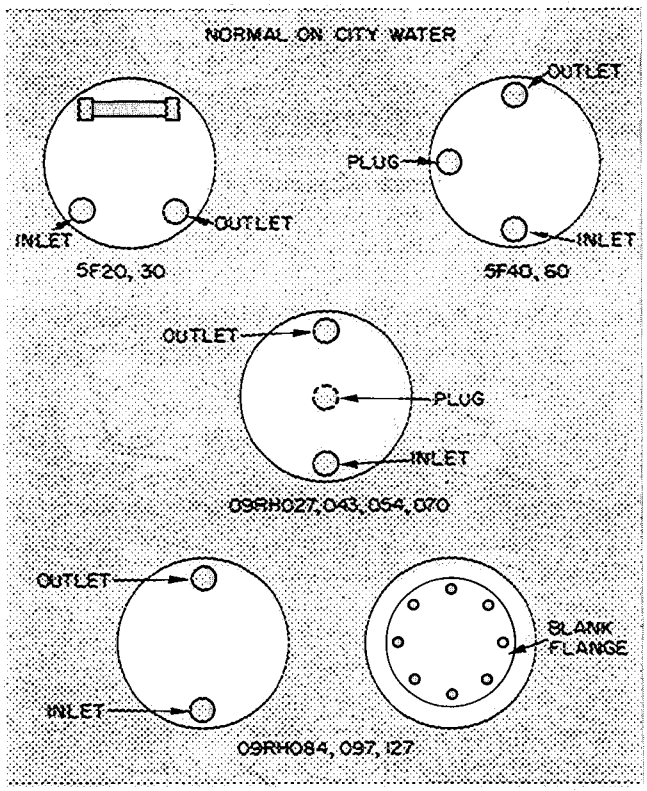


Fig. 19 – Condenser Maximum Pass Connections

If frequent draining of the condenser water side is expected, replace the vent plugs on the front and rear head and the drain plug on the front head with nipples and valves.

Adjust the water regulating valve so that the shutoff point is at least 10 F below the condensing temperature to be maintained at maximum load, but not above 90 F. Select a shutoff point high enough to close the valve when unit is not operating.

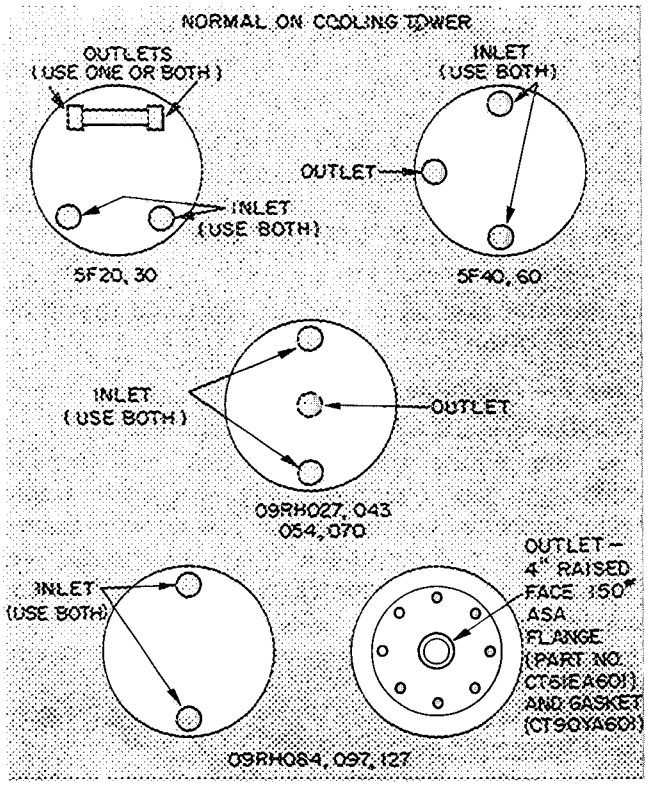


Fig. 20 — Condenser Minimum Pass Connections

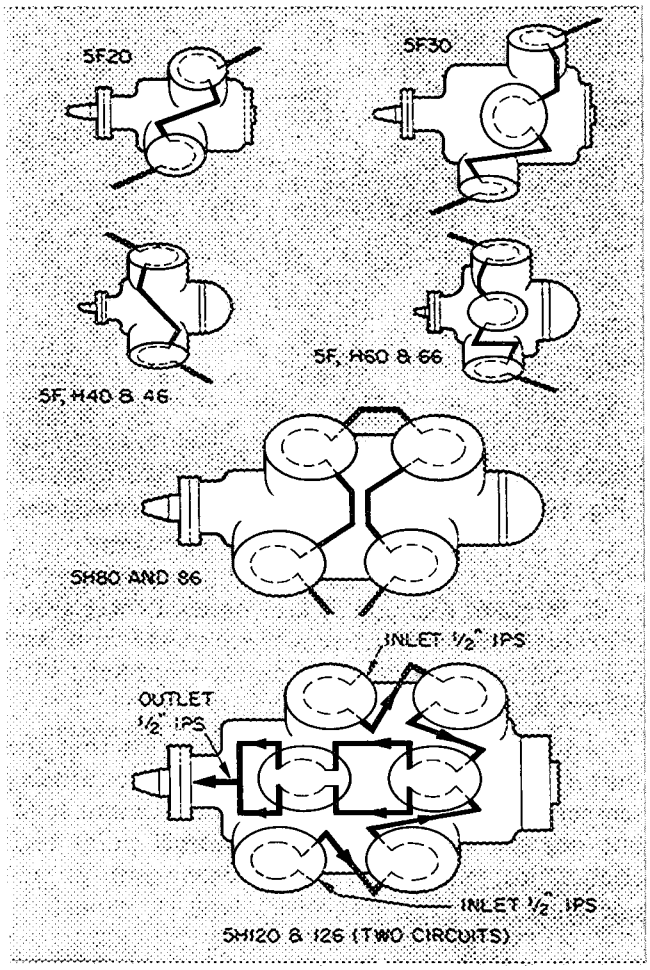


Fig. 21 — Schematic Piping for Water-Cooled Heads

WATER-COOLED HEADS (OPTIONAL)

When used, install the heads and piping as shown in Fig. 21.

All 5F compressors, and 5H40 thru 86 compressors have 1 water circuit piped for flow in either direction.

The 5H120 and 126 compressors have 2 parallel circuits with individual 1/2-in. IPS water inlet connections and a common 1/2-in. IPS outlet connection as shown in Fig. 21.

Install a manually operated valve in each water circuit, adjusted for 100 F maximum leaving water temperature.

Step 8 — Prepare Lubrication System

INSTALL OPTIONAL EQUIPMENT

Oil Filter — The oil filter for 5H40 thru 5H86 compressors is available as a separate accessory package. Refer to the instructions accompanying the package for installation procedures.

If an accessory oil cooler is also installed (see below), the oil filter should be piped into the system as shown on the diagrams in the oil cooler installation instructions.

Oil Cooler — Refer to the installation instructions included with this accessory package. Oil cooler water flow should be readjusted to maintain proper oil temperature after the compressor has reached operating temperature.

Oil Separator — If an oil separator is used in the system piping, the oil return line should be piped to the compressor suction line. The oil return line should be no larger than 1/4-in. diameter in order to minimize the possibility of flooding the compressor with oil. In addition, the line should have a manual shutoff valve to throttle the oil flow as required and to isolate the separator for service.

CHECK OIL LEVEL

Be sure that the oil level is visible at the center of the compressor sight glass. Compressors using optional equipment such as the filter, cooler and oil separator described above will require more than normal oil charge listed in Table 6. Recheck the oil level after the compressor has been operated. If oil must be added, use only a dehydrated, wax-free, refrigeration grade oil of suitable viscosity. Various oils suitable for reciprocating compressor usage are listed in Table 7.

PREPARE FOR INITIAL START-UP

Evacuate, Dehydrate and Leak Test the entire refrigerant system as described in Carrier Standard Service Techniques Manual, Chapter 1, Sections 1-6 and 1-7.

LEAK TESTING

Preferred Method — Charge the system to 10 psig with R-12; then add dry nitrogen or dry air (DO

Table 7 – Physical Data

COMPRESSOR UNIT AND CONDENSING UNIT		5F20	5F30	5F40	5F60	5H40	5H46	5H60	5H66	5H80	5H86	5H120	5H126
REFRIGERANT		R-12, R-500, R-22, R-502											
COMPRESSOR DATA													
Max Rpm		1750											
Min Rpm		400 (required for proper lubrication)											
Min Rpm Capacity Control		600	700	800	900	800	800	900	900	1100	1100	900	900
Number of Cylinders		2	3	4	6	4	4	6	6	8	8	12	12
Bore (in.)		2½	2½	2½	2½	3¼	3¼	3¼	3¼	3¼	3¼	3¼	3¼
Stroke (in.)		2	2	2	2	2¾	3 7/16	2¾	3 7/16	2¾	3 7/16	2¾	3 7/16
Oil Charge* (pt) (See Notes)		5	5 5	12	13	18	18	21	21	41	41	8,1	81
Normal Oil Pressure*		45 – 55 psig above suction pressure											
Oil Flow Rate (gpm)		1.5				3 0						4 5	
Oil Safety Switch	Cut-in (psig)	15 – 19 5 (See Notes 3 and 4)											
	Cutout (psig)	11 – 15											
High Pressure Switch†													
Cutout Range		150 – 395 (adj) nominal											
Differential (psi)		60 – 150 (adj)											
Factory Setting (psig)		Cutout, 300 ± 15; Cut-in, 210 ± 10											
Low Pressure Switch†													
Cutout Range		20 in Hg vac to 60 psig (adj)											
Differential (psi)		60 – 90 (adj)											
Factory Setting (psig)		Cutout, 50 ± 4; Cut-in, 120 ± 6											
Low Side Max Pressure		245 psig											
CONDENSER DATA		5F20‡	5F30‡	5F40	5F60	09RH-027	09RH-043	09RH-054	09RH-070	09RH-084	09RH-097	09RH-127	
Max Refrigerant Storage Cap.** (lb)	R-12	40 4	50.7	79 4	89 6	154	212	263	238	282	358	475	
	R-22	37 2	46 4	72 8	82 0	139	193	239	216	257	327	432	
	R-500	36.0	44 9	70 6	79 5	135	187	232	210	248	316	418	
	R-502	38.2	47.9	75 0	84 6	145	199	248	223	265	337	447	
Min Refrigerant Oper Charge (lb)	R-12	2 0	3 0	14 0	16 0	37 0	41 0	51 0	51 0	78	100	126	
	R-22	1 8	2 7	12 7	14 5	33 0	37 0	46 0	46 0	71	91	114	
	R-500	1 8	2 7	12 4	14 2	32 4	36 0	44 5	44 5	69	88 5	111	
	R-502	1 9	2 9	13 1	15 0	34 4	38 2	47 3	47 3	73	94	118	
Max Operating Pressure													
Refrigerant Side		385 psig											
Water Side		150 psig				250 psig							

*Oil charge for duplex compressor units below:

UNIT	5H40-60	5H60-60	5H60-80	5H80-80	5H80-120	5H120-120
OIL CHG (pts)	39	42	62	82	122	162

Nominal oil pressures shown in Physical Data table are above suction pressure, i e , pressure differential between suction pressure and discharge pressure of oil pump

†See Table 8 for typical pressure switch settings.

‡Shell-and-coil condensers All other 5F,H condensers are shell-and-tube

**Condenser storage capacity 80% filled with liquid refrigerant at 90 F

NOTES:

1 Oil Flow Rate is the nominal oil pump capacity

2 The following oils (or equivalents) are specified for use in these compressors
5F20, 30 – Sun Oil, Suniso 4G or Texaco, Capella D (wax free)
5F40 thru 5H126 – Sun Oil, Suniso 3GS; DuPont synthetic refrigeration oil, *150SSU only*, or Texaco Capella BI

3 Differential switch (oil safety switch) has time delay of 30 to 60 seconds

4 Oil safety switch has manual reset

NOT USE OXYGEN) until system pressure is 150 psig. Check for leaks with a halide or electronic leak detector.

Alternate Method – Charge the system with dry nitrogen or dry air (DO NOT USE OXYGEN) to 40 psig and use soap bubble test to find large leaks.

CAUTION: Do not use compressor to build up pressure. Do not overcharge the system.

Refrigerant Charging – Use the sight glass method to charge the system. See Section 1-8 of Carrier Standard Service Techniques Manual, Chapter 1 for details.

Charge the system to a clear sight glass while holding saturated condensing pressure constant at 125 F for air-cooled systems or 105 F for water-cooled systems. Add additional refrigerant to fill condenser subcooler coils, if required.

5F,H CONDENSING UNITS – After a clear sight glass is obtained, add charge until liquid refrigerant reaches the condenser liquid level test cock.

5F,H COMPRESSOR UNITS – See your Condenser Data for additional charge requirements..

START-UP

Preliminary Steps

1. *Energize crankcase heater for at least 24 hours before* starting unit.
2. Be sure that the felt sock filter has been installed for the first 50 hours of compressor operation. Remove and inspect the filter, clean if required and replace it for another 50 hours. Remove sock when system is clean. (Not applicable to 5F20 and 5F30).
3. Be sure that motor rotation is in the direction indicated by the arrow on the compressor oil pump cover. Refer to Installation Step 5 entitled Check Motor Rotation.
4. Check that proper oil level is indicated in compressor sight glass. Oil level should be 1/3 to 1/2 sight glass.
5. Open the water supply valve to the condenser. Open the pressure line valve of the water regulating valve (if used). If compressor unit is equipped with air-cooled condenser, turn on condenser fan.
6. Backseat (open) the compressor suction and discharge service valves. Open the liquid line valve at receiver.
7. Start evaporator fan or chilled water pump.

Start Compressor – Close the main power switch supplying current to the compressor motor.

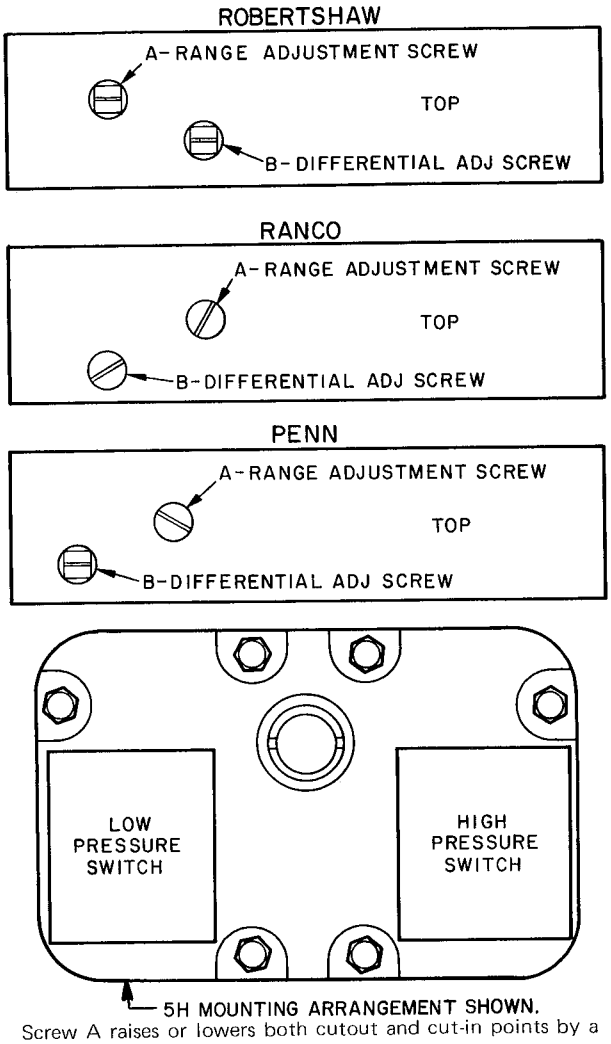
Immediately recheck oil level and check oil pressure. Pressure should be 45 - 55 psi above suction pressure. *If correct pressure is not reached in 10-12 seconds, stop compressor immediately and check oil pump.*

CAUTION: If the compressor is shut off by any safety control, do not permit the control to reset more than once before determining cause of shutdown.

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

HIGH AND LOW PRESSURE SWITCHES – All 5F and 5H units except 5F20 and 30 have factory-installed high and low pressure switches. Adjustment procedures for both switches are shown in Fig. 22.

Check High-Pressure Switch – Throttle the condenser water on water-cooled unit or block the airflow on air-cooled unit, allowing head pressure to rise gradually. Compressor should shut off within 15 psi of cutout value listed in Table 8. Now reverse procedure; compressor should start within 10 psi of cut-in value given in Table 8.



Screw A raises or lowers both cutout and cut-in points by a like amount

Range and Differential scales are on the front of the switch

High Pressure: Set *cutout* point first, with screw A, then set *cut-in* point with screw B

Low Pressure: Set *cut-in* point first, with screw A; then set *cutout* point with screw B

See Table 8 for adjustment settings

LOCATION AND ADJUSTMENTS

Fig. 22 – High and Low Pressure Switches

Check Low-Pressure Switch – Slowly close the suction service valve; suction pressure will decrease. Compressor should shut off within 4 psi of cutout value listed in Table 8. Reverse procedure; compressor should start within 6 psi of cut-in value given in Table 8.

Table 8 – Typical Pressure Switch Settings

REFRIGERANT	CONDENSER	PRESSURESTAT			
		High (psig)		Low (psig)	
		Cutout	Cut-in	Cutout	Cut-in
12	Water-Cooled	175	95	16	35
	Air-Cooled	225	145	16	35
22	Water-Cooled	280	200	36	67
	Air-Cooled	325	245	36	67
500	Water-Cooled	190	110	20	45
	Air-Cooled	270	190	20	45
502	Water-Cooled	280	200	45	77
	Air-Cooled	325	245	45	77

OIL PRESSURE SAFETY SWITCH – To check, move contact arm at left side of switch forward (Fig. 23). Compressor should stop in approximately 45 seconds.

If compressor continues to run, check the wiring to safety switch (Fig. 17). If wiring is correct, switch is faulty and should be replaced.

After completing test, wait 3 minutes; then press reset button on front of safety switch and restart the compressor.

Check the oil level in the compressor sight glass after 15-20 minutes of operation. If oil level is low, add oil by the methods described in Carrier Standard Service Techniques, Chapter 1, Section 1-11.

If an accessory oil cooler is provided, adjust the water flow as required to maintain 100-120 F crankcase return oil temperature.

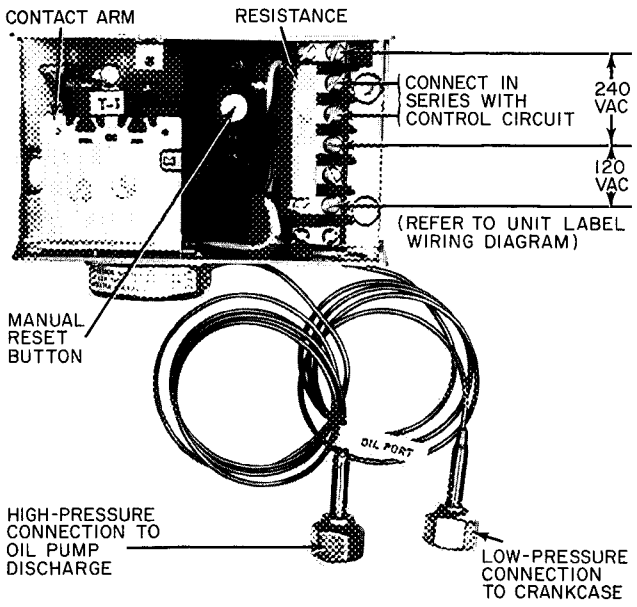


Fig. 23 – Oil Pressure Safety Switch

Adjust Capacity Control (if required)

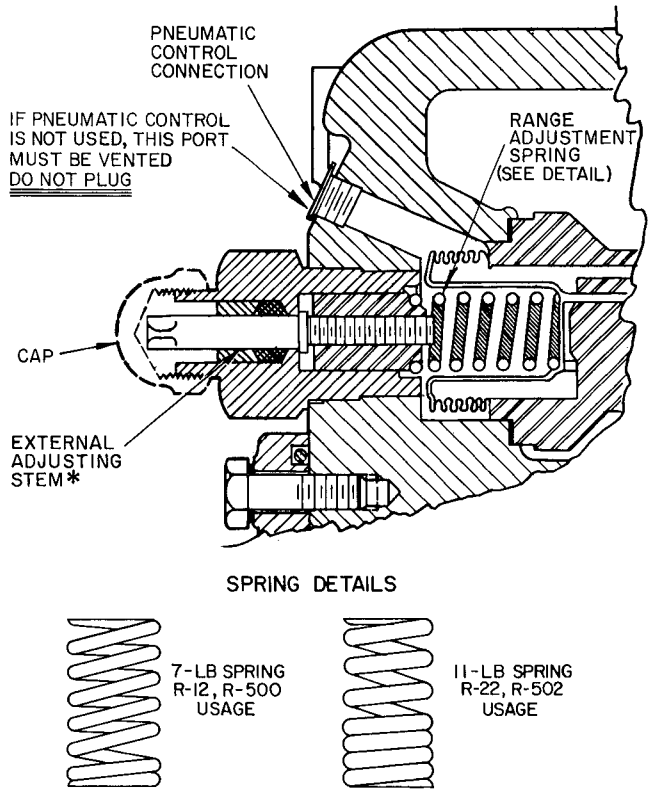
5F40 THRU 5H126 COMPRESSORS – Determine the refrigerant usage. *If the system is to use R-22 or R-502, replace the 7-lb range adjustment spring (Fig. 24) with the 11-lb spring supplied with compressor.* Refer to the instruction tag for spring replacement procedure.

An external adjusting stem (Fig. 24) sets the control point (suction pressure at which first step of cylinder unloading occurs). The control point is adjustable as follows:

REFRIGERANT	CONTROL POINT RANGE
R-22 and R-502	0 to 85 psig
R-12 and R-500	0 to 50 psig

One full clockwise turn of adjusting stem will raise the control point approximately 6 lb with R-12 and R-500, or 10 lb with R-22 and R-502.

Control oil pressure is an indication of cylinder loading condition (Table 9). Refer to Fig. 3, 4 and 5 for location of control oil pressure gage connection.



*When compressor is received the capacity control adjusting stem will be backseated (Compressor will be fully loaded under all conditions)

Fig. 24 – Capacity Control Valve

Table 9 – Control Oil Pressures for Cylinder Loading and Unloading

COMPRESSOR	STEP*	APPROXIMATE CONTROL OIL PRESSURE (psig)		
		Loading	Unloading	
5F20	1	198	130	
5F30	1	300	202	
	2	198	130	
5F40,60; 5H40,46, 60,66,80, 86,120,126	1	300	190	175
	2	260	160	140
	3	230	120	105
	4	200	90	70

5H120 and 5H126 *Capacity control reduction steps

To Adjust Control Point

1. Impose an artificial load on the compressor until suction pressure is above the desired control point.
2. Lower the compressor suction pressure to control point pressure by slowly closing the suction valve.

3. When at control point pressure, turn external adjusting stem clockwise until first step of unloading takes place. This is indicated by change in control oil pressure, current draw and sound of compressor.

Control point is now set. Reopen suction service valve. Compressor will be fully loaded when suction pressure is 3 psi (4 psi with R-22, R-502) above control point, and will be fully unloaded when suction pressure is 4 psi (7 psi with R-22, R-502) below control point.

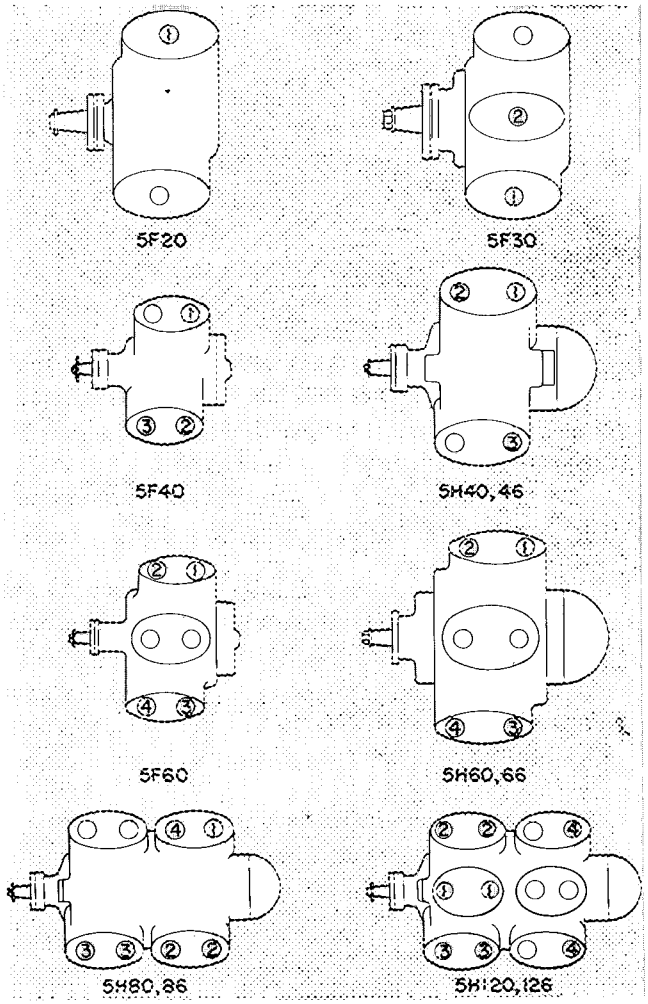


Fig. 25 — Cylinder Unloading Sequence

5F20 AND 5F30 COMPRESSORS — Two capacity control packages are available as accessories. One is suitable for R-12 or R-500 applications; the other for R-22 and R-502 applications.

When the accessory package is received, the adjusting stem (Fig. 45) is backseated (fully counterclockwise) and compressor will be fully loaded under all conditions. Adjust the capacity control set point by the same 3-step procedure described above for 5F40 thru 5H126 compressors.

SCHEDULED MAINTENANCE

These units provide long life and dependable service when properly operated and regularly maintained. Establish a maintenance schedule based on your operating hours, load conditions, water quality, etc. The maintenance time intervals listed in this section are offered as guides and should be modified, if required, to suit your individual machine requirements.

Check Lubrication System — Always check compressor oil level before starting unit. If oil is required, record date and amount of added oil. Refer to Fig. 1 thru 5 for location of oil filler plug. Refer to Table 7, Physical Data for specified types and quantities of oil.

Additional oil is required when an accessory oil separator is used. Watch the oil level and observe the action of the separator float valve during initial compressor operation. Follow the instructions furnished with the oil separator.

OIL FILTER MAINTENANCE — An accessory oil filter is available for 5H40 thru 5H86 compressors. This filter is a bleed-type, high-pressure throwaway filter as shown in Fig. 26. The oil filter should be replaced after the first 50 hours of operation and whenever the oil is changed or becomes dirty.

A yearly check should be made for a clogged filter. Clogging is indicated by a greater than normal difference between oil pressure ahead of the filter and after the filter. When this difference exceeds 5 psi, the filter requires changing. To replace the filter:

1. Close the oil-line shutoff valves on each side of the filter (Fig. 26).

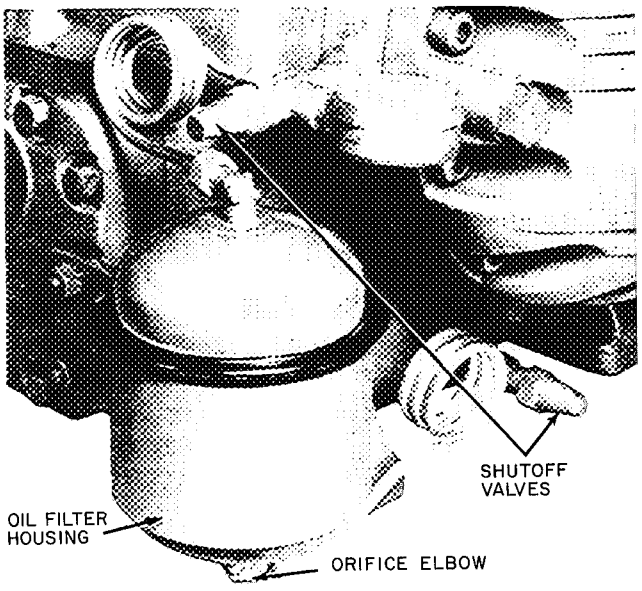


Fig. 26 — Oil Filter Accessory Package (5H40 thru 5H86)

2. Disconnect the oil lines at the filter connections.
3. Loosen the filter bracket; remove and replace filter body.

The full-flow oil filter on 5H120 and 5H126 compressors contains a replaceable cartridge. Replace the filter cartridge after the first 200 hours of compressor operation. After the initial filter change, check yearly for a clogged filter. If the pressure difference across the filter exceeds 5 psi, pump down the compressor and then remove the cartridge. Figure 35 clearly illustrates the entire filter assembly.

CHECK OIL AND SHAFT SEAL TEMPERATURE – The normal operating temperature of the oil at the crankcase is 135 to 150 F. When crankcase oil temperature is within this normal range, the shaft seal housing temperature should be approximately 160 to 170 F. Above 170 F on the *shaft seal housing,* the shaft seal can age rapidly, causing it to harden and crack. Therefore:

If shaft seal housing temperature goes above 170 F, STOP THE COMPRESSOR. Do not restart until the cause for overheating has been determined and condition corrected.

OIL COOLER USAGE – An accessory oil cooler is available to maintain safe operating oil temperature under the following conditions:

1. When the suction gas becomes highly superheated. (See Table 10.)
2. When (a), the compression ratio is above 5 to 1 on R-22 or R-502 systems, or (b), the application data for the compressor indicates the need for an oil cooler. This is especially true of increased displacement compressors such as 5H46, 66, 86 and 126.

   The compression ratio can be determined from the following formula:

$$\text{Compression Ratio} = \frac{\text{Absolute Discharge Pressure}}{\text{Absolute Suction Pressure}}$$

3. When the compressor operates for prolonged periods fully unloaded. Under these conditions there may be insufficient suction gas to remove the heat of compression and friction.

   This condition can occur on any application but is most likely on variable volume applications that use a hot gas bypass to maintain the specified conditions under low evaporator load.

Adjust the water flow thru the oil cooler to maintain the crankcase return oil temperature at 100 – 120 F. Be sure that the crankcase temperature remains below 140 F and that shaft seal temperature at the seal housing is below 170 F.

Tables 11 and 12 list maximum working pressures for the oil and water and estimated water flow rates for the various oil cooler/compressor combinations.

Table 10 – Actual Suction Gas Temperature Limits (F), R-12, R-22, R-500, R-502

SAT. SUCT GAS TEMP (F)		–60	–50	–40	–30	–20	–10	0 to 50
ACTUAL SUCTION GAS TEMP (F)	R-12, R-500	–	–	35	45	55	65	65
	R-502	25	35	45	55	65	75	75
	R-22	See Note 1						

NOTES:

1 For continuous operation with R-22

SAT. SUCT TEMP	MAX. SUPERHEAT
–40 F to 40 F	25 F
40 F to 50 F	15 F

2 For most saturated suction temperature –10 F or below, cylinder head cooling is required See rating pages for specific information

Table 11 – Oil Cooler Maximum Working Pressure

OIL	150 psig
WATER	75 psig

Table 12 – Oil Cooler Estimated Water Flow Rates

COMPRESSOR	GPM*
5F	2 – 3
5H (4, 6 and 8 Cylinders)	6
5H (12 Cylinders)	8

*Flow rate based on 80 F entering water

Water-Cooled Heads – To prevent oil breakdown and sludge formation, the discharge gas temperature must be kept below 300 F.

Water-cooled cylinder heads are available for this purpose. They should be used whenever the compression ratio is 5 to 1 or higher on R-22 systems and whenever their use is indicated in the compressor application data. Refer to Fig. 21 for piping arrangements.

If the cylinder head temperature drops below the saturated condensing temperature, refrigerant will condense on the internal surfaces of the head. To prevent such condensation, a water regulating valve is used to maintain a constant head temperature. When the compressor is off, there should be no flow thru the heads.

Condenser Maintenance – Because the condenser water circuit is usually an open system, the condenser tubes may be subject to contamination by foreign matter. Local water conditions may cause excessive fouling or pitting of tubes. Condenser tubes, therefore, should be cleaned at least once a year or more often if the water is contaminated.

Proper water treatment can minimize tube fouling and pitting. If such conditions are anticipated, water treatment analysis is recommended. Refer to the Carrier System Design Manual, Part 5, for general water conditioning information.

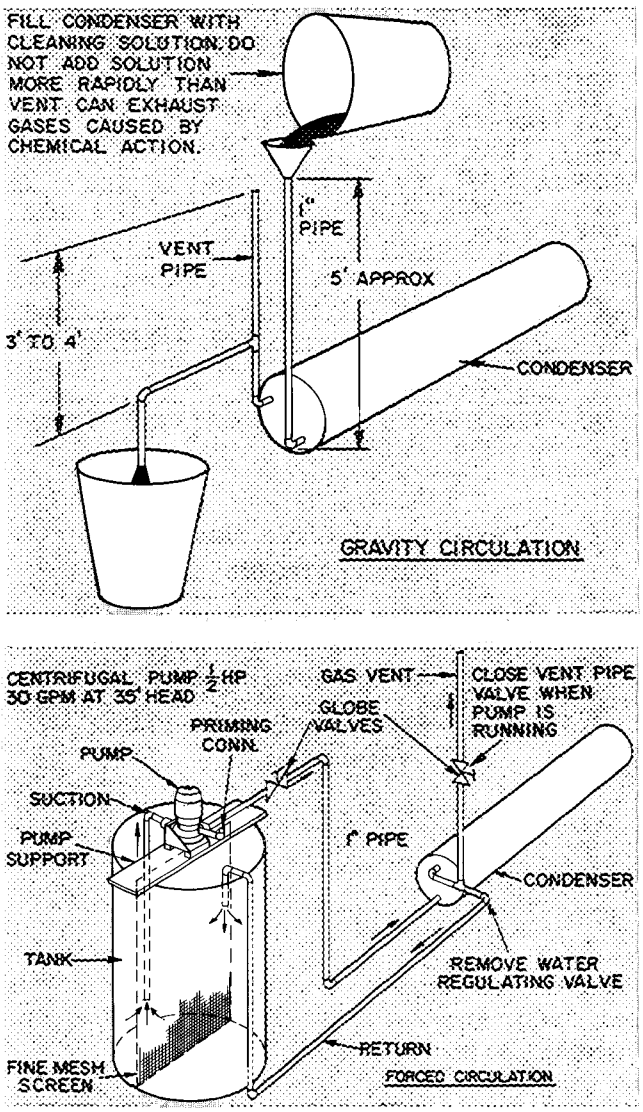


Fig. 27 – Cleaning Condenser Tubes (2 Methods)

To inspect and clean the condenser, make sure all water has been drained. Shut off the water supply and disconnect both inlet and outlet piping. Remove drain plugs and vent plug.

Next, remove the condenser heads. If heads are not removable, as on 5F20 and 30 condensers, test the water for traces of refrigerant.

With condenser heads removed, inspect the tubes for refrigerant leaks with a halide leak detector. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Section 1-6 for leak testing instructions.

Clean the condenser tubes on shell-and-tube condensers with a nylon brush. Flush water thru tubes while cleaning. Do not use brushes that can scrape or scratch tubes.

If hard scale has formed, clean the tubes chemically. All 5F20 and 30 shell-and-coil condensers must be cleaned in this manner. Consult with an experienced and reliable water-treatment firm in your area for the recommended treatment. Clean the condenser by gravity or by forced circulation as shown in Fig. 27.

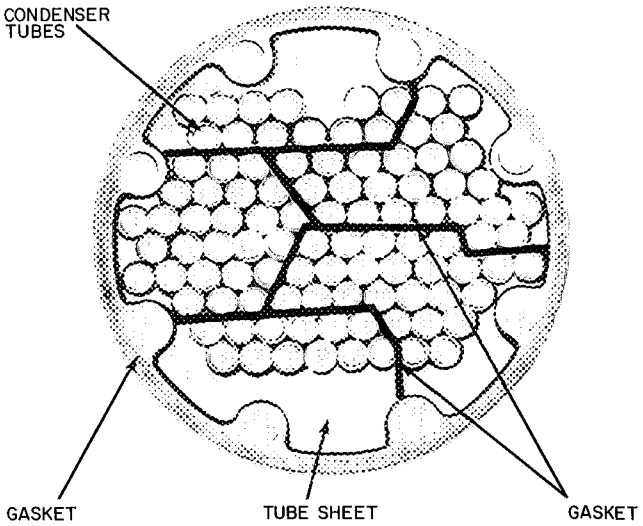


Fig. 28 – Typical Location of Pass Partition

CHECK SEAL GASKETS – The water passes are sealed by a cloth-inserted rubber partition gasket on shell-and-tube condensers (Fig. 28). Check the gasket carefully for damage. If replacement is required, be sure to locate the new gasket in the correct position by glueing it to the partitions in the condenser head with rubber gasket cement.

FREEZE-UP PROTECTION – If the ambient temperature in the area can drop below 32 F, protect the condenser tubes from freeze-up by draining the water from the system or by adding antifreeze to the water.

If the condenser water is drained, use the same size air connection as the condenser water supply connection and blow compressed air at 150 cfm and 1/2 to one psi into the tubes. Blow thru the water supply connection for 15 minutes and then thru the return connections for 15 minutes.

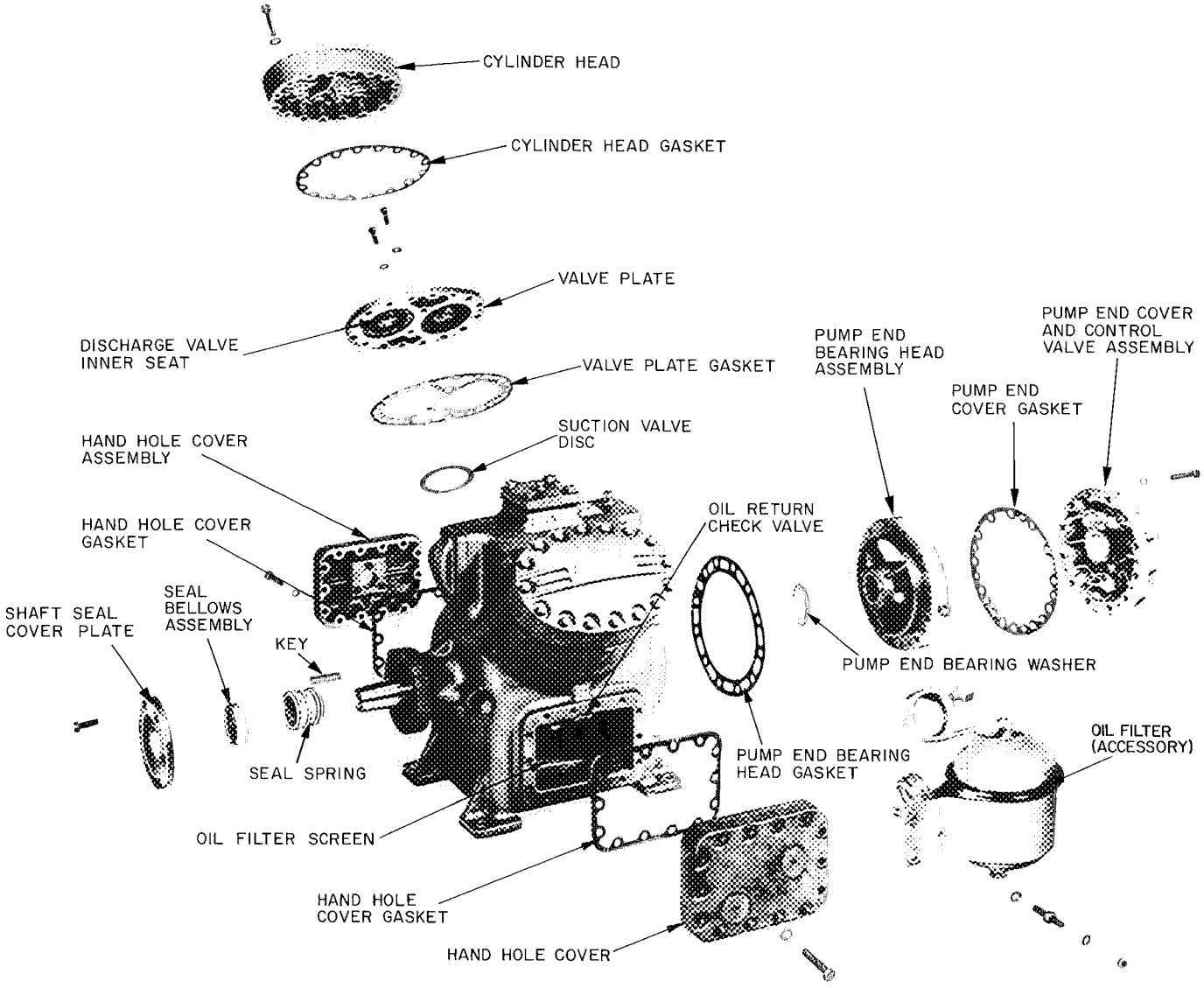


Fig. 29 – 5H Compressor Components (External)

Table 13 — Torque Values

5F UNITS

SIZE DIAM (in.)	THREADS PER IN.	TORQUE RANGE (lb-ft)	USAGE
1/4	Pipe	20–25	Pipe Plug – Pump End Bearing Head
		20–25	Pipe Plug – Crankshaft
		20–25	Pipe Plug – Suction and Discharge Manifold Cover
1/4	28 NF	10–15	Unloader Power Element Assembly – Crankcase
		10–15	Unloader Cylinder Cover Plate – Unloader Cylinder Bracket
		12–15	Discharge Valve Cap Screw – Inner Seat
		12–15	Discharge Valve Guide Assembly – Valve Plate
		12–15	Oil Pump Cover – Pump End Bearing Head
		10–12	Auxiliary Control Valve Cover – Valve Body
5/16	24 NF	22–25	Connecting Rod Bolt – Locknut
		15–20	Capacity Control Valve – Hand Hole Cover
3/8	Pipe	30–35	Pipe Plug – Pump End Bearing Head
3/8	16 NC	25–29	Cylinder Head – Crankcase
		25–29	Shaft Seal Cover Plate – Crankcase
		25–29	Bottom Plate – Crankcase
		25–29	Suction and Discharge Manifold Cover – Crankcase
		25–29	Pump End Bearing Head Assembly – Crankcase
		25–29	Hand Hole Cover – Crankcase
		25–29	Suction Manifold – Crankcase
3/8	24 NF	30–35	Flywheel Screw – Crankshaft
7/16	20 NF	25–30	Oil Return Check Valve Assembly – Crankcase
1/2	13 NC	80–85	Suction Service Valve – Crankcase
		80–85	Discharge Service Valve – Crankcase
5/8	11 NC	120–130	Suction Service Valve – Suction Manifold
5/8	18 NC	60–75	Magnetic Plug – Crankcase
		60–75	Magnetic Plug – Pump End Bearing Head
		60–75	Oil Bypass Plug – Pump End Bearing Head
		60–75	Modulating Valve Adapter – Pump End Bearing Head
		60–75	Lock Screw – Pump End Bearing Head
		45–55	Oil Relief Valve Assembly – Crankcase
		60–75	Cap-Oil Relief Valve Assembly
3/4	10 NC	45–50	Flywheel Locknut – Crankshaft
1-1/2	18 NEF	34–45	Sight Glass Clamping Gland – Hand Hole Cover
No. 6	32	8–10	Auxiliary Control Valve Cover – Valve Body

5H UNITS

SIZE DIAM (in.)	THREADS PER IN.	TORQUE RANGE (lb-ft)	USAGE
1/16	Pipe	10–15	Pipe Plug – Auxiliary Control Valve Body
1/8	Pipe	15–20	Pipe Plug – Pump End Bearing Head
1/4	Pipe	20–25	Pipe Plug – Crankcase
		20–25	Pipe Plug – Pump End Cover
		20–25	Pipe Plug – Crankshaft
1/4	28 NF	12–16	Oil Pump Cover – Pump End Bearing Head
		8–12	Auxiliary Control Valve Cover – Valve Body
		8–12	Special Cap Screw – Auxiliary Control Valve Body

5H UNITS (Cont)

SIZE DIAM (in.)	THREADS PER IN.	TORQUE RANGE (lb-ft)	USAGE
5/16	18 NC	16–20	Oil Pump Cover – Pump End Bearing Head
		16–20	Capacity Control Valve – Pump End Bearing Head
		16–20	Auxiliary Control Valve – Pump End Bearing Head
		16–20	Manifold Cover Plate – Crankcase
5/16	24 NF	18–22	Unloader Power Element – Crankcase
		18–22	Capacity Control Valve – Pump End Cover
		18–22	Discharge Valve Guide Assembly – Valve Plate
		18–22	Discharge Valve Guide – Inner Seat
		18–22	Cylinder Bracket
3/8	Pipe	30–35	Pipe Plug – Pump End Bearing Head
		30–35	Pipe Plug – Crankshaft
3/8	16 NC	25–29	Capillary Tube Assembly – Pump End Bearing Head
		28	Connecting Rod Bolt (Alum Rod)
7/16	14 NC	35–60	Suction and Discharge Manifold Cover – Crankcase
		55–60	Discharge Manifold – Cylinder Heads
		55–60	Valve Plate – Crankcase
		55–60	Cylinder Head – Crankcase
		53–60	Hand Hole Cover – Crankcase
		55–60	Pump End Cover and Pump End Bearing Head – Crankcase
7/16	20 NF	40–45	Connecting Rod Bolt – Locknut*
1/2	Pipe	35–40	Pipe Plug – Crankcase
		35–40	Pipe Plug – Pump End Bearing Head
		30–35	Pressure Relief Valve – Suction and Discharge Manifold Cover
		30–35	Pressure Relief Valve – Crankcase
1/2	13 NC	80–90	Suction and Discharge Manifold – Crankcase
		80–90	Suction Manifold Cover – Crankcase
5/8	11 NC	140–150	Suction Manifold Cover and Suction Manifold – Crankcase
5/8	18 NF	60–75	Magnetic Plug – Pump End Bearing Head
		60–75	Modulating Valve Adapter – Crankcase
		60–75	Oil Bypass Plug – Crankcase
		60–75	Oil Bypass Plug – Pump End Bearing Head
		60–75	Oil Bypass Plug – Pump End Cover
		80–90	Hollow Lock Screw – Pump End Cover and Center Main Bearing Housing
		45–55	Oil Pressure Relief Valve – Crankcase
		80–90	Cap-Oil Pressure Relief Valve Assembly
7/8	14 NF	60–75	Seal Plug – Pump End Bearing Head
		55–65	Oil Pressure Relief Valve – Crankcase
3/4	Pipe	45–50	Pipe Plug – Crankcase
1	Pipe	50–55	Pipe Plug – Crankcase
1-1/2	18 NEF	35–45	Sight Glass Clamping Gland – Hand Hole Cover
No. 6	32	8–10	Auxiliary Control Valve Cover – Valve Body

NC – National Coarse
NEF – National Extra Fine
NF – National Fine

*Steel Rod

SERVICE INSTRUCTIONS

Service and repair of Carrier Reciprocating Compressors and other refrigeration components should be performed only by fully trained and qualified personnel.

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 5F,H 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 service valve, and reduce crankcase pressure to 2 psig. (Jumper low pressurestat.)
   b. Stop compressor and isolate from system by closing discharge service valve.
   c. Bleed any residual refrigerant. Drain oil if necessary.
4. After disassembly, clean all parts with solvent. Use mineral spirits, white gasoline or naptha.
5. Before assembly, coat all parts with compressor oil and clean and inspect all gasket surfaces. Replace all gaskets with new factory-made gaskets, and coat with oil. See Table 13 for torque values.
6. After reassembly, evacuate compressor and open suction and discharge valves. Restart compressor and adjust refrigerant charge.

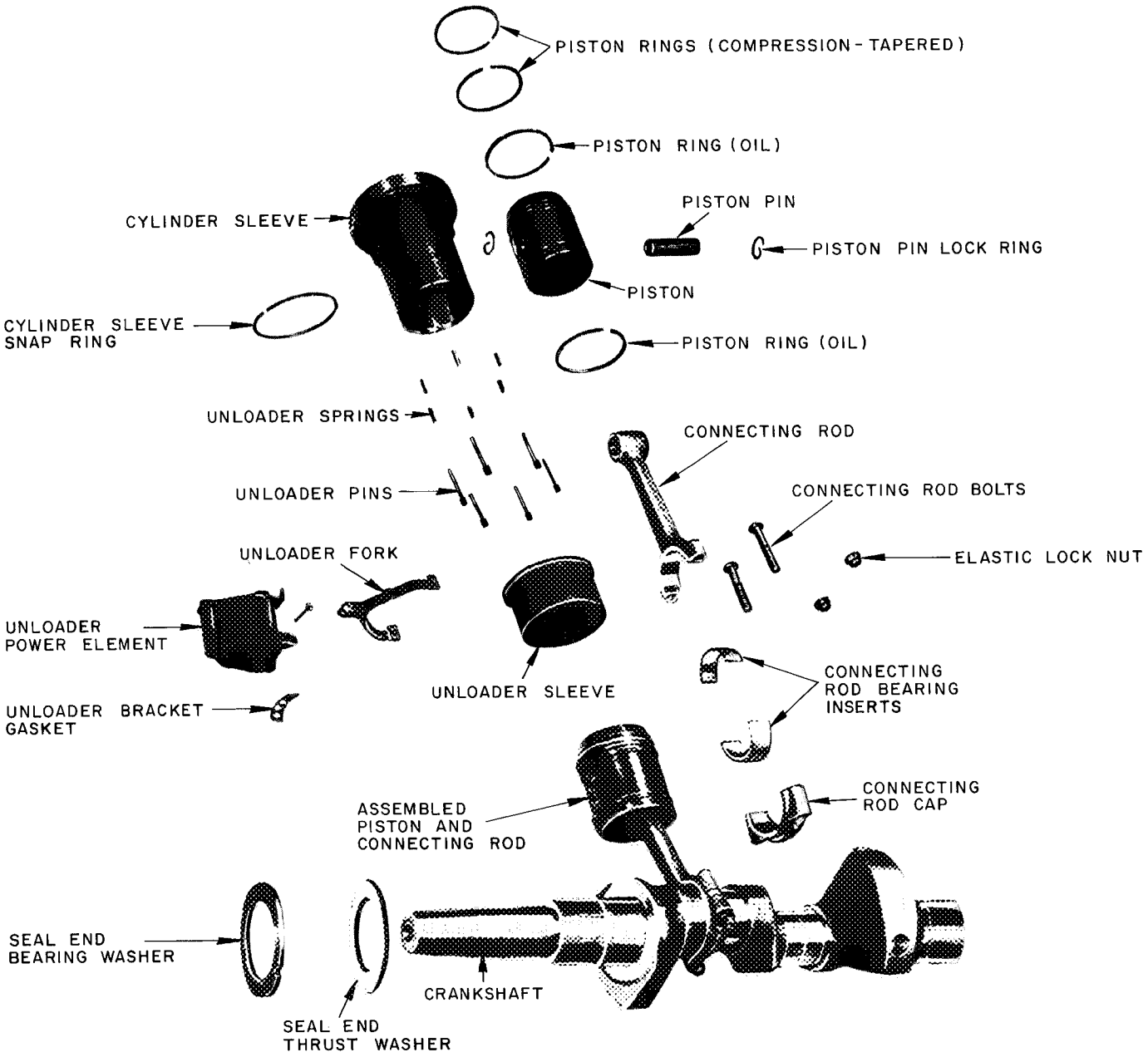


Fig. 30 – Internal 5H Compressor Components (Typical)

Table 14 — Wear Limits; 5F, H Compressors

COMPRESSOR PART	COMPRESSOR					
	5F20,30,40,60			5H40,46,60,66,80,86,120,126		
	Factory Tolerances (in.)		Max Allowable Wear (in.)	Factory Tolerances (in.)		Max Allowable Wear (in.)
	Max	Min		Max	Min	
SEAL END						
Main Bearing Diameter	1.6264	1.6250	.002	2.6278	2 6250	.001
	2.0636	2.0618	.001	—	—	—
Journal Diameter	1.6240	1.6233	.003	2.6235	2 6225	.002
	2.061	2.060	.002	—	—	—
PUMP END						
Main Bearing Diam (Assembled)	1 6264	1.6250	002	2.2530	2.2502	001
			.001	—	—	—
Journal Diam	1.6240	1.6233	.002	2.249	2.248	002
CENTER (5H80,86,120,126)						
Main Bearing Diam	—	—	—	2.6264	2 6250	001
Main Bearing Thickness	—	—	—	—	.0942	.001
Journal Diam	—	—	—	2.6235	2.6225	002
CONNECTING ROD						
Bearing Diam	1.6255	1.6245	002	2.2505	2 2495	.002
Bearing Thickness	—	06225	001	—	.06225	001
Crankpin Diam	1.6240	1.6233	003	—	2.248	.002
Seal End Bearing Washer Thk	.131	.129	—	.188	.186	—
Seal End Thrust Washer Thk	.157	.155	—	188	.186	—
Pump End Bearing Washer Thk	.131	129	*	188	.186	*
CYLINDERS						
Bore	2.501	2.500	003	3.2515	3 2505	003
Piston Diam (Steel, Std Stroke)	—	2.4980	.003	3.2485	3 2480	003
(Alum, Long Stroke)			See Fig. 32			
Piston Pin Diam	—	.7498	001	—	.9998	.001
Piston Pin Bushing	.7500	—	001	1 000	—	.001
Piston Ring End Gap (compression and oil)	.009	.004	.030	017	007	.030
Piston Ring Side Clearance						
Compression Side	.0015	.0005	003	.0015	0005	.003
Oil Side	.0012	.0002		0012	.0002	
OIL PUMP†						
Axial Clearance	.0015	.0005	.0025	0015	0005	0025
Drive Shaft Diam	.4361	.4356	.000	.4361	.4356	—
Drive Shaft Bushing Diam (10)	.4375	—	.000	.4375	.4370	—
Drive Shaft Diam (5H120 & 126)	—	—	—	6250	6240	—
Drive Shaft Bushing Diam (ID — 5H120 & 5H126)	—	—	—	.6270	.6260	—
SUCTION VALVE						
Suction Valve Disc (depth of wear below face)	—	—	.005	—	—	005
Suction Valve Seat (see Fig. 31 for Dim. A‡)	—	.012	—	—	.012	—
DISCHARGE VALVE						
Discharge Valve Disc (depth of wear below face)	—	—	.005	—	—	005
Discharge Valve Seat (see Fig. 31 for Dim. B**)	—	012	—	—	012	—

5F40 and 5F60

*Replace thrust and bearing washers when end clearance exceeds maximum listed

CRANKSHAFT END CLEARANCE (In.)	
5F20—5F60	011 to 035
5H40,46	010 to 036
5H60,66	011 to 037
5H80,86	014 to 042
5H120,126	014 to 044

†Return assemblies for factory exchange

‡Minimum height of dimension A before replacing cylinder sleeve is 010 inches

**Minimum height of dimension B before replacing valve plate and discharge valve inner seat is 010 inches

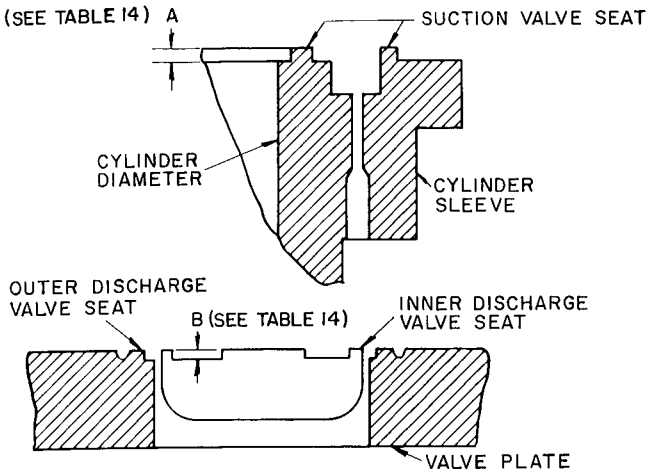


Fig. 31 – Suction and Discharge Valve Seat Height

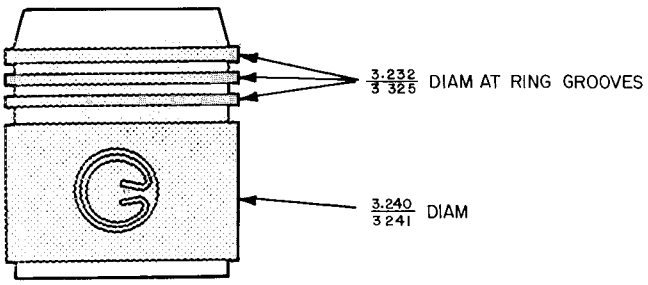


Fig. 32 – Aluminum, Long-Stroke Piston Diameters (See Table 14)

Servicing the Lubrication System

OIL PUMP (for 5H120 and 126 compressors, 1969 or later, refer to section, GEAR ROTOR TYPE OIL PUMP.)

Drain oil below level of pump end bearing head. Remove bearing head – complete end bell assembly must be removed on 5H40, 46, 60, 66, 80 and 86 Models. Check oil pump rotor for end play. Maximum allowable movement of rotor is .0025 in. (Table 14). If there is excessive end play, reposition oil pump bushing in bearing head as described below.

Turn rotor; if there is more than a slight drag, remove pump cover and disassemble oil pump. Check all parts (Fig. 33 or 35) for wear and damage. Inspect oil pump bushing for scoring. *Replace bushing if scored.* If bearing head is scored, replace complete bearing head and oil pump assembly.

Oil Pump Bushing Installation – Press new bushing into the pump end bearing head from the *inner* side of the head (see Fig. 34), positioned so that the bushing oil groove is at the top when the bearing head is installed. The "lead," or entering, end of the bushing is identified by machined circumferential lines.

Oil Pump Bushing Positioning (Fig. 34)

1. Place .001-in. circular shim against bushing and install pump. (Shim between bushing and oil pump rotor.)
2. Complete assembly of oil pump.

WARNING: Be sure oil pump assembly is flush with coverplate surface but does not protrude beyond bearing head surface.

3. Seat bushing against shim by tapping it with a cylindrical positioning tool (field-fabricated, Fig. 34).
4. Disassemble oil pump and remove shim.
5. Reassemble oil pump and check for binding.
6. Install bearing head on compressor. Line up tang on oil pump rotor shaft with slot in end of crankshaft. *Be sure that oil pump has proper rotation.*
7. Refill compressor oil to proper level.

Observe oil pressure when starting compressor. If correct pressure (Table 7) is not reached in 8-12 seconds, stop compressor and recheck oil pump.

GEAR ROTOR TYPE OIL PUMP (Models 5H120 and 126 from 1969 on.) See Fig. 35 – Remove bearing head and oil pump cover. Disassemble oil pump. Check all parts for wear and damage. Inspect bushing for scoring. *Replace bushing if scored.* If bearing head is scored, replace complete bearing head and oil pump assembly.

Install New Oil Pump Bushing – Reinstall oil pump into bearing head with 1/64-in. shim between port insert and oil pump cover. Install oil pump cover *without* gasket for this operation. Press new bushing into bearing head from *inner* side so that the bushing oil groove is at the top when the bearing head is installed (similar to Fig. 34). The "lead," or entering, end of the bushing is identified by machined circumferential lines. Press the bushing until the port insert bottoms against the 1/64-in. shim. Remove the pump cover and the shim. Reinstall the pump cover *with* the gasket and install the assembled bearing head to the compressor.

OIL PRESSURE REGULATING VALVE (nonadjustable, Fig. 36) is located on the side of compressor adjacent to seal housing. Regulator is important in maintaining correct oil pressure (Table 7) and satisfactory unloader operation.

Unscrew regulator from crankcase; use 5/16-in. allen wrench on all compressors except 5H120 which requires 1/2-in. allen wrench. Be sure regulator is not clogged or the plunger is not stuck. Check drillings to regulator for fouling.

The *nonadjustable* oil pressure regulator is interchangeable on all current 5F,H compressors except 5H120 and 5H126 Models. (Models 5H120, 126 are equipped with nonadjustable regulator of larger size.) Early 5F,H compressors were equipped with an *adjustable* type oil-pressure regulator. When necessary to replace an adjustable type regulating valve, replace it with nonadjustable type.

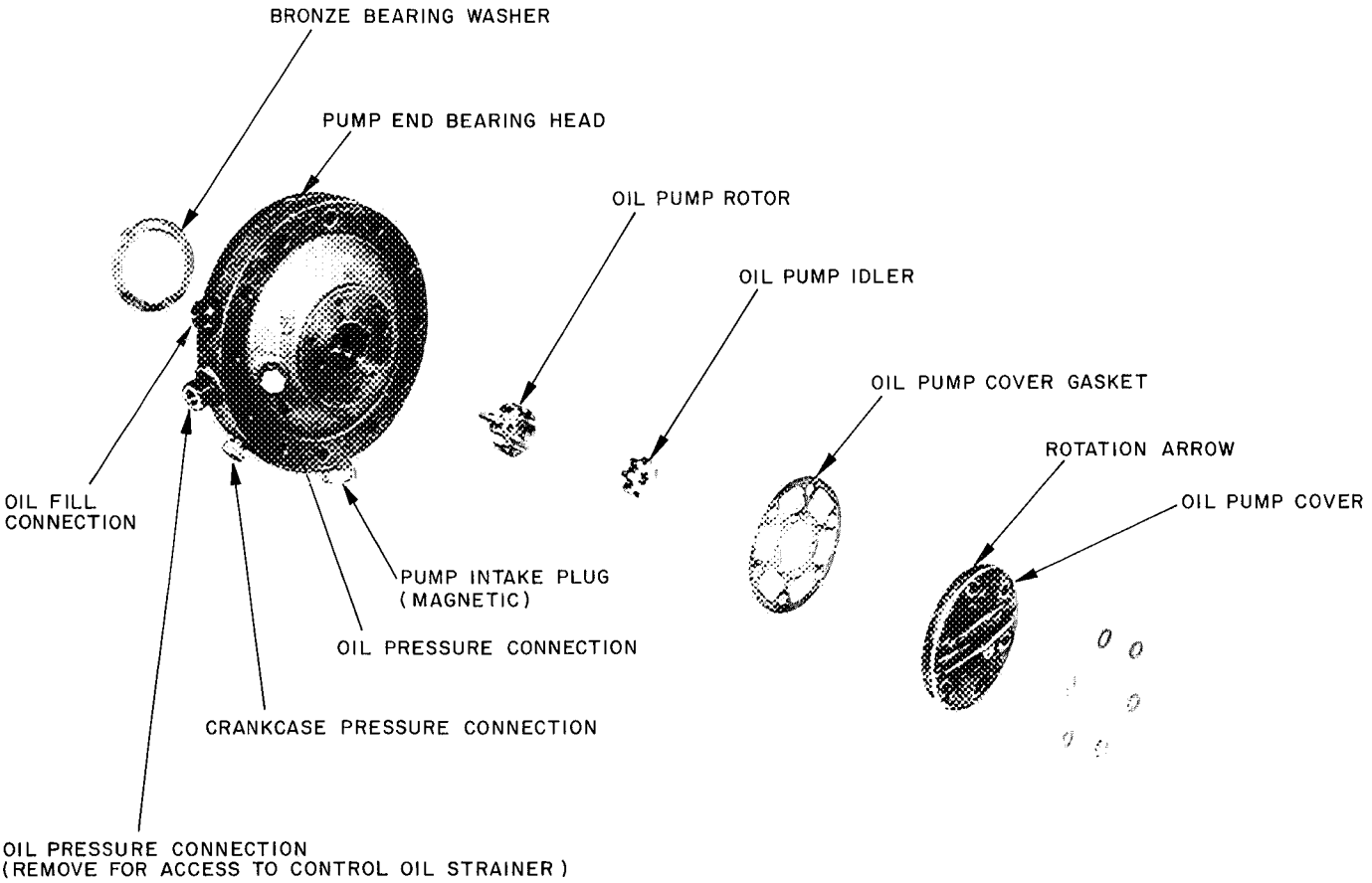


Fig. 33 – 5F Oil Pump Assembly

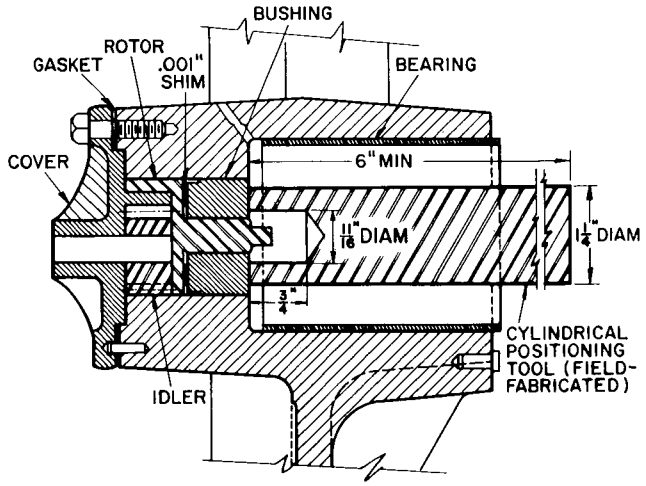


Fig. 34 – Setting Oil Pump Bushing (5H40 Bearing Head Shown)

OIL RETURN CHECK VALVE (5F20 thru 5H86) allows oil to return from suction manifold to crankcase. It is a normally open valve and will close when crankcase pressure becomes higher than suction pressure.

Two disc type check valves (Fig. 37) on 5F20 and 5F30 compressors are located beneath partition between suction manifold and crankcase, one on each side of compressor. They can be removed thru bottom cover or pump end of compressor.

Leaf type check valve (Fig. 37) on 5F40, 60; 5H40, 46, 60, 66, 80, 86 compressors is accessible thru, and located at top center of hand hole cover opening.

Remove check valves and check to see that flutter valve or leaf is not sticking and that it seats tightly.

CENTRIFUGAL OIL SEPARATOR on 5H120, 126 is mounted on crankshaft (Fig. 54) and provides for oil return to compressor crankcase. For oil separator removal and replacement instructions, see section entitled Crankshaft Inspection and Service.

OIL FILTER SCREEN (Fig. 29) in compressor crankcase is accessible thru hand hole cover or bottom plate. Remove and inspect it for holes and dirt. Clean it with solvent and replace.

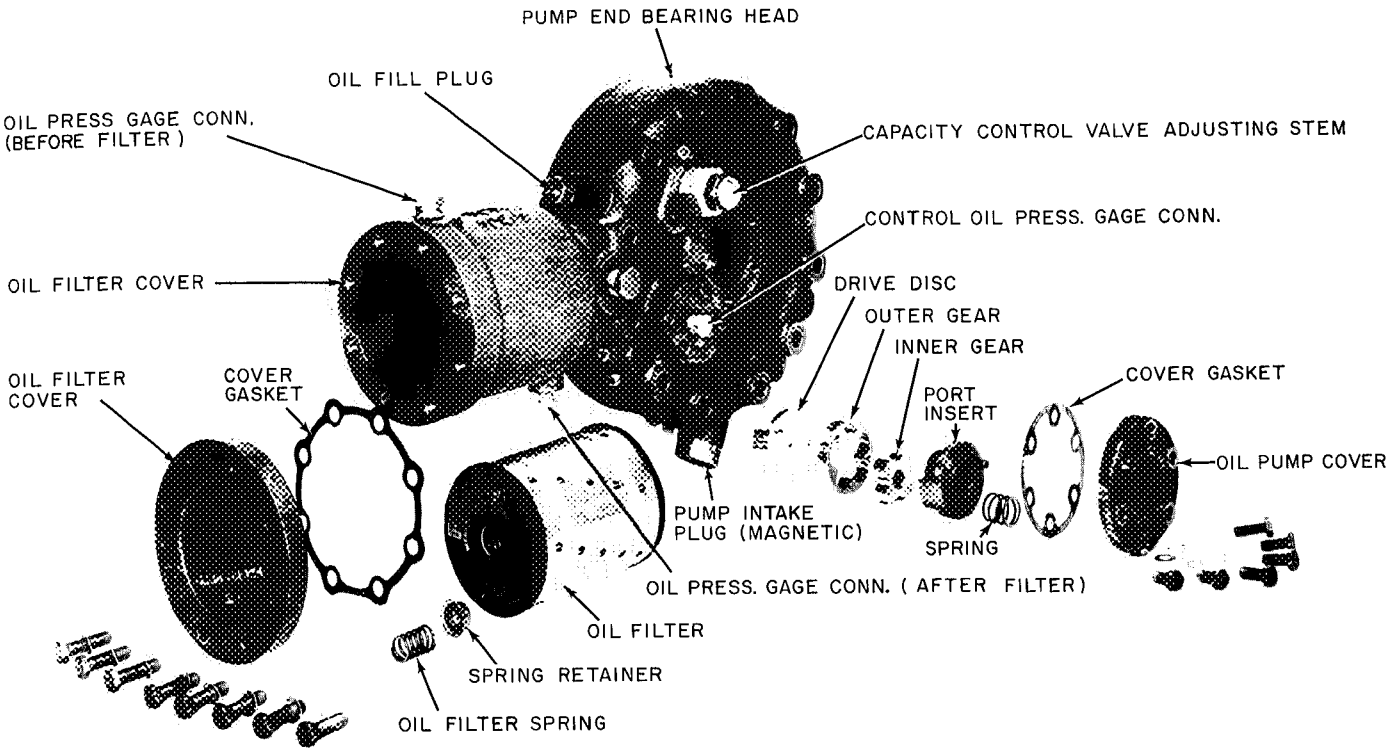


Fig. 35 – Oil Pump and Filter Assembly (5H120,126)

Fig. 36 – Oil Pressure Regulating Valve (Nonadjustable)

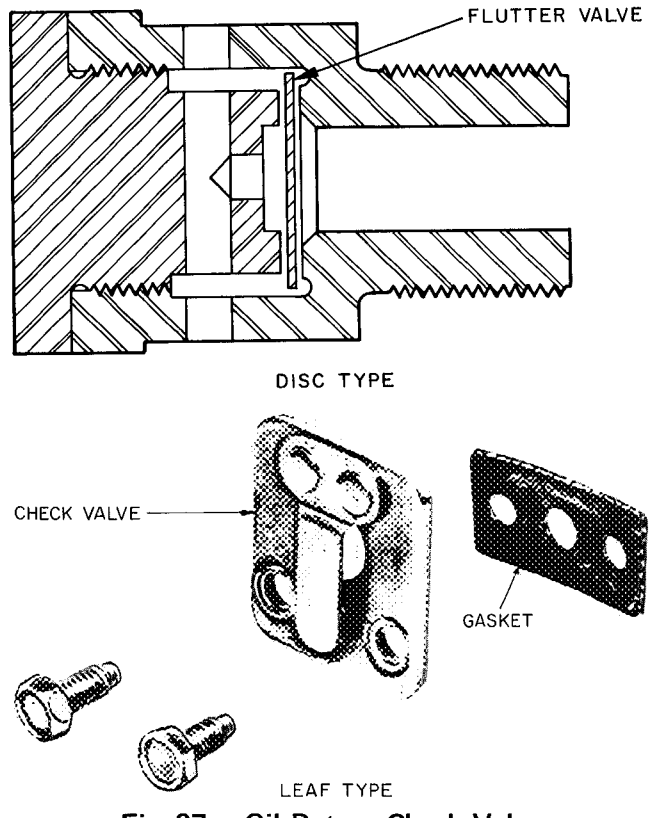


Fig. 37 – Oil Return Check Valves

Servicing Pressure Relief Valves – Internal pressure relief valves relieve refrigerant pressure from high to low side at a pressure differential of 350 ± 35 psi.

Check relief valves for evidence of leaking. Change if defective or if valve has ever opened due to excessive pressure.

5F60 COMPRESSOR (starting with Serial No. 9452380) internal relief valve screws into crankcase and projects up thru left cylinder bank valve plate (Fig. 38). Use a standard socket type screwdriver to remove and replace valve.

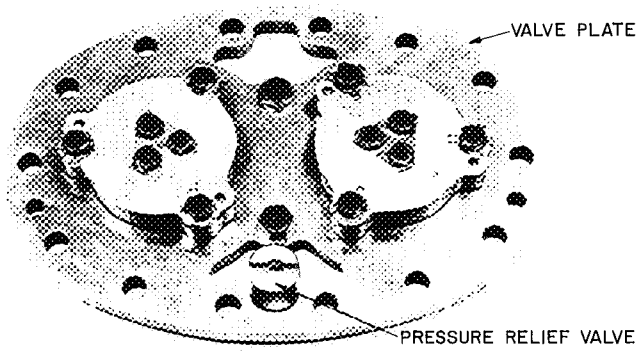


Fig. 38 – Pressure Relief Valve (5F60)

5H40, 46, 80, 86 COMPRESSOR pressure relief valves are located on suction and discharge manifold cover (Fig. 39).

5H60 AND 5H66 COMPRESSOR relief valves are located in wall between suction and discharge manifolds. Remove discharge manifold for access to relief valve. Use elongated 1-9/16 in. socket

(Fig. 40) to remove valves on compressors prior to Serial No. 510001. Use a standard 1-1/2 in. socket to remove and install relief valves on current models.

5H120 AND 5H126 COMPRESSORS are equipped with external relief valve mounted on bypass line between suction shutoff valve and discharge manifold. To remove valve, remove bolts from flanges on either side of valve.

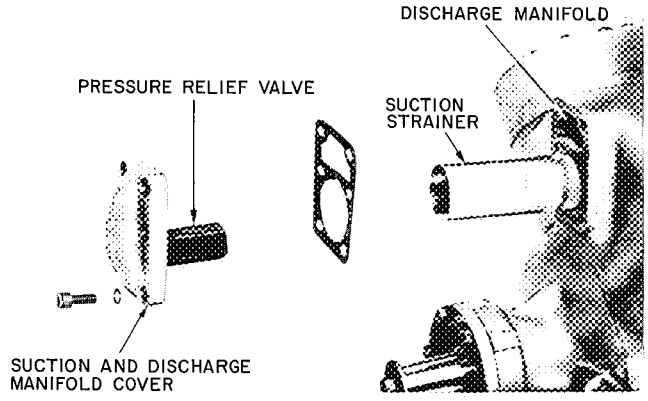


Fig. 39 – Pressure Relief Valve and Suction Strainer (5H40,46,80,86)

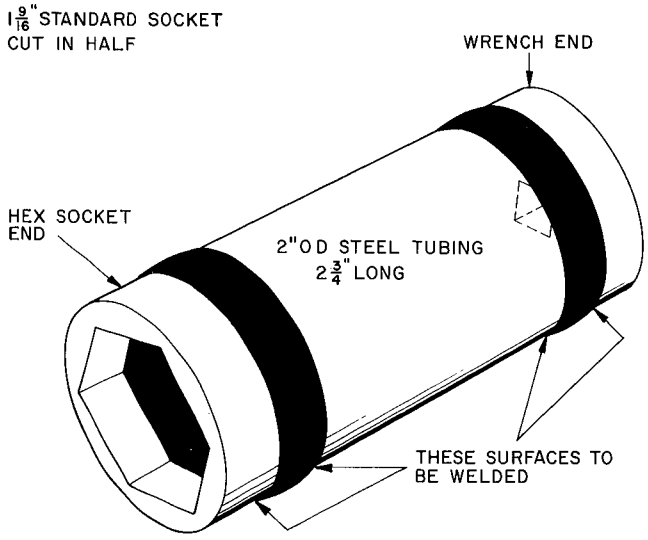


Fig. 40 – Elongation of 1-9/16 in. Socket

Cleaning Suction Strainer – To withdraw strainer: on 5F20, 40, 46 Models – remove suction and discharge manifold cover on seal end of compressor; 5F30 – remove suction service valve; 5F60 and 5H60, 66 – remove suction manifold and withdraw 2 strainers; 5H80, 86 – remove suction manifold cover.

On 5H120 and 5H126 Models, remove one suction manifold plate at a time so as not to disturb position of detachable suction manifold and suction line. Withdraw 2 suction strainers.

Clean strainer with solvent or replace if broken or corroded.

Do not damage suction strainer when replacing. On 5H120 and 5H126, be sure that strainer bail is compressed by positioned manifold coverplate. If bail is too short, grasp on side and elongate it enough to be compressed by manifold cover. Position bail between the 2 bosses on inside of manifold cover to prevent strainer from turning.

CAUTION: If a felt sock filter is installed, remove and inspect it after 50 hours of operation. Clean filter if required and replace it for another 50 hours. Remove sock when system is clean. (Not applicable to 5F20, 5F30).

Checking Cylinder Head and Valve Assemblies

CYLINDER HEAD INSPECTION – Remove cylinder heads. Check heads for warping, cracks and damage to gasket surfaces.

VALVE INSPECTION (Fig. 41)

Disassembly – Remove cylinder head. Loosen cap screws holding discharge valve seat to discharge valve guide, and cap screws holding valve guide to valve plate. Remove cap screws holding valve plate to cylinder block. Remove valve plate from cylinder block, and discharge valve guide from valve plate.

Inspection – Inspect suction and discharge valve discs and valve seats for cracks or excessive wear (refer to Wear Limits, Table 14). 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.

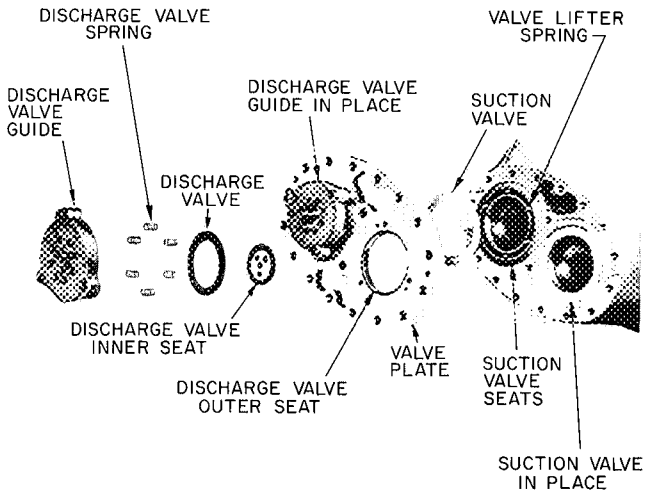


Fig. 41 – Suction and Discharge Valve Assembly

Reassembly – Pistons must be below tops of cylinder sleeves. (Turn crankshaft or force pistons down).

1. Place suction valve springs in valve plate recesses. Large spring coil should be in full contact with bottom of recess.

2. Place suction valve disc on valve springs; press disc into valve plate recess. Slide valve retainer clips into place (Fig. 42). Locate clips so they do not cover valve lifter springs or pins. Valve retainer clips 5F20-2061 (5F compressors) or 5H40-2061 (5H compressors) are field supplied.

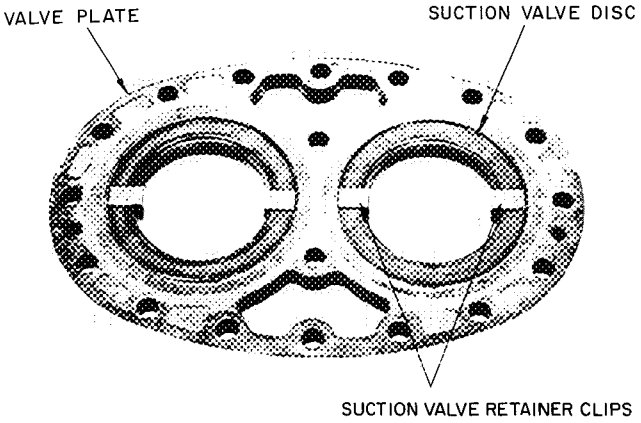


Fig. 42 – Valve Clips in Place

3. Bolt valve plate to cylinder block. Remove valve clips.
4. Place discharge valve springs in discharge valve guide spring recesses.
5. Place discharge valve disc over springs, and fit inner seat in place over valve disc. Hand tighten bolts holding inner seat to valve guide (valve guide assembly).
6. Place valve guide assembly on valve plate. Tighten all bolts and bend tabs on lock washer and lock plates. Replace cylinder head.

Inspect Cylinder and Unloader Sleeves

DISASSEMBLY – Remove cylinder head, suction and discharge valve assembly, and pump end bearing head. Whenever cylinder sleeve or valve plate is replaced, use a new suction valve disc.

1. Turn crankshaft until piston is in midposition.
2. Insert a sleeve puller into cylinder and push it down on to top of piston.
3. Tighten nut on top of sleeve puller to expand puller in sleeve.
4. Turn crankshaft, forcing sleeve upward until it can be removed.
5. Remove unloader snap rings (5H compressors only). Disassemble unloader sleeve, pins and springs.

INSPECTION – Examine bore of sleeve for wear. Check suction valve seats for scratches and wear. Check unloader sleeves, pins and springs for wear and freedom of movement.

REASSEMBLY – When new rings are being installed in a used cylinder sleeve, break the hard, glazed surface of cylinder sleeve to reduce wearing-in period of new rings. Use No. 80 emery cloth or rehone lightly. Clean sleeves thoroughly after breaking glaze.

1. Rotate crankshaft so piston is at top center.
2. Lubricate piston rings and beveled surface at lower edge of cylinder sleeve.
3. Stagger ring gaps around piston.
4. With turning motion, work sleeve over piston and rings. Compress and align each ring with beveled edge of sleeve.
5. Seat sleeve in suction manifold partition and cylinder deck recess.
6. Rotate sleeve so any 2 valve lifter pin holes lie equal distances from longitudinal axis of compressors (Fig. 43). In this position lifter pins line up with suction valve springs.

CAUTION: Never operate compressor with heads or valve plate removed. (Fig. 43)

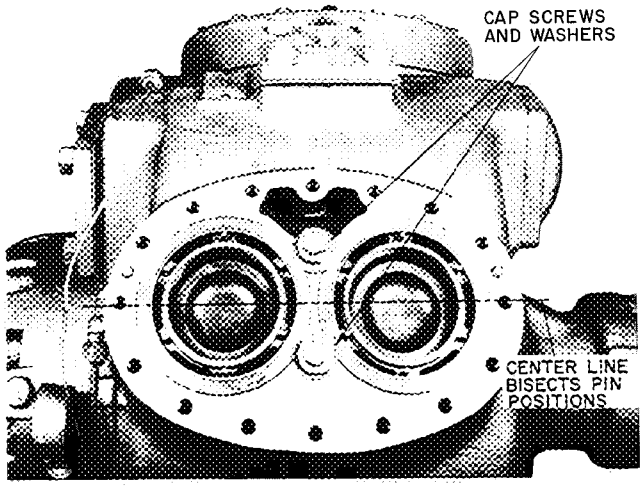


Fig. 43 – Position of Cylinder Sleeves

Inspect Connecting Rods and Pistons

REMOVAL – Gain access to rods and pistons by removing cylinder head, valve plate, and hand hole cover or bottom plate.

Refer to Fig. 30. Remove connecting rod caps. Label caps and rods so they may be reinstalled in same places on crankshaft. Remove cylinder sleeve, connecting rod, and piston assembly together by pushing assembly up thru cylinder deck. *Do not allow piston to come thru top of sleeve during removal process.* Disassemble connecting rods from pistons by removing retaining rings and piston pins. Remove 2 compression rings (plain) and 2 oil rings (one vented and one plain, Fig. 44).

Keep each connecting rod and piston assembly together for proper reassembly. Check all parts and crankpin journals for wear (Table 14).

INSPECTION AND REPLACEMENT – Attach connecting rods to pistons with piston pins and lock in place with retaining rings. Piston pins are selectively fitted for a push fit; reassemble in the piston from which they were removed. Place piston pin retaining rings, with gap on side, on piston (Fig. 44). They should be tight enough so they cannot be rotated by finger pressure.

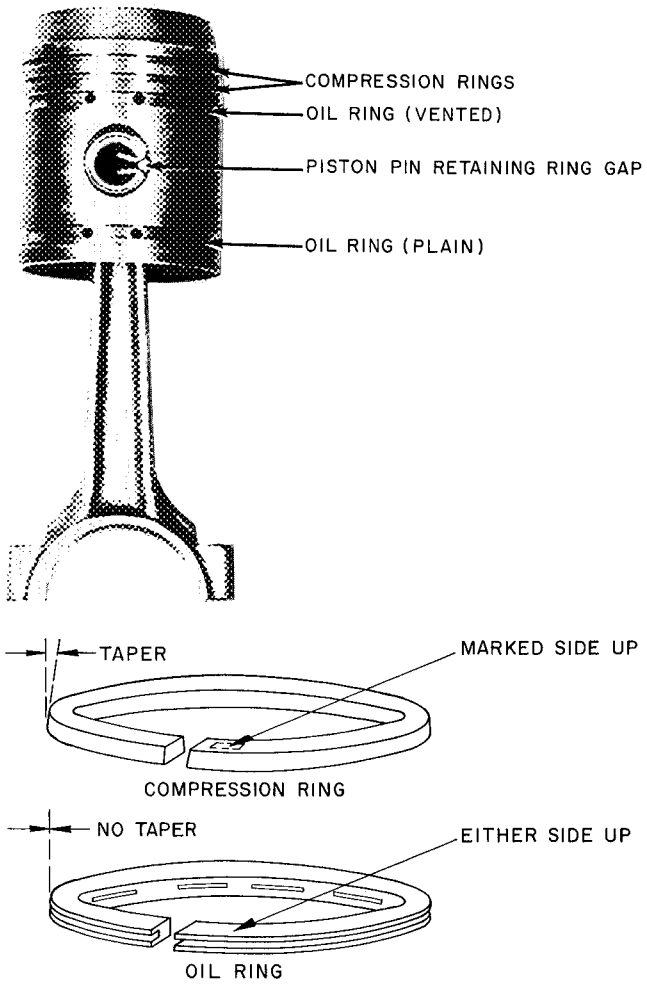


Fig. 44 – Position of Piston Rings and Piston Pin Retaining Clips

Check Rings

1. Check ring gap by inserting each ring separately in cylinder approximately 3/8-in. from top. Ring gap should be between .007 in. and .017 inch.
2. Install compression rings on piston with side marked *top* toward piston head. Install oil rings with either side up.
3. Stagger ring gaps around piston.
4. Measure side clearance between ring and piston (approximately .001 inch). Check rings for free action.

Check Rod Bearing Inserts (Fig. 30) – If bearing inserts are damaged and crankshaft is not worn, it is only necessary to replace inserts. Do not file bearing caps. Place the inserts in connecting rod and connecting rod caps so knobs on inserts fit into notches on rod and cap. Lubricate insert bearing and crankpin freely before installing caps.

Install cylinder sleeve, connecting rod and piston assembly at the same time. *Turn connecting rod, and install cap so chamfered sides are against radius of crankpin. (Small knobs on rod and caps must be on same side of journal.)*

Capacity Control Operation

5F20, 30 CAPACITY CONTROL OPERATION (Fig. 45)

Loaded Operation – A rise in suction pressure causes needle valve to close. Oil pressure in power element increases as oil enters capacity control circuit from oil pump. Power element piston is forced upwards, pivoting lifting fork downward. Lifter pins drop allowing suction valve to seat and load controlled cylinder.

Unloaded Operation – A drop in suction pressure causes needle valve to open. Oil bleeds thru valve to crankcase decreasing oil pressure in power element. As oil pressure to power element drops, the piston moves downward. Lifting fork is pivoted upward, moving lifting pins upward; suction valve is raised from its seat and controlled cylinder is unloaded.

5F40 THRU 5H126 CAPACITY CONTROL OPERATION (Fig. 46 and 47)

Loaded Operation – A rise in suction pressure increases pressure against capacity control valve bellows, compressing range adjustment spring. Compression of range adjustment spring allows valve spring to move push pins and valve needle point toward valve seat. Flow of control oil to crankcase thru oil drain is throttled. Control oil pressure rises as oil enters capacity control circuit thru orifice from compressor oil pump circuit. Increased control oil pressure advances hydraulic relay piston (against spring) which feeds oil at full pressure to one or more controlled cylinder power elements depending on position of control valve. Pump oil pressure in unloader power elements forces piston upward, pivoting the lifting fork(s) downward. Lifter pins drop allowing suction valve(s) to seat and load cylinder(s).

Unloaded Operation – A drop in suction pressure decreases pressure against control valve bellows. Range adjustment spring presses against the push pins, compressing the valve spring. This moves the needle valve off the seat. Control oil bleeds from hydraulic relay and control valve to crankcase, relieving oil pressure on hydraulic piston. The piston retracts, preventing transmission of pressurized oil to controlled cylinder power element(s), and the oil drains to crankcase.

As oil pump pressure to power element drops, the piston moves downward. Lifting fork(s) is pivoted upward, moving lifting pins upward; suction valves are raised from their seats and controlled cylinder(s) is unloaded.

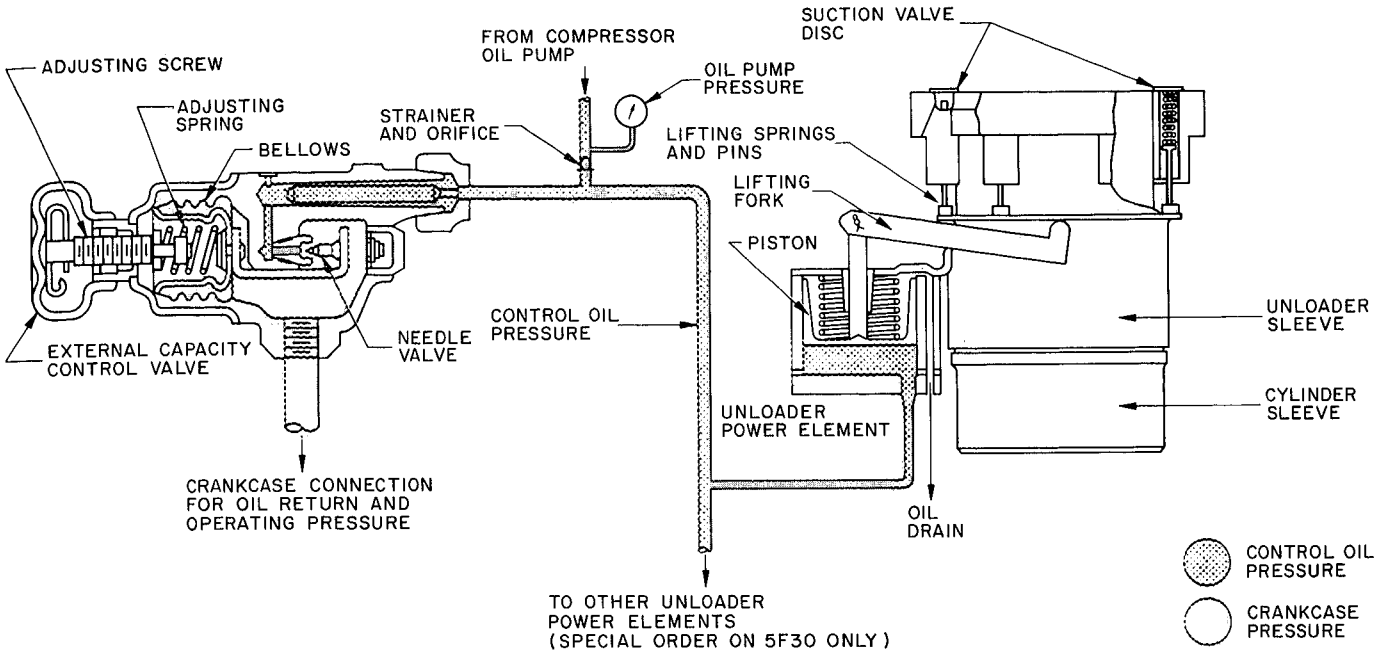


Fig. 45 – Capacity Control (5F20, 5F30)

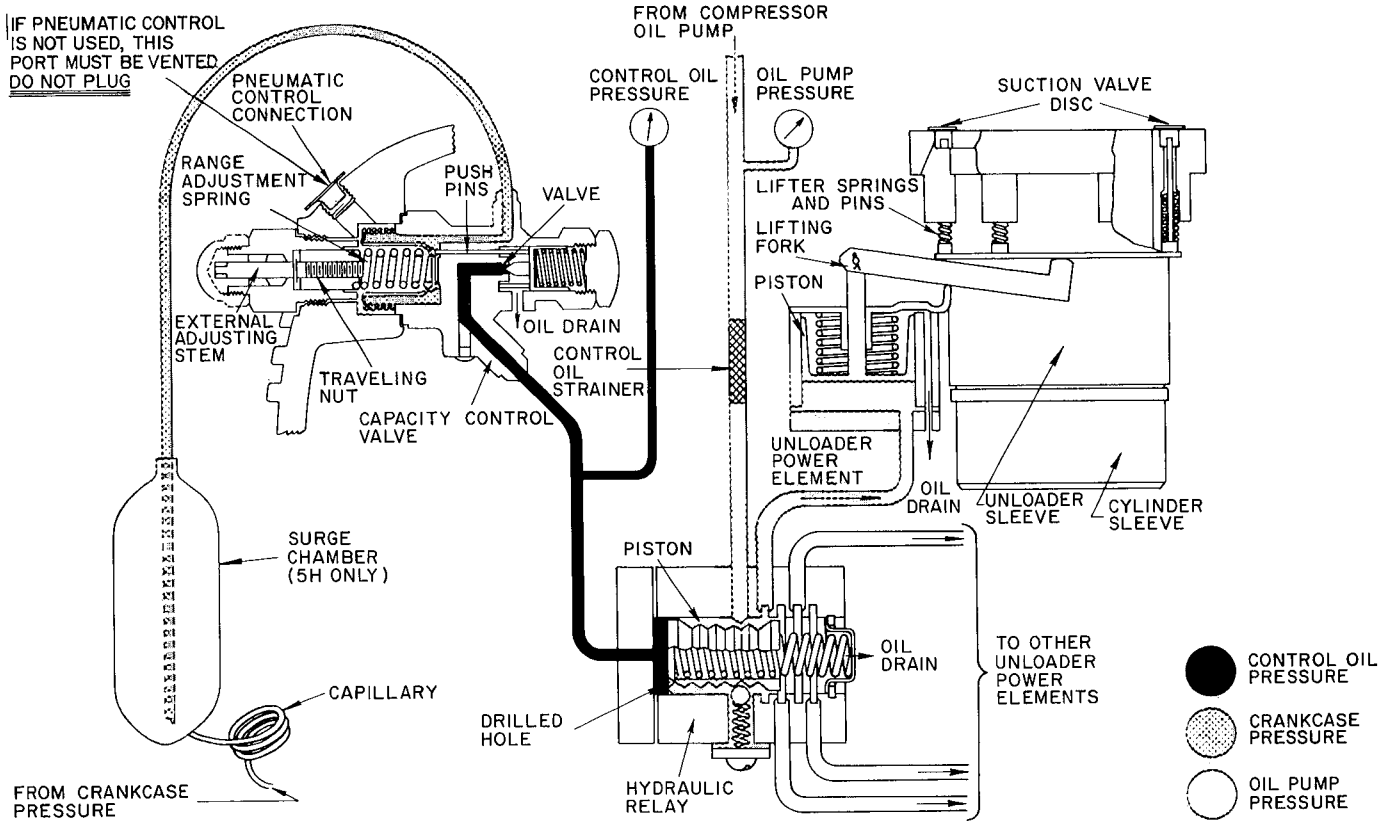


Fig. 46 – Capacity Control (5F40,60; 5H40,46,60,66,80 and 86)

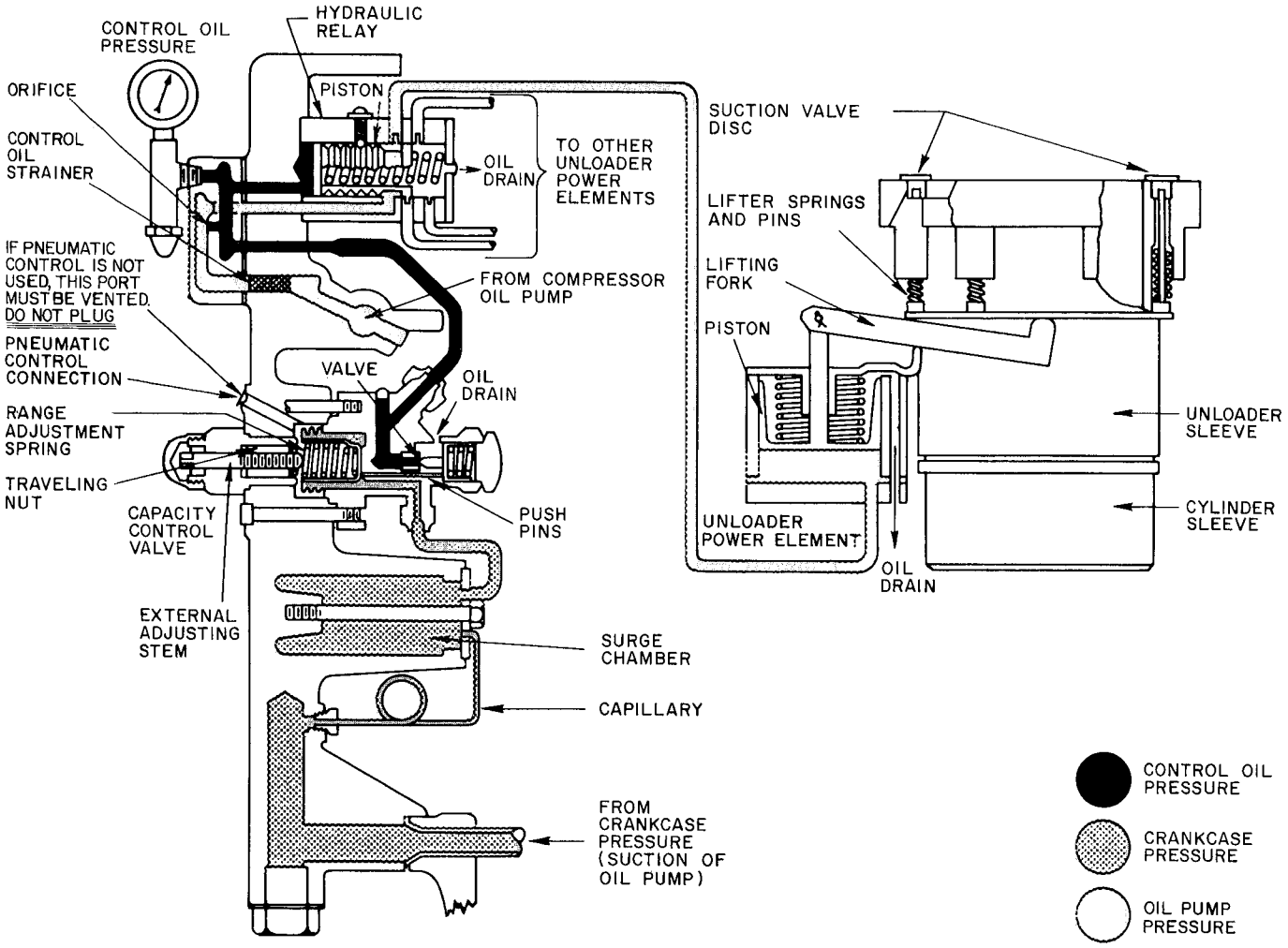


Fig. 47 – Capacity Control (5H120, 5H126)

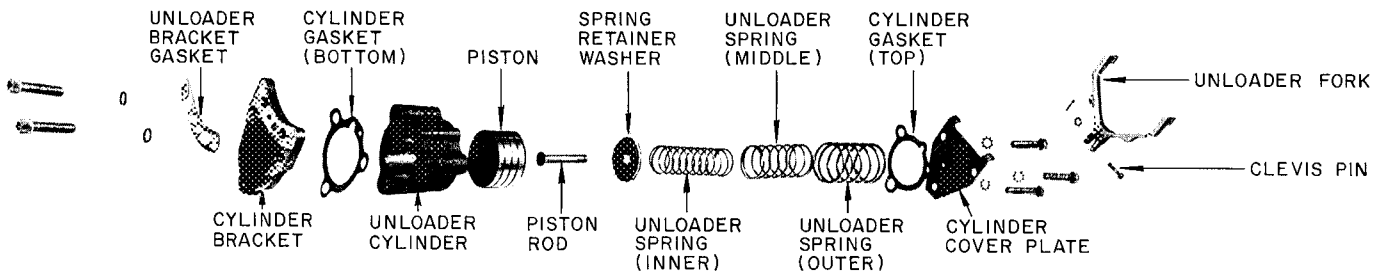


Fig. 48 – Unloader Power Element

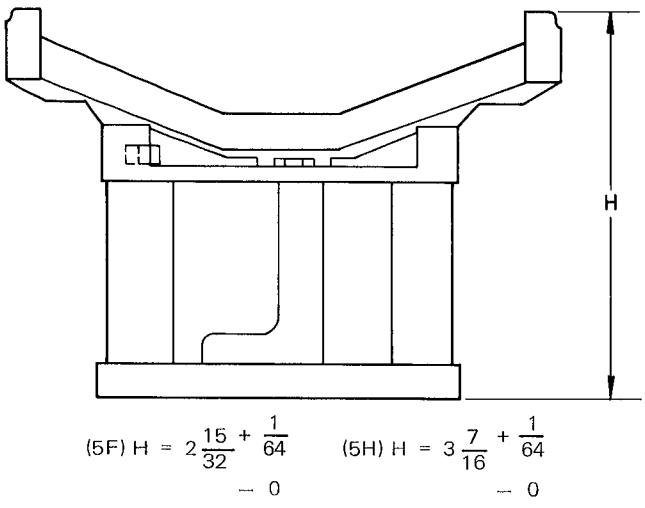


Fig. 49 – Unloader Fork Height (5F and 5H)

Capacity Control Inspection and Service

UNLOADER POWER ELEMENT REMOVAL – Remove cylinder head, valve plate, connecting rod, piston and cylinder sleeve. Remove allen head cap screws (2) holding unloader power element in position.

Remove power element (Fig. 48) and disassemble. Check all parts for wear and damage.

POWER ELEMENT REPLACEMENT – Check unloader fork height (Fig. 49) of assembled or new power element.

Attach power element to internal suction manifold. Replace cylinder sleeve piston, connecting rod, valve plate, cylinder head and handhole cover.

EXTERNAL ADJUSTING STEM REMOVAL does not require pumping compressor down. Loosen hex nut at valve stem base and remove adjusting stem assembly.

REMOVAL OF CAPACITY CONTROL VALVE AND HYDRAULIC RELAY – Assembly is located in handhole cover (Fig. 50) of 5F40 and 5F60 units, in pump end cover (Fig. 51) of 5H40, 46, 60, 66, 80 and 86 units, and in pump end bearing head (Fig. 52) of 5H120, 126 units.

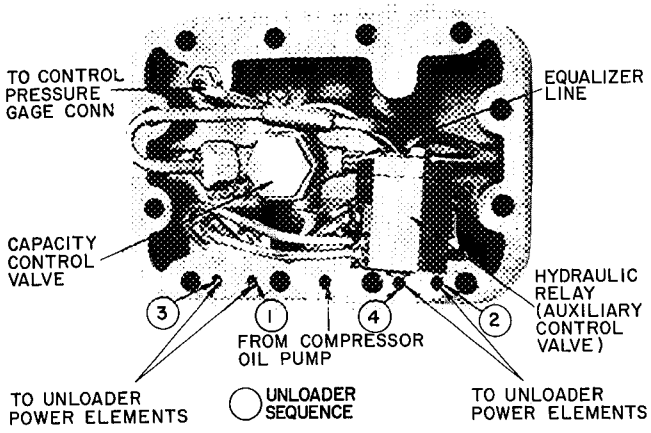


Fig. 50 – Compressor Handhole Cover and Assembly (5F40 and 5F60)

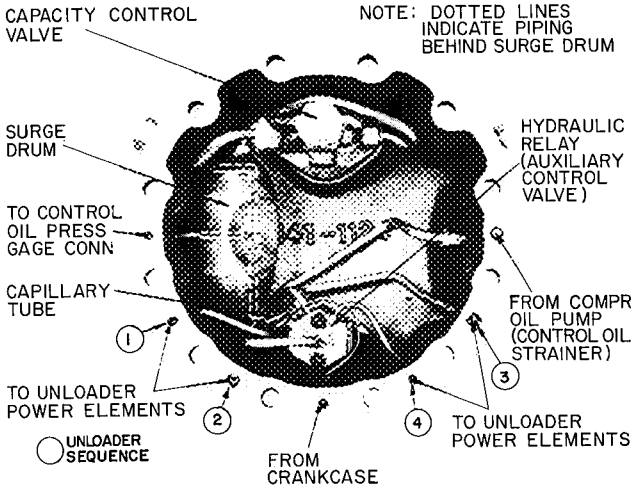


Fig. 51 – 5H Pump End Cover and Control Assembly (5H40,46,60,66,80,86)

Remove capacity control valve and hydraulic relay. Inspect parts for wear, damage and evidence of leaking or sticking.

A new handhole cover, pump end cover or pump end bearing head with control valve assembly may be installed. However, capacity control valve (and hydraulic relay on 5H120, 126 units) is available as a separate parts items for installation on original handhole cover, pump end cover or pump end bearing head.

INSPECT CONTROL OIL STRAINER – On 5F compressors the control oil strainer is on side of pump end bearing head (Fig. 33). Strainer is located on pump end bearing cover on 5H120 and 5H126 units and on pump end cover (Fig. 51) of all other 5H compressors.

Remove strainer and inspect it for holes and dirt. Clean it with solvent and replace.

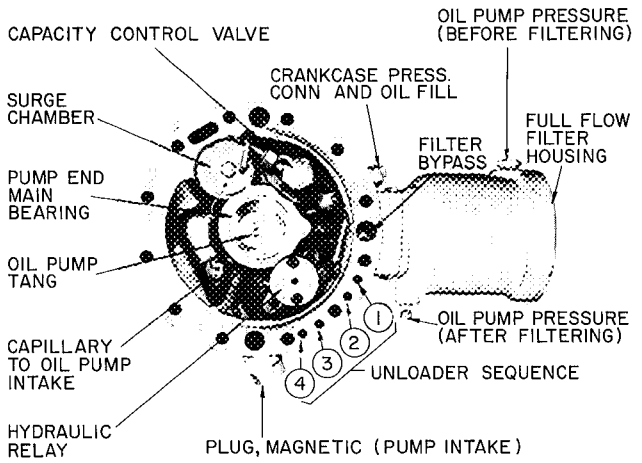


Fig. 52 – 5H120 & 5H126 Pump End Bearing Head

Crankshaft Inspection and Service

DISASSEMBLY – Remove cylinder heads, valve plates, connecting rod and piston assemblies, and pump end main bearing head.

On 5H80, 5H86, 5H120 and 5H126 Models, remove hollow center main bearing lockscrew located beneath plug (Fig. 53) and loosen hollow-cup setscrew (Fig 56) until center main bearing can be slid from its support. On 5H120 and 5H126, disconnect oil line to center main bearing. Pull crankshaft out thru pump end opening. Remove centrifugal oil separator impeller from 5H120 and 5H126 crankshaft.

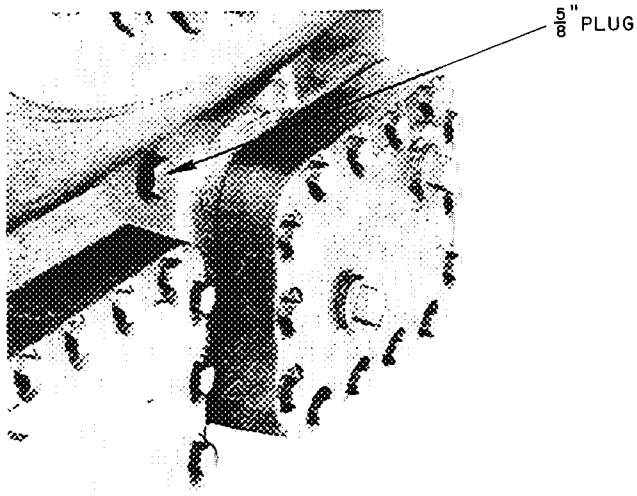


Fig. 53 – 5H80,86,120,126 Center Main Bearing Housing Setscrew Location

To remove 5H120 or 126 oil separator (Fig. 54) from crankshaft, heat to 180 F or more by immersion in hot water or oil. If water is used, be sure that all traces have been removed before reassembly. *Do not heat impeller with torch.*

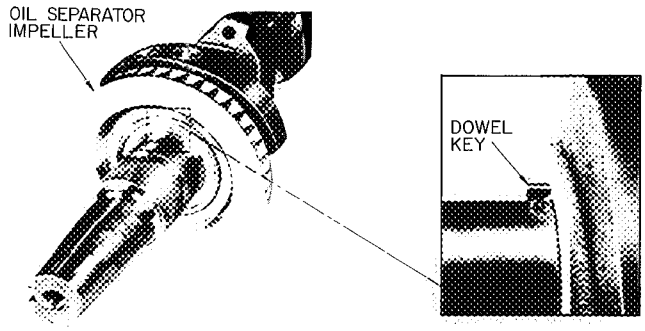


Fig. 54 – Centrifugal Oil Separator

INSPECTION – Check crankshaft journals for wear and tolerances shown in Table 14. Remove crankshaft plugs, check oil passages and clean if clogged.

Connecting rod bearing inserts and main bearings are available for crankshafts reground .010 in. to .020 in. undersize. A worn crankshaft suitable for regrinding to above tolerances can be exchanged for a factory-reground crankshaft and bearings. Factory-reground crankshafts are stamped on both ends with an A (.010 in. undersized), or B (.020 in. undersized).

The crankshafts for 5H46, 66, 86 and 126 compressors cannot be turned down. If scored, they must be replaced.

On crankshafts reground locally, hold throw to 1.001 in. for 5F compressors, and 1.376 in. on 5H compressors. Stamp A or B on crankshaft and pump-end bearing head next to oil pressure gage connection.

Determine maximum and minimum journal diameters for undersized shafts by subtracting the amount (in.) shaft will be ground undersize from factory – maximum and minimum tolerances shown in Table 14. For example, the factory tolerance for 5H40 seal-end journal is 2.6225 in. to 2.6235 inches. A crankshaft reground to .010 in. undersize is then held between 2.6125 in. and 2.6135 inches.

REASSEMBLY (Read oil separator impeller paragraph below before installing 5H120 and 5H126 crankshafts.)

When crankshaft is reground, remove crankshaft plugs and clean oil passages. Replace and tighten plugs before installing crankshaft. Insert crankshaft, and replace pump end bearing head, connecting rod and piston assemblies, valve plate and cylinder heads. On 5H80, 5H86, 5H120 and 5H126, replace center main bearing setscrew and lockscrew as described under Servicing Center Main Bearing. On 5H120 and 5H126 Models, reconnect oil line to center main bearing.

To reinstall the 5H120, 126 oil separator impeller:

1. Install dowel key (Fig. 54) with axis parallel to axis of crankshaft. Position key so chamfered edge is toward radius of crankshaft journal.
2. Heat oil separator impeller to 180 F or more by immersion in oil or hot water and install on crankshaft. If water is used, *remove all traces before reassembly*. Be sure that dowel key lines up with impeller keyway, and that impeller fits key snugly.
3. Be sure that seal end thrust washer is in place on dowel key in crankcase.

Servicing Pump-End Main Bearing

DISASSEMBLY AND INSPECTION – Remove pump end bearing head. (Remove pump end cover first on 5H40, 46, 60, 66, 80, 86 Models.) Inspect bearing for tolerances shown in Table 14. If pump end main bearing is worn, remove bronze bearing washer, and chisel out bearing. Inspect bearing housing for wear (Table 14) and damage. Remove any burrs.

REASSEMBLY – Lubricate outside of new bearing with heavy grease.

1. Line up hole in bearing with oil port in housing.
2. Press bearing into place using a puller shoulder (Table 15 and Fig. 57, 58) and jackscrew or bearing press.
3. Place bearing washer on bearing with notch in washer properly positioned around dowel key (Fig. 55).

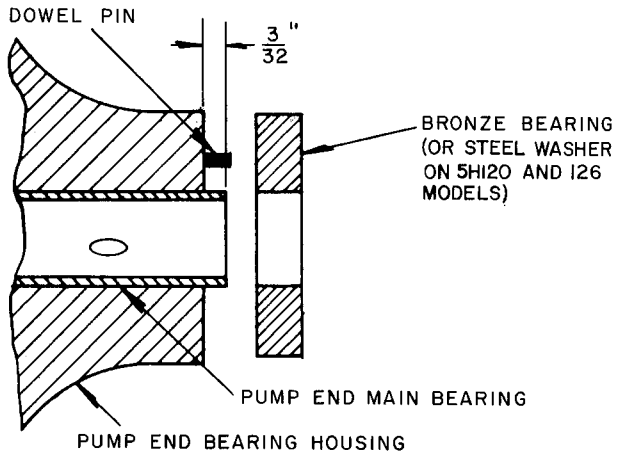


Fig. 55 – Pump End Main Bearing Position

Table 15 – Main Bearing Puller Sizes

COMPRESSOR	PULLER SIZE
5F20, 5F30	5F20
5F40, 5F60	5F40
5H40, 46, 60, 66 80, 86, 120, 126	5H40

NOTES
1 All bearing pullers part of 5F20-932 bearing puller assembly
2 Side of puller marked B is for undersized bearings

Servicing Center Main Bearing – Size 5H80 thru 5H126 compressors have a center main bearing and housing.

DISASSEMBLY AND INSPECTION – On 5H86, 5H120 and 5H126 compressors, disconnect the oil line to the center main bearing.

Remove the plug on the compressor casing (Fig. 53). Then remove the hollow lockscrew beneath the plug (Fig. 56). Next, loosen the hollow-cup setscrew until the center main bearing assembly can be slid from its support. Remove the crankshaft and bearing assembly.

Disassemble the bearing (Fig. 56) and inspect for the tolerances given in Table 14.

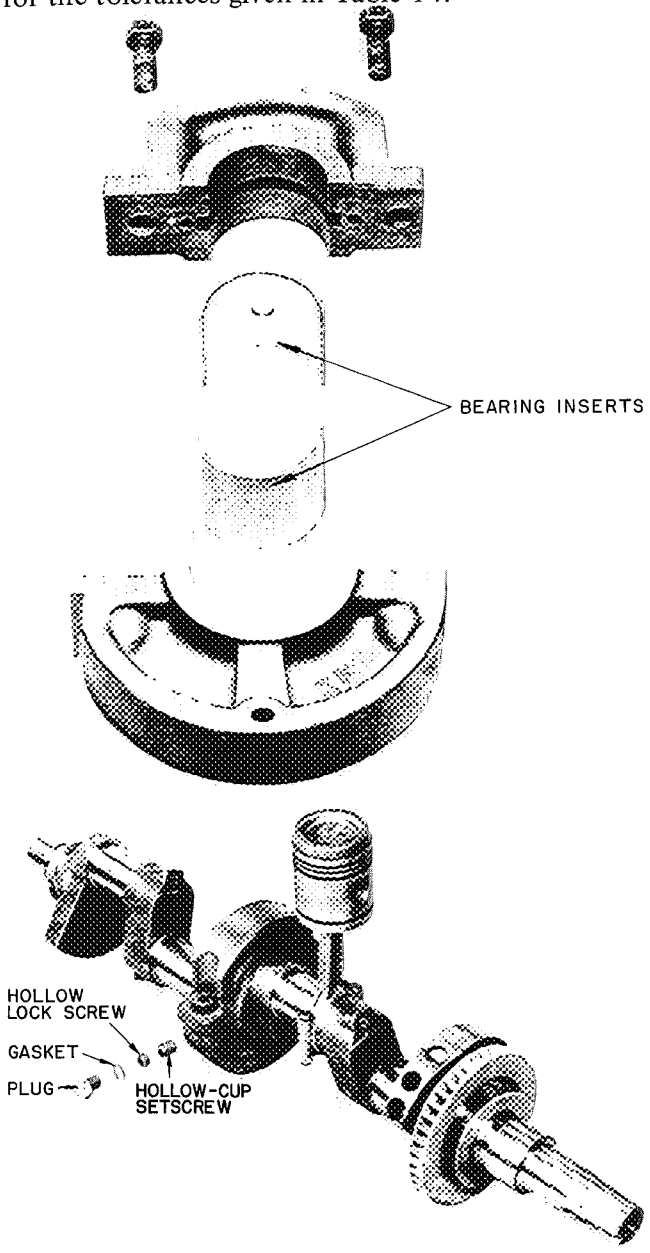


Fig. 56 – Center Main Bearing (5H120 and 5H126)

REASSEMBLY – Install the new bearing inserts. Assemble bearing housing on crankshaft *but do not tighten the hollow-cup setscrew* (Fig. 56). Install the crankshaft, center main bearing and housing, and the pump-end main bearing assembly. Tighten the bolts holding the pump-end bearing assembly. Now *rotate the crankshaft* while tightening the setscrew on the center main bearing housing. The setscrew should tighten fully without any binding of the crankshaft. If binding should occur, it will be necessary to shim the opposite side of the bearing housing, using .001-in. shim stock.

Servicing Seal-End Main Bearing

DISASSEMBLY AND INSPECTION – With crankshaft removed, use a puller shoulder to remove and install seal end main bearings (Fig. 57).

Inspect bearing and bearing housing for tolerances shown in Table 14.

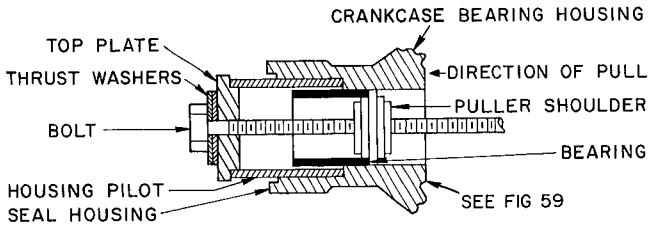


Fig. 57 – Removing 5H Seal End Main Bearing

REASSEMBLY – Remove any burrs and clean bearing housing before replacing bearing. Lubricate outside of bearing with heavy grease.

1. Position bearing so chamfered edge enters bearing housing first, oil holes in bearing and housing are aligned, and bearing relief groove is at top.
2. Pull bearing into housing. Edge of bearing should be 1/32 in. below surface of bronze bearing washer (Fig. 59).
3. Look thru oil pressure regulator opening to see that oil passage to bearing is not blocked.
4. Blow out oil groove in bearing housing and oil lines (if any) to it.

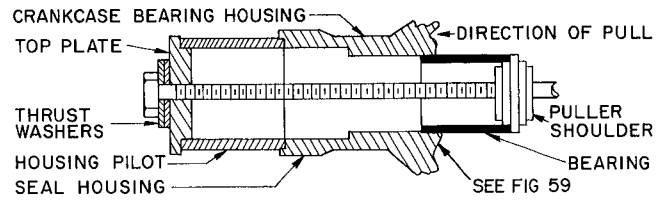
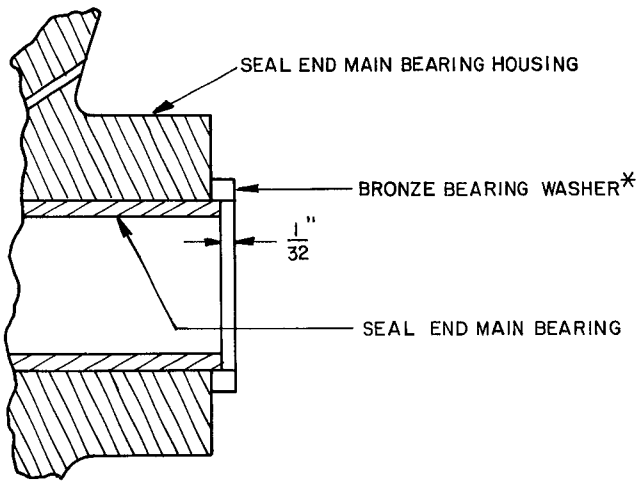


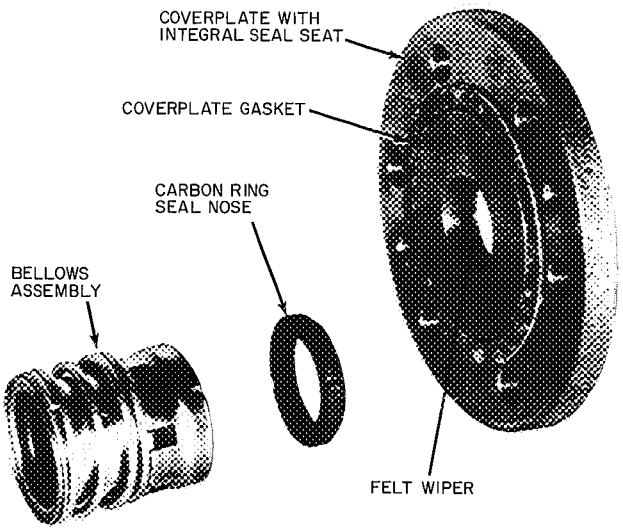
Fig. 58 – Installing 5F40 or 5F60 Seal End Main Bearing



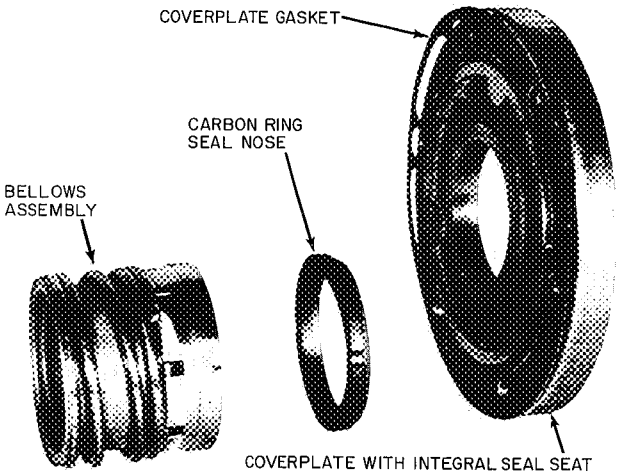
*Steel washer on 5H120 and 5H126 Models

Fig. 59 – Seal End Main Bearing Position

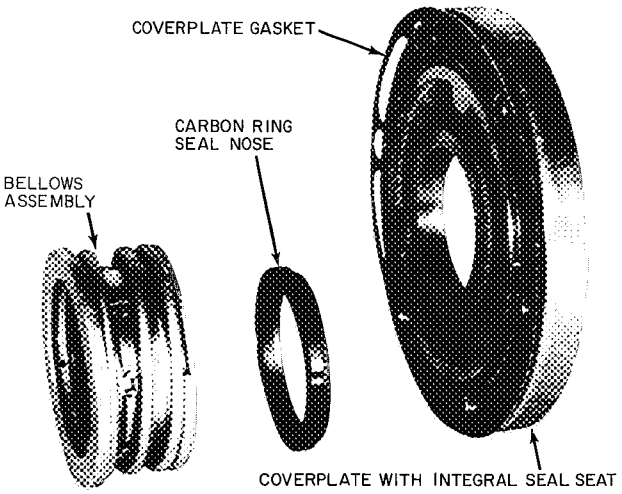
Crankshaft Seal Inspection and Replacement – The crankshaft oil seal in all current 5F,H compressors is a sleeve type with rotating bellows and integral seal seat. This seal is the service replacement for all earlier seal assemblies, Fig. 60 shows Types I and II of this design, for 5F20 thru 5H126 compressors.



A – 5F20, 30 (Type I)



B – 5F40 – 5H86 (Type I)



C – 5H120, 126 (Type II)

Fig. 60 – Service Replacement Seals

Do not attempt to repair or replace seal components Replace complete seal assembly with current sleeve type. The bellows assembly of the service replacement seal must not be taken apart.

Earlier rotating bellows type seals are shown in Fig. 61 and 62 and the stationary bellows type is shown in Fig. 63. When removing the stationary bellows type, tap the bellows frame with a plastic hammer if the seal spring pressure does not force the bellows clear of the housing.

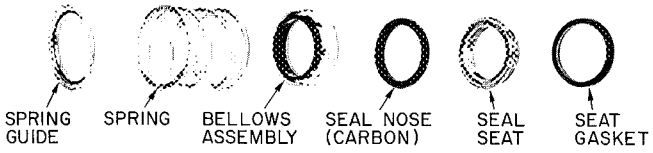


Fig. 61 – Rotating Seal with Insert Seal Seat

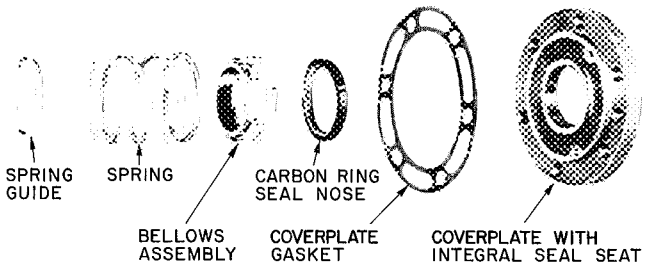


Fig. 62 – Rotating Seal with Integral Seal Seat

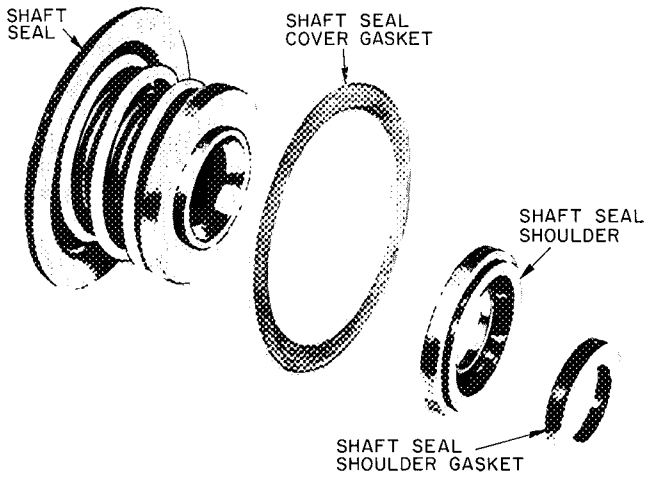
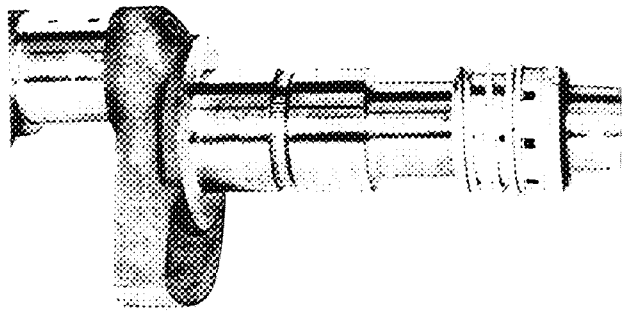


Fig. 63 – Stationary Bellows Seal

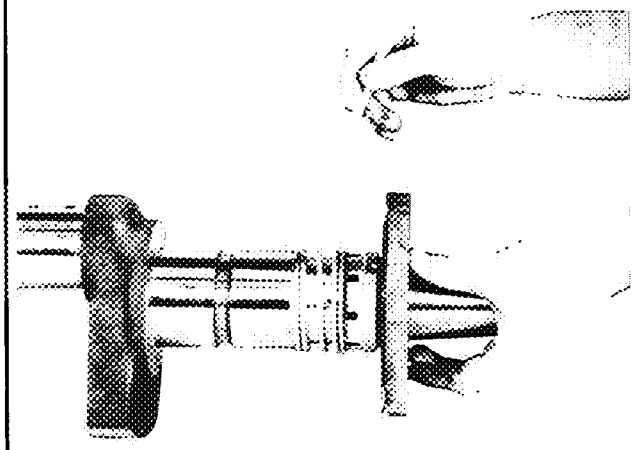
BEFORE INSTALLING SEAL

1. Pump end bearing head must be in place for proper positioning of seal on crankshaft.
2. Be sure shaft extension, especially the edges of the keyway, is free of sharp edges and nicks. Also, shaft must be clean and free of rust. Polish the shaft with crocus cloth.
3. Check seal assembly to be sure the bellows is properly in place and is clean.
4. Apply *compressor* oil to seal assembly, making sure that bellows and carbon ring are completely saturated.

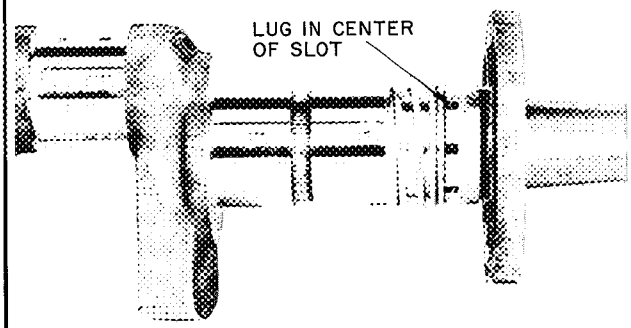
INSTALLATION – Refer to Fig. 64 for procedure instructions.



STEP 1 – Lubricate shaft and neoprene bellows (with compressor oil only) where it contacts shaft. Slide seal assembly onto shaft until neoprene starts to grasp the shaft.



STEP 2 – Using seal coverplate, push seal assembly on crankshaft until spring guide is tight against shaft shoulder. (Do not use coverplate bolts to push seal into position.) Remove coverplate being careful not to damage carbon washer.



STEP 3 – Be sure that driving band lugs are positioned in center of seal retainer shell slots. Lubricate carbon washer and seal seat. Reinstall coverplate, drawing bolts down evenly to prevent damage to carbon washer.

Fig. 64 – Installation of Service Replacement Rotating Type Seal

DIRECT-DRIVE FLEXIBLE COUPLINGS – ASSEMBLY AND ALIGNMENT

Introduction – Proper coupling alignment is essential to trouble-free operation of your unit. *The maximum permissible angular or parallel misalignment (Fig. 69,70) for all couplings is .010 inches.*

This section contains assembly and alignment instructions for all coupling packages listed in Table 16. Either of the following alignment methods can be used:

1. Straight Edge and Caliper Method
2. Dial Indicator Method

The procedures for aligning the 5H80-623 and 5H120-623 couplings, however, differ to some extent from the standard procedures.

5H80-623 COUPLING – Follow the standard procedure. Note the variations listed for the 5H80-623 coupling.

5H120-623 COUPLING – When using the dial indicator method, follow the standard procedure. When using the Straight Edge and Caliper Method, however, use only Steps 1 thru 8 and refer to Fig. 70.

Table 16 – Coupling Data

PACKAGE NUMBER	BRAKE HP*	SHAFT DIAM (in.)	USED ON
5F40-603	11 5	1⅜	5F40
5F40-623	17 5	1⅝	5F60
5F60-613	34 5	1⅞	5F60
5F60-623	30 0	1⅝	5F40 5F60
5H40-613	34 5	1⅝	5H40
5H40-623	34 5	1⅞	5H40 5H60
5H60-613	65 0	1⅞	5H40 5H60 5H80
5H60-623	65 0	2⅛	5H60 5H80 5H40-60 5H60-60 5H60-80 5H80-80
5H80-623	86 0	2⅛	5H80-80
5H80-663	86.0	1⅞	5H60,66 5H80,86 5H120
5H80-827	125 0	2⅛	5H120 5H126
5H120-613	86 0	2⅛	5H80 5H120 5H60-80
5H120-623	150 0	2⅛	5H120
5H120-827	125 0	2⅜	5H126
5H126-623	200 0	2⅜	5H126

*At 1750 rpm

Straight Edge and Caliper Method

1. Clean the compressor shaft, motor shaft and coupling flanges. Remove all burrs. Tighten compressor holddown bolts. 5H80-623 ONLY – Tighten the holddown bolts of the compressor that is doweled to the base.
2. Start the motor and scribe a light line around the motor shaft adjacent to the motor bearing housing. This line indicates the running position of the armature (Fig. 65). If the motor cannot be started, measure the amount of end play in the motor shaft. Set the motor shaft at half this measurement and mark the position. The coupling is to be aligned with the motor shaft in this running position.

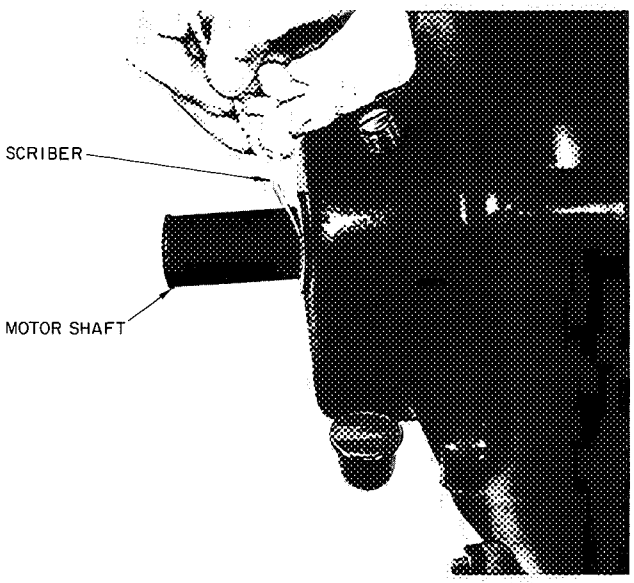


Fig. 65 – Scribing a Line to Indicate Running Position of Motor Shaft Running

3. Disassemble the coupling as shown in Fig. 66. 5H80-623 ONLY – Disassemble the coupling as shown in Fig. 73. Loop a wire thru the compressor flange-side flexible discs as shown. These discs are assembled so as to alternate the grain of the steel and the relationship should not be changed.
4. Fit the compressor flange to the compressor crankshaft.

   The flange has a tapered bore and it is most important that it fit properly on the tapered crankshaft without wobble. Any irregularities that might cause an imperfect fit must be corrected. To ensure a proper fit, proceed as follows:

   Step 1. Blue the shaft and slide the flange on without the key in place. Apply moderate pressure against the flange and rotate it slightly back and forth a few times. Remove the flange and check both the shaft and the flange bore surfaces for high spots. Use an extra fine grit stone to dress down any high spots *(do not use a file).* Reblue the shaft and repeat the operation until all high spots are gone and there is no detectable wobble. Wipe the shaft and bore clean.

   Step 2. Without the key in place, slide the flange onto the shaft as far as it will go. *Use moderate pressure but do not jam it on.* Scribe lightly around the shaft at the back end of the flange. Also note the position of the shaft end with respect to the flange face. It should be approximately 1/8 in. below the face. Then remove the flange.

   Step 3. Place the key in the keyway and again slide the flange onto the shaft as far as it will go. If the flange does not stop in the same position as in Step 2, the key is causing the misfit and must be carefully dressed down until the fit is correct.

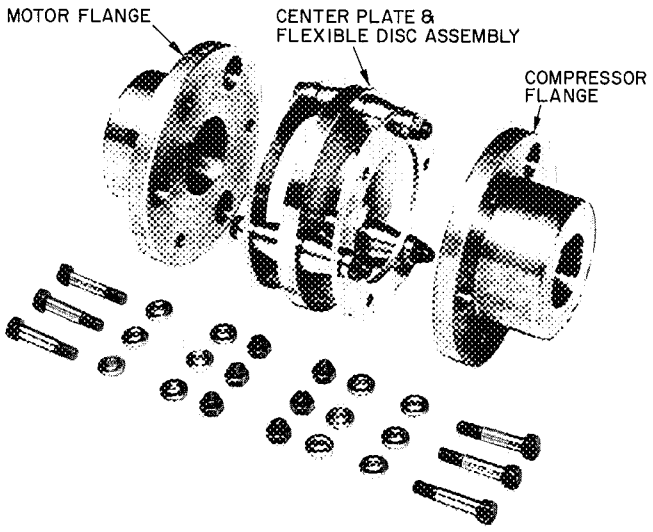


Fig. 66 – Dismantled Coupling Ready for Assembly to Compressor and Motor

   After the flange is in place, install the bolt and washer provided with the compressor. Tighten the bolt securely. Do not use the bolt and washer to force the flange into place.
5. If the compressor operates with a crankcase pressure less than 22 psig, the crankshaft will be against the pump-end thrust bearing. If crankcase pressure is over 22 psig, the crankshaft will be against the seal-end thrust bearing. Therefore, if the compressor is to be operated above 22 psig, pull the crankshaft to the seal-end extremity when aligning the coupling.
6. Fit the motor flange to the motor shaft, making sure that the key fits in the keyway. All parts should fit snugly but easily. Do not force them into place. The 5H80-623 coupling

is shown in Fig. 74 with both motor and compressor flanges installed. Install the 5H80-623 center plate assembly as shown in Fig. 75. The discs must be slightly fused to clear the compressor flange bolt.

7. Reassemble the coupling and make a preliminary adjustment of dimension E, distance between flanges, as listed in the table below:

PACKAGE NO.	DIM. E	SEE FIG. NO.
5F40-603	2 7/16	67
5F40-623	2 7/16	
5F60-613	2 15/16	
5F60-623	2 15/16	
5H40-613	2 15/16	
5H40-623	2 15/16	
5H60-613	2 15/16	
5H60-623	2 15/16	
5H80-663	3 13/16	
5H120-613	3 13/16	
5H120-623	3 1/2	
5H126-623	4 1/8	
5H80-623	3 13/16	76

When dimension E is set, tighten the motor flange set screws.

8. Move and shim the motor until dimension E (see table above) is correct when measured at 4 positions 90 degrees apart, and the edges of the flanges are in line when tested with a straight edge as illustrated in Fig. 67. For the 5H80-623 coupling, measure the coupling at the center of the arcs on the compressor flange and then rotate the coupling 90 degrees for each of the other 3 measurements. REMINDER: For the 5H120-623 coupling, refer now to Fig. 70.
9. Tighten the motor holddown bolts and check dimensions A, B, C and D as shown in Fig. 68 and 69. *If all dimensions are equal within .010 in., the coupling is correctly aligned.* Take all measurements between flange faces near the outside diameter of the flanges.
   NOTE: A convenient way to compare dimensions is to set an inside caliper at the smaller dimension and then measure the extra width at the larger dimension with the caliper and a feeler gage.
10. If dim. A and B are larger than C and D (Fig. 68), the coupling is in angular misalignment. Move and shim the motor until the dimensions are within tolerance.
11. If dim. A and D are larger than B and C (Fig. 69), the coupling is in parallel misalignment. Move and shim the motor until the dimensions are within tolerance.

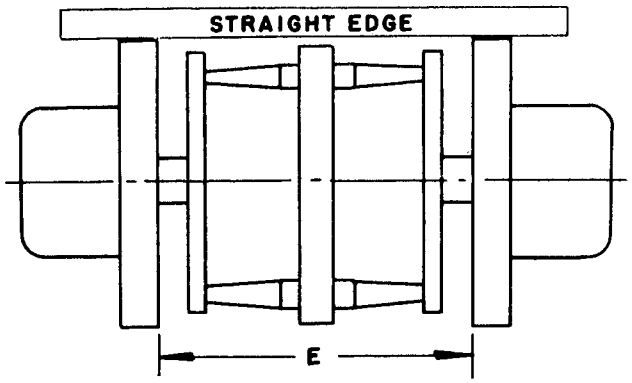


Fig. 67 – Preliminary Adjustment

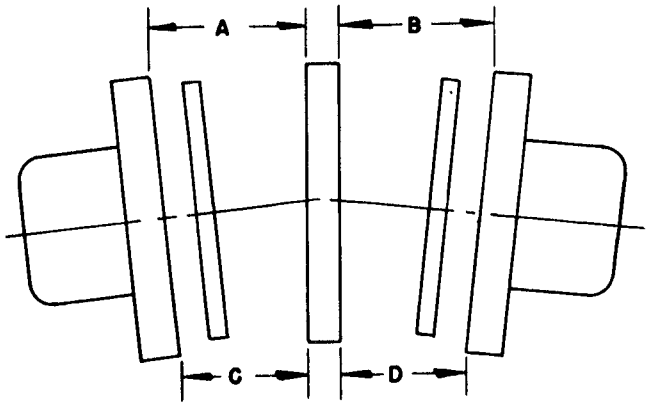


Fig. 68 – Angular Misalignment

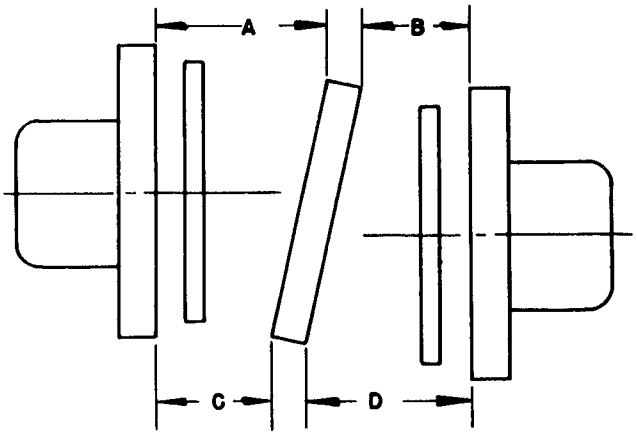


Fig. 69 – Parallel Misalignment

12. On Duplex units, align the second compressor to the motor in a similar manner.
13. Run compressor(s) until it reaches operating temperature and then recheck alignment.

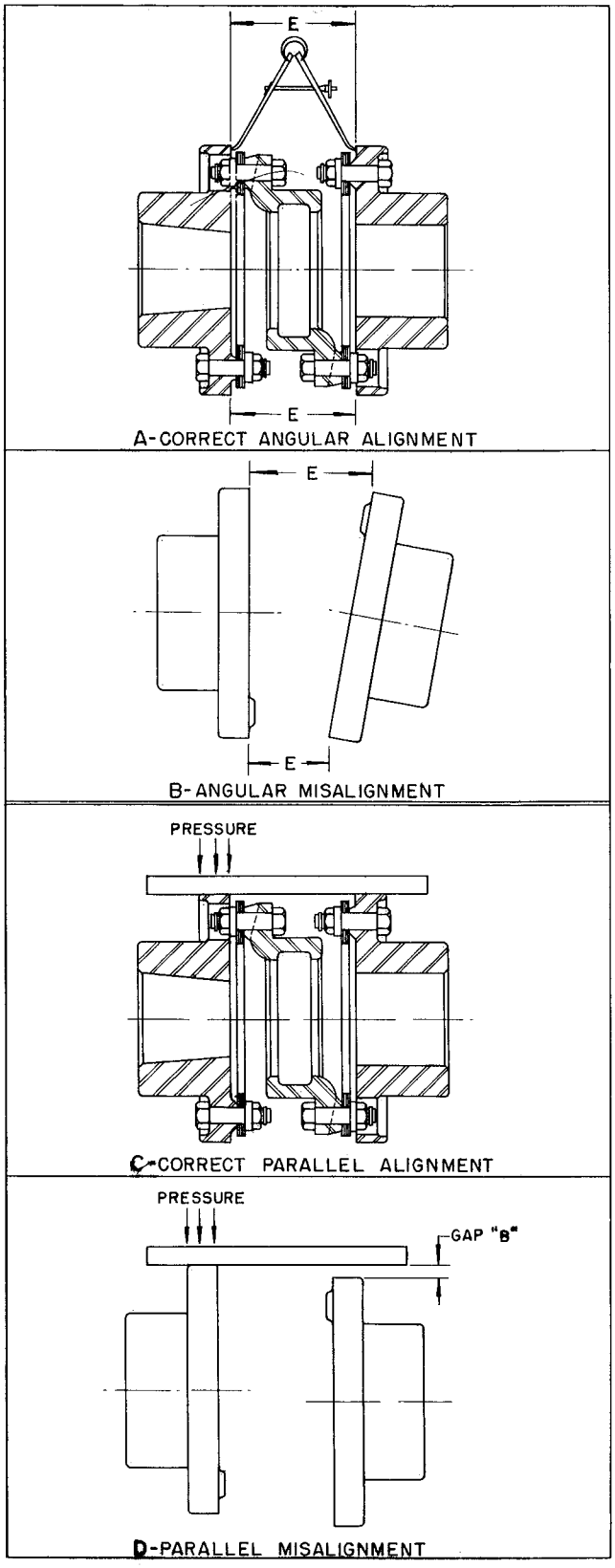


Fig. 70 — 5H120-623 Coupling Alignment

Dial Indicator Method

5H80-623 COUPLING — Tighten the holddown bolts of the compressor that is doweled to the base.

ALL — With the coupling disassembled, fit the flanges and make approximate angular and parallel alignment using the Straight Edge and Caliper Method.

5H80-623 ONLY — Do not install the center plate assembly.

ANGULAR ALIGNMENT

1. Mount the indicator on the motor flange. Be sure that the indicator is securely clamped and that the entire assembly is rigid. A typical arrangement is shown in Fig. 71. Note, however, that the indicator track for the 5H80-623 coupling is somewhat different, as indicated by Fig. 76.
2. Adjust the indicator so that its stem will contact the inside face of the compressor flange at all times while the indicator is being rotated thru 360 degrees with the motor flange. Figure 71 applies to all couplings other than 5H80-623. For the 5H80-623 coupling, refer to the indicator track on Fig. 76.

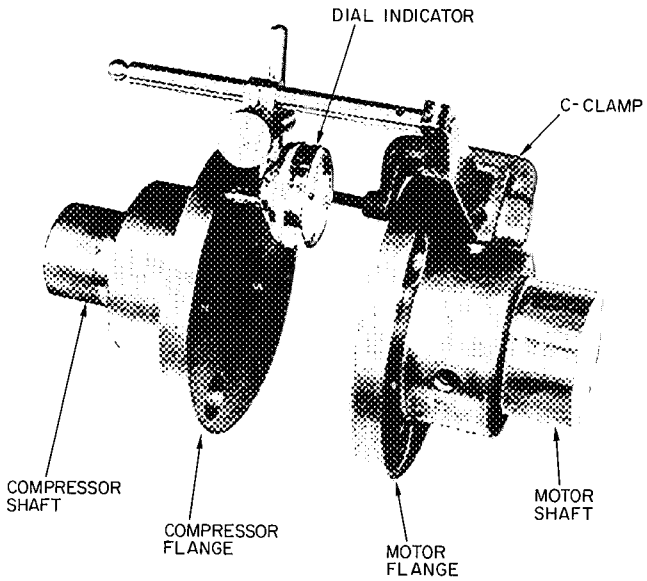


Fig. 71 — Dial Indicator Set Up to Check Angular Alignment

3. With the indicator at the top, set the dial to read zero at the pointer. Rotate the motor flange with the indicator, and note readings at top, bottom and at each side. Before taking any reading, push the motor shaft hard against its thrust bearing.

   Tilt the motor up or down in the vertical plane or swing the motor from one side to the other in the horizontal plane for a distance approximately equal to one half the difference between readings taken in the respective planes. For example, the following is a typical set of indicator readings:

Top	.000 in.
Bottom	-.020 in.
Right Side	-.010 in.
Left Side	+.030 in.

One half the difference between top and bottom readings is .010 inch. One half the difference between right and left side readings is .020 inch.

Move the motor in the direction opposite the minus readings as follows:

a. Shim the 2 motor feet at the shaft end up approximately .010 inch.
b. Jack the motor bell end over approximately .020 inch.

Coupling should now be in angular alignment.

PARALLEL ALIGNMENT

1. Mount the indicator on the motor flange. On all couplings except 5H80-623, adjust the indicator so that the indicator button will contact the periphery of the compressor flange while rotating the motor flange thru 360 degrees (see Fig. 72). For the 5H80-623 coupling, adjust the indicator button to contact the compressor flange hub as shown in Fig. 76 while rotating the motor flange thru 360 degrees.

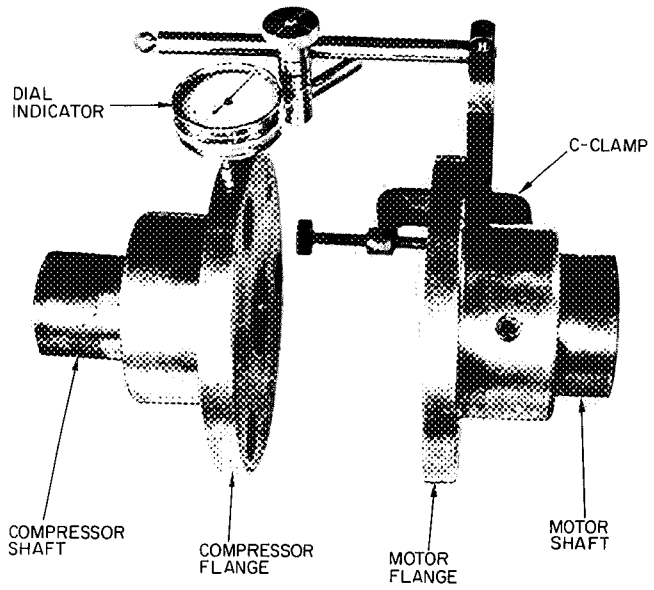


Fig. 72 – Dial Indicator Set Up to Check Parallel Alignment

2. Obtain indicator readings as in Step 3 of the ANGULAR ALIGNMENT procedure. For example, the following is a typical set of readings:

Top	.000 in.
Bottom	-.020 in.
Right Side	-.010 in.
Left Side	+.030 in.

As before, move the motor for one half the difference in readings, in a direction opposite the minus readings.

In this example, .010 shims are placed under each of the 4 motor feet to eliminate the vertical misalignment. The entire motor is also moved .020 inches sidewise and perpendicular to the motor shaft to eliminate the horizontal misalignment.

After correcting parallel misalignment, recheck the angular alignment. Tighten the motor hold-down bolts as soon as alignment is complete. Recheck alignment after tightening bolts.

3. On couplings other than 5H80-623, loosen the setscrew in the motor flange and slide the flange toward the motor to allow sufficient space for insertion of the center plate and flexible disc assembly.
4. Set the motor shaft on its magnetic center. Then set the distance between coupling flanges at dimension E (see Table, Step 7 of Straight Edge and Caliper Method). Tighten the setscrew(s) against the motor shaft.
5. On 5H80-623 COUPLING – Install the center plate assembly as shown in Fig. 75. Flex the discs slightly in order to clear the compressor flange bolt.
6. Reassemble the coupling with the motor shaft on its magnetic center and recheck the distance between flanges.
7. On Duplex units, align the second compressor to the motor in a similar manner.
8. Run the compressor(s) until it reaches operating temperature and then recheck the alignment.

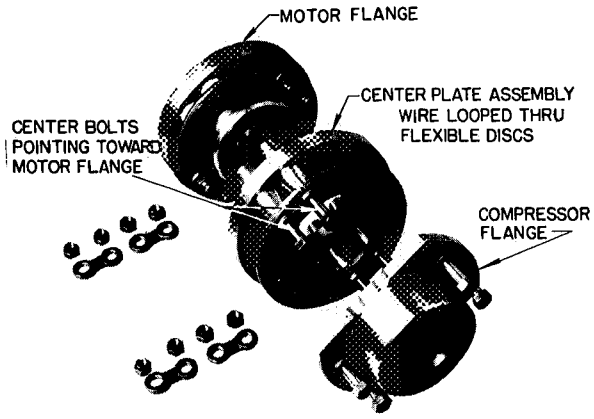


Fig. 73 – Dismantled 5H80-623 Coupling Ready for Assembly to Compressor and Motor

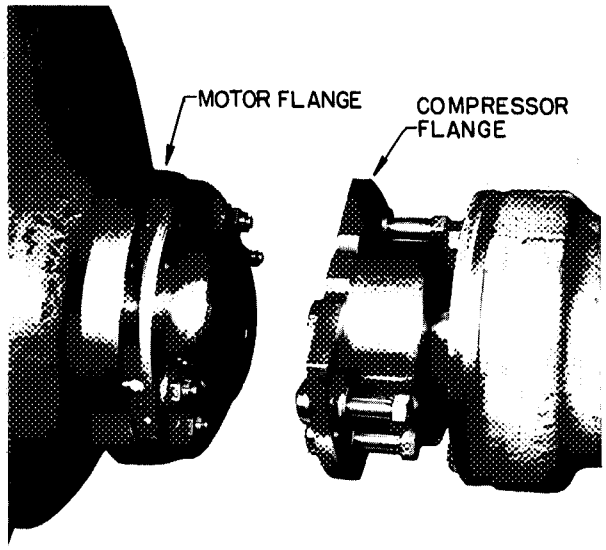


Fig. 74 — 5H80-623 Coupling Flanges Installed

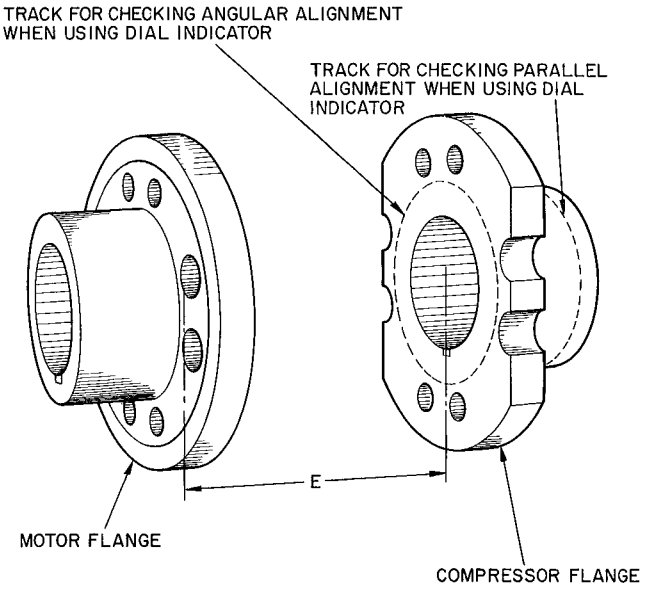


Fig. 76 — 5H80-623 Coupling Alignment Tracks

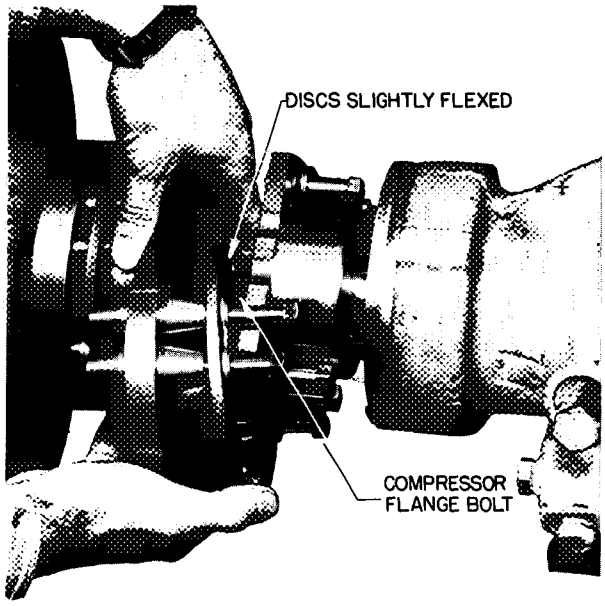


Fig. 75 — Installing 5H80-623 Coupling Center Plate Assembly

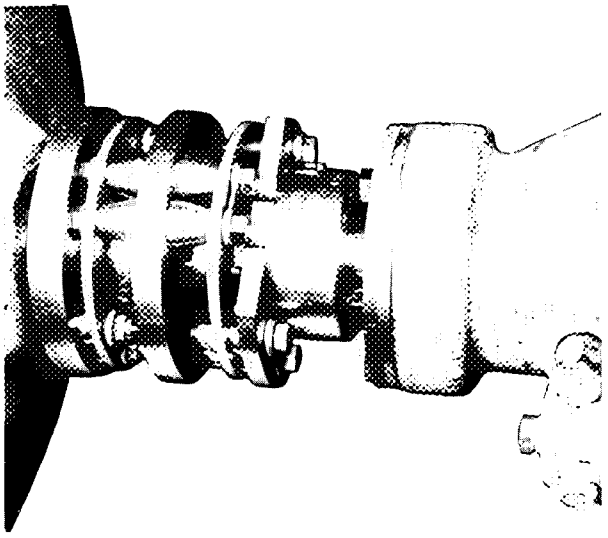


Fig. 77 — 5H80-623 Coupling Installed

Doweling — When all components have been assembled, aligned and hot checked (alignment checked at operating temperature), dowel the motor and compressor to the base as described in the Installation Step 6 entitled, Hot Check and Doweling.

TROUBLESHOOTING

TROUBLE/SYMPTOM	PROBABLE CAUSE	REMEDY
Compressor will not start.	Power off	Check main switch, fuse and wiring.
	Thermostat set too high	Reset thermostat
	Thermal overload switch open	Reset switch
	Oil safety switch open	Reset switch
	Dirty contacts	Clean all control contacts
	Loose electrical connections or faulty wiring	Tighten connections, check wiring and rewire
	Compressor motor burned out	Check and replace if defective
	Liquid line solenoid valve closed	Check for burned-out holding coil Replace if defective
	Evaporator fan off	Check fuses, overload Restart
	Evaporative condenser or cooling tower fan or pump not operating	Check fuses, overloads and controls Restart
Compressor cycles intermittently.	Low pressure switch erratic in operation	Check for clogged tubing to switch Check switch setting
	Low refrigerant charge	Add refrigerant
	Capacity control setting incorrect.	Reset
	Thermostat differential too narrow	Reset
	Suction valve closed or throttled	Open up valve
Compressor cycles on high pressurestat.	Tubing to pressurestat restricted	Check and clean tubing.
	Faulty pressurestat	Repair or replace
	Refrigerant overcharge	Remove excess refrigerant.
	Insufficient condenser water flow or clogged condenser	Adjust water regulating valve to condenser. Clean condenser.
	Discharge service valve not fully open	Open valve
	Air in system	Purge air
	Condenser water pump off	Check pump and start
High discharge pressure.	Condenser inlet water temperature too high	Increase water quantity by adjusting water regulating valve Use colder water
	Insufficient water flow thru condenser	Readjust water regulating valve Increase size of water supply main to condenser.
	Plugged or scaled condenser tubes	Clean tubes
	Discharge service valve partially closed	Open valve
	Refrigerant overcharge	Remove excess refrigerant
	Air in system	Purge air
Low discharge pressure.	Excessive water flow thru condenser	Adjust water regulating valve.
	Suction service valve partially closed	Open valve.
	Leaky compressor suction valves	Examine valve discs and valve seats Replace if worn.
	Worn piston rings	Replace

TROUBLESHOOTING (cont)

TROUBLE/SYMPTOM	PROBABLE CAUSE	REMEDY
Flooding	Defective or improperly set expansion valve	Reset to 5 F - 10 F superheat Valve operation must be stable (no hunting)
Low suction pressure.	Low refrigerant charge	Add refrigerant
	Excessive superheat	Reset expansion valves
System noises.	Loose or misaligned coupling	Check alignment and tightness
	Insufficient clearance between piston and valve plate	Replace defective parts
	Motor or compressor bearings worn	Replace bearings
	Loose or misaligned belts	Check alignment and tension (Belt slack should be at top)
	Loose holddown bolts	Tighten bolts
	Unit foundation improperly isolated	Isolate foundation
	Improper support or isolation of piping	Use correct piping techniques and support piping with suitable hangers
	Slugging from refrigerant feedback	Check expansion valve setting Check thermal bulb looseness and correct location See Carrier System Design Manual, Part 3 for standard piping techniques
	Hydraulic knock from excessive oil in circulation	Remove excess oil Check expansion valve for floodback
	Defective valve lifter mechanism (noise level varies with unloading)	Replace sticking filter pins. Check unloader fork for alignment Check power element for sticking piston. Check for oil leakage at tube connection to power element. Check amount of valve pin lift above valve seat (0 33 in for 5F, 0 125 in for 5H).
	Piping vibration	Support pipes as required Check pipe connections
	No muffler in discharge line or improperly located	Install muffler Move muffler closer to compressor
	Hissing (insufficient flow thru expansion valves, or clogged liquid line strainer	Add refrigerant Clean strainer
Compressor will not unload.	Capacity control valve not operating	Repair
	Unloader element sticking	Repair
	Hydraulic relay sticking	Replace control cover assembly
	Plugged pressure line to power element	Clean line
	External adjusting stem damaged	Replace

TROUBLESHOOTING (cont)

TROUBLE/SYMPTOM	PROBABLE CAUSE	REMEDY
Compressor will not load.	Low oil pressure (below 45 psi)	Check oil chg, switch settings (Table 7)
	Capacity control valve stuck open	Repair or replace
	Unloader element sticking.	Repair
	Plugged or broken pressure line to power element	Clean or repair.
	External adjusting stem damaged	Replace.
	Control oil strainer blocked	Clean or replace
	Control valve bellows leaking.	Remove thread protector and leak test.
		Replace valve body if bellows leaks
	Pipe plug in pneumatic connection	Remove pipe plug.
	Foaming in crankcase from refrigerant flooding	Check expansion valve and piping
	Hydraulic relay sticking	Replace control cover assembly.
Rapid unloader cycling.	Excessive fluctuation in suction pressure from oversized expansion valve	Resize expansion valve
	Partially plugged control oil strainer.	Clean or replace strainer
	Low oil pressure	See TROUBLE/SYMPTOM – low oil pressure
Low oil pressure.	Low oil charge.	Add oil.
	Faulty oil gage	Check and replace.
	Defective oil pressure regulator	Repair or replace
	Clogged oil suction strainer.	Clean strainer.
	Broken oil pump tang	Replace pump assembly
	Clogged oil line	Remove obstruction
	Worn oil pump	Replace pump assembly
	Worn compressor bearings	Replace.
Cold compressor.	Liquid carryover from evaporator	Check refrigerant charge and expansion valves.
Low crankcase oil level.	Oil return check valve stuck closed	Repair or replace check valve.
Cylinders and crankcase sweating.	Refrigerant floodback.	Check refrigerant charge and expansion valves.
High crankcase temperature. (should be 105 - 108 F at seal housing)	Liquid line strainer clogged	Clean strainer.
	Excessive superheat	Reset expansion valves
	Compression ratio too high	Recheck design
	Discharge temperature over 275 F	Check unit application
	Leaking suction or discharge valves	Replace valves

For replacement items use Carrier Specified Parts.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

Book	2	4
Tab	2a	3a

Form 5F,H-9SI Supersedes 5F,H-1SI, 5FH-2SS Printed in U S A 6-78 PC 111 Catalog No 530—526