FREE COOLING

GENERAL DESCRIPTION

This instruction explains Free Cooling as applied to OM Turbomaster Centrifugal Liquid Chilling Units.

Free Cooling can satisfy air conditioning requirements in large buildings during many spring, fall and winter days. During these seasons internal loads, solar heat and moderate outdoor temperatures often make air conditioning necessary to maintain a comfortable temperature within occupied areas of the building. Free Cooling can provide up to 50% of the full operating capacity of the unit. (Free Cooling can also be operated during cool summer days, mornings, or nights or when the condenser water temperature is lower than the chilled water temperature needed to meet co-existing load requirements.) This mode of cooling is initiated by moving a manual switch on the control center.

By using Free Cooling during these seasonal periods operation in the normal mode is unnecessary eliminating the expense of operating large motors, or steam turbines used to drive a centrifugal unit. Only operation of chilled water and condenser water pumps is necessary.

This instruction to be used in conjunction with standard unit installation and operation instructions.

INSTALLATION

Refer to Fig. 1 and Product Drawing 160.71-PA1.12. Assemble piping, valves and insulate per the above mentioned Fig. 1 and drawing. Refer to installation instruction 160.71-N1 for installation of all components, piping and electrical wiring.

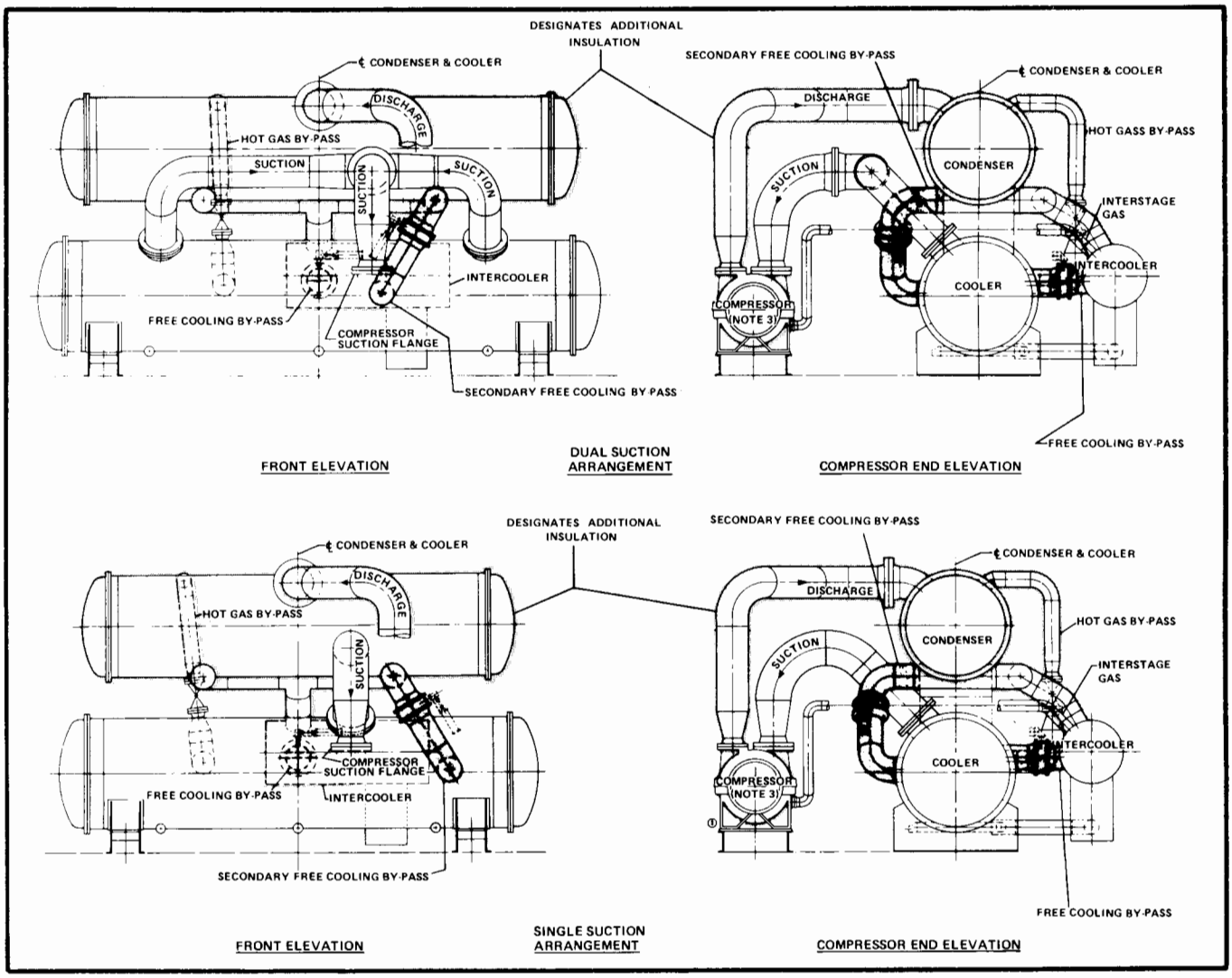


FIG. 1 – FREE COOLING PIPING ARRANGEMENTS

OPERATION (Refer to Fig. 2)

YORK Free Cooling is initiated by flipping the toggle switch to the "ON" position which opens the free cooling by-pass valve(s) (E) and/or (E1) automatically and prevents the compressor from operating. The prerotation vanes "PRV" (A) and the Interstage Modulating Valve also open automatically. The condenser (B) and chilled water (C) circulating pumps must be started and operating.

Cold condenser water ciruclates through the unit condenser (D), condensing the refrigerant gas. The liquid refrigerant drains by gravity to and through the intercooler (G) to the bottom of the cooler (F) (and the optional secondary by-pass line to the cooler). Warm water circulates through the cooler (F) evaporating the refrigerant surrounding the cooler tubes, thus chilling the water for air conditioning duty. The evaporated refrigerant migrates to the condenser via the suction line through the open PRV and compressor (A) and through the discharge line to the condenser (D). Evaporated refrigerant also migrates through the hot gas by-pass line(s) and the free cooling by-passes, completing the refrigerant cycle.

OPERATING PROCEDURE

NOTE: The Free Cooling System will not be effective unless the condenser water supply temperature is less than the desired chilled water temperature.

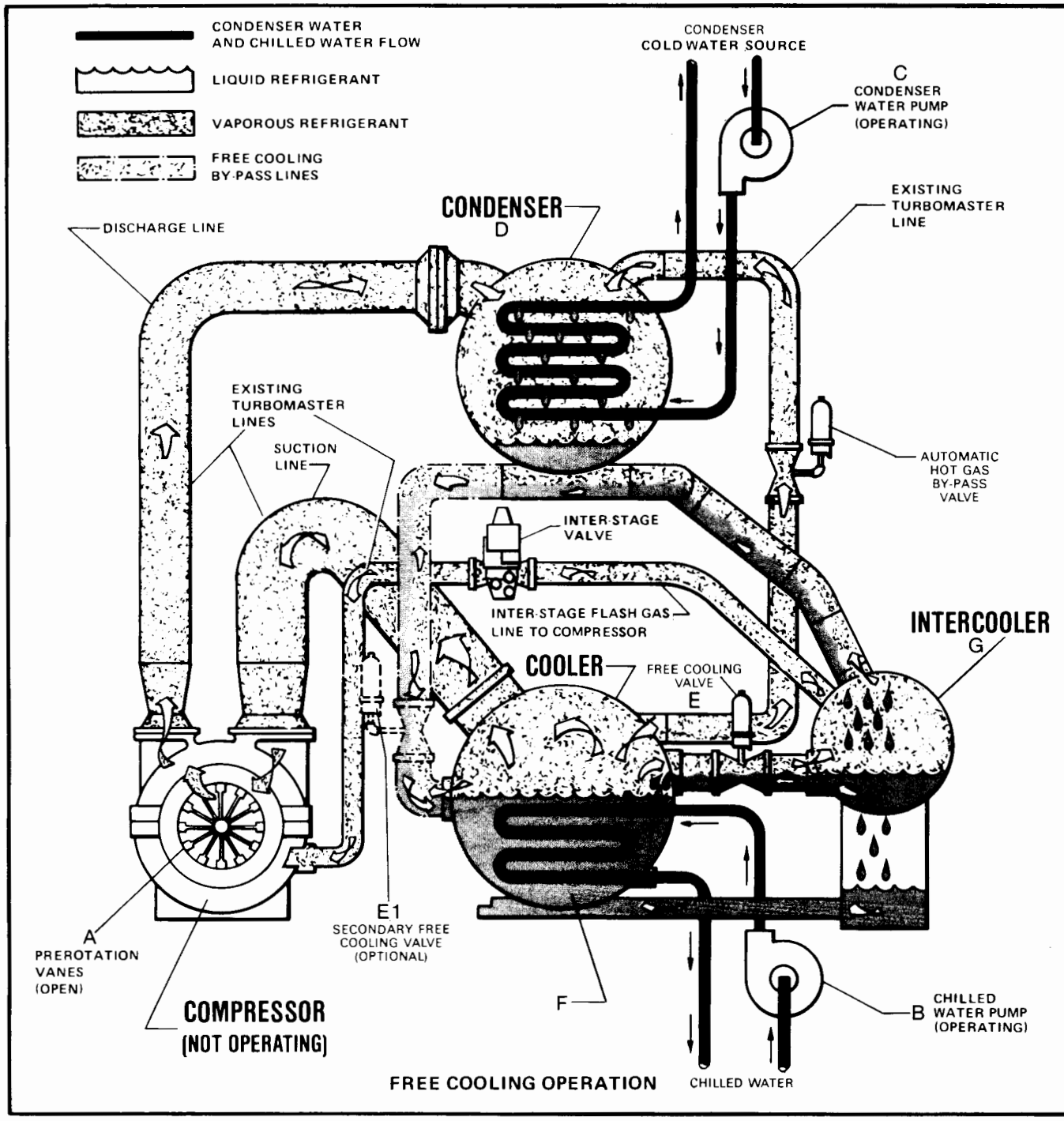


FIG. 2 – FREE COOLING REFRIGERANT AND WATER FLOW DIAGRAM

TRANSFER FROM NORMAL OPERATION TO FREE COOLING OPERATION

1. Press the compressor "Stop-Reset" button on the main unit control panel. The "Oil Heater" light will come on.

2. Turn the "Free Cooling" switch on the main unit control box to "Free Cooling". The pre-rotation vanes, the Interstage Modulating Valve and the Free Cooling By-pass Valve will open to their full open position. The "Free Cooling" light will come on.

3. Control chilled water temperature by cycling cooling tower fans, throttling condenser water flow, and/or by adjusting the Free Cooling By-pass Valve(s).

STARTING FREE COOLING FROM A NORMAL SHUTDOWN

1. Start the chilled water pump(s).

2. Start the condenser water pump(s) unless they are connected to start automatically when the "Free Cooling" switch is turned on.

3. Turn the "Free Cooling" switch on the main unit control panel to "Free Cooling". The pre-rotation vanes, the Interstage Modulating Valve and the Free Cooling Bypass Valve will open to their full open position. The "Free Cooling" light will come on.

4. Start the cooling tower fan(s), as needed.

5. Control chilled water temperature by cycling cooling tower fans, throttling condenser water flow, and/or adjustment of the Free Cooling Bypass Valve(s).

TRANSFER FROM FREE COOLING OPERATION TO NORMAL COMPRESSOR OPERATION

1. Move the "Free Cooling" switch to "normal operation". The pre-rotation vanes, the Interstage Modulating Valve and the Free Cooling Bypass Valve will close. The "Free Cooling" light will go out.

2. Open condenser water valve, if throttled.

3. Push the "Compressor Start" button. The compressor light will come on.

SHUTDOWN FROM FREE COOLING OPERATION

1. Move the "Free Cooling" switch to "normal position". The pre-rotation vanes and the Interstage Modulating Valve will close. The Free Cooling Bypass Valve will close and the "Free Cooling" light will go out.

2. Shut down chilled water pump(s).

3. Shut down condenser water pump(s) (unless they are connected to stop automatically when "Free Cooling" switch is turned off).

4. Stop the cooling tower fan(s) (if they were on).

5. Open condenser water valve, if throttled.

SEQUENCE OF CONTROL OPERATION

CONTROL CENTER – MOTOR DRIVE (Refer to Wiring Diagram, Fig. 3)

When the "Free Cooling" toggle switch is turned "on" and the Free Cooling valve is opened, the following electrical sequences take place.

The "Free Cooling" toggle switch contacts are 1P, 2P, and 3P, each contact has a normally closed and normally open position. The normally closed contact position is closed when the Free Cooling switch is "off".

"Free Cooling" Switch "ON"

Contact 1P (Line 24) – opens its normally closed contact to prevent the compressor from starting by the use of the unit "Start" switch, and energizing 7-Sol (Line 26) opening the Free Cooling Valve and lighting the Free Cooling light 13L (Line 24) (if the optional secondary Free Cooling By-pass line is used solenoid 8-Sol will also be energized to open the valve.

Contact 2P (Line 20) – normally closed, opens to prevent any possible feed-back to the motor circuit. The normally open contact closes to energize 1-Sol to open the hot gas by-pass valve.

Contact 3P (Line 15a) – normally open, contact closes to energize the CLR to open the PRV and Interstage Modulating Valve.

CONTROL CENTER TURBINE DRIVE (Refer to Wiring Diagram Fig. 4)

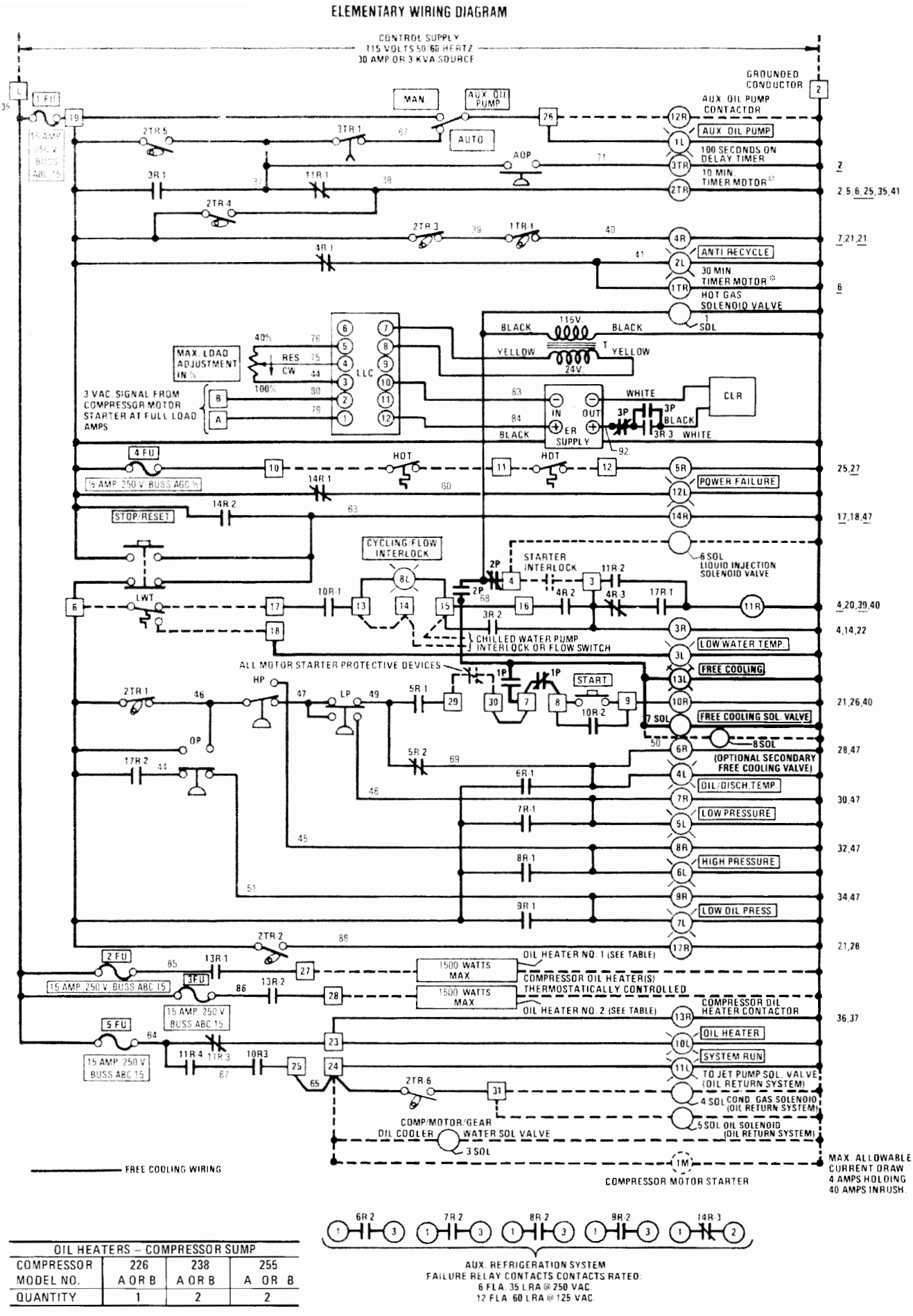
When the "Free Cooling" toggle switch is turned "on" and the Free Cooling valve is opened, the following electrical and pneumatic sequences take place.

The "Free Cooling" toggle switch contacts are 1P and 2P, each contact has a normally closed and a normally open position. The normally closed contact position is closed when the "Free Cooling" switch is off.

"Free Cooling" Switch "ON"

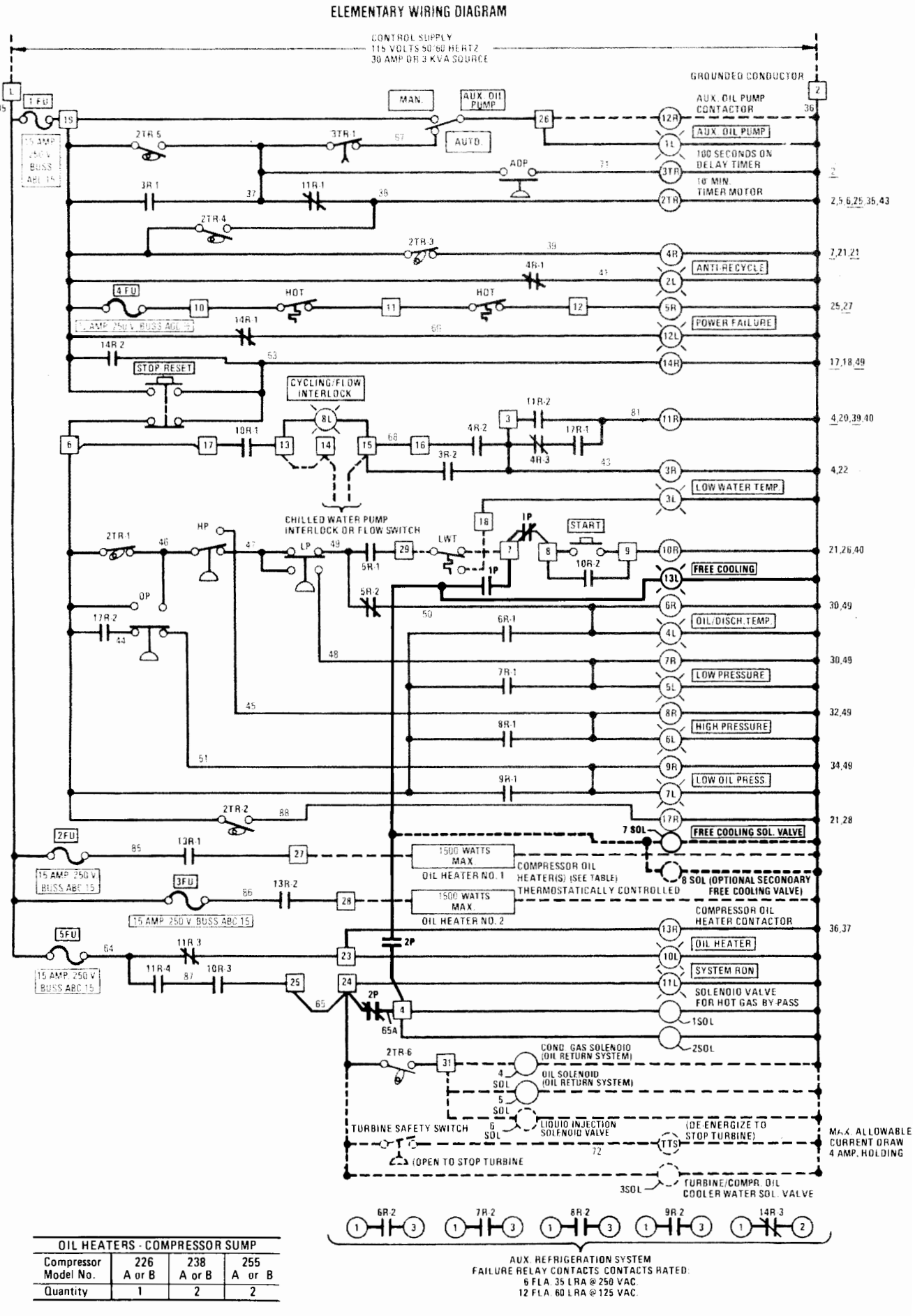
Contact 1P (Line 24) – Opens its normally closed contact to prevent the compressor from starting by the use of the unit "Start" switch energizing 7-Sol (Line 35A) opening the Free Cooling Valve and lighting the Free Cooling light 13L (Line 26) (if the optional secondary Free Cooling by-pass line is used a solenoid valve 8-Sol will be energized to open the valve).

Contact 2P (Line 41) – normally closed, opens to prevent any possible feedback to the turbine start circuit. The normally opened contact (Line 38a) closes to energize solenoid "2-Sol" which opens the prerotation vanes, the Interstage Modulating Valve and 1-Sol to open the hot gas by-pass valve.



OIL HEATERS – COMPRESSOR SUMP			
COMPRESSOR MODEL NO.	226 A OR B	238 A OR B	255 A OR B
QUANTITY	1	2	2

FIG. 3 – SCHEMATIC WIRING DIAGRAM – MOTOR DRIVE FREE COOLING



OIL HEATERS - COMPRESSOR SUMP			
Compressor Model No.	226 A or B	238 A or B	255 A or B
Quantity	1	2	2

FIG. 4 — SCHEMATIC WIRING DIAGRAM – TURBINE DRIVE FREE COOLING

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FORM 160.71-NO1.2(1078)

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