Building Automation Systems Interface

Modbus RTU for 10, 15, 20, & 30 Ton Tandem Modules with VFD's

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GENERAL DESCRIPTION

The Multistack INTEROPERABILITY PORTAL is a device that acts as a translator between a pCO^2 Controller and the Modicon MODBUS Protocol-**Revision D**.

COMMUNICATIONS WIRING

1. BAS Interface:

The INTEROPERABILITY PORTAL communicates with a Building Automation device via the MODBUS protocol over a 2-wire EIA-485 connection. The INTEROPERABILITY PORTAL has been factory configured with the following configuration:

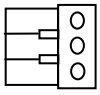
MODBUS over a 2-wire EIA 485 connection:

Transmission Mode:	RTU
Baud Rate:	9600
Data Bits:	8
Parity:	None
Stop Bits:	2
Master/Slave:	Slave
Slave Address:	1
Floating Points:	No

When connecting the INTEROPERABILITY PORTAL to a Modbus Network device, the recommended cabling to use is shielded, 20-22 AWG twisted pair. The distance from the INTEROPERABILITY PORTAL to the first EIA-485 device should not exceed 3,000 feet at 9600 baud.

Pin-Out Designation

Third Party Master		Multistack RS485 Card
		Pin 1 (GND)
(+)	———	Pin 2 (+)
(-)	———	Pin 3 (--)



2. pCO^2 Interface (RS485 Card):

The pCO^2 speaks native Modbus through a RS485 card. The RS485 card plugs into the pCO^2 master controller in the serial card port. To install the card in the pCO^2 master controller:

1. Remove the “serial card” port cover with a screwdriver;
2. Remove the pre-punched plastic to allow for the terminal to stick out;
3. Firmly insert the RS485 card into the white connector on the board of the pCO^2, making sure that the card is resting on the plastic supports of the pCO^2;
4. Replace the cover with the pre-punched hole.

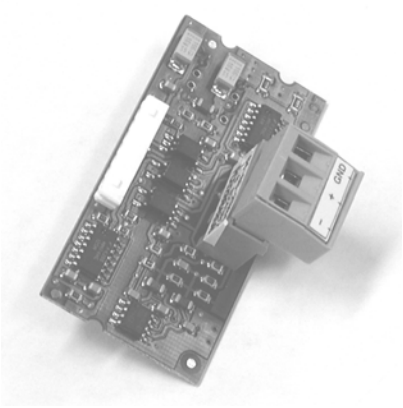


Figure 1 - RS485 Card

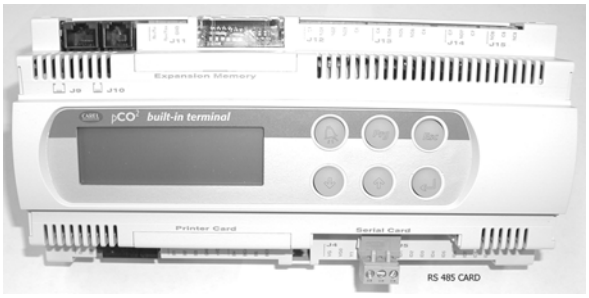


Figure 2 - pCO2 Master with RS485 Card

MODBUS PROTOCOL SETUP

Table 3 is a listing of all the points available in an Airstack Chiller. The **Object Identifier** is the description of each point. The other two columns give a listing of the Modbus **Register Type** and **Register Address**. Modbus **Register Type**'s are abbreviated as follows:

AI = ANALOG INPUT POINT
(Read from pCO^2 Master to MODBUS)
AO = ANALOG OUTPUT POINT
(Write from MODBUS to pCO^2 Master)
DI = DIGITAL INPUT POINT
(Read from pCO^2 Master to MODBUS)
DO = DIGITAL OUTPUT POINT
(Write from MODBUS to pCO^2 Master)

NOTE: All of the AI's and AO's are considered unsigned integers.

CONNECTION TYPE

The default CONNECTION TYPE for the MODBUS INTEROPERABILITY PORTAL is an EIA-485 2-wire connection.

TRANSMISSION MODE

The TRANSMISSION MODE for the INTEROPERABILITY PORTAL is RTU. This is not a selectable feature.

MODBUS COMMUNICATION SETUP

The Modbus communications has to be setup in the pCO^2 Master Controller. Go to the *System Variables* menu and using the *down* arrow button, go to *BAS INTERFACE*. Press the *enter* key to get into the BAS options of the program. First, the BAS INTERFACE needs to be enabled. This defaults to *NO*. Enable this setting. Then under protocol choose Modbus. This defaults to BACnet. The *Baud Rate* needs to be set at the correct rate and is selectable from 1200 to 19200. The bits, parity and stop bits are not selectable. They are set at 8 bits, no parity, and 2 stop bits.

SLAVE NODE

The portal is a SLAVE on the EIA-485 network. A SLAVE NODE cannot initiate communications on the network, and therefore is not a routable port.

SLAVE ADDRESS

This is the SLAVE ADDRESS for the INTEROPERABILITY PORTAL on the MODBUS network. This parameter is third party dependant. The default value for the first portal is SLAVE 1. Only one portal is required per pCO^2 Master. If there are multiple AIRSTACK chillers on the Modbus network, then there would be multiple pCO^2 Masters, resulting in multiple PORTAL's. The range for this variable is from 1 to 200.

FLOATING POINTS

The INTEROPERABILITY PORTAL does not have the ability to handle floating point variables. All analog values must be divided by 10 to get the correct decimal place. This is due to the nature of the Carel controller and floating points not being available.

POINTS LIST

READ POINTS - Analog

SYSTEM ECHW – The entering chilled water temperature of the system.

SYSTEM LCHW – The leaving chilled water temperature of the system.

CHW OFFSET – The number degrees that the upper and lower setpoints are increased by an external source through the customer CHW Reset Option.

M(x) LCHW TEMP – The leaving chilled water temperature of the module, where (x) is the number of the module. ((x) can be 1-14.)

M(x) SUCT TEMP – The suction temperature of the module, where (x) is the number of the module.
((x) can be 1-14.)

M(x) VFD PERCENT – The fans operate from 15 to 60 Hz. This is a percentage of the actual speed of the fans. The fans increase in speed with an increase in the condenser pressure.

Note: Analog read points must be divided by 10 to get the correct value with one decimal point.

READ POINTS – Digital

CHILLER ON/OFF STATUS – Displays whether the chiller is *ON* or *OFF*. **(ON=1 & OFF=0)**

CHW FLOW INPUT– Monitors the input of the flow switch to tell if the flow switch is open when it should be closed. This is an automatic reset and restart of the chiller. **(Fault=1 & Normal=0)**

POWER PHASE MONITOR INPUT– Monitors the input of the Phase Monitor to tell if it is tripped or operating under normal conditions. This is an automatic reset and restart of the chiller. **(Fault=1 & Normal=0)**

REMOTE START/STOP INPUT – Monitors an input at the pCO^2 Master Controller that can start and stop the chiller from a remote location. Acts just like at on/off switch. **(Stopped=1 (will not run) & Started=0 (capable of running))**

EX1 INPUT – Monitors an input at the at the pCO^2 Master Controller that the customer can use to stop the chiller. Open to stop operation; closed to operate. This fault requires a reset at the pCO^2 Master Controller. **(Fault=1 & Normal=0)**

SYSTEM LOW LCHW TEMP– This fault occurs when the LCHW temperature falls below 36 °F. The fault is required to be reset and restart the chiller at the pCO2 Master Controller.
(Fault=1 & Normal=0)

SYSTEM LCHW SENSOR FAIL – The LCHW sensor for the system has either opened or shorted. This fault requires a reset at the pCO2 Master Controller. **(Fault=1 & Normal=0)**

SYSTEM ECHW SENSOR FAIL – The ECHW sensor for the system has either opened or shorted. This fault requires a reset at the pCO2 Master Controller. **(Fault=1 & Normal=0)**

GLOBAL ALARM - A digital point that tells when there is a current alarm that needs to be reset for the chiller to resume operation.
(Fault=1 & Normal=0)

FAHRENHEIT/CELSIUS – Tells whether the temperature readings are in Fahrenheit or Celsius. **(°C=1 & °F=0)**

CUSTOMER RESET ACTIVE – Tells whether the Load Limit or Chill Water Customer Resets are active. **(Active=1 & Inactive=0)**

LOAD LIMIT RESET ACTIVE – Tells whether the Load Limit Customer Reset is active.
(Active=1 & Inactive=0)

CHILLED WATER RESET ACTIVE – Tells whether the Chill Water Customer Reset is active. **(Active=1 & Not Active=0)**

SYSTEM VARIABLES LOCK – Tells whether the password is set that locks and unlocks the system variables at the pCO2 Master. When locked, the system variables can not be changed or written to. **(Locked=1 & Unlocked=0)**

M(x)-1 RUN STATUS – Tells whether the first compressor in a particular module is *ON* or *OFF*, where (x) is the number of the module.
(ON=1 & OFF=0)

M(x)-2 RUN STATUS – Tells whether the second compressor in a particular module is *ON* or *OFF*, where (x) is the number of the module.
(ON=1 & OFF=0)

M(x) COMMUNICATION ERROR – Monitors the communication line (pLAN) between the module and the pCO2 Master, where (x) is the number of the module. **(Fault=1 & Normal=0)**

M(x) FAN STATUS – Tells whether the fans in a particular module is *ON* or *OFF*, where (x) is the number of the module. **(ON=1 & OFF=0)**

READ POINTS – Integer

CAPACITY - A percentage of how many compressors are on compared to the number of compressors installed.

DEMAND – A percentage of current load needed compared to the maximum design load. This value depends on the ECHW and the settings of the System Variables: Upper Setpoint, Lower Setpoint, and VSP.

TDIFF COUNTDOWN – Time Difference Counter.

SYSTEM COUNTDOWN – System counter used when the chiller is turned from off to on.

NUM OF FAULTS – The number of current faults or faults that can be reset in the chiller system.

LOAD LIMIT – A percentage value to limit the maximum number of compressors available at any given time. (Would include any change by the customer Load Limit Reset Signal)

LEAD COMPRESSOR SV– The compressor that will be the first compressor on and the last off if available. Compressors 1 and 2 would be in module 1; compressors 3 and 4 would be in module 2, and so on. This system variable can only be set at the pCO2 Master.

NUMBER OF MODULES SV – Number of modules that are in the chiller bank. This system variable can only be set at the pCO2 Master.

HOUR (TIME) – Current hour as set in the pCO2 Master.

MINUTE (TIME) – Current minutes as set in the pCO2 Master.

MONTH (DATE) – Current month as set in the pCO2 Master.

DAY (DATE) – Current day as set in the pCO2 Master.

YEAR (DATE) – Current year as set in the pCO2 Master.

XX% LOAD PROFILE – This value relates to the total operating hours to the percent load and is subdivided into 10% segments. EX. If the chiller was running at 25% for 4 hours then the hours would be logged in the 20-29% segment.

TOTAL LOAD PROFILE – This is the total number of operating hours for the chiller.

M(x) FAULT – The number of a current in a particular module, where (x) is the number of the module where the fault occurred. See page 6 for a table of faults.

M(x)-1 RUN HOURS – The total number of running hours for compressor #1, where (x) is the module where the compressor is located.

M(x)-2 RUN HOURS – The total number of running hours for compressor #2, where (x) is the module where the compressor is located.

M(x) CONTROL MODE – Tells what mode the module is running in, where (x) is the module number. **(Auto Mode=1, Manual Mode=2, Disabled=3)**

M(x) HP – High Pressure reading of a particular module based on the high pressure transducer, where (x) is the module number.

M(x) LP – Low Pressure reading of a particular module based on the low pressure transducer, where (x) is the module number.

WRITE POINTS – Analog

UPPER SETPOINT SV – The desired entering chilled water temperature (SYSTEM ECHW) at full load.

LOWER SETPOINT SV – The desired leaving chilled water temperature (SYSTEM LCHW) at full load.

MANUAL SETPOINT SV – The desired leaving chilled water temperature in a module when operating in Manual Mode.

MANUAL RANGE SV – A value, when added to the Manual Setpoint, where the first compressor will turn on in a module when in Manual Mode, based on the LCHW temperature in the module.

MANUAL OFFSET SV – A value, when added to Manual Setpoint plus Manual Range, where the second compressor will turn on in a module when in Manual Mode, based on LCHW temperature in the module.

Note: Analog read points must be divided by 10 to get the correct value with one decimal point. Analog write points must be multiplied by 10 to input the correct value.

WRITE POINTS – Digital

CHILLER ON/OFF – Point used to turn the chiller *ON* and *OFF*. **(ON=1 & OFF=0)**

SEQUENCING SV – System Variable that allows the chiller to run in standard sequencing or odd/even sequencing. **(Odd/Even=1 & Standard=0)**

INDEXING SV – System Variable that allows the lead compressor to index at midnight.
(Indexing=1 & Non-Indexing=0)

WRITE POINTS – Integer

VSP SETPOINT SV – A percentage value that is used to determine the no load chill water temperature.

No Load CHWT = [(U - L) × V% ÷ 100] + L

EX. Upsetpt=55, Losetpt = 45, VSP = 30%
NoLoad = [(55-45)× 30%÷100] +45=48ºF

LOAD LIMIT SV - A percentage value to limit the maximum number of compressors available at any given time. If set at 100%, then all compressors can run, if needed. If set at 50%, then only 50% of the compressors can run.

TDIFF SV (Delay Time) – A time in seconds which sets the amount of time between starts and stops of compressors. Counter is displayed on the main status screen as Tdiff Countdown. Counter starts every time a compressor starts or stops.

FAIL INDICATOR SV – A percentage value which provides for an output signal in the pCO^2 Master Controller whenever compressors of the indicated value have failed. A 0% setting will give an output signal after any failure within the system.

FAN SETPOINT SV – The point, in psig, where the fans turn off.

FAN OFFSET SV – A value, measured in psig, when added to the FAN SETPOINT where the fans turn on.

HP CUTOUT SV – The point where a high pressure fault occurs based on the high pressure transducer reading.

FAULTS CONDITIONS

SYSTEM FAULTS DEFINITIONS

EX1 FAULT - Input in the pCO2 Master that disables the chiller and requires a reset at the pCO^2 Master Controller of the chiller.
(Fault=1 & Normal=0)

POWER PHASE MONITOR - Input in the pCO^2 Master Controller that disables the chiller. This fault is an automatic reset and restart.
(Fault=1 & Normal=0)

LOW CHW FLOW - Low Chilled Water Flow. Input in the pCO^2 Master Controller that disables the chiller and is intended to be used with the Chilled Water Flow Switch. Automatic reset and restart of the chiller. **(Fault=1 & Normal=0)**

LOW LCHW SYSTEM TEMP - Low leaving chill water system temperature faults below 36 °F. This requires the fault to be reset at the pCO^2 Master Controller and a restart of the chiller after the temperature reaches above 40°F.
(Fault=1 & Normal=0)

LCHW SYS SENSOR FAIL – The sensor for the system LCHW has either opened or shorted. This fault requires resetting at the pCO^2 Master Controller. **(Fault=1 & Normal=0)**

ECHW SYS SENSOR FAIL – The sensor of the system ECHW has either opened or shorted. This fault requires resetting at the pCO^2 Master Controller. **(Fault=1 & Normal=0)**

MODULE FAULTS DEFINITIONS

HP - High Pressure Cutout. This fault can occur when the high pressure transducer reaches its cutout. The HP switch on the module could also be tripped. It requires resetting at both the HP switch and the pCO^2 Master Controller to resume operation after pressure has gone below 300 psig.

HP SENSOR FAIL – The HP transducer has either opened or shorted. This fault requires resetting at the pCO^2 Master Controller.

LP - Low Pressure Cutout. This fault occurs when the low pressure goes below 15 psig. This fault requires resetting at the pCO^2 Master Controller to resume operation after pressure has reached above 30 psig.

LP SENSOR FAIL – The LP transducer has either opened or shorted. This fault requires resetting at the pCO^2 Master Controller.

LP DELAY – Low Pressure Delay. This fault occurs when the low side pressure drops below 25 psig disabling the compressors in that module for 5 minutes. It automatically resets after the 5 minutes, if the pressure is above 30 psig.

CIRCUIT FAULT - This fault occurs if the compressor contactor is not operating normally. It requires resetting at the pCO^2 Master Controller to resume normal operation.

LOSUC - Low Suction Temperature. If during operation this temperature should drop to 25 °F, the compressor will shut down. The temperature must rise back up to 30 °F before the fault can be reset at the pCO^2 Master Controller.

SUCT SENSOR FAIL – The sensor for the suction has either opened or shorted. This fault requires resetting at the pCO^2 Master Controller.

LOCHW - Low leaving chill water temperature faults below 36°F. This requires the fault to be reset at the pCO^2 Master Controller and a restart of the chiller after the temperature reaches above 40°F.

LCHW SENSOR FAIL – The sensor for the LCHW has either opened or shorted. This fault requires resetting at the pCO^2 Master Controller.

COMMUN-Communication Error between the module and the pCO^2 Master Controller.

AUTO MODE – The position of the Manual/Off/Auto Switch is in the *Auto* position. This means that the compressors are being staged on and off by the pCO^2 Master Controller and based on the ECHW temperature in the system. The value will only be 0 if the module is in Auto Mode and there are no other faults.

MANUAL MODE – The position of the Manual/Off/Auto switch is in the *Manual* position. This means that the compressors are being staged by the board in that module and is based on the LCHW temperature of that module.

DISABLED – The position of the Manual/Off/Auto switch is in the *OFF* position. This disables that module and the compressors in that module are not available to run.

NOTE: Module fault information for individual compressor circuits are sent to Modbus devices in the form of an analog number. The **Object Name** is labeled **M(x) FAULT** where (x) is the module number in the system. The following table lists the values that could occur in the M(x) FAULT variable.

M(x) FAULT – This table is to decode the fault number in the modules.

VALUE	FAULT CODE
0	Auto Mode – No Faults
1	High Pressure Fault
2	Low Pressure Fault
3	Circuit Fault C1
4	Circuit Fault C2
5	Low Suction Temp
6	Suction Sensor Fail
7	LCHW Sensor Fail
8	Low LCHW Temp Fault
9	Low Pressure Delay
10	Manual Mode
11	Disabled
12	HP Sensor Fail
13	LP Sensor Fail

Multistack Modbus Points List for ASP Chillers with VFD's

VARIABLE NAME	DESCRIPTION	NOTES	REGISTER TYPE	REGISTER ADDRESS
Analog Read Points				
SYS_ECHW	System ECHW Temperature	Divide by 10	AI	40002
SYS_LCHW	System LCHW Temperature	Divide by 10	AI	40003
CHW_OFFSET	Chilled Water Offset	Divide by 10	AI	40004
UPSETPT_SV	Upper Setpoint	Divide by 10	AI	40005
LOWSETPT_SV	Lower Setpoint	Divide by 10	AI	40006
MAN_SETPT_SV	Manual Setpoint	Divide by 10	AI	40007
MAN_RANGE_SV	Manual Range	Divide by 10	AI	40008
MAN_OFFSET_SV	Manual Offset	Divide by 10	AI	40009
M1_LCHW	Module 1 LCHW Temp	Divide by 10	AI	40010
M1_SUCT	Module 1 Suction Temp	Divide by 10	AI	40011
M1_VFD	Module 1 VFD Percent	0-100% (Divide by 10)	AI	40012
M2_LCHW	Module 2 LCHW Temp	Divide by 10	AI	40013
M2_SUCT	Module 2 Suction Temp	Divide by 10	AI	40014
M2_VFD	Module 2 VFD Percent	0-100% (Divide by 10)	AI	40015
M3_LCHW	Module 3 LCHW Temp	Divide by 10	AI	40016
M3_SUCT	Module 3 Suction Temp	Divide by 10	AI	40017
M3_VFD	Module 3 VFD Percent	0-100% (Divide by 10)	AI	40018
M4_LCHW	Module 4 LCHW Temp	Divide by 10	AI	40019
M4_SUCT	Module 4 Suction Temp	Divide by 10	AI	40020
M4_VFD	Module 4 VFD Percent	0-100% (Divide by 10)	AI	40021
M5_LCHW	Module 5 LCHW Temp	Divide by 10	AI	40022
M5_SUCT	Module 5 Suction Temp	Divide by 10	AI	40023
M5_VFD	Module 5 VFD Percent	0-100% (Divide by 10)	AI	40024
M6_LCHW	Module 6 LCHW Temp	Divide by 10	AI	40025
M6_SUCT	Module 6 Suction Temp	Divide by 10	AI	40026
M6_VFD	Module 6 VFD Percent	0-100% (Divide by 10)	AI	40027
M7_LCHW	Module 7 LCHW Temp	Divide by 10	AI	40028
M7_SUCT	Module 7 Suction Temp	Divide by 10	AI	40029
M7_VFD	Module 7 VFD Percent	0-100% (Divide by 10)	AI	40030
M8_LCHW	Module 8 LCHW Temp	Divide by 10	AI	40031
M8_SUCT	Module 8 Suction Temp	Divide by 10	AI	40032
M8_VFD	Module 8 VFD Percent	0-100% (Divide by 10)	AI	40033
M9_LCHW	Module 9 LCHW Temp	Divide by 10	AI	40034
M9_SUCT	Module 9 Suction Temp	Divide by 10	AI	40035
M9_VFD	Module 9 VFD Percent	0-100% (Divide by 10)	AI	40036
M10_LCHW	Module 10 LCHW Temp	Divide by 10	AI	40037
M10_SUCT	Module 10 Suction Temp	Divide by 10	AI	40038
M10_VFD	Module 10 VFD Percent	0-100% (Divide by 10)	AI	40039
M11_LCHW	Module 11 LCHW Temp	Divide by 10	AI	40040
M11_SUCT	Module 11 Suction Temp	Divide by 10	AI	40041
M11_VFD	Module 11 VFD Percent	0-100% (Divide by 10)	AI	40042
M12_LCHW	Module 12 LCHW Temp	Divide by 10	AI	40043
M12_SUCT	Module 12 Suction Temp	Divide by 10	AI	40044
M12_VFD	Module 12 VFD Percent	0-100% (Divide by 10)	AI	40045

Multistack Modbus Points List for ASP Chillers with VFD's

VARIABLE NAME	DESCRIPTION	NOTES	REGISTER TYPE	REGISTER ADDRESS
M13_LCHW	Module 13 LCHW Temp	Divide by 10	AI	40046
M13_SUCT	Module 13 Suction Temp	Divide by 10	AI	40047
M13_VFD	Module 13 VFD Percent	0-100% (Divide by 10)	AI	40048
M14_LCHW	Module 14 LCHW Temp	Divide by 10	AI	40049
M14_SUCT	Module 14 Suction Temp	Divide by 10	AI	40050
M14_VFD	Module 14 VFD Percent	0-100% (Divide by 10)	AI	40051
Integer Read Points				
CAPACITY	Capacity		AI	40130
DEMAND	Demand		AI	40131
TDIFF_COUNT	TDiff Countdown		AI	40132
SYS_COUNT	System Countdown		AI	40133
NUM_FAULTS	Number of Faults		AI	40134
LEAD_COMP	Lead Compressor		AI	40135
LOAD_LMT	Load Limit		AI	40136
VSP_SV	VSP Setpoint SV		AI	40137
LOAD_LMT_SV	Load Limit SV		AI	40138
TDIFF_SV	TDIFF SV		AI	40139
FAIL_IND_SV	Fail Indicator SV		AI	40140
LEAD_COMP_SV	Lead Compressor SV		AI	40141
NUM_MOD_SV	Number of Modules SV		AI	40142
FAN_SETPT_SV	Fan Setpoint SV		AI	40143
FAN_OFFSET_SV	Fan Offset SV		AI	40144
HP_CUTOUT_SV	HP Cutout SV		AI	40145
HOUR	Hour	TIME	AI	40146
MINUTE	Minute	TIME	AI	40147
MONTH	Month	DATE	AI	40148
DAY	Day	DATE	AI	40149
YEAR	Year	DATE	AI	40150
LOAD_PRO_1	0-9% Load Profile		AI	40151
LOAD_PRO_2	10-19% Load Profile		AI	40152
LOAD_PRO_3	20-29% Load Profile		AI	40153
LOAD_PRO_4	30-39% Load Profile		AI	40154
LOAD_PRO_5	40-49% Load Profile		AI	40155
LOAD_PRO_6	50-59% Load Profile		AI	40156
LOAD_PRO_7	60-69% Load Profile		AI	40157
LOAD_PRO_8	70-79% Load Profile		AI	40158
LOAD_PRO_9	80-89% Load Profile		AI	40159
LOAD_PRO_10	90-100% Load Profile		AI	40160
TOTAL_HRS	Total Load Profile Hours		AI	40161
M1_FAULT	Module 1 Fault	0-13 See Fault Table pg 6	AI	40162
M1-1_RUN_HRS	Module 1 Comp 1 Run Hours		AI	40163
M1-2_RUN_HRS	Module 1 Comp 2 Run Hours		AI	40164
M1_HP	Module 1 High Pressure		AI	40165
M1_LP	Module 1 Low Pressure		AI	40166
M1_CTRL_MODE	Module 1 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40167
M2_FAULT	Module 2 Fault	0-13 See Fault Table pg 6	AI	40168
M2-1_RUN_HRS	Module 2 Comp 1 Run Hours		AI	40169
M2-2_RUN_HRS	Module 2 Comp 2 Run Hours		AI	40170

Multistack Modbus Points List for ASP Chillers with VFD's

VARIABLE NAME	DESCRIPTION	NOTES	REGISTER TYPE	REGISTER ADDRESS
M2_HP	Module 2 High Pressure		AI	40171
M2_LP	Module 2 Low Pressure		AI	40172
M2_CTRL_MODE	Module 2 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40173
M3_FAULT	Module 3 Fault	0-13 See Fault Table pg 6	AI	40174
M3-1_RUN_HRS	Module 3 Comp 1 Run Hours		AI	40175
M3-2_RUN_HRS	Module 3 Comp 2 Run Hours		AI	40176
M3_HP	Module 3 High Pressure		AI	40177
M3_LP	Module 3 Low Pressure		AI	40178
M3_CTRL_MODE	Module 3 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40179
M4_FAULT	Module 4 Fault	0-13 See Fault Table pg 6	AI	40180
M4-1_RUN_HRS	Module 4 Comp 1 Run Hours		AI	40181
M4-2_RUN_HRS	Module 4 Comp 2 Run Hours		AI	40182
M4_HP	Module 4 High Pressure		AI	40183
M4_LP	Module 4 Low Pressure		AI	40184
M4_CTRL_MODE	Module 4 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40185
M5_FAULT	Module 5 Fault	0-13 See Fault Table pg 6	AI	40186
M5-1_RUN_HRS	Module 5 Comp 1 Run Hours		AI	40187
M5-2_RUN_HRS	Module 5 Comp 2 Run Hours		AI	40188
M5_HP	Module 5 High Pressure		AI	40189
M5_LP	Module 5 Low Pressure		AI	40190
M5_CTRL_MODE	Module 5 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40191
M6_FAULT	Module 6 Fault	0-13 See Fault Table pg 6	AI	40192
M6-1_RUN_HRS	Module 6 Comp 1 Run Hours		AI	40193
M6-2_RUN_HRS	Module 6 Comp 2 Run Hours		AI	40194
M6_HP	Module 6 High Pressure		AI	40195
M6_LP	Module 6 Low Pressure		AI	40196
M6_CTRL_MODE	Module 6 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40197
M7_FAULT	Module 7 Fault	0-13 See Fault Table pg 6	AI	40198
M7-1_RUN_HRS	Module 7 Comp 1 Run Hours		AI	40199
M7-2_RUN_HRS	Module 7 Comp 2 Run Hours		AI	40200
M7_HP	Module 7 High Pressure		AI	40201
M7_LP	Module 7 Low Pressure		AI	40202
M7_CTRL_MODE	Module 7 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40203
M8_FAULT	Module 8 Fault	0-13 See Fault Table pg 6	AI	40204
M8-1_RUN_HRS	Module 8 Comp 1 Run Hours		AI	40205
M8-2_RUN_HRS	Module 8 Comp 2 Run Hours		AI	40206
M8_HP	Module 8 High Pressure		AI	40207
M8_LP	Module 8 Low Pressure		AI	40208
M8_CTRL_MODE	Module 8 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40209
M9_FAULT	Module 9 Fault	0-13 See Fault Table pg 6	AI	40210
M9-1_RUN_HRS	Module 9 Comp 1 Run Hours		AI	40211
M9-2_RUN_HRS	Module 9 Comp 2 Run Hours		AI	40212
M9_HP	Module 9 High Pressure		AI	40213
M9_LP	Module 9 Low Pressure		AI	40214
M9_CTRL_MODE	Module 9 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40215
M10_FAULT	Module 10 Fault	0-13 See Fault Table pg 6	AI	40216
M10-1_RUN_HRS	Module 10 Comp 1 Run Hours		AI	40217
M10-2_RUN_HRS	Module 10 Comp 2 Run Hours		AI	40218

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VARIABLE NAME	DESCRIPTION	NOTES	REGISTER TYPE	REGISTER ADDRESS
M10_HP	Module 10 High Pressure		AI	40219
M10_LP	Module 10 Low Pressure		AI	40220
M10_CTRL_MODE	Module 10 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40221
M11_FAULT	Module 11 Fault	0-13 See Fault Table pg 6	AI	40222
M11-1_RUN_HRS	Module 11 Comp 1 Run Hours		AI	40223
M11-2_RUN_HRS	Module 11 Comp 2 Run Hours		AI	40224
M11_HP	Module 11 High Pressure		AI	40225
M11_LP	Module 11 Low Pressure		AI	40226
M11_CTRL_MODE	Module 11 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40227
M12_FAULT	Module 12 Fault	0-13 See Fault Table pg 6	AI	40228
M12-1_RUN_HRS	Module 12 Comp 1 Run Hours		AI	40229
M12-2_RUN_HRS	Module 12 Comp 2 Run Hours		AI	40230
M12_HP	Module 12 High Pressure		AI	40231
M12_LP	Module 12 Low Pressure		AI	40232
M12_CTRL_MODE	Module 12 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40233
M13_FAULT	Module 13 Fault	0-13 See Fault Table pg 6	AI	40234
M13-1_RUN_HRS	Module 13 Comp 1 Run Hours		AI	40235
M13-2_RUN_HRS	Module 13 Comp 2 Run Hours		AI	40236
M13_HP	Module 13 High Pressure		AI	40237
M13_LP	Module 13 Low Pressure		AI	40238
M13_CTRL_MODE	Module 13 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40239
M14_FAULT	Module 14 Fault	0-13 See Fault Table pg 6	AI	40240
M14-1_RUN_HRS	Module 14 Comp 1 Run Hours		AI	40241
M14-2_RUN_HRS	Module 14 Comp 2 Run Hours		AI	40242
M14_HP	Module 14 High Pressure		AI	40243
M14_LP	Module 14 Low Pressure		AI	40244
M14_CTRL_MODE	Module 14 Control Mode	Auto=1, Manual=2, Disabled=3	AI	40245
Digital Read Points				
ON/OFF_STAT	Chiller On/Off Status	Chiller ON=1 & Chiller OFF= 0	DI	10002
CHW_FLOW	Chilled Water Flow Input	Fault=1 & Normal=0	DI	10003
PWR_PH	Power Phase Monitor Input	Fault=1 & Normal=0	DI	10004
REM_STOP	Remote Start/Stop Input	Stopped=1 & Start=0	DI	10005
EX1_FLT	EX1 Input	Fault=1 & Normal=0	DI	10006
SYS_LCHW_TEMP	System Low LCHW Temp	Fault=1 & Normal=0	DI	10007
SYS_LCHW_SEN	System LCHW Sensor Failure	Fault=1 & Normal=0	DI	10008
SYS_ECHW_SEN	System ECHW Sensor Failure	Fault=1 & Normal=0	DI	10009
GLB_ALARM	Global Alarm	Fault=1 & Normal=0	DI	10010
ON/OFF_CTRL	Chiller On/Off Control	Chiller ON=1 & Chiller OFF= 0	DI	10011
SEQ_SV	Sequencing SV	Odd/Even=1 & Standard=0	DI	10012
INDEX_SV	Indexing SV	Indexing=1 & Non-Indexing=0	DI	10013
CST_RESET_ACT	Customer Reset Active	Active=1 & Inactive=0	DI	10014
LL_RESET_ACT	Load Limit Reset Active	Active=1 & Inactive=0	DI	10015
CHW_RESET_ACT	Chilled Water Reset Active	Active=1 & Inactive=0	DI	10016
SYS_VAR_LOCK	System Variables Locked	LOCKED=1 & UNLOCKED=0	DI	10017
FAHR_CELC	Fahrenheit/Celsius Readings	°C=1 & °F=0	DI	10018
M1-1_RUN_STAT	Module 1 Comp 1 Run Status	ON=1 & OFF=0	DI	10019
M1-2_RUN_STAT	Module 1 Comp 2 Run Status	ON=1 & OFF=0	DI	10020
M1_COMM_ERR	Module 1 Communication Error	Fault=1 & Normal=0	DI	10021

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VARIABLE NAME	DESCRIPTION	NOTES	REGISTER TYPE	REGISTER ADDRESS
M1_FAN_STATUS	Module 1 Fan Status	ON=1 & OFF=0	DI	10022
M2-1_RUN_STAT	Module 2 Comp 1 Run Status	ON=1 & OFF=0	DI	10023
M2-2_RUN_STAT	Module 2 Comp 2 Run Status	ON=1 & OFF=0	DI	10024
M2_COMM_ERR	Module 2 Communication Error	Fault=1 & Normal=0	DI	10025
M2_FAN_STATUS	Module 2 Fan Status	ON=1 & OFF=0	DI	10026
M3-1_RUN_STAT	Module 3 Comp 1 Run Status	ON=1 & OFF=0	DI	10027
M3-2_RUN_STAT	Module 3 Comp 2 Run Status	ON=1 & OFF=0	DI	10028
M3_COMM_ERR	Module 3 Communication Error	Fault=1 & Normal=0	DI	10029
M3_FAN_STATUS	Module 3 Fan Status	ON=1 & OFF=0	DI	10030
M4-1_RUN_STAT	Module 4 Comp 1 Run Status	ON=1 & OFF=0	DI	10031
M4-2_RUN_STAT	Module 4 Comp 2 Run Status	ON=1 & OFF=0	DI	10032
M4_COMM_ERR	Module 4 Communication Error	Fault=1 & Normal=0	DI	10033
M4_FAN_STATUS	Module 4 Fan Status	ON=1 & OFF=0	DI	10034
M5-1_RUN_STAT	Module 5 Comp 1 Run Status	ON=1 & OFF=0	DI	10035
M5-2_RUN_STAT	Module 5 Comp 2 Run Status	ON=1 & OFF=0	DI	10036
M5_COMM_ERR	Module 5 Communication Error	Fault=1 & Normal=0	DI	10037
M5_FAN_STATUS	Module 5 Fan Status	ON=1 & OFF=0	DI	10038
M6-1_RUN_STAT	Module 6 Comp 1 Run Status	ON=1 & OFF=0	DI	10039
M6-2_RUN_STAT	Module 6 Comp 2 Run Status	ON=1 & OFF=0	DI	10040
M6_COMM_ERR	Module 6 Communication Error	Fault=1 & Normal=0	DI	10041
M6_FAN_STATUS	Module 6 Fan Status	ON=1 & OFF=0	DI	10042
M7-1_RUN_STAT	Module 7 Comp 1 Run Status	ON=1 & OFF=0	DI	10043
M7-2_RUN_STAT	Module 7 Comp 2 Run Status	ON=1 & OFF=0	DI	10044
M7_COMM_ERR	Module 7 Communication Error	Fault=1 & Normal=0	DI	10045
M7_FAN_STATUS	Module 7 Fan Status	ON=1 & OFF=0	DI	10046
M8-1_RUN_STAT	Module 8 Comp 1 Run Status	ON=1 & OFF=0	DI	10047
M8-2_RUN_STAT	Module 8 Comp 2 Run Status	ON=1 & OFF=0	DI	10048
M8_COMM_ERR	Module 8 Communication Error	Fault=1 & Normal=0	DI	10049
M8_FAN_STATUS	Module 8 Fan Status	ON=1 & OFF=0	DI	10050
M9-1_RUN_STAT	Module 9 Comp 1 Run Status	ON=1 & OFF=0	DI	10051
M9-2_RUN_STAT	Module 9 Comp 2 Run Status	ON=1 & OFF=0	DI	10052
M9_COMM_ERR	Module 9 Communication Error	Fault=1 & Normal=0	DI	10053
M9_FAN_STATUS	Module 9 Fan Status	ON=1 & OFF=0	DI	10054
M10-1_RUN_STAT	Module 10 Comp 1 Run Status	ON=1 & OFF=0	DI	10055
M10-2_RUN_STAT	Module 10 Comp 2 Run Status	ON=1 & OFF=0	DI	10056
M10_COMM_ERR	Module 10 Communication Error	Fault=1 & Normal=0	DI	10057
M10_FAN_STATUS	Module 10 Fan Status	ON=1 & OFF=0	DI	10058
M11-1_RUN_STAT	Module 11 Comp 1 Run Status	ON=1 & OFF=0	DI	10059
M11-2_RUN_STAT	Module 11 Comp 2 Run Status	ON=1 & OFF=0	DI	10060
M11_COMM_ERR	Module 11 Communication Error	Fault=1 & Normal=0	DI	10061
M11_FAN_STATUS	Module 11 Fan Status	ON=1 & OFF=0	DI	10062
M12-1_RUN_STAT	Module 12 Comp 1 Run Status	ON=1 & OFF=0	DI	10063
M12-2_RUN_STAT	Module 12 Comp 2 Run Status	ON=1 & OFF=0	DI	10064
M12_COMM_ERR	Module 12 Communication Error	Fault=1 & Normal=0	DI	10065
M12_FAN_STATUS	Module 12 Fan Status	ON=1 & OFF=0	DI	10066
M13-1_RUN_STAT	Module 13 Comp 1 Run Status	ON=1 & OFF=0	DI	10067
M13-2_RUN_STAT	Module 13 Comp 2 Run Status	ON=1 & OFF=0	DI	10068
M13_COMM_ERR	Module 13 Communication Error	Fault=1 & Normal=0	DI	10069

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VARIABLE NAME	DESCRIPTION	NOTES	REGISTER TYPE	REGISTER ADDRESS
M13_FAN_STATUS	Module 13 Fan Status	ON=1 & OFF=0	DI	10070
M14-1_RUN_STAT	Module 14 Comp 1 Run Status	ON=1 & OFF=0	DI	10071
M14-2_RUN_STAT	Module 14 Comp 2 Run Status	ON=1 & OFF=0	DI	10072
M14_COMM_ERR	Module 14 Communication Error	Fault=1 & Normal=0	DI	10073
M14_FAN_STATUS	Module 14 Fan Status	ON=1 & OFF=0	DI	10074
Analog Write Points				
UPSETPT_SV	Upper Setpoint	45-80°F (Multiply by 10)	AO	40005
LOWSETPT_SV	Lower Setpoint	40-70°F (Multiply by 10)	AO	40006
MAN_SETPT_SV	Manual Setpoint	40-70°F (Multiply by 10)	AO	40007
MAN_RANGE_SV	Manual Range	2-20°F (Multiply by 10)	AO	40008
MAN_OFFSET_SV	Manual Offset	0-5°F (Multiply by 10)	AO	40009
Integer Write Points				
VSP_SV	VSP Setpoint SV	0-80%	AO	40137
LOAD_LMT_SV	Load Limit SV	0-100%	AO	40138
TDIFF_SV	TDIFF SV	15-200 sec	AO	40139
FAIL_IND_SV	Fail Indicator SV	0-90%	AO	40140
FAN_SETPT_SV	Fan Setpoint SV	170-350 psig	AO	40143
FAN_OFFSET_SV	Fan Offset SV	20-60 psig	AO	40144
HP_CUTOUT_SV	HP Cutout SV	300-425 psig	AO	40145
Digital Write Points				
ON/OFF_CTRL	Chiller On/Off Control	Chiller ON=1 & Chiller OFF= 0	DO	11
SEQ_SV	Sequencing SV	Odd/Even=1 & Standard=0	DO	12
INDEX_SV	Indexing SV	ON=1 & OFF=0	DO	13