TRANE

General Service Bulletin

RTHA-SB-12

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Literature Change History

RTHA-SB-12 - Original Service Bulletin

Subject: Model RTHA Series R CenTraVac Load/Unload Solenoid Valve Check Procedure

Introduction:

The purpose of this Service Bulletin is to provide the necessary troubleshooting information for Trane Model RTHA hydraulic system.

Discussion:

This bulletin is intended to serve as a supplement to the operation and maintenance manual for the RTHA units.
The subject covered in this bulletin is intended to provide more comprehensive information for the RTHA unit.

Caution: Be sure to refer to wiring diagrams that apply specifically to the design sequence of the unit being serviced.

Since The Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and designs without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified, experienced technicians.

General

This service bulletin should be used if loading or unloading difficulties are encountered on the RTHA Series R CenTraVac 130 to 450 ton units.

The slide valve is operated by a piston/cylinder assembly. The piston/cylinder assembly is powered by oil pressure that is regulated by the load and unload solenoid valves. These are two "normally closed" solenoid valves with coils that require 110 VAC.

As shown in Figure 1, the unload solenoid on 130 ton to 215 ton units is on the motor side of the compressor. On the 255 ton to 450 ton units, the unload solenoid is on the discharge side of the compressor. See Figures 2 and 3.

Figure 1
RTHA Model 130 to 215
Solenoid Valves

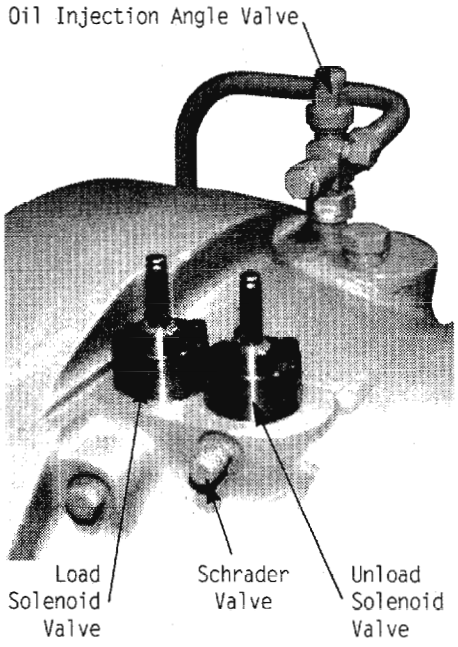


Figure 2
RTHA Model 255 to 300
Solenoid Valves

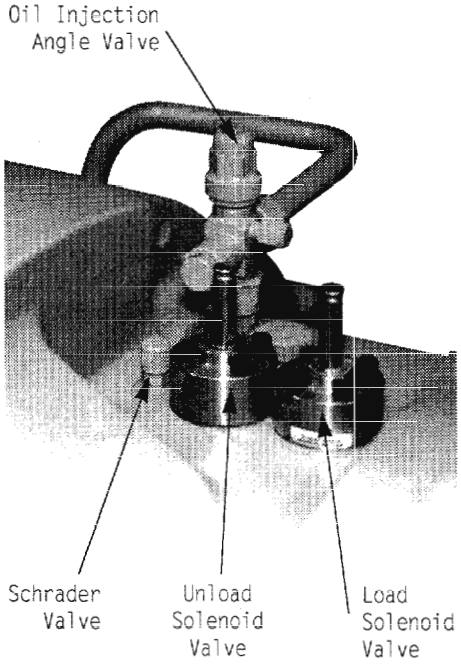
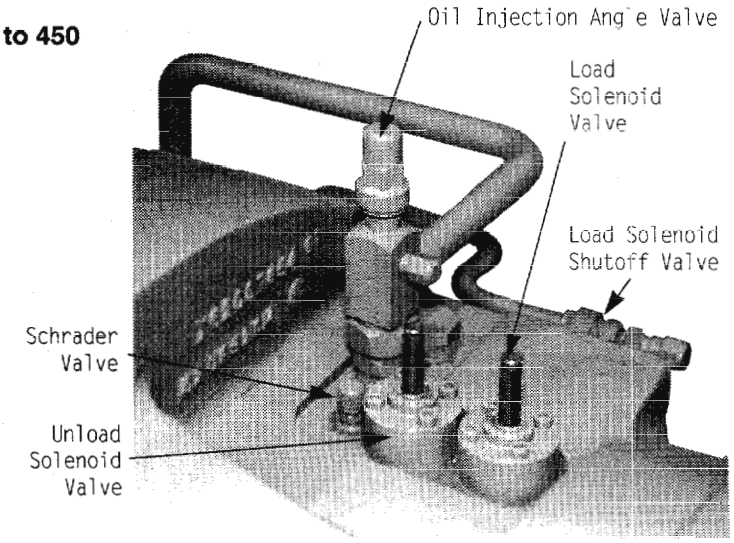


Figure 3
RTHA Model 380 to 450
Solenoid Valves



Operating Process

The microprocessing controls operate the load and unload solenoid valves, in response to varying demands for capacity. On a demand for increased capacity, the load solenoid valve is energized (pulsing 110 volts). The energized load solenoid valve opens, to allow oil under pressure to enter the piston/cylinder cavity and thus move the piston. The piston moves the slide valve over the rotors, thus loading the compressor.

On a demand for decreased capacity, the unload solenoid valve is energized (pulsing or constant 110 VAC, depending on the mode of the microprocessor controls). The energized unload solenoid valve relieves the oil pressure that was built up in the piston/cylinder cavity, which allows spring pressure to retract the piston. The retracting piston pulls the slide valve shaft away from the rotors and the compressor unloads.

On a hold demand, both the load and unload solenoid valves remain de-energized. With no change in control pressure, the piston and slide valve maintain the same position.

Troubleshooting the Loading and Unloading

Electrical

Insure that the valves are electrically correct before proceeding. Place a small metal object next to the energized coil to check for magnetism. Using a voltmeter, check to insure coil is receiving 110 VAC.

Note the LED indicator on the display of the unit control module. It should be lit when the corresponding load/unload solenoid valve is energized.

Oil Supply to Load Solenoid

If the machine is to load, it will need adequate oil pressure at the load solenoid valve. This pressure can be read at the oil injection angle valve (see Figures 4 and 5). It must be 20-25 PSID or greater than the evaporator pressure to initiate slide valve movement.

If this pressure is not met, the following needs to be considered:

1. Inherent Differential Pressure - The unit uses the inherent pressure difference between the condenser and the evaporator to operate the slide valve. If the chilled water temperature approaches or exceeds the condenser water temperature (eg. at unit start-up), the pressure needed to move the slide valve is decreased. This will slow the loading process.

2. Hydraulic Line Restriction - The pressure drop between the oil sump charging valve and the oil injection angle valve, assuming a clean filter, should not exceed 30 PSID. This is at 200 PSIG condenser pressure and 70 PSIG evaporator pressure.

If the pressure differential is greater, check for possible restrictions in the hydraulic system.

- **a.** Partially closed service valves
- **b.** Clogged oil filter
- **c.** Master solenoid valve malfunction
- **d.** Check valve fails to open

Figure 4
RTHA Model 130 to 300
Hydraulic System Schematic

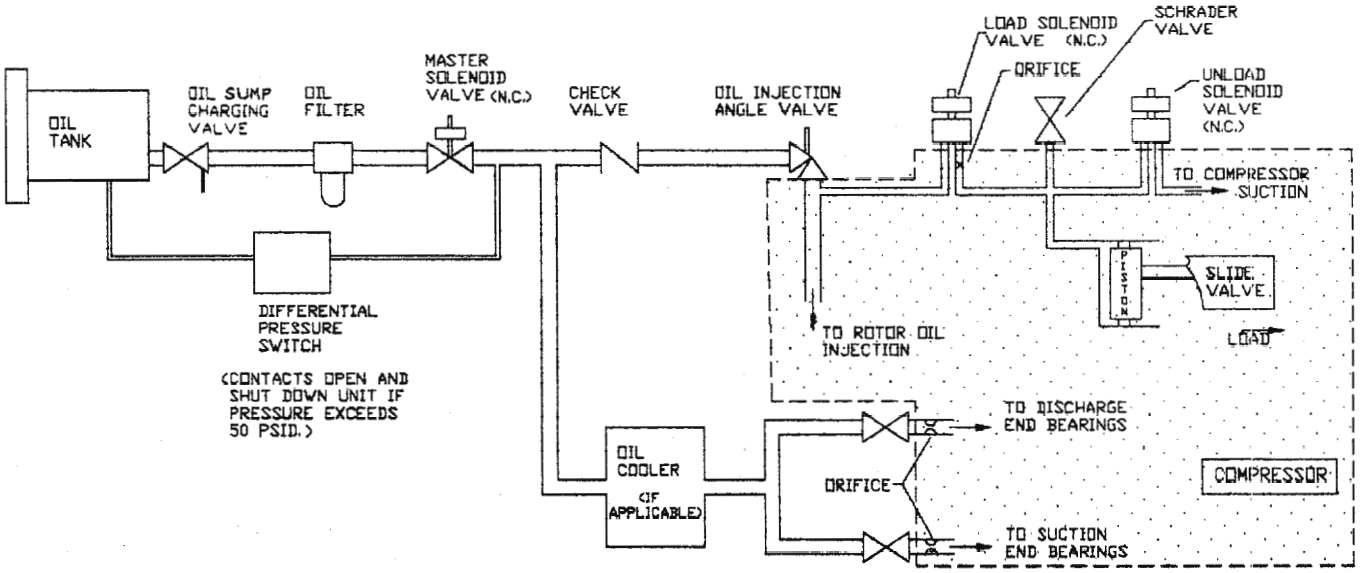
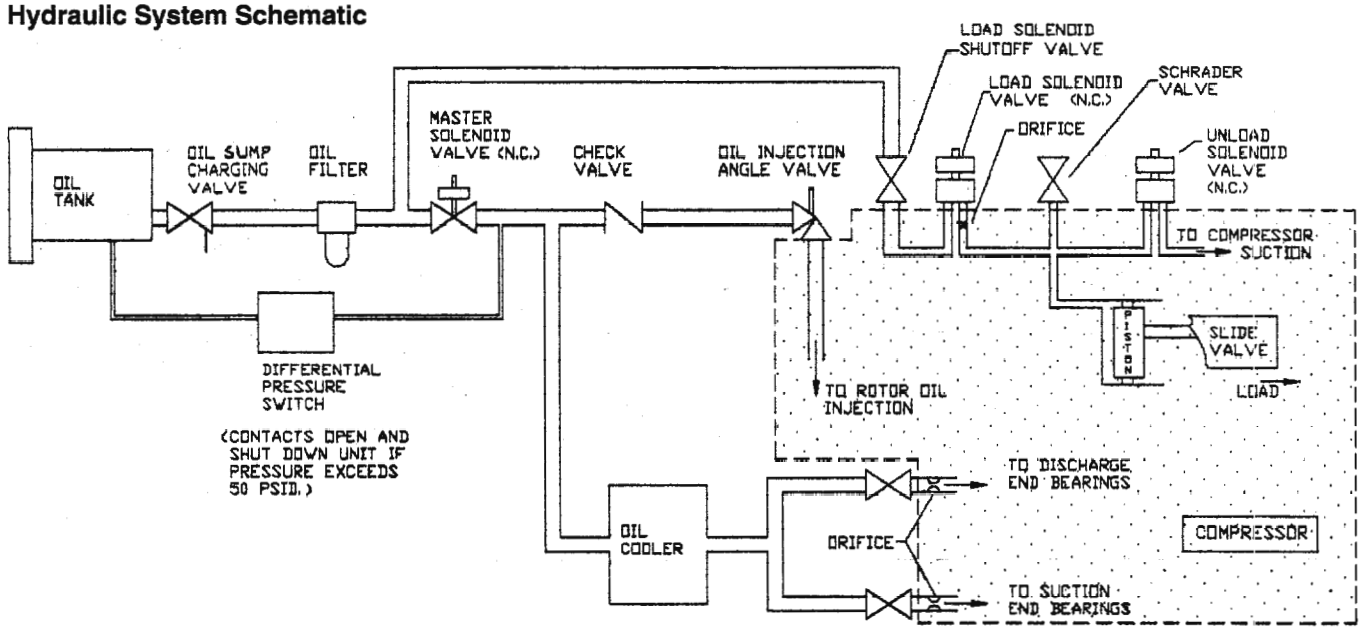


Figure 5
RTHA Model 380 to 450
Hydraulic System Schematic



Schrader Valve Pressure

The solenoid valves are "normally closed" valves. When energized, the load solenoid valve opens, which adds oil pressure/volume to the piston/cylinder cavity and pushes the slide valve over the rotors. When the unload solenoid is energized, oil pressure/volume is subtracted from the piston housing, to retract the slide valve from over the rotors.

Below is a procedure to check the unit when the control switch is in the load, unload, hold or auto position.

LOAD - While in this position on the UCM, the load solenoid valve is constantly energized and the unload solenoid valve is de-energized (unless the machine is in a limit condition which may cause the unload solenoid valve to become energized). In the load position, the Schrader valve pressure should approximately equal the oil injection angle valve pressure.

Note: On 380 to 450 ton units, the Schrader valve pressure may exceed the oil injection angle valve pressure. This is due to the designated line to the load solenoid, which is teed into the hydraulic line upstream of the master solenoid and check valve. For master solenoid and check valve locations, refer to Figures 4, 5, 6 and 7.

If the Schrader valve pressure is significantly lower, suspect the following:

1. Load solenoid valve fails to open
2. Unload solenoid valve fails to close
3. Plugged orifice under the load solenoid valve

UNLOAD - While the UCM is in this position, the unload solenoid valve is constantly energized and the load solenoid is de-energized. The Schrader valve pressure should approach the evaporator pressure.

If the Schrader valve pressure is significantly higher than the evaporator pressure, suspect the following:

1. Unload solenoid fails to open
2. Load solenoid fails to close
3. An internal leak has occurred on the hydraulic line to the piston/cylinder, which is inside the oil tank. Due to the high pressure in the oil tank, the hydraulic line will leak from the outside of the line to the inside. This is less likely to occur on the 255 to 450 ton units because the lines are part of the bearing casting. See "Diagnostic Tips" for more information.

HOLD - While the UCM is in this position, both the load and unload solenoids are de-energized. In essence, the pressure is trapped between the load/unload solenoid valves and the piston/cylinder.

Before switching the dial to "HOLD", note the pressure reading at the Schrader valve. Turn the dial to "HOLD" and the pressure reading at the Schrader valve should remain the same (unless the unit goes into a limit condition that causes the unload solenoid valve to become energized.)

If the pressure increases, suspect the following:

1. Load solenoid valve fails to close
2. Internal leak on hydraulic line - See Item 3 of "UNLOAD", above, for more details.

If the pressure decreases, suspect the following,

1. Unload solenoid valve fails to close

AUTO - In this position on the UCM, the load and unload solenoid valves are controlled by the microprocessor. Depending on the temperatures and limits established in the UCM, the load/unload solenoid valves will increase or decrease the oil pressure/volume into the piston assembly.

Note: Oil pressure at the Schrader valve is not proportional to the position of the slide valve. The oil pressure will be whatever it is necessary to hold the slide valve in a given position to produce the load demand.

Figure 6
RTHA Model 130 to 300
Master Solenoid and Check Valve

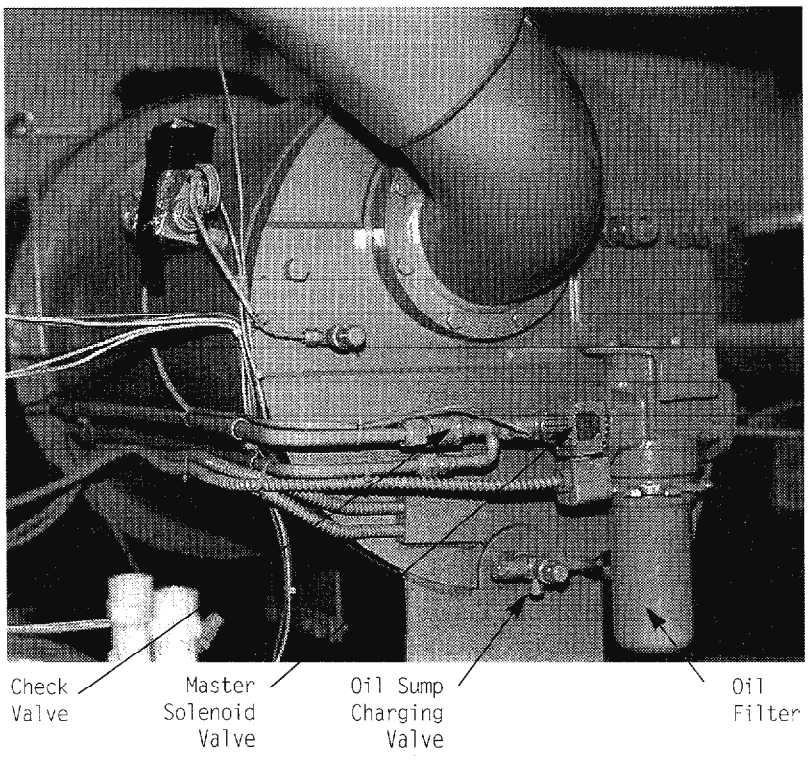
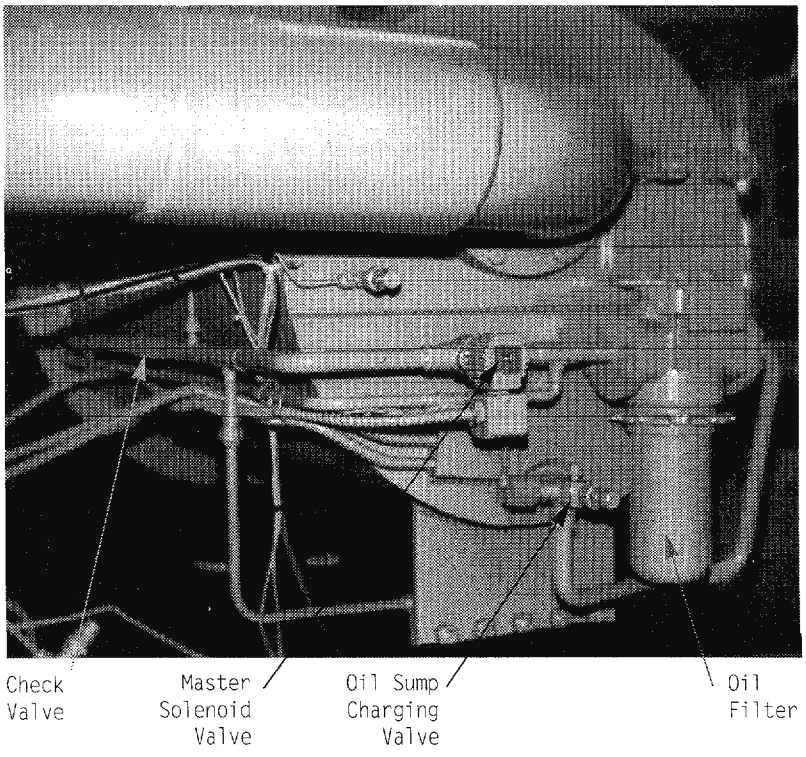


Figure 7
RTHA Model 380 to 450
Master Solenoid and Check Valve



Diagnostic Tips

Listed below are some tips on how to diagnose a suspected problem. Possible causes of problems are also listed in Table 1.

1. If either a load or unload solenoid valve is suspected of not closing, a piece of shim stock can be placed between the valve and the gasket, sealing off the ports of the valve. This will simulate a closed valve and confirm the diagnostic of a solenoid valve that fails to close.

2. To confirm an internal leak, place a piece of shim stock under both the load/unload solenoid valves. If the Schrader valve pressures still rises, there is an internal leak.

3. If a closed/plugged load solenoid valve is suspected, manually load the machine with a manifold gauge set. Connect one end of the gauge set to the oil injection angle valve and the other end to the Schrader valve. Add pressure from the oil injection angle valve to the Schrader valve. If the unit loads, this will confirm a closed/plugged load solenoid valve and/or orifice.

4. If a closed/plugged unload solenoid valve is suspected, manually unload the machine with a manifold gauge set. Connect one end of the gauge set to the Schrader valve and the other end to the evaporator. Relieve the pressure from the Schrader valve to the evaporator. If the unit unloads, this will confirm a closed/plugged unload solenoid valve.

Table 1
Troubleshooting

Problem	Possible Causes
Unit will not load	1. Solenoid coil is receiving improper electrical signal 2. The Inherent Differential Pressure is incorrect 3. Service valves on hydraulic lines are not fully open 4. Oil filter is clogged 5. Master solenoid valve fails to open 6. Check valve fails to open 7. Load solenoid valve fails to open 8. Unload solenoid valve fails to close 9. Orifice under load solenoid valve is plugged
Unit will not unload	1. Solenoid coil receives improper electrical signal 2. Unload solenoid valve fails to open 3. Load solenoid valve fails to close 4. Internal leak of hydraulic line connected to piston cylinder

Parts Ordering Information

This service bulletin is informational only and does not authorize any parts or labor.

For further information on this product or other Trane products, refer to the "Trane Service Literature Catalog", ordering number IDX-IOM-1. This catalog contains listings and prices for all service literature sold by Trane. The catalog may be ordered by sending a $15.00 check to:
The Trane Company, Service Literature Sales, #600 Pammel Creek, La Crosse, WI 54601.

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