UNITED TECHNOLOGIES CARRIER

Commercial Division
Carrier Corporation

BULLETIN: CA-SB-19-C-62-13
DATE: 3/8/62
PAGE: 1 OF: 20

SERVICE BULLETIN

SUPERSEDE BULLETIN:
DATE:
PAGE: OF:

SUBJECT:

THERMAL PURGE SERVICE GUIDE

PURPOSE: To transmit the attached Thermal Purge Service Guide.

MACHINES AFFECTED: All 19C Standard Line machines shipped after February 1961 having the thermal type purge.

PROCEDURE: The attached Service Guide is to be used when servicing the thermal purge section of the control console.

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BULLETIN: CA-SB-19-C-62-13
DATE: 3/8/62
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SERVICE BULLETIN

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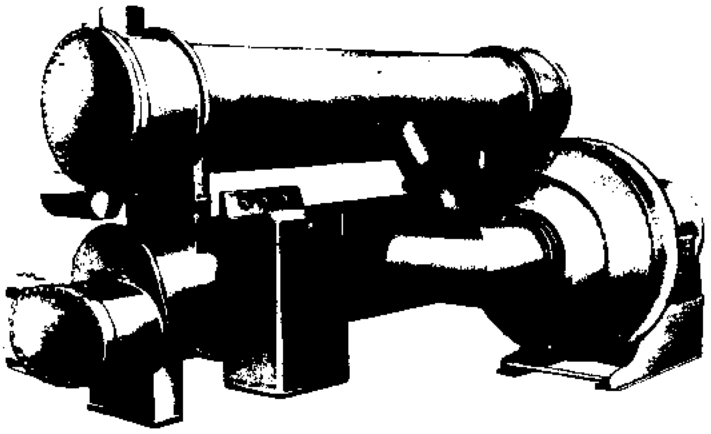
Carrier

19C



THERMAL PURGE SERVICE GUIDE

19C

HERMETIC CENTRIFUGAL REFRIGERATION MACHINE

19C-6Z

SERVICE BULLETIN

SUBJECT:

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INTRODUCTION

The purpose of the purge recovery system is to:

a). Indicate air or water leakage
b). Remove water and non-condensible gases
c). Recover refrigerant from purged gases
d). Evacuate the machine after repairs

If the purge system does not function properly in one of the above categories, consult the Service Guide on page 4 if the trouble is not immediately obvious.

HOW TO USE THIS GUIDE

The Thermal Purge Service Guide Chart, page 4, is constructed listing possible troubles and the probable causes of these troubles. The chart has major headings above the probable causes dividing these into categories:

System (piping, connections, valves, ets.)

Electrical (motor, solenoid, fuses, etc.)

Condenser and Separation Chambers (internal parts, leaks)

Pump (bearings, diaphragm, valves, etc.)

General

The numbers listed in the reference boxes refer to the page and paragraph number where the potential trouble and corrective action is more fully explained. Example: 3.1 means page 3, paragraph 1.

When trouble is experienced on a purge, pull out the Service Guide Chart and locate the item in the "Trouble" column that most closely represents the problem. Next, travel across the chart horizontally to the squares with numbers listed. The slant column above each number lists one of the probable causes of this trouble. Turn to the text and locate the page and paragraph indicated by the number for a more full explanation of the probable cause and corrective action required. After checking thoroughly the listed cause, move to the next probable cause. Follow this procedure until the problem has been located and corrected.

PURGE SYSTEM

3.1 The swing check valve (item 28, figure 4) must swing free and seat tight to prevent back flow of air when removing water and to prevent recirculation of air when evacuating the machine. If the check valve leaks excessively, install a stop valve at the check valve.

3.2 A dirty strainer will reduce the flow of gas to the purge condensing chamber. Remove the strainer and wash it with refrigerant. Replace the strainer if it has corrosion deposits. Replace the copper washer under the strainer plug whenever the plug is removed.

3.3 The factory installed orifice (item 27, figure 4) is 1/16" in diameter. Replace with a 1/16" orifice if it is larger, smaller, or missing completely. The orifice must be installed at the top of the condenser. Locating it elsewhere in the suction line will allow condensation of refrigerant which will restrict the flow of gas through the Orifice-Strainer-Check-Valve Assembly.

3.4 To check the pressure gage zero setting disconnect the copper line to the gage. To reset the zero setting, remove snap ring and gage glass and adjust calibration screw. Replace the gage if it cannot be calibrated.

3.5 The purge piping should be installed in accordance with the 19C Installation Instructions. Check all flare connections for leaks by pressurizing the machine to 5 - 8 PSIG and check all joints, sight glasses, pressure differential switches with a Halide Leak Detector or an electronic detector.

3.6 Check purge suction and discharge lines for restrictions and obstructions which could restrict flow. The suction line from the Orifice-Strainer-Check Valve Assembly must be free of sharp bends, kinks, and traps that can hold condensed refrigerant.

3.7 A low refrigerant level in the cooler will also cause a low level in the condensing chamber and partial condensing may result. Be sure that the liquid refrigerant line from the cooler is free of restrictions and that the service valve is wide open. Check the refrigerant level in the main cooler and add refrigerant as required.

ELECTRICAL

4.1 Rotate the motor by hand to be sure it is not binding and that the motor thermal overload is not open.

If the purge motor is defective and needs replacing, a standard 1/4 H. P. single phase motor can be used which operates at 115 Volts, 60/50 cycles, and 1750 RPM. Replacement motors are available through PSD. **Install the replacement motor with the thermal overload on the ground side.**

Add several drops of good grade motor oil (SAE 10) to each bearing cup before start-up.

4.2 Check 15 amp fuse (item 41, figure 4) located inside of the purge switch box. Replace if necessary.

4.3 Check electrical connections at the purge switch, solenoid switch and coil, purge motor, 15 amp fuse, and indicator light. Be sure connections are tight and that the wires or their insulation are not broken.

4.4 The voltage source to the purge motor must be 115 volts. Place a clamp-on ammeter on the line side of the motor. Look for loose connections or high resistance connections which can cause low voltage to the motor.

4.5 Remove the holding clip from the back of the gage panel and replace the neon indicator from the front of the panel. When re-wiring the light use solderless connectors or plastic electrical tape to make the lead connections.

4.6 An audible "click" should be heard when the solenoid switch is turned "ON". If the click is not heard, remove the coil and check the plunger for possible binding. Check the coil for an open circuit and replace it if required with one rated at 115 volts, 50/60 cycles, single phase current or order from the Service Parts Department.

4.7 Check the operating and safety differential pressure switches with a volt-ohmmeter using the ohmmeter scale with leads across the micro-switch. The purge operating switch is normally closed and the purge safety switch is normally open. Replace the faulty switch as necessary.

5.1 Disconnect the leads from the purge switch and check it with a volt-ohmmeter using the ohm scale with the leads across the switch lugs. Check the switch for continuity with the switch in the closed position. Replace the switch if faulty. The solenoid switch can be checked in a similar manner.

5.2 Check the wiring in accordance with the 19C Electronic Control Diagram found in the Initial Start-Up Instructions. Wiring not in accordance with this wiring diagram will cause the purge to malfunction.

CONDENSER AND SEPARATION CHAMBERS

5.3 Be sure the service valve (item 37, Figure 4) is open during machine and purge operation. Remove the supply line and check it for obstructions which could restrict refrigerant flow to the condensing chamber.

5.4 The 3/4" vent line from the condensing chamber to the cooler must be free of traps which could allow condensed refrigerant to accumulate. Remove the vent line and be sure that the cooler opening is free of obstructions. This line should be insulated to prevent condensation from dripping on the machine room floor.

5.5 Swing check valve (item 24, Figure 4, R-11 and R-113 machines only) located in the refrigerant return line must swing free. Remove this line (flare nuts on each end) and check it for obstructions. Any restriction in this line will raise the refrigerant level in the float and water chambers.

5.6 The level in the refrigerant float chamber should be approximately in the center of the sight glass under normal operating conditions. Remove the float valve cover and check the valve for free movement. Examine the plunger and its seat for foreign matter or scoring of the plunger ball. Replace the plunger and seat assembly if scoring of the ball is causing the leak.

5.7 The level in the refrigerant float chamber should be approximately in the center of the sight glass under normal operating conditions. A high refrigerant level may be caused by foreign particles getting in between the plunger and seat. Remove the float valve cover and inspect the valve parts carefully and clean as required.

6.1 A leaking tube or a leaking O-ring gasket on the condensing chamber tube bundle will cause bypassing of refrigerant and non-condensible gases and poor purging action. If a leak is suspected, pressurize the condensing side of the chamber. Break the flare connection on the suction side of the purge pump. Open valve #2 and close valves #1, #3, #4, and #5 and de-energize the solenoid valve. Start the purge pump, pressurize the chamber to 15 PSIG while observing the purge pressure gage. (See Figure 4).

Shut the pump down and watch the pressure gage for a decrease in pressure which would indicate a leak in the condensing system. If pressure loss is observed, disconnect and plug the orifice line at the condenser, the refrigerant return line at the float chamber and the low side of the purge operating switch. Pressurize the condensing chamber again and observe the pressure gage.

Any pressure loss now would be thru the tubes, tube sheet or O-ring gasket at the tube sheet. Relieve the pressure thru valve #4 and isolate the purge at the refrigerant supply line and at the vent to the main cooler. Remove the condensing chamber end covers and drain the refrigerant from the chamber. Check the O-ring sealing gasket and the tubes for leaks. Replace the tube bundle and/or O-ring gaskets if they are found leaking.

The tube bundle is installed on two machined "lands" inside the condenser shell, the O-ring gaskets falling on the "lands". Force the bundle off the "lands" in either direction and remove it from the chamber. Replace the tube bundle and O-rings in the same manner.

PURGE PUMP

6.2 The stainless steel inlet and outlet valve disc (items 4 and 5, Figure 1) must move free and seat tight to prevent leakage during pump operation. To check if the discs are leaking or stuck, remove the flare inlet and outlet connections. Place your finger over one connection at a time and rotate the pump by hand. There should be no leakage past the inlet valve on the upstroke and no leakage past the outlet valve on the downstroke.

If the valves leak, remove the valve plate cover (item 7, Figure 1) and examine the cover, discs, spring and valve plate for scoring and for foreign particles. Replace any damaged parts and install in the position shown in Figure 1. Be sure the valves are seating properly after reassembly by repeating the hand rotation and finger over valve operation.

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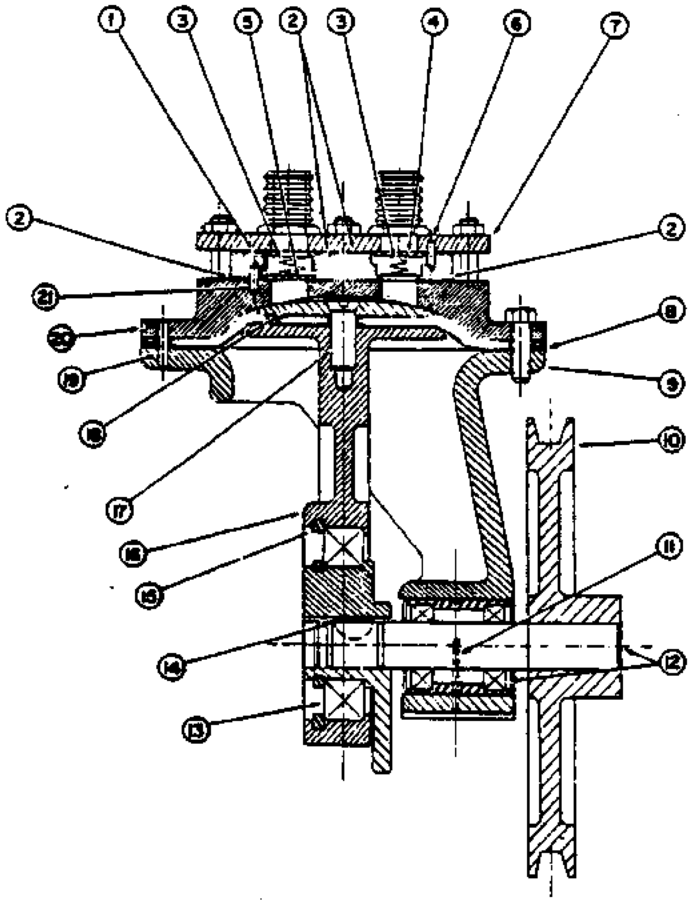

1	VALVE PLATE	8	DIAPHRAGM	15	SNAP RING
2	O-RING GASKET	9	PUMP BODY	16	CONNECTING ROD
3	VALVE SPRING	10	PULLEY	17	SCREW
4	INLET VALVE DISC	11	LOCKING WIRE	18	DIAPHRAGM RETAINER
5	OUTLET VALVE DISC	12	SHAFT & BEARING ASSEMBLY	19	PIN
6	PIN	13	ECCENTRIC BEARING	20	PUMP COVER
7	VALVE PLATE COVER	14	KEY	21	PIN

FIGURE I - PURGE PUMP

8.1 A cracked or broken diaphragm will make the purge pump inoperative. If a cracked diaphragm is suspected, remove the inlet and outlet flare connections. Place your finger on the discharge opening while rotating the pump by hand. If no compression can be felt, remove the pump to a workbench. Remove the pump cover, retainer and screw (items 20, 18, and 17, Figure 1) and examine the diaphragm. If diaphragm is not damaged see Paragraph 6.2.

Replace the damaged or worn diaphragm with one from PSD. If the down time is critical, fabricate a diaphragm locally using 1/8" thick Buna-N material having two-ply cotton cloth insertion.

When installing the diaphragm, tighten the pump cover cap screws with the connecting rod in its upper stroke position. This pre-stretches the diaphragm to increase its operating life. After installing the new diaphragm, rotate the pump by hand to be sure the retainer does not strike the pump cover on the upstroke. If it does strike, loosen the cover cap screws slightly or add a thin shim under the cover at the bolt circle.

8.2 The eccentric bearing (item 13, Figure 1) is held in place by two snap rings. To replace this bearing, remove the pump to a workbench and remove the two snap rings. Remove and replace the bearing, being certain that the bearing O.D. and I.D. are tight against their mating parts. A loose fit may result in pump noise.

8.3 On purge units built from February 1961 to approximately March 1962, the shaft bearing assembly (item 12, Figure 1) was held in place with a roll pin or locking wire. (item 11, Figure 1). With either of these two methods of attachment, it is virtually impossible to remove the shaft and bearing assembly. If a bearing replacement is required, order a pump body (item 9, Figure 1) with the shaft bearing assembly installed rather than trying to replace the existing bearing.

Starting with machines shipped in April 1962, the shaft and bearing assembly is held in place with a set screw and makes the assembly readily replaceable.

8.4 Be sure the two pump hold-down bolts and lockwashers are tight. If excessive vibration persists and/or if the operation of the controls is effected, try installing an angle iron brace underneath the pump, install spring mountings under the pump, or replace the entire purge pump.

8.5 If the pump is jammed and will not rotate, remove the pump cover and examine the diaphragm retainer and retainer screw. If the pump shaft will not rotate with the pump cover removed, the eccentric bearing or shaft bearing is frozen. Refer to paragraph 8.2 and 8.3.

The slotted, flat head retainer screw is held in the connecting rod with Loc-Tite on pumps manufactured before March 1962. Pumps manufactured after this date have an Allen head screw with lock washer and are installed with 90 in Lbs. of torque. If damage has been done to the screw or retainer, replace these parts with the Allen head style with lock washers.

9.1 Calibrate the purge safety or operating switches if they are not operating properly according to the settings in Figure 3. Referring to Figure 2, the switch range is determined by adjusting nuts (3) while the switch differential is determined by adjustment of the micro-switch (7) using holding screws (8).

To recalibrate the R-11 and R-113 switches, refer to Figure 2 and proceed as follows:

(a). Remove the switch from the purge console to a workbench with an air supply available.

(b). Tighten the spring adjusting nuts (3) to insure the bellows stops (2) are striking the bellows housing.

(c). Connect air pressure, through a pressure reducing valve and gage, to the high pressure side (5). Be sure the low pressure side (1) is open to atmosphere.

(d). Install a dial indicator on top of the actuating rod (4) to record its travel. Set the indicator at zero.

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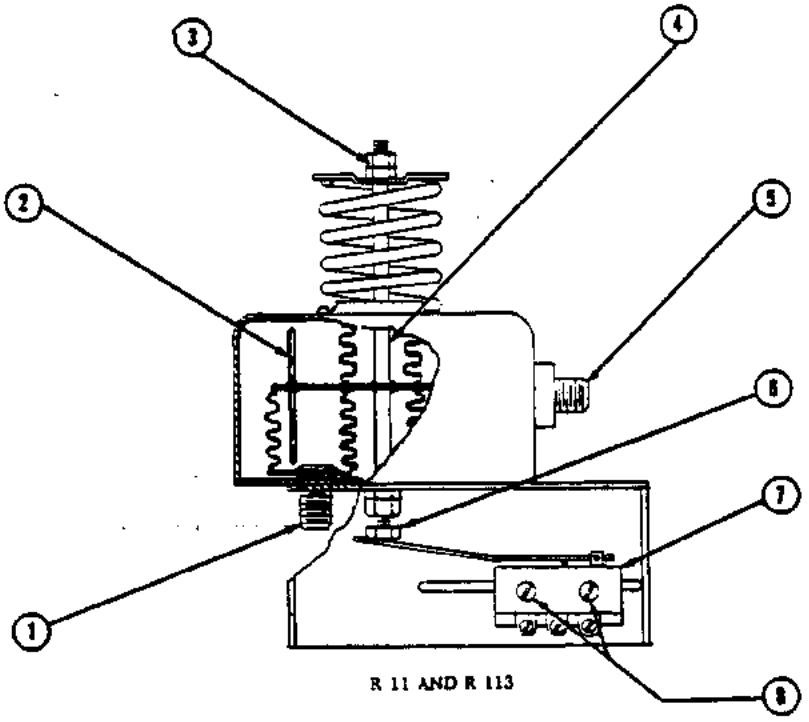

R 11 AND R 113

FIGURE 2 - PURGE SAFETY OR PURGE OPERATING SWITCH

1. Low Pressure Connection
2. Bellows Stop
3. Adjusting Nut
4. Actuating Rod
5. High Pressure Connection
6. Cap Screw
7. Micro-Switch
8. Holding Screw

(e). Select the switch operating range pressure from Figure 3.

(f). Set the high side air pressure to equal the lower pressure of the switch range. For example, on the 2 - 4 PSI operating switch, set the air pressure at 2 PSI.

(g). Back off the spring adjusting nuts while reading the dial indicator until the actuating rod moves .015"-.020" away from the housing.

(h). Lock jam nut and remove dial indicator.

(i). Adjust cap screw (6) until the micro-switch (7) closes (or opens). Vary the air pressure several times to be certain the micro-switch operates at the set pressure. Re-adjust cap screw if necessary.

(j). To check the switch differential, slowly raise the air supply and record the pressure required to operate the micro-switch. If this pressure is higher than the higher pressure of the switch range, loosen the micro-switch holding screws (3) and slide the switch toward the cap screw, thus shortening the lever arm. If the recorded air pressure is lower than the higher pressure of switch range, move the micro-switch away from the cap screw, thus lengthening the lever arm.

NOTE: If the micro-switch is moved, repeat step (i) above.

If the purge or operating switches do not operate properly because of an internal bellows leak, replace the entire switch. Do not attempt to repair leaking bellows in the field.

SWITCH	NORMAL POSITION	REFRIGERANT	DIFFERENTIAL PRESSURE SETTING		CONNECTION
			OPEN	CLOSE	
Purge Safety	Open	R 113	4 psi	5 psi	Condenser-Cooler
Purge Operating	Closed	R 113	2 psi	1 psi	Purge Condenser-Condenser
Purge Safety	Open	R 11	6 psi	8 psi	Condenser-Cooler
Purge Operating	Closed	R 11	4 psi	2 psi	Purge Condenser-Condenser
Purge Safety	Open	R 114	11 psi	16 psi	Condenser-Cooler
Purge Operating	Closed	R 114	8 psi	4 psi	Purge Condenser-Condenser

FIGURE 3 - SWITCH PRESSURE SETTING CHART

11.1 The purge valves must be set according to the valve chart located on the inside of the valve access door. (On R-114 machines, the chart is located inside the purge console door). If the chart is missing on the purge console refer to the chart in the 19C Operation and Maintenance Instructions.

11.2 During purge operation, be sure the valves that are supposed to be closed are closed tight. Leaking valves will cause recirculation resulting in slow and ineffective purging.

11.3 Be sure that all the service valves are open if they are installed to isolate the purge for service work.

11.4 Check the pump drive belt for proper belt tension. A belt that is too loose will slip and one that is too tight may cause vibration and may overload the motor and pump bearings. Adjustments can be made by loosening the motor hold-down bolts and repositioning the motor. Replace the belt if it shows signs of wear.

11.5 To pressurize the machine on R-11 and R-113 machines, it is necessary to install the cross-over line (item 6, Figure 4) between the flare capped valve and valve #3 (items 29 and 3, Figure 4) and operate the purge per step number 3 on the valve chart. (See paragraph 11.1).

11.6 A direct acting solenoid valve is used in the condensing chamber discharge line to prevent continual discharge of refrigerant and non-condensible gases when the chamber pressure is above atmospheric pressure. The check valve and solenoid valve prevent air from entering the purge on machine shutdown or between purge pump cycles. A leaking check valve and solenoid valve will cause excessive purge down time and will cause the pump to cycle often.

With the condensing chamber below atmospheric,pressure, the valves can be checked for leakage by closing valves #4, #3, and #1 tight, loosening the flare nut on the inlet to the pump and allow cigarette smoke to drift past the opening. If the valves are leaking the smoke will be drawn into the line. If found leaking, replace the valves with valves from PSD only. **The valves must have resilient seats and be good for refrigerant duty.**

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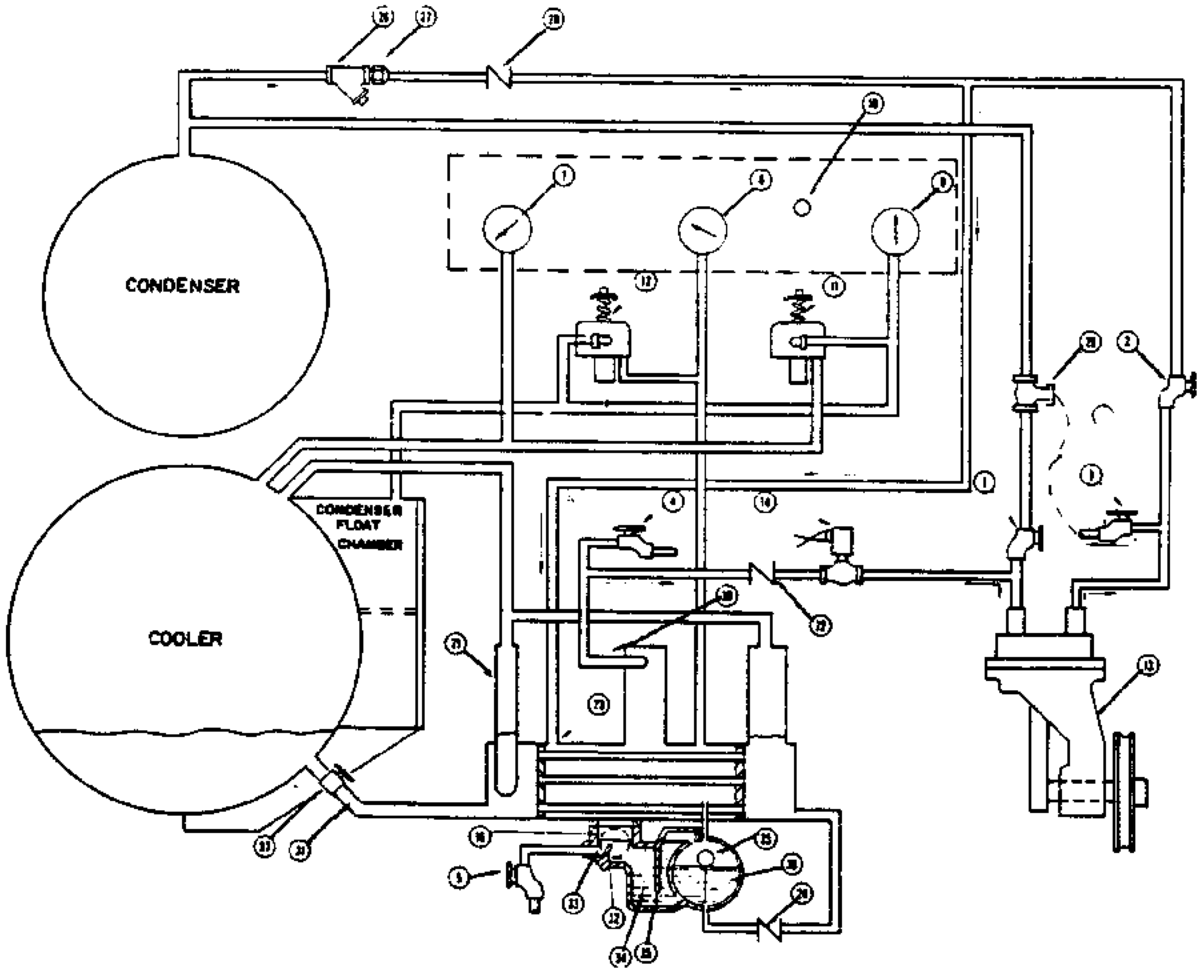

FIGURE 4 - PURGE CYCLE
(Note: See Nomenclature Page 13)

Referring to Figure 4, noncondensible gases, together with water vapor and refrigerant vapor, enter the purge condensing chamber (23) by first passing through a strainer (26), orifice (27), and check valve (28). The condensing chamber contains a small tube bundle which is supplied with refrigerant thru line (31). The refrigerant level inside the tubes is maintained by the cooler refrigerant level.

As the noncondensible gases accumulate in the purge condensing chamber, the pressure inside the chamber will rise to approach condenser pressure, closing the contacts of the purge operating switch, and energizing solenoid valve (14) and purge pump motor. The purge pump (13) will discharge the noncondensible gases to atmosphere thru valve (3). As the pressure in the condensing chamber drops, the purge operating switch (12) contacts will open, de-energizing the solenoid valve and stopping the purge pump.

When the Centrifugal machine is shut down, the pressure throughout the system will equalize. To prevent the purge operating switch from operating the purge pump, a purge safety switch (11) is connected between the cooler and condenser. When the pressure between these two vessels approaches a pre-determined setting of the purge safety switch, the contacts open, preventing the purge pump and motor from running.

The above cycle is a continual process whenever the centrifugal machine is operating and the purge switch is in the "AUTO" position. Under this condition, the purge pump operates only when there is air or noncondensible gases present in the system. The tighter the system the less the purge pump will operate.

The condensed water and refrigerant separate in the settling compartment (34), the lighter water collecting on top. The water, when observed thru the sight glass (16) can be drawn off thru valve (5). This is intentionally a manual operation since the presence of water in the machine should be noted by the operator.

The heavier refrigerant passes from the settling compartment (34), under a partition (35), and into the refrigerant float chamber (36). As the refrigerant level in the chamber rises, lifting float valve (25), refrigerant is automatically returned thru check valve (24) to the tube side of the condensing chamber.

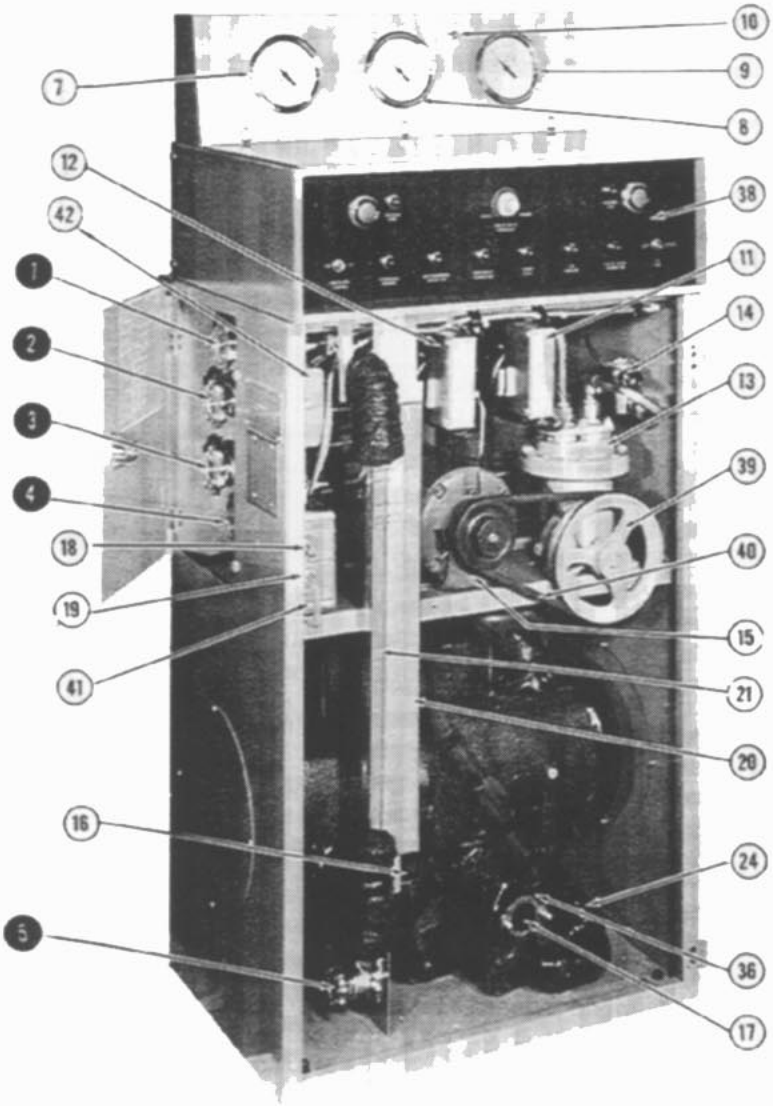

FIGURE 5 - PURGE AND CONTROL CONSOLE

No.	Nomenclature
1.	Valve #1
2.	Valve #2
3.	Valve #3
4.	Valve #4
5.	Valve #5 Water Drain
6.	Cross-over Line
7.	Cooler Pressure Gage
8.	Purge Pressure Gage
9.	Condenser Pressure Gage
10.	Purge Pilot Light
11.	Purge Safety Switch
12.	Purge Operating Switch
13.	Purge Pump
14.	Solenoid Valve
15.	Electric Motor
16.	Water Sight Glass
17.	Refrigerant Sight Glass
18.	Solenoid "ON-OFF" Switch
19.	Purge "MAN.-OFF-AUTO" Sw.
20.	Refrigerant Level Indicator
21.	Refrigerant Sight Glass
22.	Check Valve
23.	Condensing Chamber
24.	Check Valve
25.	Refrigerant Float Valve
26.	Strainer
27.	Orifice
28.	Check Valve
29.	Capped Flare Tee
30.	Noncondensible Discharge
31.	Refrigerant Supply Line
32.	Water Weir
33.	Water Compartment
34.	Settling Compartment
35.	Trap Partition
36.	Refrigerant Float Chamber
37.	Service Valve
38.	Control Panel
39.	Pulley
40.	Belt
41.	Purge Fuse (not shown)
42.	Condenser Hi-Pres. Cutout

19C THERMAL PURGE SERVICE GUIDE CHART

CAUSE →
TROUBLE ↓

TROUBLE	PURGE SYSTEM: CHECK VALVE LEAKING	PIPING CONNECTIONS - LEAKING OR INCORRECT	CLOGGED STRAINER	LINE PLUGGED	TRAP IN LINE	ORIFICE - INCORRECT SIZE, MISSING, PLUGGED	COOLER REFRIGERANT LEVEL LOW	DEFECTIVE GAUGE		ELECTRICAL: PUMP MOTOR DEFECTIVE	LOOSE CONNECTIONS OR BROKEN WIRES	INADEQUATE VOLTAGE	DEFECTIVE SAFETY OR OPERATING MICRO-SWITCH	BLOWN FUSE	SWITCH DEFECTIVE	SOLENOID COIL DEFECTIVE	INCORRECT WIRING	INDICATOR LAMP BURNED OUT OR DEFECTIVE	
1. EXCESSIVE PUMPDOWN TIME AFTER SERVICE WORK	3.1	3.5		3.6								4.4				4.6			
2. PUMP MOTOR WILL NOT OPERATE										4.1	4.3	4.4		4.2	5.1		5.2		
3. PUMP WILL NOT OPERATE IN "MANUAL"										4.1	4.3	4.4		4.2	5.1		5.2		
4. PUMP CYCLES OFTEN ("AUTO" POSITION)		3.5				3.3	3.7												
5. PUMP DOES NOT OPERATE IN "AUTO" POSITION			3.2	3.6	3.6	3.3				4.1	4.3		4.7	4.2	5.1		5.2		
6. PUMP OPERATION DOES NOT REDUCE PURGE CHAMBER PRESSURE		3.5				3.3		3.4								4.6			
7. PURGE CHAMBER PRESSURE LOWERS BUT MACHINE PRESSURE DOES NOT													4.7				5.2		
8. PUMP OPERATES DURING MACHINE START-UP AND SHUTDOWN		3.5	3.2	3.4		3.3													
9. UNABLE TO PRESSURIZE MACHINE AFTER SERVICE WORK	3.1	3.5		3.6															
10. PURGE PRESSURE NEVER INCREASES ("AUTO" POSITION)		3.5	3.2	3.6	3.6	3.3													
11. "WATER LEVEL" CANNOT BE SEEN																			
12. REFRIGERANT FLOAT LEVEL LOW																			
13. REFRIGERANT FLOAT LEVEL HIGH																			
14. SOLENOID DOES NOT ENERGIZE WITH PUMP MOTOR ("AUTO" POSITION)											4.3				5.1	4.6	5.2		
15. INDICATOR LAMP DOES NOT LIGHT WHEN PUMP OPERATES											4.3						5.2	4.5	
16. EXCESSIVE PUMP VIBRATION																			
17. NOISY PURGE PUMP																			
18. EXCESSIVE REFRIGERANT LOSS						3.3	3.7												

TROUBLE	CONDENSER & SEPARATION CHAMBERS: REFRIGERANT SUPPLY LINE RESTRICTED	VENT LINE RESTRICTED	FLOAT VALVE STUCK OPEN OR LEAKING	FLOAT VALVE STUCK CLOSED	CHECK VALVE STUCK	REFRIGERANT RETURN LINE PLUGGED	O-RING SEAL LEAK	TUBE LEAK		PURGE PUMP: INLET AND OUTLET VALVE STUCK	DIAPHRAGM BROKEN OR LEAKING	LOOSE OR WORN ECCENTRIC BEARING	WORN SHAFT BEARING	LOOSE HOLD DOWN BOLTS	JAMMED PUMP		GENERAL: INCORRECT SAFETY SWITCH SETTING	INCORRECT OPERATING SWITCH SETTING	WRONG VALVE SETTING	VALVES NOT TIGHTLY CLOSED	SERVICE VALVES CLOSED (IF USED)	PUMP DRIVE BELT LOOSE, WORN OR TOO TIGHT	CROSS-OVER LINE NOT INSTALLED	SOLENOID VALVE OR CHECK VALVE LEAKING			
1. EXCESSIVE PUMPDOWN TIME AFTER SERVICE WORK			5.6				6.1	6.1		6.2	8.1								11.1	11.2	11.3	11.4		11.6			
2. PUMP MOTOR WILL NOT OPERATE															8.5							11.4					
3. PUMP WILL NOT OPERATE IN "MANUAL"															8.5							11.4					
4. PUMP CYCLES OFTEN ("AUTO" POSITION)	5.3	5.4		5.7	5.5	5.5												9.1		11.2				11.6			
5. PUMP DOES NOT OPERATE IN "AUTO" POSITION							6.1	6.1									9.1	9.1									
6. PUMP OPERATION DOES NOT REDUCE PURGE CHAMBER PRESSURE							6.1	6.1		6.2	8.1								11.1	11.2							
7. PURGE CHAMBER PRESSURE LOWERS BUT MACHINE PRESSURE DOES NOT																	9.1										
8. PUMP OPERATES DURING MACHINE START-UP AND SHUTDOWN																			11.1	11.2	11.3						
9. UNABLE TO PRESSURIZE MACHINE AFTER SERVICE WORK										6.2	8.1								11.1	11.2	11.3		11.5	11.6			
10. PURGE PRESSURE NEVER INCREASES ("AUTO" POSITION)			5.6				6.1	6.1													11.3						
11. "WATER LEVEL" CANNOT BE SEEN			5.6	5.7	5.5	5.5																					
12. REFRIGERANT FLOAT LEVEL LOW			5.6																								
13. REFRIGERANT FLOAT LEVEL HIGH				5.7	5.5	5.5																					
14. SOLENOID DOES NOT ENERGIZE WITH PUMP MOTOR ("AUTO" POSITION)																											
15. INDICATOR LAMP DOES NOT LIGHT WHEN PUMP OPERATES																											
16. EXCESSIVE PUMP VIBRATION												8.2	8.3	8.4								11.4					
17. NOISY PURGE PUMP											8.1	8.2	8.3	8.4								11.4					
18. EXCESSIVE REFRIGERANT LOSS	5.3	5.4		5.7	5.5	5.5																					

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