TRANE™

General Service Bulletin

RTAA-SB-12

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Subject:Troubleshooting High Pressure Cutout and Low Oil Flow Diagnostics on RTAA 130-400 ton chillers.

Introduction:

This service bulletin is a response to calls related to High Pressure Cutout's (HPC), and Low Oil Flow diagnostics on RTAA 130-400. RTAA 70-125 chillers rarely experience HPC's because the chiller stages fans differently, and it does not use an oil pressure differential switch.

To properly diagnose the chiller, the procedures below should be done in the order they are listed. Always measure the condensing pressure with a gauge at the liquid line angle valve before diagnosing the chiller.

Discussion:

High condensing pressures can cause Low Oil Flow diagnostics. Why? Condensing pressure pushes the oil through the oil line. The velocity of the oil through the oil line and filter causes the pressure drop. As the condensing pressure increases so does the velocity of the oil, therefore, the pressure drop also increases. If a chiller's condensing pressure runs normally in excess of 325 p.s.i.d., or reaches 375 p.s.i.d. on startup, the technician should first investigate the cause of the high condensing pressures.

Low Oil Flow Diagnostics

If the chiller has Low Oil Flow trips, but has no symptoms of high condensing pressures use the following checklist:

1. Valves and Wiring:
   Confirm that the oil line shutoff valve is open (backseated), and the master oil line solenoid valve is energized and opening.

   The screws in the oil pressure switch's terminal block should be tight and on bare copper wire. Check for loose wires at the plug that connects the oil pressure switch to the compressor protection modules (1U4, 1U5, 1U6, and 1U7). To do so, remove the white cover on the back of the plug.

Caution: Refer to RTAA-SB-10. The compressor and oil line may need to be evacuated to perform the following procedures.

2. Oil Filter:
   The fully loaded pressure drop across the oil filter, oil line solenoid valve, and oil line shutoff valve, should vary between ten and forty pounds (10 to 40 p.s.i.d.), depending on load and ambient conditions. Higher load and ambients can cause the pressure drop to increase.

   To measure the pressure drop across the hydraulic circuit perform the following test (refer to RTAA-SB-10). Measure the high side pressure at the oil line shutoff valve. To measure the low side pressure, insert an access fitting, such as a " swivel tee ," into the differential pressure switch's low side oil line. Depending upon the date the chiller was constructed, either a flare fitting or Schrader valve connects the low side of the switch to the oil line. The pressure difference at these two points is the pressure drop the oil differential switch is sensing.

3. Oil Pressure Differential Switch:
   The switch is a normally closed differential pressure switch. It senses the oil pressure upstream of the oil line shutoff valve (highside), and downstream of the oil line solenoid valve (lowside). If the lowside pressure falls nominally fifty pounds (50 +/- 2 p.s.i.d.) below high side the switch's contacts snap open. The chiller controller senses the open contacts and calls out a Low Oil Flow diagnostic (198, 199, 19A, and 19B).

   To check the switch's calibration, measure the oil pressure at the oil line angle valve. Remove the oil line leading to the low side of the switch. The switch's normally closed contacts should open. Using a manifold gauge and nitrogen, or a hand oil pump, slowly raise the low side pressure toward high side pressure. When the low side pressure comes within forty to forty-eight pounds (40- 48 p.s.i.d.) of the high side pressure the switch's contacts should reclose.

If these procedures indicate a dirty oil filter, replace the filter, and recheck the pressure drop. If the switch is opening at the wrong pressure, use the thumbwheel in the switch to adjust and recalibrate the switch.

High Pressure Cutout Diagnostics

When diagnosing HPC's and Low Oil Flow trips on RTAA 130-400 chillers, use the following checklist.

1. Valves:
   Confirm that the compressor discharge ball valve, suction service valve, oil line shutoff valve, and liquid line angle valve are fully open.

2. Condenser Coil:

The outside and inside coil of each circuit, and the fan orifices should be clean and unobstructed. The condenser is rated up to 115 degrees F inlet air. Higher condenser inlet air temperatures may cause nuisance High Pressure Cutout or Low Oil Flow diagnostics. If the chiller is installed next to a building, inside a pit, or close to a wall that is taller than the height of the chiller, check for recirculation of the warm discharge air.

Use a thermometer attached near the center of the inlet face of the condenser coil to measure the inlet air temperature. This temperature should not be much greater than ambient. If recirculation is suspected refer to RLC-EB-7.

3. Fan Motors:

Check the fuses protecting the fan motors. Confirm that the fans are all working, and turning in the clockwise direction. Energize each fan contactor, and confirm the proper fan's rotation.

4. Subcooling:

Subcooling is the best measure of refrigerant charge. It should be 15 degrees F when the <u>circuit</u> is running fully loaded, and maintaining superheat, for more than ten minutes.

The refrigerant pressure reported by the computer may be inaccurate if subcooling is too high. Therefore, to accurately measure subcooling, the condenser pressure should be measured at the backseat port of the liquid line angle valve. Attach a thermometer to the liquid line just upstream of the angle valve and subtract this temperature from the condenser pressure converted to temperature. This is the true subcooling.

5. Compressors:

HPC's and Low Oil Flow diagnostics can also be caused by a compressor loading too fast or too soon. At startup the unload solenoid valve should be energized for thirty seconds, afterwards, the load solenoid valve may be energized. Monitor the compressor's amp draw after start. Upon startup the compressor will draw approximately forty percent amps, and should not increase until the thirty second unload has passed. Refer to RTAA-SB-4 to troubleshoot the slide valve and load/unload solenoid valves.

6. Non-Condensables & Restrictions:

If the chiller experiences HPC's or Low Oil Flow diagnostics, but the sight glass is bubbling suspect non-condensable gas or restrictions to the flow of refrigerant in the condenser and liquid line.

A large temperature drop in the liquid line is indicative of a flow restriction. A large pressure drop between the compressor discharge and liquid line angle valve may also be caused by a restriction. Approximately, twenty pound's differential (20 p.s.i.d) is a normal pressure drop across the condenser. To check for non-condensable gas do the following with the chiller switch in Stop/Reset:

1. Enable Service Pumpdown **(Caution: refer to RTAA-SB-10).**
2. Once the compressor has stopped, close the discharge service valve. The majority of the refrigerant should now be trapped in the condenser.
3. Energize all fan contactors for fifteen or more minutes.

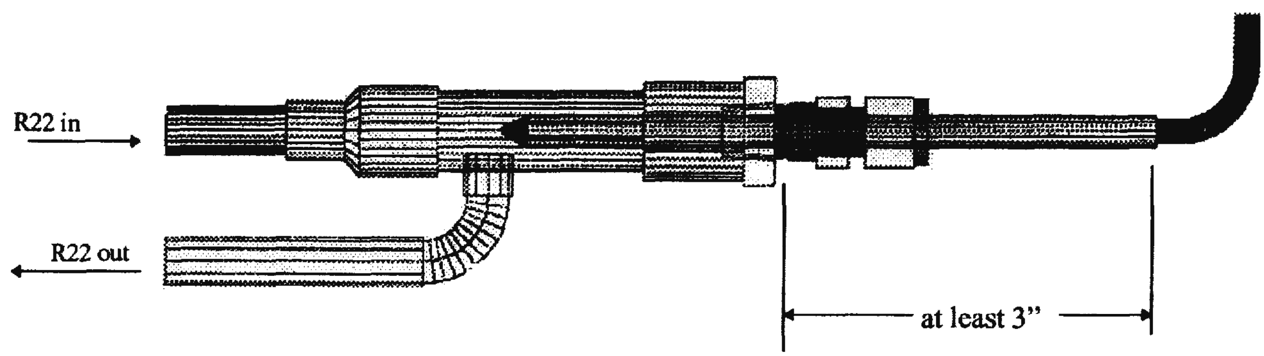
4. Use a gauge to measure the condenser refrigerant pressure at the liquid line angle valve. Measure the condenser discharge air temperature--it should be near ambient. Convert this temperature to a saturated refrigerant pressure. The converted pressure, gauge pressure, and the computer pressure, should be within ten pounds (10 p.s.i.g.) of each other. If the pressure at the liquid line angle valve is too high, this may indicate non-condensables in the refrigerant.

7. Saturated Condenser Temperature Sensor Depth:

The saturated condenser temperature sensor is inserted in a return bend near the top of each condenser. The sensor measures the refrigerant temperature, and the chillers controller converts the temperature to a pressure. For the sensor to be accurate, it should be submerged in a mixture of gas and liquid refrigerant.. It uses this pressure to stage fans on and off. (Refer to figure 1)

If the sensor is inserted too deep, the tip of the sensor blocks the flow of refrigerant. The condenser tube upstream of the sensor fills with liquid refrigerant. Since the sensor only comes in contact with the liquid refrigerant that is not flowing, the temperature of that refrigerant is not the true saturated condensing temperature. It is much lower, therefore, the pressure the chiller controller indicates is also much lower. Since the controller senses a pressure much lower than actual, it does not stage fans on appropriately. The result is High Pressure Cutout and Low Oil Flow diagnostics. Figure 1 indicates how deep the sensor should be installed and how to measure the sensor depth.

Figure 1. Saturated Condenser Temperature Sensor and Return Bend Fitting



Units Affected: The information in this bulletin applies to RTAA 130-400 ton air-cooled chillers.

Parts Ordering: This bulletin is informational only. It does not authorize labor or material.