

Sequence of Operation for Typical Startup

Energize the chilled water pump starter K12(line 13).

Set switch S6(line 26) in the "auto" position.

Control power flows through the string of safety controls and safety lock-out contacts(line 16). If all safeties are satisfied, light DS1(line 20) will light. Power flows to the chilled water demand switch(line 26) whose temperature sensing element is located in the return water entering the chiller. Upon a rise in return water temperature, S3 closes energizing light DS2(line 20) and feeding power to timer contact S4. If 30 minutes or more have elapsed since the previous compressor start, timer contact S4(line 26) feeds power to light DS3(line 20). Power also flows through compressor inlet vane end switch A3(if vanes are closed), through relay K7 contacts(if compressor is off) to terminal 8. If chilled water flow is proven,power feeds through flow switch S5 to light DS4(line 20). Power also feeds through switch S6 energizing relay K4(line 19). K4 contacts (line 16) close to energize the condenser water pump starter, K13. If condenser water flow is proven,power feeds through flow switch S7(line 26) to light DS5(line 20) and also energizes relay K5(line 21). One set of K5 contacts(line 43) close energizing the oil pump timer S9. In 40 seconds, timer S9 contacts(line 44) close energizing the oil pump motor B2(line 45).

The oil pump has a capacitor start-induction run single phase motor. It utilizes a current sensitive relay K15(line 45)wired in series with the run winding to switch from start to run. When the oil pump motor is first started, it draws locked rotor current, this high current draw causes K15 to close its contact(line 45) energizing the start capacitor and start

winding of the motor to begin its rotation. When the motor is fully accelerated, the current draw drops causing K15(line 45) to open its contact(line 45) and drop out the start winding putting the motor in its run configuration.

When oil pressure is established, oil pressure switch S8(line 26) closes, lighting DS6(line 22) and energizing relay K6(line 23). One set of K6 SPDT contacts(lines 14 and 15) switch to energize K3(line 14). In turn K3 contacts(line 16) close arming the Low Oil Pressure circuit interrupter CB1 (line 14). A second K6 contact(line 35) closes energizing timer S4. In 25 seconds S4 contacts(line 34) close. Twenty five seconds later S4 contacts (line 28) close lighting DS7(line 28), energizing K9(line 26) and initiating a compressor start by energizing K1(line 29). One set of K1 "start" contacts (line 29), close to maintain power to the compressor starter. Simultaneously, a second K1 "start" contact(line 34) closes energizing K10. K10 contacts(line 32) close to maintain K10 energized for the duration of anti-recycle timer S4.

A third K10 contact(line 29) opens to interrupt the "start" signal through S4 contacts(line 26). Thus to original "start" signal through S4(line 26) is maintained only long enough to energize the "start" contactor of K1.

If K1 drops out for any reason, K1 stays de-energized until anti-recycle timer S4 completes its cycle. A third K1 "start" contact(line 45) closes to keep the oil pump energized as long as K1 contacts are closed.

When K1 connects the compressor in the run configuration, K1 "run" contacts (line 40) close feeding power to terminal 84 of the capacity control module U1(line 40) (if refrigerant temperature switch S2 is closed) thus allowing U1 to open the compressor inlet vanes as necessary.

When K1 is initially energized, relay K9(line 26) is also energized K9 contacts (line 25) open keeping relay K8 de-energized. This arms the Starter Fault safety circuit 15 seconds after the initial start pulse is sent to K1. S4 contacts(line 26) switch from 13-81 to 13-79, energizing relay K7(line 24). K7 contacts(line 25) close keeping K7 energized and completing the arming of the Starter Fault circuit. If K1 opens for any reason, contacts K1(line 29) open de-energizing relay K9. K9 contacts (line 25) close energizing relay K8. K8 contacts(line 15) close tripping safety lockout CB5 and locking the unit off. When there is no longer a call for cooling or if a safety opens, compressor starter K1 and relay K5 will be de-energized. A contact of timer S9(line 44) will keep timer S9 and oil pump motor B2 energized for 7 minutes to provide lubrication during compressor coast-down.

If there is a loss of oil pressure while the compressor is running, oil pressure switch S8(line 26) opens, stopping the compressor and de-energizing relay K6(line 23). Power then feeds from terminal 12(line 26) through contacts of K2(line 16) and NC contacts of K6(line 14) to trip safety lockout CB1, locking the compressor off.

Alarm contacts(line 56) are factory wired using NC contacts of the control safety lockouts. NO alarm contacts may be used by moving one wire on each safety lockout.

