Installation

RTHC

Condenser Water Regulating Valve Option

Order Number: **RTHC-SVN02C-EN** Date: June 2003

Pueblo Built Units Only

Introduction

To satisfy system oil protection safeties and to maximize energy efficiency, adequate condenser water control on the RTHC units is necessary. The required system differential (condensing pressure minus evaporator pressure) is 25 psid for all RTHC units. This differential must be maintained at all load conditions and must be achieved, following a start-up, within 2 minutes.

On start-up, the system differential must be at least 8 psid within 20 seconds, which generally equates to the condenser leaving water temperature being equal to or greater than the evaporator leaving water temperature. The system also must achieve a leaving condenser water temperature 25 F higher than the evaporator leaving water temperature within 2 minutes from start-up and maintain thereafter.

To maintain proper oil flow to the compressor, strict condensing water control is necessary. One method of achieving this control is through the installation of an optional water regulating valve.

NOTICE: Warnings and Cautions appear at appropriate sections throughout this literature. Read these carefully.

⚠ **WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION: Indicates a situation that may result in equipment or property-damage only accidents.

Discussion

The purpose of this manual is to outline the installation and setup procedures for the regulating valve and the associated controller for optimal condensing water control.

The condenser water regulating valve option can be ordered with or without the water regulating valve. Just the controls and pressure transducers can be ordered if an valve and electric actuator are already available . This manual will cover installation of the water regulating valve, the controller and the pressure transducers.

Condenser Water Regulating Valve

The optional condenser water regulating valve is produced by *Center Line*. Below is a basic installation procedure for installing the valve. For detailed instructions, refer to the *"Center Line Installation and Maintenance Instructions for UL Approved Valves"* found on the internet at http://www.cranevalve.com.

Table 1 Valves Available

Trane Part Number	Crane Series Number	Rating (PSIG)	Actuator Voltage (AC)	Valve Size (inches)
VAL06912	06B1021319-**44300M**-20A	200	115	6
VAL06913	08B1021319-**44300M**-20B	200	115	8
VAL06914	06B1021319-**44300M**-20A-220VAC	200	220	6
VAL06915	08B1021319-**44300M**-20B-220VAC	200	220	8
VAL06916	06M2521319-**44300M**-20A	300	115	6
VAL06917	08M2521319-**44300M**-20B	300	115	8
VAL06918	06M2521319-**44300M**-20A-220VAC	300	220	6
VAL06919	08M2521319-**44300M**-20B-220VAC	300	220	8

Water Valve Rating

Confirm that the correct valve was shipped by referring to the Center Line nameplate attached to the valve body. Refer to Table 1 for the list of valves available.

Installation Tools

A hoist will be necessary to manipulate the valve into place and a wrench suitable for tightening the flange bolts and/or nuts. Temporary pipe supports maybe used to keep flange faces parallel during installation.

Condenser Water Regulating Valve Installation

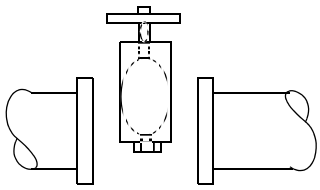
It is recommended that the valve be installed downstream of the condenser to insure undisturbed flow into the condenser. Also insure that the condenser does not drain when the valve is shut off and or when the water pump is off. Drainage of the condenser will increase tube fouling.

⚠ WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

Figure 1 Correct Position of the Valve Seat



1. Inspect the valve for the proper rating.
2. Remove the protective flange covers from the valve.
3. Ensure the valve is free of shipping defects.
4. Be certain the waterway is free of all debris.
5. Almost close the valve prior to installing to avoid damage to the disc or seat of the valve. Refer to Figure 1.
6. The valve can be installed at any angle; therefore it is recommended that the indicator and controller be positioned so that it can be read and adjusted, if necessary.
7. Place the valve between the flanges. Do not use any gasketing material. The elastomer seat extends beyond the valve seat and provides a leak proof seal between the valve and the mating pipe flange faces.

   Important: Gaskets are not needed and should not be used when the valve is installed between standard weld neck or slip-on type flanges.
8. Install all bolts between the valve and the mating flanges. Hand tighten all bolts as necessary.
9. Torque the bolts in the sequence outlined in Figure 2 and to the value listed in Table 2.
10. Verify full stroke operation with the manual crank and rotation indicator.

CAUTION

Equipment Damage!

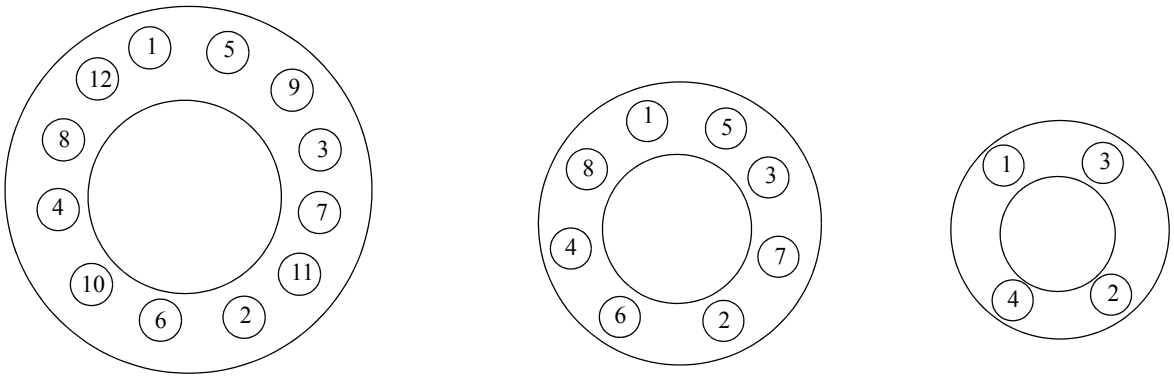
Do not manually crank the valve with power applied. Damage will occur to the valve or the actuator.

Table 2 Water Regulating Valve Installation Information

Valve Size	Valve psig Rating	Number of Bolts Required	Thread Size (inches)	Bolt Length (inches)	Required Torque (ft-lbs)
6	200	8	3/4 - 10	2	25-100
8	200	8	3/4 - 10	2	25-100
6	300	12	3/4 - 10	2 1/2	25-100
8	300	12	7/8 - 9	2 3/4	50-200

NOTE: Bolting and Torquing recommendations are made without a warranty, and apply only to steel weld-neck or slip-on flanges. The use of lock washers and/or lubrication with the bolting will affect stated torque values.

Figure 2 Bolt Torquing Sequence



Set-up of Electric Valve Actuator

The electronic actuator supplied with the water regulating valve is produced by *Crane*. The actuator will come already mounted on the valve and factory set. For detailed instructions, refer to the *"Electronic Control Actuator, Series 44000M, Operation Manual"* released by *Crane*.

Factory Settings

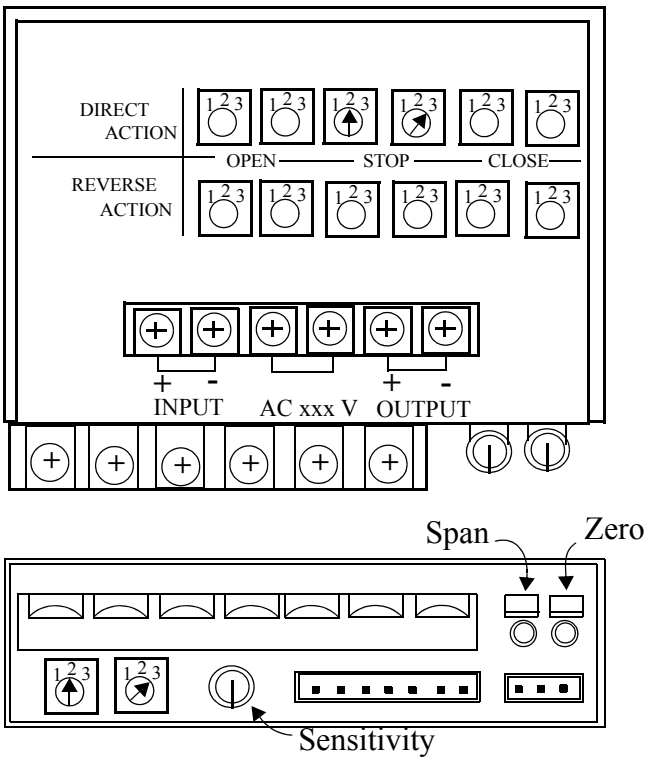
CAUTION

Equipment Damage!

The actuator is intended for indoor use. Special precautions must be taken if the actuator will be exposed to rainwater or direct sunlight. Failure to adequately protect actuator may result in equipment damage.

Several potentiometers are factory set. The settings should not need adjusting in most applications but are field adjustable if required. Refer to Figure 3.

Figure 3 Valve Actuator



The actuator is factory set with a "close limit" of 15 degrees open. The "open limit" is factory set for 90 degrees open.

NOTE: The "close limit" of 15 degrees open is a nominal opening for a typical system with typical pressure drops.

"Zero" and "Span" are used to adjust the corresponding mA signal. "Zero" is factory set such that 4 mA corresponds to 15 degrees open and 20 mA corresponds to 90 degrees open.

The "Sensitivity" is factory set to allow the valve to operate with the largest allowable number of steps. If the valve appears to sluggish the sensitivity may need to be decreased.

CAUTION

Equipment Damage!

Valve should be adjusted such that overheating of the condenser water pump does not occur at reduced flows. It is recommended that the flow rates remain above 25% of the flow at the best efficiency point. Failure to properly adjust regulating valve may result in equipment damage.

Important: An improperly sized water valve can result in unstable operation and throttling difficulties. Follow the valve manufacturer's guidelines when sizing the valve.

Mounting the 4U1 (ASM) Module

UCP2 does not have software capabilities to operate a water regulating valve; therefore an additional controller is required to monitor the system pressures and adjust the position of the water valve accordingly. The 4U1 controller is the additional controller required. It is an adder subtractor module (ASM) manufactured by *Moore Industries Inc.* and is a special design for Trane. It is not Moore's standard ASM module.

On factory installations, the 4U1 controller is mounted on the bracket between the evaporator and condenser, above the system differential pressure switch.

This module is mounted in a sheet metal box and is labeled "*ASM Adder Subtractor Module*". The module will accept the input from two pressure transmitters, one on the evaporator and one on the condenser. It subtracts the two values to determine the system differential. The module will then produce either a 4-20 mA or 1-5 VDC signal output to be wired to the actuator on the water valve.

If the controller is not factory installed, use the procedure below to mount the controller.

Installation

1. Locate the factory mounted pressure differential switch for detecting low system differential. It is located on the left side of the unit while facing the control panel, between the evaporator and condenser.
2. Above the switch, mount the 4U1 module to the bracket, facing outward. Use four 10-32 x 1" screws and four 10-32 nuts.
3. On the left side of the 4U1 box, press out one of the electrical knock-outs and install one of the bushing strain reliefs (X1910-0028-350) in the opening.
4. On the right side of the 4U1 box, press out one of the electrical knock-outs and install one of the bushing strain reliefs (X1910-0028-350) in the opening. This should be level with the knock-out on the left side.
5. On the right side of the 4U1 box, above the strain relief already installed, press out one of the electrical knock-outs and install the final bushing strain relief (X1906-0094-010) in the opening.
6. The module is shipped with a resistor between (+) Out and (-) Out terminals to supply a 1 to 5 VDC output signal. If a 4-20 mA output signal is required, the resistor between (+) Out and (-) Out must be removed and discarded.

Mounting of the Pressure Transducers

A *Danfoss* pressure transmitter needs to be installed on the evaporator and the condenser to feed the system pressures to the 4U1 module.

Installation

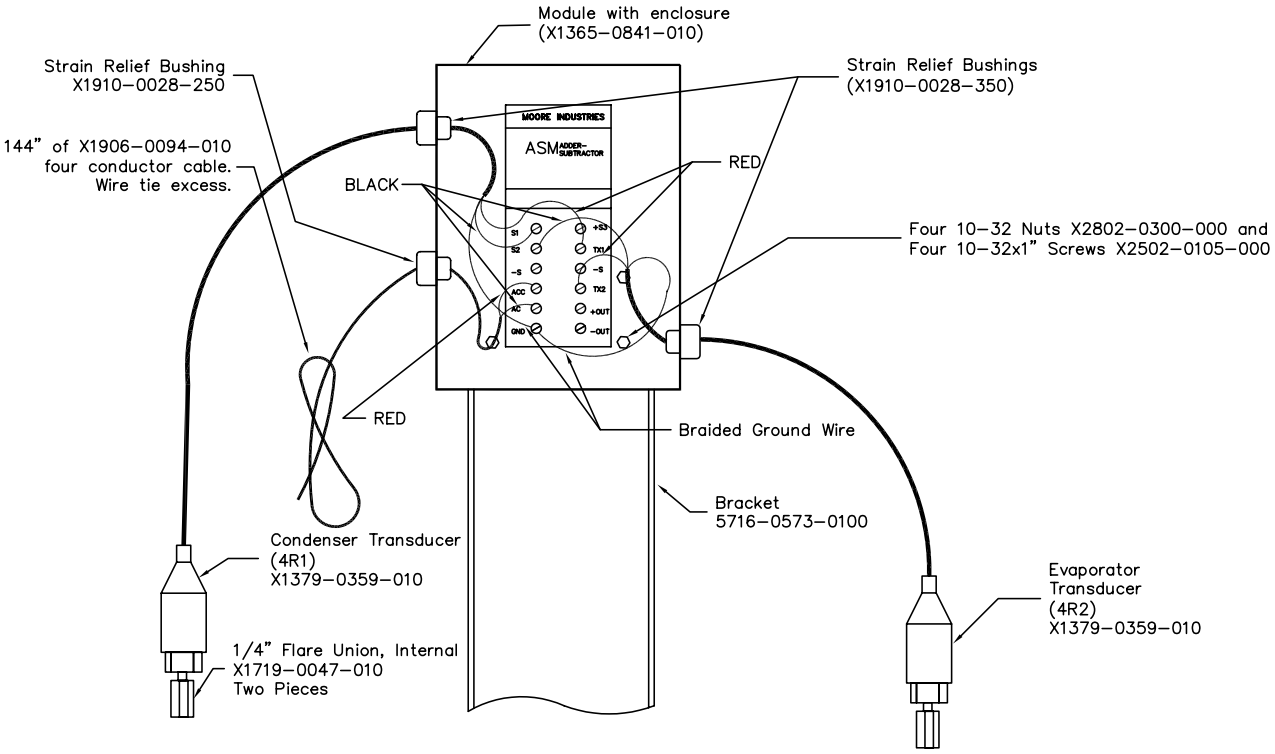
To install the transmitters to both the evaporator and the condenser, follow the procedures below.

1. Locate the two transducers, X1379-0359-010.
2. Locate the two 1/4" flare unions, X1719-0047-010.
3. Tighten one union to each transducer.
4. Close the service valve on the evaporator and condenser where the transducers will be installed.
5. Install one of the transmitters to condenser service valve located on the top of the shell.

   NOTE: Install a schrader tee prior to the transducer, if an access port is desired.
6. Install one of the transducers on the evaporator service valve located on top of the shell.

   NOTE: Install a schrader tee prior to the transducer, if an access port is desired.
7. Open all service valves and insure all connections are leak free.
8. Run the electrical leads of the transducers to the 4U1 controller. Wire according to the next section.

Figure 4 4U1 (ASM) Mounting and Wiring



Wiring

Wiring can be completed once all of the components are installed.

⚠ WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

Connecting Supply Voltage to the 4U1

The controller requires 24 VAC to operate.

Note: If the module is factory installed, the power supply wiring will already be connected.

1. To connect the power to the module, use four-lead conductor wire, (X1906-0094-010).
2. Connect the red lead to the J2-4 on the 1U2 starter module.
3. Connect the black lead to the J2-3 on the 1U2 starter module.
4. Connect the other end of red lead to ACC in the 4U1 controller.
5. Connect the other end of the black lead to AC in the 4U1 controller.

NOTE: Conduit is not required. Four-lead conductor wire is to be used X1906-0094-010. Trim the two additional wires.

Wiring the Pressure Transducers to the 4U1 Module

1. The transducer ships from the supplier with a four-wire cable and a ground. Only 2 wires and the ground will be used. Install a fork connector to the black lead, red lead and the ground. The white and green leads are not used and can be cut back out of the way.
2. Prepare the wire leads for both transducers.
3. Feed the leads through the lower bushing strain reliefs installed in the sheet metal box.
4. Connect the black lead of the transducer installed on the condenser to S1 - 4U1.
5. Connect the red lead of the transducer installed on the condenser to TX1 - 4U1.
6. Connect the ground of the transducer installed on the condenser to GND - 4U1.
7. Connect the black lead of the transducer installed on the evaporator to S2 - 4U1.
8. Connect the red lead of the transducer installed on the evaporator to TX2 - 4U1.
9. Connect the ground of the transducer installed on the evaporator to GND - 4U1.

Connect the 4U1 Output to the Water Valve

The wiring between the 4U1 controller and the water valve is customer supplied. It is class 2 wiring. It should not be run in conduit with higher voltage wire.

Important: To avoid erratic control of the valve, do not run the signal wire between the 4U1 controller and the water valve in conduit with voltages higher than 30 volts.

4-20 mA Signal

1. Remove the 250 ohm resistor, factory mounted on the 4U1 module between the **-Output** and **+Output.**
2. Connect the first wire between the **+Output** on the 4U1 controller and the **Input (+)** on the actuator.
3. Connect the second wire between the **-Output** 4U1 controller and **Input (-)** on the actuator.

   Note: If the water valve and actuator were not ordered, the signal can also be used by a BAS system.

1-5 VDC Signal

1. Confirm the connection of the 250 ohm resistor, factory mounted on the 4U1 module between the **-Output** and **+Output.**
2. Connect to **+Output** on the 4U1 controller and **Input (+)** on the actuator.
3. Connect the second lead to **-Output** 4U1 controller **Input (-)** on the *actuator.*

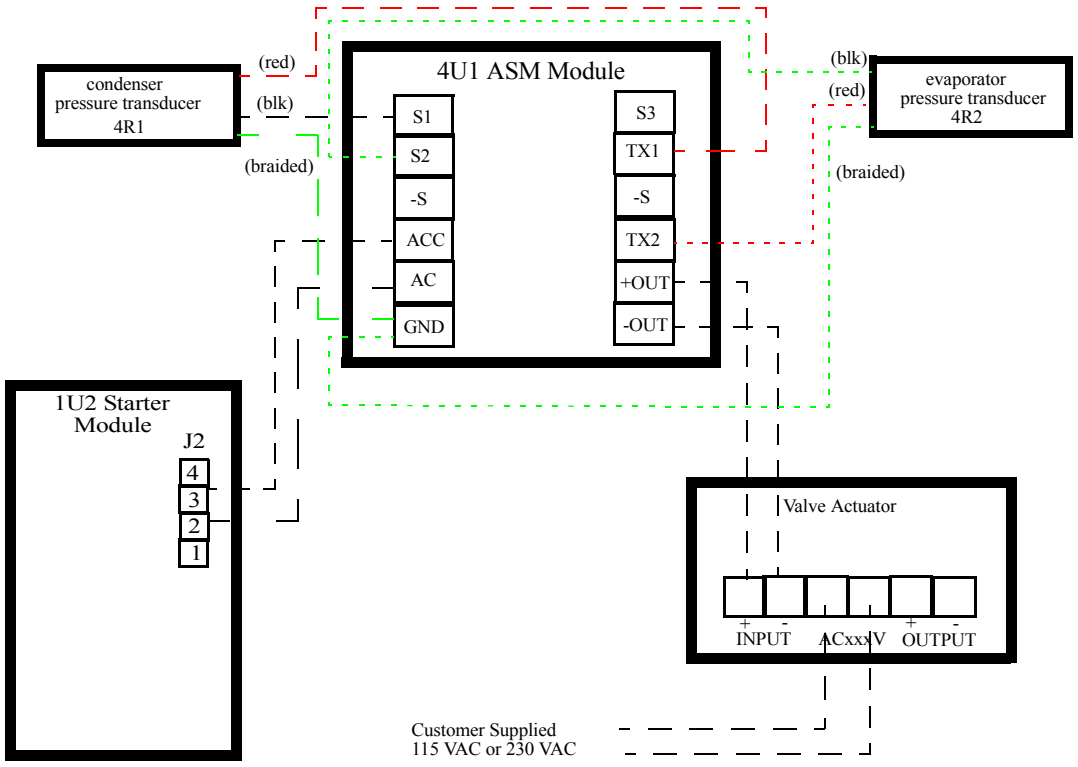
   Note: If the water valve and actuator were not ordered, the signal can also be used by a BAS system.

Connecting Supply Voltage to the Water Valve Actuator

The power supply for the valve actuator is customer supplied. For 115 VAC applications, #14 AWG 600V wire is needed.

Connect the customer supplied voltage to terminal points labeled "XXX" ACV on the right side of the actuator. Refer to Figure 5.

Figure 5 Wiring Schematic



Start-up

It is recommended that the steps below are followed once the installation is complete to insure proper operation.

⚠ WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

1. Remove line power from valve. Manually crank condenser valve wide open. Set condenser flow valve to obtain max water flow (correct pressure drop) per IOM.
2. Configure with chiller OFF, condenser pump ON. Apply line power to valve, it should move to 15% open. Remove power from valve.
3. Measure water pressure drop across condenser. It should be 0.7 ft to 2.0 ft for C1, C2, D1, D2, E1, E2, F2 and F3 condensers and 0.4 ft to 1.0 ft for BI, B2, E3, FI, GI, G2 and G3 condensers. Go to step 7, if water side pressure drop is correct.
4. If pressure drop is not as described in step 2, remove line power from valve, manually adjust valve opening with attached crank until proper condenser pressure drop is obtained. Mark pointer location. Reset closed limit microswitch to trip at this location / pressure drop.
5. Leave transducer 4R1 connected to condenser pressure and arrange so transducer 4R2 can be connected to either atmospheric or above 70 psi. Apply 24 VAC to 4U1 and line power to valve. Stroke valve open and closed by applying and removing pressure to 4R2.
6. Adjust valve closed position with zero adjustment so it coincides with closed limit switch trip point that was adjusted in step 4. Cycle valve open by increasing pressure to 4R2. It should be full open at 60 to 70 psid. Adjust span if not. Recheck zero, if span is adjusted.

⚠ Warning

Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

7. Let condenser pump run for at least 15 minutes with motorized valve in closed position. Verify that pump doesn't overheat when throttled. Check that condenser flow switch makes with this low flow. Disconnect flow switch or use a pressure switch if flow switch can't be adjusted low enough.
8. Verify operation during a normal start. If valve overshoots and then re-closes, increase damping on the 4U1 module. Valve should open and close as shown in Figure 6.

Troubleshooting Procedures

This section offers some basic troubleshooting for the modules and components associated with the condenser water regulating valve option.

4U1 ASM Module Checkout

⚠ Warning

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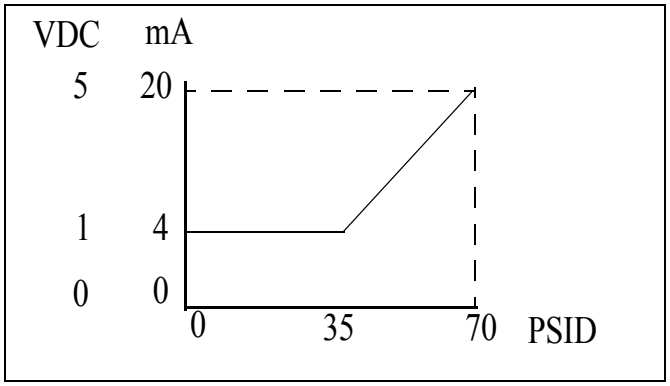
1. To perform this checkout, leave all power applied and all pressure transducers connected.
2. First, check the power supply to the 4U1 module. Measure the VAC across AC and ACC on the 4U1 board. It should be 24 VAC.
3. Measure the voltage between "TX1" and "-S" on the 4U1 module. The voltage should be 25 VDC.
4. Measure the voltage between "TX2"and "-S" on 4U1 module. The voltage should be 25 VDC.
5. If the supply voltages are out of range, check and tighten all the connections between the 4U1 module and the 1U2 module.

Figure 6 4U1 Output Signal



6. If the voltages are still out of range, check the 1U2 module. Replace the 1U2 module if necessary.
7. Once the supply voltage is within range, the 4U1 module can be checked.

8. The 4U1 - ASM Module subtracts the signal from the evaporator transducer from the signal from the condenser transducer. Record the actual evaporator and condenser pressures of the unit.
9. Subtract and record the actual pressures to determine the system differential (psid).
10. A 250 ohm resistor should be connected between "+OUT" and "-OUT" for 1 to 5 VDC signal. This resistor needs to be added it using the 4-20 mA signal to control the valve
11. Record the VDC output signal by measuring across "+OUT" and "-OUT".
12. Refer to the graph to compare the recorded values in steps 8 and 9. Refer to Figure 6.
13. If the values are out of range, check the 250 ohm resister and then proceed with the "Pressure Transducer Checkout".

Pressure Transducer Checkout

1. Manually read and record the actual pressure of the either the condenser or evaporator.
2. With the transducer connected to the 4U1, measure the voltage across S1 and -S, for the condenser transducer. Measure across S2 and -S, for the evaporator transducer.
3. Compare the voltage reading to the graph in figure 7. The converted pressure should be $\pm$ 5% of the reading recorded in step 1.
4. If the reading is out of range, disconnect the transducer from the condenser or the evaporator and attach a tank of nitrogen with a pressure regulator to the transducer. Increase the pressure to 50 psi and hold the pressure.
5. With pressure applied to either transducer, the output voltages, measured between S1 and -S for the condenser or S2 and -S for the evaporator, should be:

   50 psi applied should equal an output voltage of 1.96 VDC

   75 psi applied should equal an output voltage of 2.48 VDC

   100 psi applied should equal an output voltage of 2.95 VDC

   The voltage can vary $\pm$10%. The input resistor should be 250 ohms.
6. If the voltage is out of range, replace the transducer.
7. If the voltages are within range but the valve is not responding properly, check the mechanical operation of the water regulating valve and the operation of the electrical actuator.

Figure 7 Pressure Transducer Graph

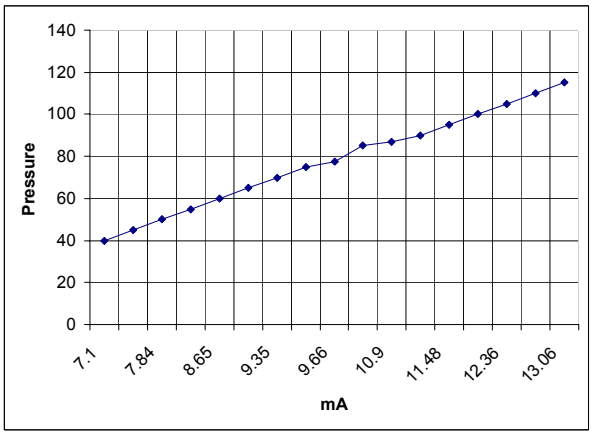


Table 3 Troubleshooting Table

Problem	Possible Causes
Water valve won't modulate	• mechanical failure of valve • failure of valve actuator • incorrect signal sent by 4U1 (ASM) module • failure of one or both of the pressure transducers • incorrect power supply • loose connections
Valve opening unstable	• noise on signal line • potentiometer loose on 4U1 module (tighten set screws) • system water pressure incorrect • factory settings on valve actuator need to be adjusted
Valve opening does not match input signal	• incorrect signal • improper adjustment to the Zero/Span settings on the valve actuator • loose connections

Parts Information

This bulletin is informational only and does not authorize any parts or labor. Various components can be ordered for controlling the condenser water side of the system. Refer to the table below for the various parts available through your local Trane Parts Center.

Table 4 Parts

Trane Part Number	Qty needed	Description
MOD00983	1	Adder Subtractor Module - 4U1 Controller with enclosure
TDR00301	2	Pressure Transducer (4R1 and 4R2)
BUS00363	2	Strain relief bushings
BUS00184	1	Strain relief bushing
CAB00906	144 inches	Conductor cable
UNN00040	2	1/4" flare union, internal
BRK02884	1	Bracket
NUT00148	4	10-32 nut
SCR01557	4	10-32 x 1" screw

Table 5 List of Water Regulating Valves (one required)

Trane Part Number	Description
VAL06912	6", 200 psi, water regulating valve with 115 VAC actuator
VAL06913	8", 200 psi, water regulating valve with 115 VAC actuator
VAL06914	6", 200 psi, water regulating valve with 220 VAC actuator
VAL06915	8", 200 psi, water regulating valve with 220 VAC actuator
VAL06916	6", 300 psi, water regulating valve with 115 VAC actuator
VAL06917	8", 300 psi, water regulating valve with 115 VAC actuator
VAL06918	6", 300 psi, water regulating valve with 220 VAC actuator
VAL06919	8", 300 psi, water regulating valve with 220 VAC actuator

Questions

Contact the Product Technical Service department in Pueblo, Colorado with questions regarding this Service Bulletin. They can be reached at techservicepueblo@trane.com or 888-244-5537.

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Supersedes	RTHC-SVN02B-EN
Stocking Location	Inland