BACnet Points For Versatec Dual Compressor Water to Water PRODCWW-02

The network variables will be listed by point type: instance convention. 2:1 would mean point type 2, point instance 1. All volatile (Output) type points will revert to the uncommanded values after a power interruption. These have no limit on the number of writes in a lifetime. The nonvolatile (Value) type points have their values stored in flash memory and they retain their values through a power outage. These have a limited life-time number of write cycles, about 2,000,000.

Analog Input (Type 0)

0:1	Source Frz 1	[Read, shows the refrigerant temp entering the surce heat exchanger for compressor 1]
0:2	Load Frz 1	[Read, shows the refrigerant temp entering the Load heat exchanger for compressor 1]
0:3	Enter Load Temp	[Read, water temperature entering load heat exchanger]
0:4	Leave Load Temp1	[Read, water temperature leaving the load heat exchanger 1]
0:5	Enter Source Temp1	[Read, water temperature entering the source heat exchanger 1]
0:6	Leave Source Temp	[Read, water temperature leaving the source heat exchanger]
0:7	Source Frz Setpt	[Read, low temperature limit of the source heat Exchangers to avoid freezing]
0:8	Load Frz Setpt	[Read, low temperature limit of the load heat Exchangers to avoid freezing]
0:9	Comp1 Status Output	[Read, 0% means compressor = Off, 100% means Compressor = On]
0:10	Alarm Status Output	[Read, 0% means no alarm, 100% means In alarm]
0:11	Comp2 Status Output	[Read, 0% means compressor = Off, 100% means Compressor = On]
0:12	Source Frz 2	[Read, shows the refrigerant temp entering the source heat exchanger for compressor 2]
0:13	Load Frz 2	[Read, shows the refrigerant temp entering the load heat exchanger for compressor 2]

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0:14	Leave Load Temp2	[Read, water temperature leaving the load heat exchanger 2]
0:15	Enter Source Temp2	[Read, water temperature entering the source heat exchanger 2]

Analog Value (Type 2) *These are written in Flash memory and have about 2,000,000 write cycles. Should only be written to by manual or scheduled writes, not by automated reset process.* ***Excessive writes will cause controller failure.***

2:1	Frz Setpt 1	[Read/Write, the low limit of the heat exchangers With the selection jumpers installed]
2:2	Frz Setpt 2	[Read/Write, the low limit of the heat exchangers With the selection jumpers removed]

Binary Input (Type 3)

3:1	Compr 1 Cmd Status	[Read, 'Inactive' means the compressor is Off 'Active' means the compressor is On]
3:2	Compr 2 Cmd Status	[Read, 'Inactive' means the compressor is Off 'Active' means the compressor is On]
3:3	Rev Valve Status	[Read, 'Inactive' means cooling 'Active' means heating]
3:4	Acc 1 Status	[Read, 'Inactive' means the accessory1 is Off 'Active' means the accessory1 is On]
3:5	Acc 2 Status	[Read, 'Inactive' means the accessory2 is Off 'Active' means the accessory1 is On]
3:6	Stage 1 Alarm	[Read, 'Inactive' means normal 'Active' means in alarm]
3:7	Stage 2 Alarm	[Read, 'Inactive' means normal 'Active' means in alarm]

Binary Output (Type 4)

4:1	Alarm Reset	[Write, allows remote reset of manual reset alarms, Command to a 'Active' value for reset action, 'Inactive' for Normal operation.]

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Multistate Input (Type 13)

13:1	Mode of Operation	[Read, 1=Auto, 7 = Shutdown]

Multistate Output (Type 14) *These are volatile memory and allow unlimited writes.*

14:1	Emergency Override	[Write, 1 puts the unit in normal operation 5 puts the unit in shutdown]
14:2	Compressor 1 Enable	[Write, Control lead compressor (Y1), 1=OFF, 2=ON.]
14:3	Valve Enable	[Write, Control reversing valve (B), 1=Cooling, 2=Heating.]
14:4	Application Mode	[Not used]
14:5	Heat Cool Mode	[Not Used]
14:6	Compressor 2 Enable	[Write, Control lag compressor (Y2), 1=OFF, 2=ON.]

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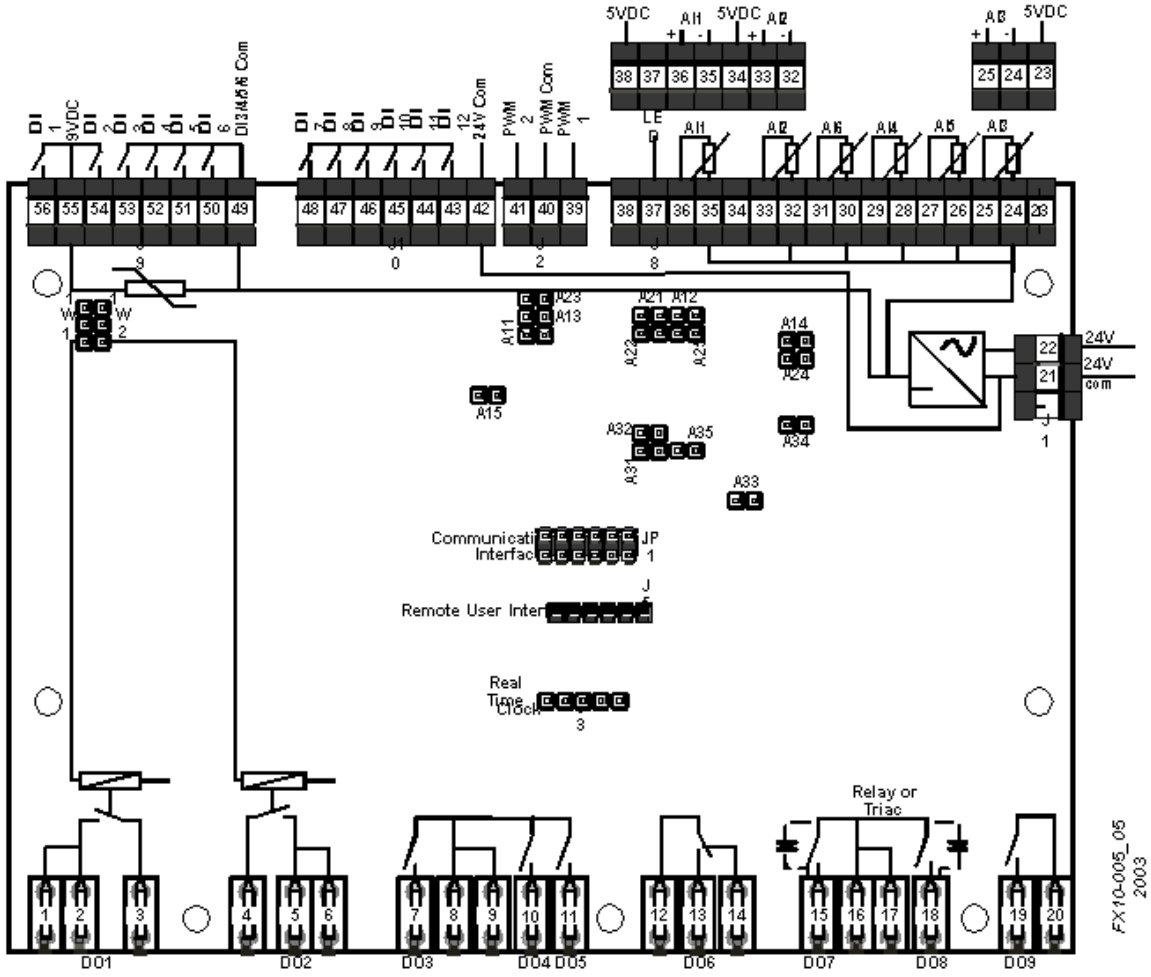
The reversible chiller is equipped with an OEM DDC controller produced by Johnson Controls, Inc. This controller—the FX10—has 6 analog inputs, 12 digital inputs, and 9 digital outputs. The FX10 is depicted below.



Physical I/O Assignment

The asterisk * denotes a point that is integral to the heatpump control algorithms.

Channel	Name	Pin Number	Type
AI1*	Entering Load Water Temperature Sensor (AI1)	36	A99
AI2*	Leaving Load Water Temperature Sensor 1 (AI2)	33	A99

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AI3*	Source Freeze Protection 1 Temperature Sensor (AI3)	25	A99
AI4*	Source Freeze Protection 2 Temperature Sensor (AI4)	29	A99
AI5*	Load Freeze Protection 1 Temperature Sensor (AI5)	27	A99
AI6*	Load Freeze Protection 2 Temperature Sensor (AI6)	31	A99
AI1 EXP*	Entering Source Water Temperature Sensor (XP AI1)	21	A99
AI2 EXP*	Leaving Source Water Temperature Sensor 1 (XP AI2)	24	A99
AI3 EXP*	Leaving Load Water Temperature Sensor 2 (XP AI3)	27	A99
AI4 EXP*	Leaving Source Water Temperature Sensor 2 (XP AI4)	30	A99
DI1*	Load Flow Proving Switch (BI1)	56	Binary
DI2*	Emergency Shutdown (BI2)	54	Binary
DI3*	2nd Stage Low Pressure Switch (BI3)	53	Binary
DI4*	Source Freeze Protection Setpoint Selection (BI4)	52	Binary
DI5*	Load Freeze Protection Setpoint Selection (BI5)	51	Binary
DI6*	1st Stage Low Pressure Switch (BI6)	50	Binary

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DI7*	Y1 Compressor Command (BI7)	48	Binary
DI8*	Y2 Compressor Command (BI8)	47	Binary
DI9	O Reversing Valve Command (BI9)	46	Binary
DI10*	Source Flow Proving Switch (BI10)	45	Binary
DI11*	1st Stage High Pressure Switch (BI11)	44	Binary
DI12*	2nd Stage High Pressure Switch (BI12)	43	Binary
DO1*	Stage 1 Alarm Output (BO1)	3	Binary
DO2*	1st Stage Compressor Output (BO2)	4	Binary
DO3	Reversing Valve 1 Output (BO3)	7	Binary
DO4*	2nd Stage Compressor Output (BO4)	10	Binary
DO5	Reversing Valve 2 Output (BO5)	11	Binary
DO6*	Alarm Output (BO6)	13	Binary
DO7	Accessory Output 1 (BO7)	15	Binary
DO8	Accessory Output 2 (BO8)	18	Binary
DO9*	Stage 2 Alarm Output (BO9)	19	Binary

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When the controller is first powered up, the outputs will be disabled for a random start delay time. The delay is provided to prevent simultaneous starting of multiple heat pumps. Once the timer expires, the controller will operate in the occupied mode until it is commanded to another mode by a facility management system or a remote thermostat. A restart status variable is available for indication of this occurrence. This delay will be used after every power failure, as well as the first time the compressor(s) is started after the control exits the emergency shutdown mode. The default time period for the start delay will be random between 1 and 120 seconds.

The load flow-proving switch shall be a normally open flow switch that will close when the water flow through the load side heat exchanger reaches an acceptable level. The load flow-proving switch must be closed 15 seconds prior to enabling either compressor output. If the load flow-proving switch opens at any time both compressor outputs will be disabled immediately. Flow switches are field installed.

The source heating freeze protection 1 and 2 temperature sensors will monitor the liquid refrigerant temperature leaving the condenser on compressor circuit 1 and 2. If the temperature drops below the source heating freeze protection trip point for the recognition delay period (30 seconds), the condition will be recognized as a fault. The source heating freeze protection 1 and 2 trip point will be factory set for 30°F and will be field selectable for 15°F by removing a jumper wire. The heating freeze protection fault condition will be bypassed 2 minutes at normal compressor startup, to allow the refrigeration circuit to stabilize. If a source heating freeze protection 1 or 2 fault occurs the other compressor will continue to operate based on the heating or cooling demand.

The load heating freeze protection 1 and 2 temperature sensors will monitor the liquid refrigerant temperature leaving the condenser on compressor circuit 1 or 2. If the temperature drops below the load heating freeze protection trip point for the recognition delay period (30 seconds), the condition will be recognized as a fault. The load heating freeze protection 1 and 2 trip point will be factory set for 30°F and will be field selectable for 15°F by removing a jumper wire. The heating freeze protection fault condition will be bypassed 2 minutes at normal compressor startup, to allow the refrigeration circuit to stabilize. If a load heating freeze protection 1 or 2 fault occurs the other compressor will continue to operate based on the heating or cooling demand.

The emergency shutdown mode can be activated by a command from a facility management system or a closed contact on BI-2. The Default State for the emergency shutdown data point is off. When the emergency shutdown mode is activated, both compressors will be turned off immediately and will remain off until the emergency shutdown mode is de-activated. The first time the compressors start after the emergency shutdown mode has been de-activated; there will be a random start delay present.

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Water-to-Water units are operated by externally generated compressor and reversing valve calls ONLY. There is no internal temperature setpoint operation mode in these units. The compressor and reversing valve calls may be issued via the terminal board connections or over the supervisory network.

When a Y1 call is issued, the X1 output will turn on. After a 90 second delay (to allow time for the isolation valve to open) the compressor will run. A Y2 call will cause the X2 output to turn on, then after a delay, the second compressor will start. Cycling the reversing valve will shut down the compressors.

Troubleshooting
There are several important symptoms to notice when diagnosing any heat pump malfunction: Does the compressor start at all? If so, how long does it run? In the water-to-water units, there are 6 things that can cause the compressor to not start at all:

1. Open flow switch
2. Emergency shutdown
3. Bad freeze sensor
4. Open high pressure switch
5. Compressor protection module
6. Phase Guard Monitor

Items 2 and 3 will also prevent the X1 output from coming on.

If the compressor runs for 1 to 3 seconds, suspect a wiring problem between the high pressure switch and the controller's binary input used for monitoring the high pressure switch. The phase guard monitor has also been observed to cause this symptom.

If the compressor runs for 2 ½ minutes, suspect a low pressure switch or freeze protection related issue. If the compressor in any unit runs for a period of 4 to 10 minutes and cycles off prematurely (the call for the compressor still exists) you should suspect inadequate water flow or temperatures outside of the operating envelope. Most of the time you can fairly easily identify these conditions by observing the entering and leaving temperatures as the unit operates.

If this fails to show the reason for the compressor stopping, and the compressor seems well-behaved while you watch, but still has a tendency to drop out in a low pressure or high pressure alarm after prolonged periods, this is often due to unaccounted for interruptions in water flow caused by some valve or pump operation issue in other parts of the water loop.

The maximum operating temperature for the water-to-water units should be limited to127 degrees leaving water temperature. This places you very close to tripping on high head pressure. If you operate this warm and you have a brief flow issue, it will likely trip.