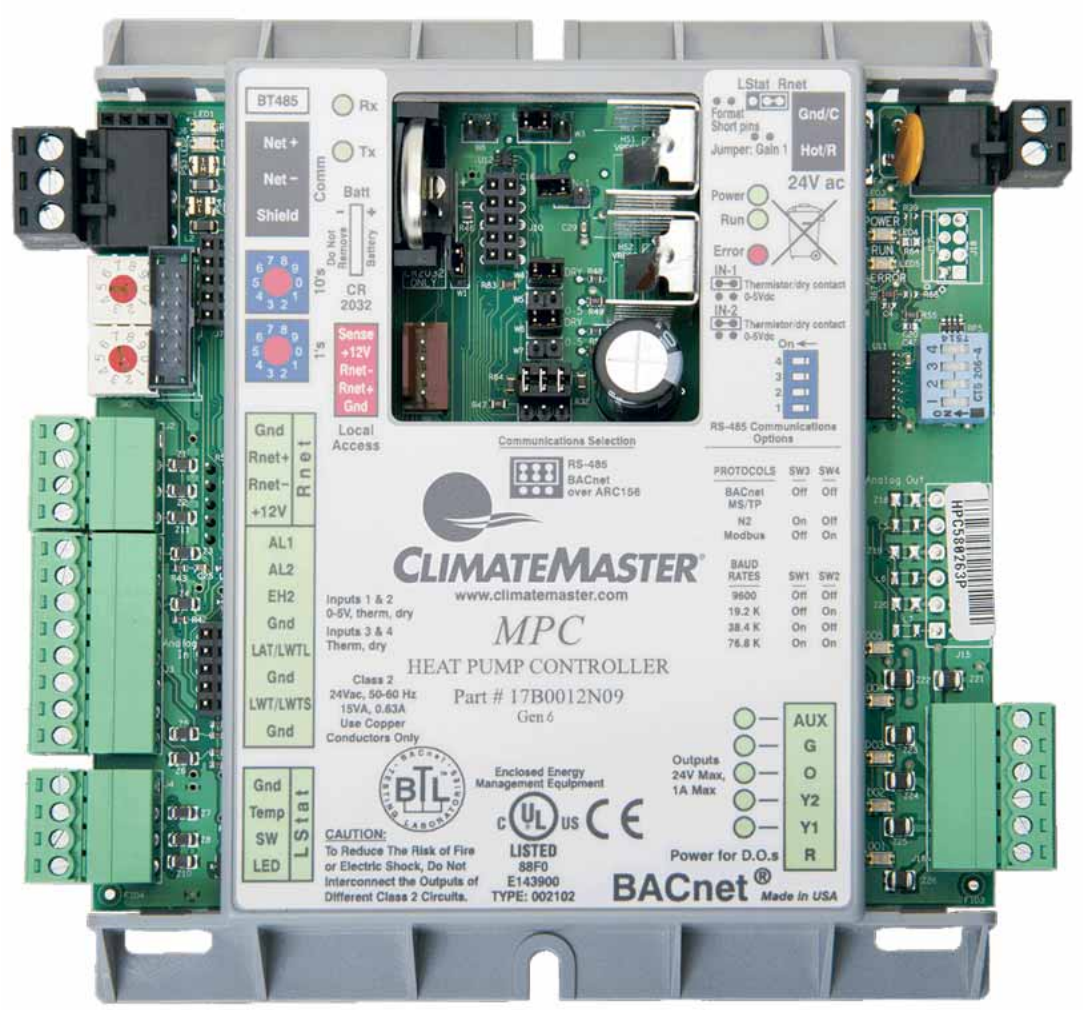

MPC MULTIPROTOCOL DDC CONTROLS

Application, Operation & Maintenance

97B0031N01

Revised: March 7, 2017

MPC MultiProtoCol DDC Controls

Revised: March 7, 2017

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MPC Controller Overview

The MultiProtoCol (MPC) Heat Pump controller is a dual purpose controller: it contains the logic to perform as an advanced customizable thermostat when combined with a wall sensor and is designed to allow the integration of water source heat pump equipment into DDC systems. The MPC Controller has the ability to communicate through a choice of four widely used protocols: BACnet MS/TP, Johnson Controls N2, and Modbus and LonWorks. The protocol of choice for the particular system is selected by simply configuring DIP switches on the MPC Controller with the exception of LonWorks. The LonWorks option requires an additional Lon option card (LOC). This flexibility allows one controller, the MPC, to be used in a multitude of buildings which use any of these four common protocols.

The MPC serves as a node of information processing between the heat pump and the DDC network. The MPC commands the heat pump to heat and cool based upon sensor inputs. The MPC then monitors operation of the heat pump and communicates the operating parameters to the DDC network. The MPC will always work in conjunction with a CXM, DXM or DXM2 controller, which also resides in the heat pump control box. The MPC has factory pre-loaded application software which allows optimal control of the heat pump equipment. The MPC can run in stand-alone operation as well as with the DDC network. Therefore, when the heat pump arrives at the jobsite with the factory installed MPC Controller, the heat pump is ready to run stand-alone and then can be connected to the DDC network at any time.

Features & Benefits

System Controls: In conjunction with the wall sensors, the MPC offers features such as:

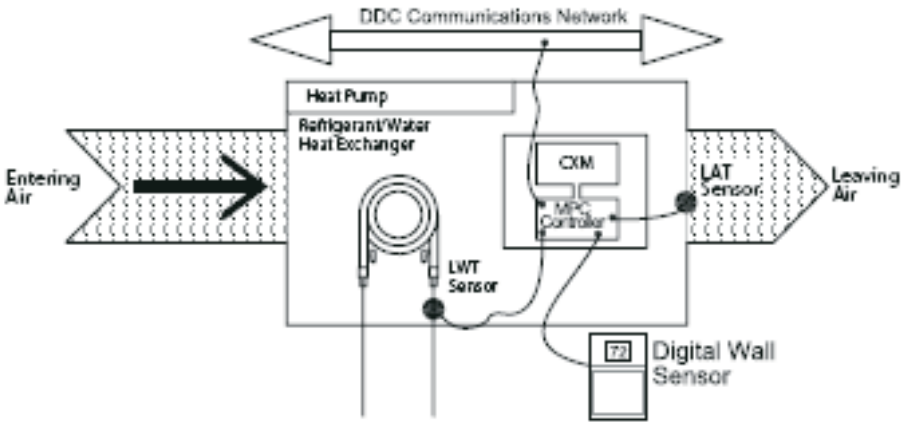
- Room temperature sensing
- Local setpoint adjustment
- Local override into Occupied Mode
- LED for alarm status
- LED for fault status type
- Heat pump reset at the wall sensor
- Digital room temperature display
- Information from the wall sensors can then be reported to the DDC network system.
- Has the ability to add various sensors such as occupancy sensors.

Communications: Multi-Protocol communications provides DDC system flexibility.

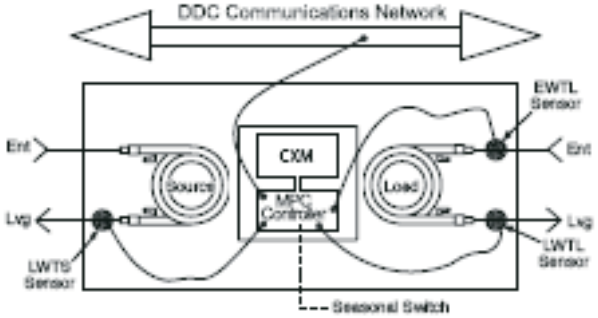
- Supports native BACnet MS/TP communications (the ASHRAE standard protocol for interoperability).
- Supports Johnson Controls N2 communications (for integration into Johnson Controls Metasys
- DDC systems).
- Supports Modbus communications for integration into Modbus DDC networks.
- Supports LonWorks communications. Requires LOC daughter card (PN-17B0012N08
- Four baud rate levels offer flexible communications speeds of 9600, 19.2k, 38.4k, or 76.8k baud.
- High speed 16-bit Hitachi Processor with 1024 kBytes RAM and 4096 kBytes Flash Memory which allows, if needed, MPC programs to be upgraded and easily downloaded in the field.
- Removable field wiring connectors for ease of field service.
- Engineered for quality and reliability
- Enables building operators to easily upgrade firmware in the future.

Figure 1: Typical System

Water-to-Air Heat Pump



Water-to-Water Heat Pump



Power:	24VAC ± 10%, 50 or 60Hz, 15VA max. power consumption.
Size:	5-1/16" [129mm] width x 5-11/16" [144mm] height x 1-1/2" [38mm] (minimum panel depth).
Housing:	Rugged GE C2905HG Cycoloy plastic housing (complies with UL 94 V-O).
Environmental:	0-130°F (-17.8 to 54.4 °C), 10% to 95% non-condensing.
Protection:	Surge & transient protection circuitry for the power and I/O. Optical isolation for communications port.
Processor/Memory:	High speed 16-bit Hitachi Processor with 1024kB RAM and 4096kB Flash Memory.
LED Indicators:	Individual LEDs for digital outputs, power, run, error, transmit, and receive.
Compliance:	UL916; FCC Part 15, Subpart B, Class A; ICES, Class A; EN55022, Class A; IEC61000-6-1; RoHS complaint, WEEE Complaint; BTL listed
I/O Point Count:	5 digital outputs (on-board relays rated for 1A resistive at 24VAC). 6 universal inputs (IN-1 and IN-2 are jumper selectable for dry contact or 0-5VDC). 1 analog wall sensor port for non-communicating (Lstat) wall sensors. 1 digital wall sensor port for communicating (Rnet) wall sensors.
Communications:	EIA-485 communications port using twisted pair. A two position DIP switch allows for manual selection of desired protocol. Available protocols are BACnet MS/TP, Johnson Controls N2, Modbus and LonWorks (requires Loc daughter card. Another 2 position DIP switch allows for manual selection of desired baud rate. Available baud rates are 9600, 19.2k, 38.4k, and 76.8k.
Addressing:	2 rotary switches are provided for setting the individual controller's primary network address (for more information on network addressing, see Addressing & Power Up).
Wall Sensor:	The wall sensors provide room temperature sensing with digital display, local setpoint adjust, local override, LED for alarm status and fault type indication, and heat pump reset. The wall sensors require a 4 wire connection for communication or 5 wire connection for non-communicating.
Mounting Hole Dimensions:	Two mounting holes center line as below with 5-9/16 " [141mm] height spacing. Factory mounted.

MPC MultiProtoCol DDC Controls

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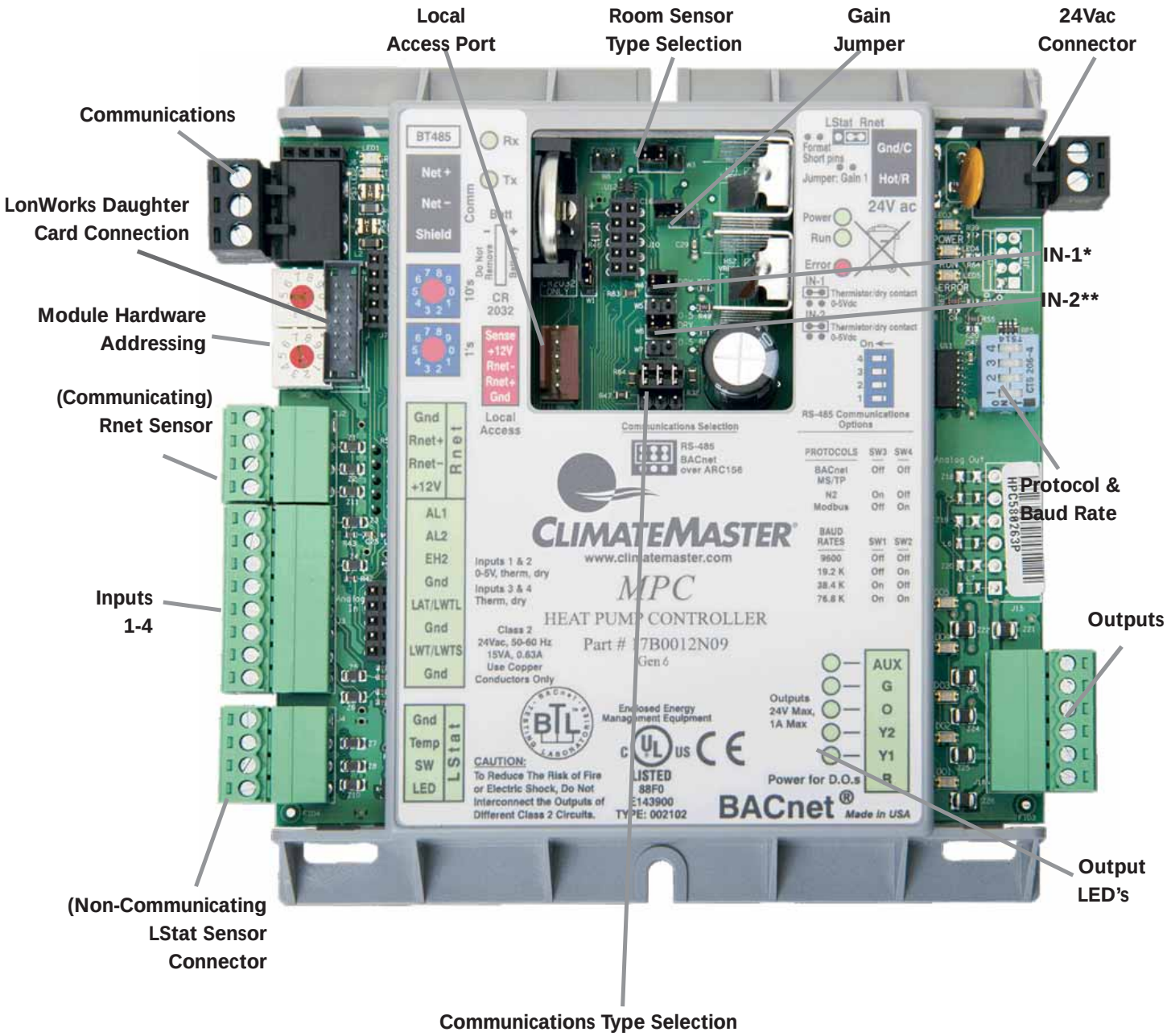


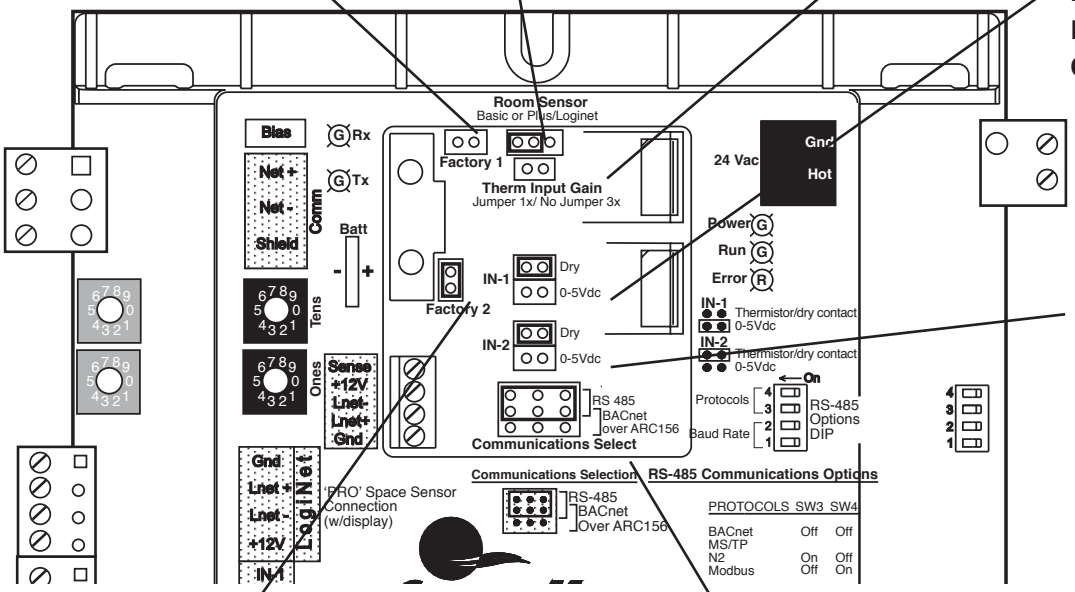
Physical Dimension: 5.88" (149.4mm) x 5.66" (143.8mm)

Selects 1x (jumpered) or 3x (no jumper) gain for "Therm" Input. Default = 3x (no jumper)

Factory Use Only - 1
Default = no jumper

Selects "LSTAT Sensor Connection" or "RNET" port as the active port for room sensor.
Default = LSTAT

Selects "Thermistor/Dry contact or "0 to 5Vdc" input for IN-1
Default = "Thermistor/Dry Contact"



Selects "Thermistor/Dry contact or "0 to 5Vdc" input for IN-2
Default = "Thermistor/ Dry Contact"

Factory Use Only - 2
Default = jumpered

Selects "RS-485 MS/TP" or "ARC156"
Default = "RS-485 MS/TP"

Communications Selection
When the Communications Selection Jumper is in the "BACnet over ARC156" position, DIP switch selectors SW1, SW2, SW3, and SW4 are all disabled. When the Communications Selection Jumper is in the "BACnet over ARC156" position, BACnet protocol is selected and the baud rate is also selected to be 156 kbps. In this scenario, when the comm. port is configured for "BACnet over ARC156" communications, use an A3ARC156 wire available from:

When the comm. port is configured for RS-485 communications, use standard dedicated 22AWG-18AWG twisted pair wire.

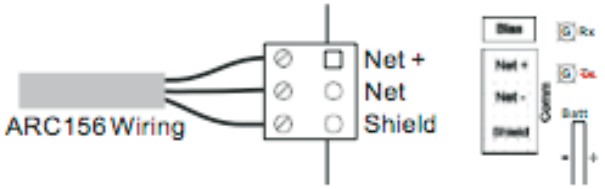
For complete details on wiring, termination, and ng for BACnet MS/TP, refer to ANSI/ASHRAE 135-1995, clause 9.2.2. Refer to the Application Note for the BACnet devices that you will be interfacing with for specific wiring.

Communications Wiring Instructions
1. Be sure the module's power is off before wiring it to the ARC156 or RS-485 communications bus.
2. Check the network communication wiring for shorts and grounds.
3. Connect the ARC156 or RS-485 wires and shield to the module's screw terminals as shown in Figure 9. Be sure to follow the same polarity as the rest of the ARC156 or RS-485 communications network.
4. Power up the module.
5. Proper communications for all protocols and baud rates can be verified by making sure the transmit (Tx) and receive (Rx) LEDs are active.

Protocol Configure
The comm. port on the MPC has MultiProtoCol capability which means the MPC can be configured to communicate via BACnet, Johnson Controls N2, or ModBus communication protocols. This configuration is done via the "Communications Selection" jumper and the 4-position DIP switch package (SW1, SW2, SW3, SW4) located on the MPC. The comm. port's baud rate is also set with this same 4-position DIP switch package. See Figure 9 below.

Note: If using ARC156 wiring, then only BACnet protocol can be used. When using RS-485 wiring, any of the 3 protocols (BACnet, N2, ModBus) can be used.

Figure 9: Wiring the ARC156



BACnet Setup – The MPC can be set up to communicate via "BACnet over ARC156" or "BACnet MS/TP". Refer to Table 2 for setup.

N2 Setup – N2 must be configured for RS-485 communications with a baud rate of 9600, using 8 data bits, no parity, and 1 stop bit. The MPC is always an N2 slave. Refer to Table 2 for setup.

ModBus Setup – ModBus must be configured for RS-485 communications. Baud rate can be selected from 38.4 kbps, 19.2 kbps, or 9.6 kbps. Refer to Table 2 for setup.

Figure 10: Communications Selections

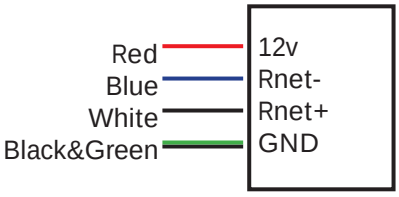
Table 2: Communications Set Up

Desired Set Up	Communications Selection Jumper	RS-485 Communciations Options DIP			
		Baud Rate		Protocol	
		SW1	SW2	SW3	SW4
BACnet Set Up					
BACnet over ARC156 (156kbps baud rate)	BACnet over ARC156	Doesn't Matter		Doesn't Matter	
BACnet MS/TP (76.8 kbps baud rate)	RS-485	On	On	Off	Off
BACnet MS/TP (38.4 kbps baud rate)	RS-485	On	Off	Off	Off
BACnet MS/TP (19.2 kbps baud rate)	RS-485	Off	On	Off	Off
BACnet MS/TP (9.6 kbps baud rate)	RS-485	Off	Off	Off	Off
N2 Set Up					
N2 (9.6 kbps baud rate)	RS-485	Off	Off	On	Off
MODbus Set Up					
MODBus (38.4 kbps baud rate)	RS-485	On	Off	Off	On
MODbus (19.2 kbps baud rate)	RS-485	Off	On	Off	On
MODbus (9.6 kbps baud rate)	RS-485	Off	Off	Off	On

BACview6 Service Tool

BACview6 provides local access to control and operational properties of equipment. The BACview6 simply plugs into an Rnet connection (local access port) and allows you to display and modify Climate Master-defined properties without any computer software. The BACview6 features a numeric keypad, directional keys, and four function keys. A large 4-line by 40-character backlit LCD display is provided for easy reading even in poor lighting conditions. The device also includes an alarm indicator light and audible warning. **ClimateMaster recommends this service tool for sites over 25 units or units with the stand-alone application.**
Part#1: ABACVIEW6
Part#2: ABACVIEW6A (cable)

HOW TO WIRE ABACVIEW to ABACVIEW6A

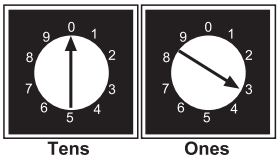


When prompt for password.
ClimateMaster Password: 1111

Addressing & Power Up

Before setting or changing the module's hardware address, make sure the MPC Controller power is off. The MPC only reads the address when the module is turned on. The MPC has two rotary switches for assigning the module's hardware address. One switch corresponds to the "tens" digit and the second switch corresponds to the "ones" digit, allowing for hardware- based addressing of up to address 99. For example, if the module's address is three, set the tens switch to zero and the ones switch to three. The station ID for each MS/TP node must be unique on a MS/TP segment. The MPC's rotary address switches are used to set this unique ID.

Setting Module Address



After setting the address, turn power on to the MPC. The Run, Error, and Power LEDs should turn on. The Run LED should begin to blink and the Error LED should turn off. Use Table 1 to troubleshoot the LEDs.

NOTE: Set address for heat pump #1 (HP-1) at 02 per typical BMS naming conventions. All other heat pump addresses should be assigned as HP# + 1.

Changing the device instance when using a network of more than 99 MPC units

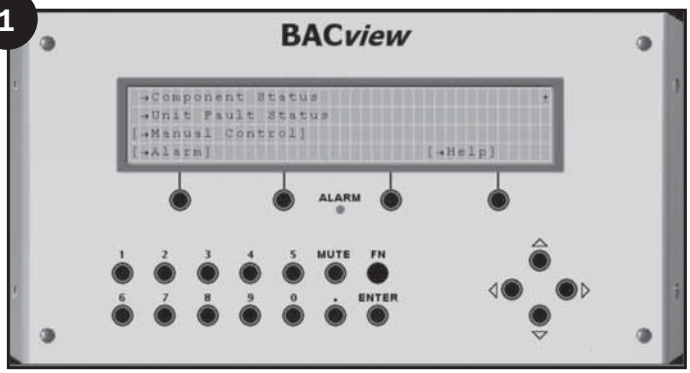
Note – This applies to Gen4 MPC's only. When using Gen3 MPC's, to allow for more than 99 unique addresses, a special request should be made through the Product Management and Applications team.

The Gen 4, 5 and 6 MPC allows the device instance to be changed using the BACview6 service tool. This feature allows an installation with more than 99 MPC-based units to be set and managed on-site rather than factory preset.

In order to change the device instance, the MPC must be powered up. Connect the BACview6 service tool to the MPC using the local access port. When the main screen appears, scroll down to "Manual Control" using the down arrow and press "Enter";

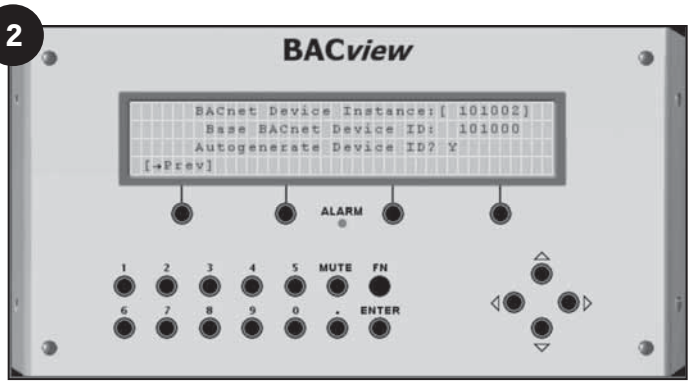
At the "Manual Control" screen, press "Enter" with "Unit Configuration" highlighted and again with "BACnet" highlighted. The following screen should appear;

1

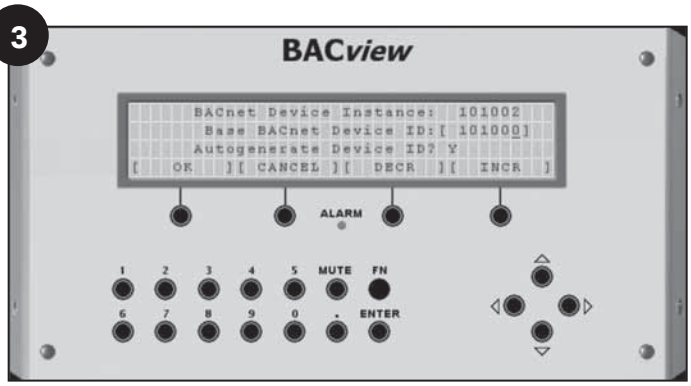


Addressing & Power Up

2



3

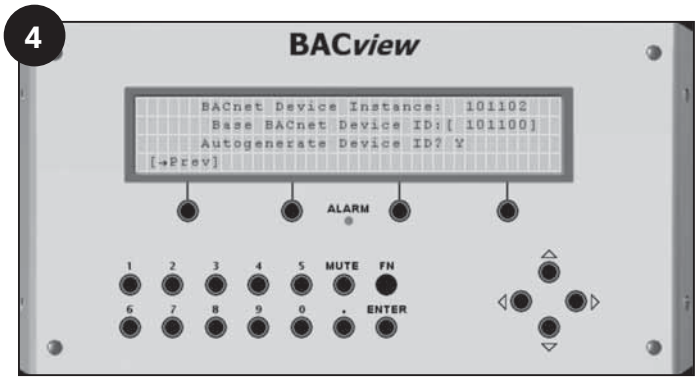


The device instance is typically six digits long. The last two digits correspond to the hardware's module address so these should not be changed using the BACview6

To change the device instance, use the down arrow to highlight the numbers beside "Base BACnet Device ID" and press "Enter". You will be prompted for an Admin Password, the password is 1111. A cursor underlining the final digit of the "Base BACnet Device ID" will appear.

Before change (fourth digit is 0);

4



LED Codes

The MPC Controller has the following LEDs:

Power - indicates when power is on.
Run - blinks when the processor is running.
Error - lights when an error is detected.
Receive (Rx) - lights when the Comm Port receives data.
Transmit (Tx) - lights when the Comm Port transmits data.
Digital Output - lights when the associated digital output turns on.

LED Power-Up Sequence

During power-up, the module goes through an initialization and self test sequence.

Proper module power-up can be verified by observing the LEDs as follows:

1. The Run and Error LEDs turn on and begin blinking.
2. The Error LED then turns off.
3. The Run LED continues blinking.

Note: The Error LED flashes three times in sync with the Run LED when the module is being formatted. The Run LED should never stop flashing. If it stops flashing for 1.5 seconds, the watchdog timer will reset the module.

Overcurrent Protection

The MPC Controller is protected by internal solid state polyswitches (polymeric PTC, resettable overcurrent protection device, also called PPTC) on the incoming power. The overcurrent protection circuitry is a positive temperature coefficient (PTC) thermistor that increases in resistance as it warms up and stays in that mode until the power is removed. Once the power is removed, the polyswitch resistance lowers to operational level as the device cools down. After power has been re-applied, the unit will operate properly if the fault condition has been removed.

It is not necessary to remove power on the communication line in order to reset the solid state overcurrent circuit. Once the power level is low enough, the overcurrent circuit cools down to operating temperature. A blown polyswitch can indicate incorrect wiring if the polyswitch is blown during installation. Generally, a blown polyswitch indicates a power surge was received by the board.

Digital Output LEDs

There are 5 digital outputs on the MPC. One output (AUX) can be custom configured to control an external device (1amp at 24VAC.). G, O, Y2, and Y1 are required to operate the heat pump and are connected to the CXM, DXM or DXM2 board.

Run LED	Error LED	Condition
2 flashes per second	OFF	Normal
2 flashes per second	2 flashes, alternating with Run LED	Five minute auto-restart delay after system error
2 flashes per second	3 flashes then OFF	Module has just been formatted
2 flashes per second	4 flashes then pause	Two or more devices on this network have the same ARC156 network address
2 flashes per second	6 flashes then OFF	Module's response to a LonTalk 'wink' command received from a LonWorks Network Management Tool
2 flashes per second	ON	Exec halted after frequent system errors or GFB's halted
5 flashes per second	ON	Exec start-up aborted, Boot is running
5 flashes per second	OFF	Firmware transfer in progress, Boot is running
7 flashes per second	7 flashes per second, alternating with Run LED	Ten second recovery period after brownout
14 flashes per second	7 flashes per second, alternating with Run LED	Brownout

Room Sensors

The MPC is design to work with specific sensors. Two types of sensors may be used: Lstat (ASW06, ASW07, and ASW08) and RNet (ASW13, ASW14, and ASW15). The RNet connection is at the upper left of the MPC and the LSat is at the lower left. Both are four to five wire sensors. The MPC comes factory set for the Lstat sensor at the room sensor jumper. To utilize the RNet (ASW13, 14, 15) sensors the jumper must be changed to RNet.

The use of the RNet sensor allows for an extra input into the MPC. The ASW13, 14 15 are available with additional internal sensors possibilities including Humidity, CO2 or VOC. When using a unit equipped with Climadry Reheat, a combination temperature and humidity sensor is required. Refer to ASW section.

Additional Inputs

There are four inputs available when either type of sensor is used. Two additional inputs are available when the Rnet sensor is used.

AL1/AL2 and EH2 input terminals can accept 0-5VDC, Thermistor, or dry contact signals. Terminals LAT/LWTL and LWT/LWTS accept thermistor or dry contact signals.

LAT/LWTL and LWT/LWTS come with leaving air and leaving water temperature thermistors installed but can be repurposed. The Lsat terminals can be used for an additional thermistor input (Gnd/Temp) and SW can be used as a dry input contact.

The MPC allows custom programing of the various inputs to accomplish various sequence of operations as the building may require. A common use could be an occupancy sensor which can put units in a standby mode.

Certain options can be added to the MPC programing after installation if controls system upgrades/changes are being considered. Consult factory for applicability. The MPC can be programmed with a 7 day program: the routine is built into the software.

Operation Overview

Fan Operation – Digital output point G (DO4) is the fan output and is connected to the "G" terminal on the CXM, DXM or DXM2 control. If fan Mode is set to "Auto" mode, then the fan is energized only during a call for heating or cooling. "Auto" mode is the default mode of operatio **At 30% PID, the fan(G) energizes in Auto mode.**

Heating/Cooling Changeover – Digital output point O(DO3) is the RV output and is connected to the "O" terminal on the CXM, DXM or DXM2 board. O is energized during call for cooling. **The RV(O) energizes at 40% PID in cooling only.**

Compressor Operation – Digital output points Y1 (DO1) and Y2 (DO2) are the outputs for compressors stage 1 and 2. Y1 is connected to Y terminal on the CXM/ DXM/DXM2 and if the heat pump is dual stage, Y2 is connected to a second CXM Y input or Y2 on the DXM/ DXM2.

Y1 and Y2 are off when the zone temperature is between the heating and cooling set points. As the zone temperature rises above cooling set point, **Y1 is energized at 50% PID and Y2 is energized at 75% and vise versa in heating mode.**

Note: All 5 digital outputs have associated LEDs to indicate operating status. If the digital out is on, then the associated LED will be on.

Occupied/Unoccupied Changeover – When the MPC is in the stand-alone mode of operation, the MPC defaults to the occupied mode of operation. Occupancy changeover may be provided through the communications network.

Troubleshooting Tips – If the BMS is having trouble communicating with the MPC, check the following items before contacting technical support.

- Make sure the MPC wiring is correct. Make sure all color codes match and that no wire strands are shorting over to other terminals.
- Make sure the MPC and other network controllers have power and are turned on. Make sure all equipment have power and LEDs lit with no solid error light. Some devices, especially communication devices, receive power from a source other than
- a power cable or adapter. Some panels can be reinitialized be resetting the panel.
- Verify operation of all LEDS: RX, TX, Power, Run, DOs and error.
- Make sure that all jumpers are set to default and that there is nothing jumped on the format pin.

Sequence of Operation

Water-to-Air Startup Check

1. Unit powered up and starting.
2. Led check: Rx, Tx, Power, Run and no solid red error.
3. Program initializing schedule status for Occupied Mode (default) or Unoccupied Mode to determine set point range. Occupied set points will be defaulte to 74 cooling and 72 Heating. If a schedule is implemented, the unoccupied set points will default to 82 cooling and 62 heating.
4. Program will determine if unit is master or slave. If stand-alone or no BAS connected, it will default to master.
5. The MPC will then check for sensor type: If LSTAT or RNET sensor, make sure that the jumper is jumped to RNET, if Lstat sensor, make sure to jump to Lstat. If no sensor is connected, the MPC will default to 73F.
6. Current zone sensor will check again for set points.
7. Any temperature adjustments at the wall sensor will be taken into account when determining the actual set point range. The temperature adjustment range is +/- 5°F, this value can be changed via Bacview6 or BAS systems
8. Set points are then taken account into a PID algorithm to determine the mode(heating or cooling) and appropriate outputs.
9. The fan will energize at 30% ramp, the RV will energize at 40% ramp, Y1 will energize at 50% ramp and Y2 will energize at 75% and EH (default) will energize at 90%.
10. Software delay of 5 minutes between compressor cycles.
11. There is a built in timer that allows Y1 to be energized for 5 minutes before energizing Y2 if the safety timer within the CXM/DXM/DXM2 has expired.
12. When the zone is satisfied, the PID will decay at a rate of 1% every 2 seconds. Each component will turn off at the respective percentages minus 2.
13. While the unit is on, the program will continue to monitor the CXM/DXM/DXM2 board for faults. If an event of a fault occurs and the unit is in lockout, the relay will close (IN1/GND) and the fault code is transmitted via EH2 output to the IN2 input on the MPC. This is readily avail via BAS network points. A history counter will also keep track of past and present faults which can also be seen via BAS or bacview6.
14. The MPC can also function in metric mode or Celsius mode.

Water-to-Water Startup Check

1. Unit powered up and starting.
2. Led check: Rx, Tx, Power, Run and no solid red error led.
3. Program initializing schedule status for Occupied Mode (default) or Unoccupied Mode to determine set point range. Occupied set points will be defaulted to 60 cooling and 105 heating. If a schedule is implemented, the unoccupied set points will default to 80 cooling and 85 heating.
4. Program will determine if the unit is either a Master or Slave.
5. Program will control the water temperature based on the Entering Water Temperature (EWT) load sensor. This can be changed to control based off of the LWT via BAS or bacview6 service tool.
6. Program will check for which water temperature set point to use based on Heating Mode or Cooling Mode determined by the state of the RV.
7. In a water to water application, the mode has to be manually changed via Bacnet or with Bacview 6 service tool. If it is in heating, it will permanently stay in heating mode until it is changed to specifically cooling mode.
8. Like water to air, Y1 will come on a 50% and Y2 at 75% and not off until the EWT/LWT conditions have been satisfied.
9. 5 minute delay built in between compressor cycles.
10. While the Unit is on, the program will continue to monitor the CXM/DXM/DXM2 board for faults. If an event of a fault occurs and the unit is in lockout, then the relay will close (IN1/GND) and the fault code is transmitted via EH2 output to the IN2 input on the MPC. This is readily available through BAS network points. A history counter will also keep track of past and present faults which can also be seen via BAS or Bacview6.
11. The MPC can also function in metric mode or Celsius mode.

Variable Points List (Water-to-Air)

Point Name	BACnet			Read / Write	Modbus		N2		LonWorks NV Name	Default Value	Description
	Name	Point Type	Instance		Object Type	Register	Type	ID			
Zone Temp	zone_temp_zone_temp_1	Analog Input	1	R	Float Value	30001	Analog In	1	*Special Order Only	N/A	Raw Space Temp from Wall Sensor
Actual CL SP	actual_cl_sp_1	Analog Value	1	R	Float Value	30007	Data Float	1	nvoActCLSP	74°F	Actual cooling setpoint based upon occupancy status, setpoint adjustment, and metric conversion.
Actual HT SP	actual_ht_sp_1	Analog Value	2	R	Float Value	30009	Data Float	2	nvoActHTSP	72°F	Actual heating setpoint based upon occupancy status, setpoint adjustment, and metric conversion.
Occupied CL SP	occupied_cl_sp_1	Analog Value	3	R/W	Float Value	40001	Data Float	3		74°F	Network input for the Fahrenheit cooling setpoint in the occupied mode.
Master ZT	master_zt_1	Analog Value	4	R/W	Float Value	40003	Data Float	4	nviMasterZT	73°F	Fahrenheit network input for multiple WSHP sharing the same space temperature sensor. This input is only for slave units where the M/S Switch (BV:16) must be on.
Occupied Deadband	occupied_deadband_1	Analog Value	5	R/W	Float Value	40005	Data Float	5	nviOccDB	2°F	Creates the Fahrenheit heating setpoint using occupied cooling setpoint minus current value when using the deadband mode. Minimum value is 2 deg F with a default of 2 deg F. DB Mode (BV:48) value must be on.
Pulse Signal Value	pulse_signal_value_1	Analog Value	6	R	Integer Value	30011	Data Int	1	nviPSV	1	Indicates the last fault code in memory on the CXM/DXM/DXM2 board. Refer to CXM/DXM/DXM2 manual for fault codes.
Unoccupied CL SP	unoccupied_cl_sp_1	Analog Value	7	R/W	Float Value	40007	Data Float	6	nviUnOccCLSP	82°F	Network input for the Fahrenheit cooling setpoint in the unoccupied mode.
Slave HT SP	slave_ht_sp_1	Analog Value	9	R/W	Float Value	40011	Data Float	8	nviSlaveHTSP	72°F	Network input for the actual Fahrenheit heating setpoint when used as a slave unit. This input is only used for slave units where the M/S Switch (BV:16) must be on.
Slave CL SP	slave_cl_sp_1	Analog Value	10	R/W	Float Value	40009	Data Float	7	nviSlaveCLSP	74°F	Network input for the actual Fahrenheit cooling setpoint when used as a slave unit. This input is only used for slave units where the M/S Switch (BV:16) must be on.
HP Fault Counter	hp_fault_counter_1	Analog Value	11	R	Integer Value	30014	Data Int	2	*Special Order Only	0	Indicates the number of HP faults that have occurred since unit startup or resetting the Fault Count Reset (BV:24)
LP Fault Counter	lp_fault_counter_1	Analog Value	12	R	Integer Value	30015	Data Int	3	*Special Order Only	0	Indicates the number of LP faults that have occurred since unit startup or resetting the Fault Count Reset (BV:24)
FP1 Fault Counter	fp1_fault_counter_1	Analog Value	13	R	Integer Value	30016	Data Int	4	*Special Order Only	0	Indicates the number of FP1 faults that have occurred since unit startup or resetting the Fault Count Reset (BV:24)
FP2 Fault Counter	fp2_fault_counter_1	Analog Value	14	R	Integer Value	30017	Data Int	5	*Special Order Only	0	Indicates the number of FP2 faults that have occurred since unit startup or resetting the Fault Count Reset (BV:24)
CO Fault Counter	co_fault_counter_1	Analog Value	15	R	Integer Value	30018	Data Int	6	*Special Order Only	0	Indicates the number of CO faults that have occurred since unit startup or resetting the Fault Count Reset (BV:24)
Over/Under Voltage Fault Counter	over_under_voltage_fault_counter_1	Analog Value	16	R	Integer Value	30019	Data Int	7	*Special Order Only	0	Indicates the number of over/under voltage faults that have occurred since unit startup or resetting the Fault Count Reset (BV:24)
UPS Fault Counter	ups_fault_counter_1	Analog Value	17	R	Integer Value	30020	Data Int	8	*Special Order Only	0	Indicates the number of UPS faults that have occurred since unit startup or resetting the Fault Count Reset (BV:24)
Swapped FP1/FP2 Fault Counter	swapped_fp1_fp2_fault_counter_1	Analog Value	18	R	Integer Value	30021	Data Int	9	*Special Order Only	0	Indicates the number of swapped FP1/FP2 faults that have occurred since unit startup or resetting the Fault Count Reset (BV:24)
C1 Cycle Counter	c1_cycle_counter_1	Analog Value	19	R	Integer Value	30022	Data Int	10	*Special Order Only	0	Indicates the number of times that compressor 1 has cycled on/off more than 6 times in 60 minutes since unit startup or resetting the C1 Cycle Reset (BV:21).
C2 Cycle Counter	c2_cycle_counter_1	Analog Value	20	R	Integer Value	30023	Data Int	11	*Special Order Only	0	Indicates the number of times that compressor 1 has cycled on/off more than 6 times in 60 minutes since unit startup or resetting the C2 Cycle Reset (BV:22).

Variable Points List (Water-to-Air) Continued

Occupied HT SP	occupied_ht_sp_1	Analog Value	21	R/W	Float Value	40051	Data Float	34	nviOccHTSP	72°F	Network input for the Fahrenheit occupied heating setpoint when not using the deadband mode. DB Mode (BV:48) value must be off.
Occupied HT SP Celsius	occupied_ht_sp_celsius_1	Analog Value	22	R/W	Float Value	40053	Data Float	35	*Special Order Only	22.22°C	Network input for the Celsius occupied heating setpoint when not using the deadband mode. DB Mode (BV:48) value must be off.
Unoccupied HT SP	unoccupied_ht_sp_1	Analog Value	23	R/W	Float Value	40055	Data Float	36	nviUnOccHTSP	65°F	Network input for the Fahrenheit unoccupied heating setpoint when not using the deadband mode. DB Mode (BV:48) value must be off.
Unoccupied HT SP Celsius	unoccupied_ht_sp_celsius_1	Analog Value	24	R/W	Float Value	40057	Data Float	37	*Special Order Only	18.33°C	Network input for the Celsius unoccupied heating setpoint when not using the deadband mode. DB Mode (BV:48) value must be off.
HT PID	ht_pid_1	Analog Value	28	R	Float Value	30024	Data Float	17	nvoHtPID	0%	Heating PID output based on the setpoint and actual space temperature.
CL PID	cl_pid_1	Analog Value	29	R	Float Value	30026	Data Float	18	nvoClPID	0%	Cooling PID output based on the setpoint and actual space temperature.
Dirty Filter Interval	dirty_filter_interval_1	Analog Value	30	R/W	Float Value	40027	Data Float	19	nviDFI	1500 hrs	Represents the time interval for changing air filters.
AUX CFG	aux_cfg_1	Analog Value	31	R/W	Float Value	29	Data Float	20	nviAuxCfg	1	Configuration parameter for the aux output relay (W): 1 = Electric Heat, 2 = Cycle w/ Y1, 3 = Cycle w/ G, 4 = Slow opening water valve, 5 = High speed fan, 6 = Alarm Relay, 7-10 = Unused, 11 = Manual Control, 12 = Humidity Control, 13 = CO2 Control, 14 = VOC Control.
SF CFG	sf_cfg_1	Analog Value	33	R/W	Float Value	33	Data Float	22	nviSfCfg	1	Configuration parameter for controlling the supply fan: 1 = Cycle with Compressor. 2 = On during occupancy, cycle with compressor during unoccupied. 3 = On all the time.
Zone Temp Status	zone_temp_status_1	Analog Value	34	R	Float Value	30028	Data Float	23	nvoZTStatus	N/A	Network Output for Space Temperature. Celsius/Fahrenheit.
LVG Air Temp Status	lvg_air_temp_status_1	Analog Value	35	R	Float Value	30030	Data Float	24	nvoLAT	N/A	Leaving Air Temperature for the WSHP. Celsius/Fahrenheit.
LVG Water Temp Status	lvg_water_temp_status_1	Analog Value	36	R	Float Value	30032	Data Float	25	nvoLWT	N/A	Leaving Water Temperature for the WSHP. Celsius/Fahrenheit.
Manual SP Adjust	manual_sp_adjust_1	Analog Value	37	R/W	Float Value	40035	Data Float	26	nviManSPAdj	5°F	Network input for user defined Fahrenheit Setpoint adjustment. Should not be used with RS PRO sensors.
Master ZT Celsius	master_zt_celsius_1	Analog Value	38	R/W	Float Value	40037	Data Float	27	*Special Order Only	22.78°C	Celsius network input for multiple WSHP sharing the same space temperature sensor. This input is only for slave units where the M/S Switch (BV:16) must be on.
Unoccupied CL SP Celsius	unoccupied_cl_sp_celsius_1	Analog Value	39	R/W	Float Value	40039	Data Float	28	*Special Order Only	27.78°C	Network input for the Celsius cooling setpoint in the unoccupied mode.
Occupied Deadband Celsius	occupied_deadband_celsius_1	Analog Value	40	R/W	Float Value	40041	Data Float	29	*Special Order Only	1.11°C	Creates the Celsius heating setpoint using occupied cooling setpoint minus current value when using the deadband mode. Minimum value is 1.11 deg C with a default of 1.11 deg C. DB Mode (BV:48) value must be on.
Slave CL SP Celsius	slave_cl_sp_celsius_1	Analog Value	41	R/W	Float Value	40043	Data Float	30	*Special Order Only	23.33°C	Network input for the actual Celsius cooling setpoint when used as a slave unit. This input is only used for slave units where the M/S Switch (BV:16) must be on.
Slave HT SP Celsius	slave_ht_sp_celsius_1	Analog Value	42	R/W	Float Value	40045	Data Float	31	*Special Order Only	22.22°C	Network input for the actual Celsius heating setpoint when used as a slave unit. This input is only used for slave units where the M/S Switch (BV:16) must be on.
Occupied CL SP Celsius	occupied_cl_sp_celsius_1	Analog Value	43	R/W	Float Value	40047	Data Float	32	*Special Order Only	23.33°C	Network input for the Celsius cooling setpoint in the occupied mode.
Manual SP Adjust Celsius	manual_sp_adjust_celsius_1	Analog Value	44	R/W	Float Value	40049	Data Float	33	*Special Order Only	2.78°C	Network input for user defined Celsius Setpoint adjustment. Should not be used with RS PRO sensors.
Unoccupied Deadband	unoccupied_deadband_1	Analog Value	45	R/W	Float Value	40015	Data Float	10	nviUnOccDB	17°F	Creates the Fahrenheit heating setpoint using unoccupied cooling setpoint minus current value when using the deadband mode. Minimum value is 2 deg F with a default of 17 deg F. DB Mode (BV:48) value must be on.

Unoccupied Deadband Celsius	unoccupied_deadband_celsius_1	Analog Value	46	R/W	Float Value	40017	Data Float	11	*Special Order Only	9.44°C	Creates the Celsius heating setpoint using unoccupied cooling setpoint minus current value when using the deadband mode. Minimum value is 1.11 deg C with a default of 9.44 deg C. DB Mode (BV:48) value must be on.
Relative Humidity SP	rel_hum_sp_1	Analog Value	47	R/W	Float Value	59	Data Float	38	nviRHSP	60%	Network input for dehumidification setpoint above which the auxiliary output is activated when AUX CFG (AV:31) is set to 12 for humidity control.
Relative Humidity DB	rel_hum_db_1	Analog Value	48	R/W	Float Value	61	Data Float	39	nviRHDB	5%	Creates dehumidification turn off point using Relative Humidity SP minus the current value when AUX CFG (AV:31) is set to 12 for humidity control.
Relative Humidity Status	rel_hum_status_1	Analog Value	49	R	Float Value	34	Data Float	40	nvoRHStatus	N/A	Network Output for Space Relative Humidity when using appropriate space sensor.
Aux 5 Temp	aux5_temp_1	Analog Value	50	R	Float Value	36	Data Float	41	nvoAux5Temp	N/A	Network Output for Auxiliary Temperature 5 when Rnet Mode (BV:44) is on and Aux 5 Config (BV:46) is set to on for temperature sensor.
Aux 6 Temp	aux6_temp_1	Analog Value	51	R	Float Value	38	Data Float	42	nvoAux6Temp	N/A	Network Output for Auxiliary Temperature 6 when Rnet Mode (BV:44) is on and Aux 6 Config (BV:47) is set to on for temperature sensor.
CO2 Status	co2_status_1	Analog Value	52	R	Float Value	40	Data Float	43	nvoCO2Status	N/A	Network Output for Space CO2 level when using appropriate space sensor.
VOC Status	voc_status_1	Analog Value	53	R	Float Value	42	Data Float	44	*Special Order Only	N/A	Network Output for Space VOC level when using appropriate space sensor.
CO2 Trippoint	co2_trippoint_1	Analog Value	54	R/W	Float Value	63	Data Float	45	nviCO2Trip	800 ppm	Network input for CO2 trippoint above which the auxiliary output is activated when AUX CFG (AV:31) is set to 13 for CO2 control.
VOC Trippoint	voc_trippoint_1	Analog Value	55	R/W	Float Value	65	Data Float	46	*Special Order Only	800 ppm	Network input for VOC trippoint above which the auxiliary output is activated when AUX CFG (AV:31) is set to 14 for VOC control.
Fan Speed Trigger	fan_speed_1	Analog Value	56	R/W	Integer Value	67	Data Int	12	nviFanSpdTrig	75%	Network input for heating or cooling PID value above which the auxiliary output is activated when AUX CFG (AV:31) is set to 5 for fan speed control.*NOTE - requires field wired relay for PSC motors only.
Airflow Fault Counter	airflow_fault_counter_1	Analog Value	57	R	Integer Value	44	Data Int	13	*Special Order Only	0	Indicates the number of airflow faults that have occurred since unit startup or resetting the Fault Count Reset (BV:24)
Pump Fault Counter	pump_fault_counter_1	Analog Value	58	R	Integer Value	45	Data Int	14	*Special Order Only	0	Indicates the number of pump faults that have occurred since unit startup or resetting the Fault Count Reset (BV:24)
Application Type	application_type_1	Analog Value	99	R	Float Value	13	Data Float	9			Factory use only
Alarm State	alarm_state_1	Binary Value	1	R	Discrete Input	10001	Binary In	1	nvoAlarmState	N/A	ON indicates a Lockout condition exists. Off indicates normal operation.
C1 Reset	c1_reset_1	Binary Value	2	R/W	Discrete Out	1	Binary Out	1	*Special Order Only	OFF	Network input used to reset the C1 Runtime Alarm (BV:17) once the event is triggered.
C1 Status	c1_status_1	Binary Value	3	R	Discrete Input	10002	Binary In	2	nvoC1Status	N/A	Indicates if compressor 1 is ON/OFF.
System Reset	system_reset_1	Binary Value	4	R/W	Discrete Out	2	Binary Out	2	nviSystemReset	OFF	Network input used to reset the unit from lockout mode. Turn ON to reset, then turn OFF.
C2 Reset	c2_reset_1	Binary Value	5	R/W	Discrete Out	3	Binary Out	3	*Special Order Only	OFF	Network input used to reset the C2 Runtime Alarm (BV:18) once the event is triggered.
C2 Status	c2_status_1	Binary Value	6	R	Discrete Input	10003	Binary In	3	nvoC2Status	N/A	Indicates if compressor 2 is ON/OFF.
Dirty Filter Reset	dirty_filter_reset_1	Binary Value	7	R/W	Discrete Out	4	Binary Out	4	nviDFReset	OFF	Network input used to reset the Dirty Filter Alarm (BV:19).
Emergency Shutdown	emergency_shutdown_1	Binary Value	8	R/W	Discrete Out	5	Binary Out	5	nviESD	OFF	Network input for emergency shutdown. When emergency shutdown is turned on, then Y1, Y2, G & W output relays turn off.
SF Status	sf_status_1	Binary Value	10	R	Discrete Input	10004	Binary In	4	nvoSFStatus	N/A	Indicates if the supply fan is ON/OFF.
Occupied Status	occupied_status_1	Binary Value	11	R	Discrete Input	10005	Binary In	5	nvoOccStatus	N/A	Indicates whether the WSHP is in occupied(ON) mode or unoccupied (OFF) mode.

Occupied Mode	occupied_mode_1	Binary Value	12	R/W	Discrete Out	7	Binary Out	7	nviOccMode	ON	Network input to put the heat pump in unoccupied (OFF) or occupied (ON) mode. Can be used instead of work schedule.
RV Status	rv_status_1	Binary Value	13	R	Discrete Input	10006	Binary In	6	nvoRVStatus	N/A	Indicates if the reversing valve is ON/OFF.
Work Schedule	work_schedule_1	Binary Value	14	R/W							Reads schedules from WebCTRL and informs controls whether they are in occupied or unoccupied mode. WebCTRL ONLY.
UPS Signal	ups_signal_1	Binary Value	15	R	Discrete Input	10007	Binary In	7	*Special Order Only	N/A	Indicates if the UPS mode is ON/OFF. Refer to CXM/DXM/DXM2 AOM for UPS definition.
M/S Switch	m_s_switch_1	Binary Value	16	R/W	Discrete Out	8	Binary Out	8	nviMS	OFF	Master / Slave network input to enable the use of Master ZT. Master unit is defined as one WSHP per sensor and the value is OFF. Slave unit is defined as unit that shares a sensor with the Master Unit and the value is ON.
C1 Runtime Alarm	c1ralm_1	Binary Value	17	R	Discrete Input	10008	Binary In	8	*Special Order Only	N/A	Indicates that the number of operational hours for compressor 1 has exceeded 50,000. Reset via C1 reset (BV:2).
C2 Runtime Alarm	c2ralm_1	Binary Value	18	R	Discrete Input	10009	Binary In	9	*Special Order Only	N/A	Indicates that the number of operational hours for compressor 2 has exceeded 50,000. Reset via C2 reset (BV:5).
Dirty Filter Alarm	df_alm_1	Binary Value	19	R	Discrete Input	10010	Binary In	10	nvoDFAlarm	N/A	Indicates that the number of operational hours for the supply fan has exceeded the Dirty Filter Interval setting. Reset via Dirty Filter Reset (BV:7).
Valid Sensor Alarm	vs_alm_1	Binary Value	20	R	Discrete Input	10011	Binary In	11	nvoVSAlarm	N/A	Indicates that there is no valid room sensor connected to the MPC control board.
C1 Cycle Reset	c1_cycle_reset_1	Binary Value	21	R/W	Discrete Out	9	Binary Out	9	*Special Order Only	OFF	Network input used to reset the C1 Cycle Counter (AV:19) back to 0.
C2 Cycle Reset	c2_cycle_reset_1	Binary Value	22	R/W	Discrete Out	10	Binary Out	10	*Special Order Only	OFF	Network input used to reset the C2 Cycle Counter (AV:20) back to 0.
Lockout Alarm	lo_alm_1	Binary Value	23	R	Discrete Input	10012	Binary In	12	nvoLOAlarm	N/A	Indicates that the CXM/DXM/DXM2 is currently in Lockout Mode.
Fault Count Reset	fault_count_reset_1	Binary Value	24	R/W	Discrete Out	11	Binary Out	11	*Special Order Only	OFF	Network Input used to reset all of the historical counters for each error code back to 0.
C1 Cycle Alarm	c1calm_1	Binary Value	25	R	Discrete Input	10013	Binary In	13	*Special Order Only	N/A	Indicates that compressor 1 has cycled ON/OFF more than 6 times during one hour.
C2 Cycle Alarm	c2calm_1	Binary Value	26	R	Discrete Input	10014	Binary In	14	*Special Order Only	N/A	Indicates that compressor 2 has cycled ON/OFF more than 6 times during one hour.
AUX Status	aux_status_1	Binary Value	27	R	Discrete Input	10015	Binary In	15	nvoAuxStatus	N/A	Indicates if the auxiliary output is ON/OFF.
SF Manual	sf_manual_1	Binary Value	28	R/W	Discrete Out	12	Binary Out	12	nviSFMan	OFF	Manual Switch to turn the supply fan ON/OFF. ONLY WORKS WITH TEST MODE ACTIVE.
RV Manual	rv_manual_1	Binary Value	29	R/W	Discrete Out	13	Binary Out	13	nviRVMan	OFF	Manual Switch to turn the reversing valve ON/OFF. ONLY WORKS WITH TEST MODE ACTIVE.
C1 Manual	c1_manual_1	Binary Value	30	R/W	Discrete Out	14	Binary Out	14	nviC1Man	OFF	Manual Switch to turn compressor 1 ON/OFF. ONLY WORKS WITH TEST MODE ACTIVE.
C2 Manual	c2_manual_1	Binary Value	31	R/W	Discrete Out	15	Binary Out	15	nviC2Man	OFF	Manual Switch to turn compressor 2 ON/OFF. ONLY WORKS WITH TEST MODE ACTIVE.
AUX Manual	aux_manual_1	Binary Value	32	R/W	Discrete Out	16	Binary Out	16	nviAuxMan	OFF	Manual Switch to turn the auxiliary output ON/OFF. ONLY WORKS WITH TEST MODE ACTIVE.
Test Mode	test_mode_1	Binary Value	34	R/W	Discrete Out	18	Binary Out	18	nviTestMode	OFF	Network input used to bypass the normal logical operations in order to operate the unit manually. Maximum on time is 60 minutes.
Test Mode Alarm	tm_alm_1	Binary Value	38	R	Discrete Input	10025	Binary In	21	*Special Order Only	N/A	Indicates that the unit is still in Test Mode after the Test Mode Timer has expired.
Metric	metric_1	Binary Value	39	R/W	Discrete Out	21	Binary Out	28	*Special Order Only	OFF	Network input used to define inputs and outputs. Celsius (ON) Fahrenheit (OFF).
AUX toggle	aux_toggle_1	Binary Value	40	R/W	Discrete Out	17	Binary Out	17	nviAuxToggle	OFF	Network input used to toggle the auxiliary output relay (W) on and off. Used when AUX CFG (AV:31) is set to a value of 11.

Air Duct Mode	air_duct_ mode_1	Binary Value	41	R/W	Discrete Out	26	Binary Out	30	nviDuct-Mode	OFF	Network input used to activate the Air Duct control mode. The Air Duct mode uses the Aux 5 Temperature value for the controlling zone temperature for operation.
Aux 5	aux_5_1	Binary Value	42	R	Discrete Input	10026	Binary In	22	nvoAux5	N/A	Indicates the status of Auxiliary input 5 when Rnet Mode (BV:44) is on and Aux 5 Config (BV:46) is set to off for binary input.
Aux 6	aux_6_1	Binary Value	43	R	Discrete Input	10027	Binary In	23	nvoAux6	N/A	Indicates the status of Auxiliary input 6 when Rnet Mode (BV:44) is on and Aux 6 Config (BV:47) is set to off for binary input.
RNet Mode	rnet_ mode_1	Binary Value	44	R/W	Discrete Out	27	Binary Out	31	nviRnet-Mode	ON	Network input used to select between LStat (ASW06-08) wall sensors and communicating wall sensors. RNet should be off when using ASW06-08 sensors, and on in all other configurations.
Humidity Occupan-cy	hum_ occ_1	Binary Value	45	R/W	Discrete Out	28	Binary Out	32	nviRHOcc	OFF	Network input used to enable / disable humidity control when AUX CFG (AV:31) is set to 12 for humidity control.
Aux 5 Config	aux5_ cfg_1	Binary Value	46	R/W	Discrete Out	29	Binary Out	33	nviAux-5Cfg	ON	Network input to select the configuration of Auxiliary input 5 when Rnet Mode (BV:44) is on: On = temperature, Off = binary.
Aux 6 Config	aux6_ cfg_1	Binary Value	47	R/W	Discrete Out	30	Binary Out	34	nviAux-6Cfg	ON	Network input to select the configuration of Auxiliary input 6 when Rnet Mode (BV:44) is on: On = temperature, Off = binary.
DB Mode	db_ mode_1	Binary Value	48	R/W	Discrete Out	31	Binary Out	35	nviDB-Mode	OFF	Network input to select between using separate cooling and heating setpoints (Off) or a cooling setpoint and deadband to determine the heating setpoint (On).
CO2 Alarm	co2_ alarm_1	Binary Value	49	R	Discrete Input	10028	Binary In	24	nvo-CO2Alarm	N/A	Indicates that the CO2 Status (AV:52) is above the CO2 Trippoint (AV:54) when using an appropriate space sensor.
VOC Alarm	voc_ alarm_1	Binary Value	50	R	Discrete Input	10029	Binary In	25	*Special Order Only	N/A	Indicates that the VOC Status (AV:53) is above the VOC Trippoint (AV:55) when using an appropriate space sensor.
Fan Speed Enable	fan_speed_ en_1	Binary Value	51	R/W	Discrete Out	32	Binary Out	36	*Special Order Only	OFF	Network input to activate the auxilliary output for high speed fan when AUX CFG (AV:31) is set to 5 for fan speed control. *NOTE - requires field wired relay for PSC motors only.
Compressor Shutdown	comp_off_1	Binary Value	52	R/W	Discrete Out	33	Binary Out	37	*Special Order Only	OFF	Network input to deactivate compressor functions.
Fault	fault_1	Multi State Value	1	R							Multi state BACnet value for text description of current alarm state.
AUX Config Status	aux_cfg_ status_1	Multi State Value	2	R							Multi state BACnet value for text description of current auxiliary output configura-tion.
Zone Mode Status	mode_1	Multi State Value	3	R							Multi state BACnet value for text description of current operating mode.

Feature Setups

This section will go over the necessary setups to establish specific applications. The MPC has many applications, but needs to be specified through bacnet or Bacview 6 service tool.

AUX CFG (AV31): The AUX_CFG_1 point allows the W output to be utilized for different functions.
1 – Electric Heat (default). Cycles W output as third-stage heat.
2 – Cycle with Compressor.
3 – Cycle with Fan.
4 – Slow Opening Water valve. Delays compressor operation for 60 seconds while activing W immediately.
5 – High Speed Fan. Used in conjunction with AV56, Fan Speed Trigger, the W output will activate when either the heating or cooling demand rises above the value in AV56. Alternately, BV51, Fan Speed Trigger, can be used to toggle the output on when desired.
6 – Alarm Relay Output. The W output will activate in the event of a lockout alarm.
11 – Aux Toggle. Using BV40, Aux Toggle, the W output can be activated or deactivated manually.
12 – Relative Humidity control. Used in conjunction with the ASW13-15H sensors, the W output will activate when the relative humidity from the sensor, AV49, rises above the Relative Humidity setpoint, AV47.
13 – CO2 control. Used in conjunction with the ASW13-15C sensors, the W output will activate when the CO2 value from the sensor, AV52, rises above the CO2 Trippoint, AV54.
14 – VOC control. Used in conjunction with the ASW13-**15** - V sensors, the W output will activate when the VOC value vrom the sensor, AV53, rises above the VOC Trippoint, AV55.
NOTE – all auxiliary configurations may require additional wiring changes to utilize special functions.

DB Mode: Gen 4 MPC's use a cooling setpoint and a deadband to create the heating setpoint while Gen 5 and 6 MPC's use individual heating and cooling setpoints for temperature control. To allow for backward compatibility with Gen 4 temperature control, change BV48 to ON and used the occupied/unoccupied cooling setpoints and the occupied/unoccupied deadband points.

Air Duct Mode: Air Duct Mode allows unit control based on the return air temperature in the duct. To enable ADM, activate BV41 and RNET Mode, BV44. Users can adjust the set points using an RNET wall sensor.
NOTE – Field-supplied 10k type II duct sensor required. Wiring should be landed at the Temp and GND input on the LSTAT connector of the MPC.

Test Mode: Test mode is used to test the output functions of the MPC. This configuration will only remain active for 30 minutes. To put the unit in test mode and test all outputs, turn on Test Mode (BV34). When BV34 is active, BV28 to 32 are available to activate and deactivate. Once testing is completed, make sure to deactivate Test Mode. After 30 minutes of operation, the Test Mode Alarm, BV38, will activate.
NOTE - BV28-32 are only available for use when Test Mode is active.

Input 5 and 6: Gen 5 and 6 allows the user to use Input 5(Temp and GND) and Input 6(SW and GND) for added features such as temperature reading and/or status reading(current switch sensing). With RNET Mode, BV44, active, inputs 5 and 6 will monitor field-supplied 10k type II thermistors via Aux 5 Temp, AV50, and Aux 6 Temp, AV51. If a dry contact input is desired, activate Aux 5 CFG, BV46, and/or Aux 6 CFG, BV47. This will allow the user to monitor switch closure status at Aux 5, BV42, and Aux 6, BV43.
Note: This application cannot be used with a LSTAT sensors (ASW09-11). It is only compatible with RNET or ASW13-15 sensors.

Master/Slave: Before this setup can be implemented, make sure that there is no wall sensor connected to the Slave MPC and that the building management system is capable of mapping points between devices.
This method is described for 1 master and 1 slave MPC. For the slave unit(s), turn on the Master/Slave, BV 16. Turning on this point will make the unit a slave. Identify the master points; **Zone Temp Status (AV34), Actual HTSP (AV2), Actual CLSP (AV1) and Occupied Status (BV11).** These point values will be "pushed" from the master unit to specific points on the slave unit.
Identify the slave points; **Master ZT (AV4), Slave HTSP (AV9), Slave CLSP (AV10) and Occupied Mode (BV12).**
Map the master AV34 to the slave AV4.
Map the master AV2 to the slave AV9.
Map the master AV1 to the slave AV10.
Map the master BV11 to the slave BV12.
Once the mappings are completed, verify that the **slave** Actual CLSP, AV1, and the Actual HTSP, AV2, match those points on the master unit. This will force the slave to operate as a "twin" to the master unit..

Variable Points List (Water-to-Water)

Display Name	Read/ Write	Default	Reference Name	Type	Object ID	Description
LWT Load	R		lwt_load	AI	2	Load coil leaving water temperature
EWT Load	R		ewt_load	AI	3	Load coil entering water temperature
LWT Source	R		lwt_source	AI	4	Source coil leaving water temperature
Actual CL SP	R		actual_cl_sp	AV	1	Actual CLSP with all offsets applied
Actual HT SP	R		actual_ht_sp	AV	2	Actual HTSP with all offsets applied
Occupied CL SP	R/W	53°F	occupied_cl_sp	AV	3	Network input for the CLSP in occupied mode
Master WT	R/W	105°F	master_wt	AV	4	Applicable only with MS switch ON
Occupied HT SP	R/W	105°F	occupied_ht_sp	AV	5	Network input for the HTSP in occupied mode
Pulse Signal Value	R		pulse_signal_value	AV	6	The current fault flash in the unit control
Unoccupied CL SP	R/W	73°F	unoccupied_cl_sp	AV	7	Network input for the CLSP in unoccupied mode
Slave HT SP	R/W	105°F	slave_ht_sp	AV	9	Applicable only with MS switch ON
Slave CL SP	R/W	53°F	slave_cl_sp	AV	10	Applicable only with MS switch ON
HP Fault Counter	R		hp_fault_counter	AV	11	High pressure fault counter
LP Fault Counter	R		lp_fault_counter	AV	12	Low pressure fault counter
FP1 Fault Counter	R		fp1_fault_counter	AV	13	Water coil freeze protection counter
FP2 Fault Counter	R		fp2_fault_counter	AV	14	Air coil freeze protection counter
CO Fault Counter	R		co_fault_counter	AV	15	Condensate overflow fault counter
Over/Under Voltage	R		over_under_voltage	AV	16	Over/Under voltage fault counter
Swapped FP1/FP2	R		swapped_fp1_fp2	AV	18	Swapped FP1/FP2 fault counter
C1 Cycle Counter	R		c1_cycle_counter	AV	19	Compressor 1 multiple fault counter
C2 Cycle Counter	R		c2_cycle_counter	AV	20	Compressor 2 multiple fault counter
Unoccupied HT SP	R/W	85°F	unoccupied_ht_sp	AV	21	Network input for the HTSP in unoccupied mode
CLD	R/W	5°F	cld	AV	22	Cooling differential deadband. CLSP - CLD = Turn off
HTD	R/W	5°F	htd	AV	23	Heating differential deadband. HTSP - HTD = Turn off
Slave CLD	R/W	5°F	slave_cld	AV	24	Applicable only with MS switch ON
Slave HTD	R/W	5°F	slave_htd	AV	25	Applicable only with MS switch ON
AUX CFG	R/W	1	aux_cfg	AV	26	1=cycle with C1, 2=slow opening water valve, 3=alarm relay
Master WT Celcius	R/W	40.56°C	master_wt_c	AV	27	Applicable only with MS switch ON
Unoccupied HT SP Celsius	R/W	29.44°C	unoccupied_ht_sp_c	AV	28	Applicable only with Metric mode ON
Occupied HT SP Celsius	R/W	40.56°C	occupied_ht_sp_c	AV	29	Applicable only with Metric mode ON
Unoccupied CL SP Celsius	R/W	22.78°C	unoccupied_cl_sp_c	AV	30	Applicable only with Metric mode ON
Occupied CL SP Celsius	R/W	11.67°C	occupied_cl_sp_c	AV	31	Applicable only with Metric mode ON
Slave HT SP Celsius	R/W	40.56°C	slave_ht_sp_c	AV	32	Applicable only with Metric mode ON/MS switch ON
Slave CL SP Celsius	R/W	11.67°C	slave_cl_sp_c	AV	33	Applicable only with Metric mode ON/MS switch ON
LWT Load Status	R		lwt_load_status	AV	34	Leaving water temperature of the load coil
EWT Load Status	R		ewt_load_status	AV	35	Entering water temperature of the load coil
LWT Source Status	R		lwt_source_status	AV	36	Leaving water temperature of the source coil
HT PID	R		ht_pid	AV	38	Heating PID based on HTSP and actual water temp
CL PID	R		cl_pid	AV	39	Cooling PID based on CLSP and actual water temp
Alarm Relay	R		alarm_relay	BI	1	Indicates the alarm relay is closed(ON) or open(OFF)
Pulsed Alarm	R		pulsed_alarm	BI	2	Reads the pulsed alarm code from EH2
Mode Control	R		mode_control	BI	3	Dry contact between SW and Gnd to manual control the RV.
C1	R/W	0	c1	BO	2	Sends ON/OFF value to Y1
C2	R/W	0	c2	BO	3	Sends ON/OFF value to Y2
RV	R/W	0	rv	BO	4	Sends ON/OFF value to O
AUX	R/W	0	aux	BO	5	Sends ON/OFF value to W
Alarm State	R		alarm_state	BV	1	On indicates alarm state Off indicates normal operation
C1 Reset	R/W	Inactive (0)	c1_reset	BV	2	Reset the C1 runtime alarm once triggered
System Reset	R/W	Inactive (0)	system_reset	BV	4	Reset the Lockout alarm at the front end, but not the unit alarm
C2 Reset	R/W	Inactive (0)	c2_reset	BV	5	Reset the C2 runtime alarm once triggered

Variable Points List (Water-to-Water) Continued

Display Name	Read/ Write	Default	Reference Name	Type	Object ID	Description
MC Switch	R/W	Inactive (0)	mc_switch	BV	7	Mode control, ON for cooling, OFF for heating
Emergency Shutdown	R/W	Inactive (0)	emergency_shutdown	BV	8	Turns off all outputs but maintains PID
CC Mode	R/W	Inactive (0)	cc_mode	BV	9	Cooling control: ON(EWT)/OFF(LWT)
HC Mode	R/W	Inactive (0)	hc_mode	BV	10	Heating control: ON(EWT)/OFF(LWT)
Occupied Status	R		occupied_status	BV	11	Occupied status indicator
Occupied Mode	R/W	Active (0)	occupied_mode	BV	12	Occupied mode: ON by default
UPS Signal	R		ups_signal	BV	15	Indicates if UPS mode is ON/OFF
M/S Switch	R/W	Inactive (0)	m_s_switch	BV	16	Turn on to put unit in slave mode
C1 Runtime Alarm	R		c1ralm	BV	17	Indicates if there is a C1 runtime alarm
C2 Runtime Alarm	R		c2ralm	BV	18	Indicates if there is a C2 runtime alarm
C1 Cycle Reset	R/W	Inactive (0)	c1_cycle_reset	BV	19	Network input to reset C1 runtime
C2 Cycle Reset	R/W	Inactive (0)	c2_cycle_reset	BV	20	Network input to reset C2 runtime
Lockout Alarm	R		lo_alm	BV	21	Indicates if there is a Lockout alarm active
Fault Count Reset	R/W	Inactive (0)	fault_count_reset	BV	22	Resets all historical counters to 0
C1 Cycle Alarm	R		c1calm	BV	23	Indicates that C1 has cycled ON/OFF more than 6 per hour
C2 Cycle Alarm	R		c2calm	BV	24	Indicates that C2 has cycled ON/OFF more than 6 per hour
RV Manual	R/W	Inactive (0)	rv_manual	BV	25	Applicable only with Test mode ON
C1 Manual	R/W	Inactive (0)	c1_manual	BV	26	Applicable only with Test mode ON
C2 Manual	R/W	Inactive (0)	c2_manual	BV	27	Applicable only with Test mode ON
Test Mode	R/W	Inactive (0)	test_mode	BV	29	Allow access to all output points
Test Mode Alarm	R		tm_alm	BV	30	Test mode indicator
AUX Manual	R/W	Inactive (0)	aux_manual	BV	32	Applicable only with Test mode ON
Metric Mode	R/W	Inactive (0)	metric_mode	BV	33	Turns on metric mode

MPC Wall Sensors

ASW sensors are wall-mounted temperature sensors for use with the MPC controller with Water- Air units. The ASW is available in 3 different models to allow for application flexibility. Features such as room temperature sensing, digital LCD readout, set point adjustment, override pushbutton, heat pump reset, lockout recognition, fault type, LED indicator, cosmetics and occupancy status can be supplied by the different types of ASW wall sensors. The ASW wall mounted sensors are low profile, which provides a distinguished look for building architects and engineers.

The three different types of ASW wall sensors feature easy to use analog to digital connections on the MPC. With only 4 to 5 wire connections, the field technician can easily troubleshoot the ASW to determine if it is operating properly.

The ASW 15 displays zone temperature, heating setpoint, cooling set point. And if so equiped will display sensed values of humidity, CO2 and VOC's.

Room temperature is measured using a 10k thermistor and can be indicated on an easy to read LCD display (with display only wall sensor). The set point adjust is a slide potentiometer which provides an analog output and is available with a Warm/Cool legend imprinted on the unit's base. The override is a momentary, normally open, push contact.

ASW wall sensors are suitable for direct-wall mount or electrical box mounting. Terminations are easily made at the screw terminal block located on the wall sensor back plate.

ASW 13,14,15 Wall Sensors - For use with MPC

ASW13

ASW14

ASW15

Features	ASW13	ASW14	ASW15
Temp, CO_2, Humidity, and VOC Options	✔	✔	✔
Neutral color	✔	✔	✔
Addressable / Supports daisy-chaining	✔	✔	✔
Hidden communication port	✔	✔	✔
Mounts on a standard 2″x 4″ electrical box	✔	✔	✔
Occupancy status indicator		✔	✔
Push-button occupancy overrride		✔	✔
Setpoint adjust		✔	✔
Large, easy-to-read LCD			✔
Alarm indicator			✔
Fan speed control			
Cooling / Heating / Fan Only – Mode Control			
°F to °C conversion button			

Options	Part Number	Part Number	Part Number
Temperature Only	ASW13	ASW14	ASW15
Temp with CO_2	ASW13C	ASW14C	ASW15C
Temp with Humidity	ASW13H	ASW14H	ASW15H
Temp with VOC	ASW13V	ASW14V	ASW15V
Temp, Humidity, CO_2	ASW13CH	ASW14CH	ASW15CH
Temp Humidity, VOC	ASW13HV	ASW14HV	ASW15HV

Specifications

Sensing Element Accuracy

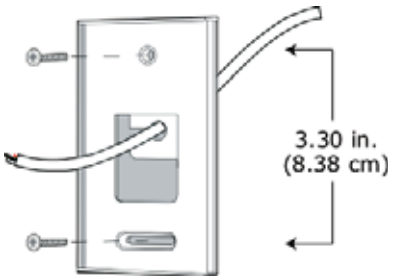
Temperature	Temperature Only: 32° to 122°F (0° to 50° C): ±0.36°F (0.2° C)	Temperature if humidity is included: 50° to 104° F (10° to 40° C) ±0.54° F (0.3° C)
Humidity	10% to 90%: ±1.8% typical	
CO2	400 to 1250 PPM: ±30 PPM or 3% of reading, whichever is greater 1250 to 2000 PPM: ±5% of reading plus 30 PPM	
VOC	0 to 2,000 CO2 PPM Equilvant: ±100 PPM	

Power Requirements	Temperature only: ASW13,14: ASW15:	 12 Vdc @ 6 mA 12 Vdc @ 7 mA
	Temperature with humidity: ASW13,14: ASW15:	 12 Vdc @ 7 mA 12 Vdc @ 8 mA
	Temperature with humidity and VOC - All models	12 Vdc @ 60 mA
	Temperature with humidity and CO_2 - All models	12 Vdc @ 15 (idle) to 190 mA (CO_2 measurement cycle)
	Temperature and CO_2 - All models	12 Vdc @ 14 mA (idle) to 189 mA (CO_2 measurement cycle)
Power Supply	The 4-conductor Rnet cable from a controller supplies +12 Vdc @ 210 mA. For additional power, use an external power supply. Use the above power requirements to calculate the size of the external power supply. The controller and the external power supply must share a common ground.	
Communication	115 kbps	
Local Access Port	For local access to start up and troubleshoot the system	
Environmental Operating Range	32° to 122°F (0° to 50° C), 10% to 90% relative humidity, non-condensing	
Mounting	Standard 4x2-in. electrical box using the 6-32 x 1/2" mounting screws provided	
Overall Dimensions	Temperature sensor or temperature with humidity sensor	Width: 3 in. (7.62 cm) Height: 4-13/16 in. (12.22 cm) Depth: 13/16 in. (2.01 cm)
	Sensor with CO_2 or VOC	Width: 2-7/8 in. (7.3 cm) Height: 4-13/16 in. (12.22 cm) Depth: 1-1/4 in. (3.18 cm)
Listed by	FCC Part 15-Subpart B-class A, CE	

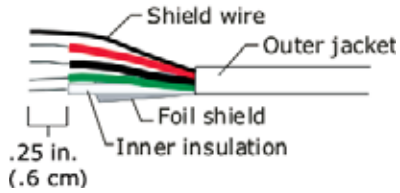
To wire and mount a ASW13-15 Sensor

PREREQUISITE The Rnet cable is wired to the controller. The shield wire and the ground wire should be inserted into the controller's GND terminal.

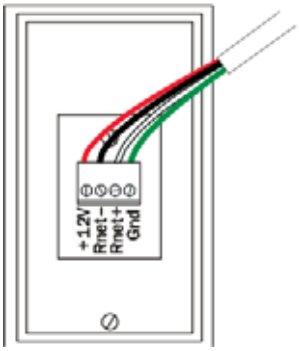
1 Turn off the controller's power.
2 Pull the backplate off the ZS Sensor. You may need to turn the setscrew in the bottom of the sensor clockwise until you can remove the backplate.
3 Pull the Rnet communication cable through the large rectangle in the backplate.



4 Use 2 screws to mount the backplate to the wall or outlet box.
5 Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation.



6 Strip about .25 inch (.6 cm) of the inner insulation from each wire.
7 If wiring 1 cable to the ZS Sensor, cut the shield wire off at the outer jacket, then wrap the cable with tape at the outer jacket to cover the end of the shield wire.
If wiring 2 cables in a daisy-chain configuration, twist together the shield wires, then wrap the shield wires with tape.
8 Insert the other 4 wires into the ZS Sensor's screw terminal connector. If wiring 2 cables, insert like-colored wires into each terminal.



Climatemaster recommends that you use the following Rnet wiring scheme:

Connect this wire...	To this terminal...
Red	+12V
Black	Rnet-
White	Rnet+
Green	Gnd

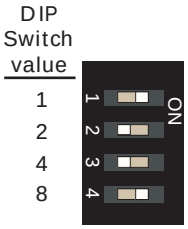
CAUTION Allow no more than .06 inch (1.5 mm) bare communication wire to protrude. If bare communication wire contacts the cable's foil shield, shield wire, or a metal surface other than the terminal block, the sensor may not communicate correctly.

Attach the sensor's cover and circuit board to the mounted backplate, inserting the top first.

9 Turn the setscrew one full turn counterclockwise so that the cover cannot be removed.
10 Turn on the controller's power.

To address a ASW13-15 Sensor

Each ASW13-15 Sensor on an Rnet must have a unique address, but addresses do not have to be sequential. Use the DIP switches on the back of the ZS Sensor to set an address from 0 to 14. (0 is factory default.) Each DIP switch has the value shown in the figure below. Turn on as many DIP switches as you need so that their total value equals the address.



EXAMPLE DIP switches 1 and 4 above are on. Their values (1 + 8) total 9, so the sensor's address is 9.

ASW LED indicator on the wall sensor turns 'on' during Occupied Mode and turns 'off' during "Unoccupied" Mode.

Push Button Override (if equipped)

During the Unoccupied Mode of operation, if the "Override" button on the ASW14 or ASW15 sensor is pressed for 1 second, then the MPC switches to the Occupied Mode of operation and the ASW LED will turn 'on'. Control is now based upon occupied attribute values. The occupant will acquire 60 minutes of override for each time the "Override" button is pushed; with a maximum of 180 minutes of override time. If the "Override" button is pressed and held for at least 3 seconds during the override operation, then the override period is cancelled and the MPC is returned to Unoccupied Mode of operation.

To override the Unoccupied Mode: Press override button for 1 second. The LED indicator on the ASW wall sensor will turn 'on' to indicate occupied status. The controller goes into Occupied Mode for 60, 120, or 180 minutes, determined by the number of times the override button is pressed by the occupant.
To increase the override time: If override time has not expired, press the override button for additional minutes of override time. The maximum override time will always be 180 minutes.
To cancel override: Press and hold the override button for 3 seconds or more. The override time is cancelled and the ASW LED indicator will turn off. The MPC will return to Unoccupied Mode.

Reading Lockout Code at ASW Wall Sensor

If a heat pump experiences a lockout condition (for example, "high pressure" refrigeration failure), a corresponding code will be displayed at the wall sensor (providing a sensor with LED/display is used). See CXM or DXM Application Manual for detailed description of operation and fault types.

The Lockout code will be displayed as long as the alarm relay on the CXM or DXM is closed, meaning that the CXM or DXM remains locked out. When the CXM or DXM is reset from Lockout Mode, the ASW LED/display will return to indicating "Occupied" or "Unoccupied" mode.

Note: If the MPC Controller is connected to a dual compressor heat pump with 2 CXM controls, the wall sensor will only display the lockout information with regards to the CXM which is connected to compressor stage 1. Lockout information from the CXM controlling the second stage compressor will never be displayed. If the MPC is connected to a dual compressor heat pump with 2 DXM controls, the wall sensor will always display the lockout code for the compressor stage 1, even if the stage 2 compressor locks out. If the second stage DXM Control locks out, a warning code, of some type will always be displayed at the wall sensor.

LED and Fault Indications

LED or LCD Indicator	Operation Indication
LED "ON" or "Occupied" LCD display	Occupied Mode with no heat pump faults
LED "OFF" or "Unoccupied" LCD display	Unoccupied Mode with no heat pump faults
2 flashes (E2 display)	High pressure lockout
3 flashes (E3 display)	Low pressure lockout
4 flashes (E4 display)	Water coil low temperature lockout
5 flashes (E5 display)	Air coil low temperature lockout
6 flashes (E6 display)	Condensate overflow lockout
7 flashes (E7 display)	Over / Under voltage shutdown
8 flashes (E8 display)	UPS (Unit Performance Sentinel) warning
9 flashes (E9 display)	Thermistor swapped position

Resetting Lockout at ASW wall sensor

The "Override" or "Manual On" button can be used to reset a heat pump lockout at the wall sensor.
a) The LED or indicator will indicate a lockout code.
b) Push the "Override" or "Manual On" button for 1 second.
c) The MPC will interpret the button a manual reset and the MPC will reset the heat pump.
d) The MPC will return the heat pump to normal operating mode.

Note: If the MPC was in Unoccupied Mode before the heat pump lockout, then once the heat pump is reset via the "Override"/"Manual On" button, the MPC will reset (as stated above) AND will now have 60 minutes of override time.

Setpoint Adjust
The setpoint adjust is a slidepot which provides an analog output and is available with a Warm/Cool legend imprinted on the unit's base. The user can adjust the setpoint by up to the negative user set value (default -5) by sliding the adjust to the "cool" position. The user can adjust the setpoint by up to the positive user set value (default +5) by sliding the adjust to the "heat" position. The setpoint adjust operation can be modified by changing the function block programming within the MPC (See Section 7 of the Water-to-Air Sequence of Operation).

Fail Safe Mode

If the connections between the MPC and ASW wall sensor are interrupted or disconnected, the MPC will force the digital outputs to the "Off" state. When the connections to the wall sensor thermistor are restored, the MPC resumes normal control.

MPC Technical FAQs

Q. Why does the set point go to 45°F in heating mode 5 minutes after unit startup?

A. This is the default condition if there is not a valid resistance between the GND and SW terminals on the MPC. IF this occurs, check the MPC for loose strands of copper or a missed wire.

Q. Why is my compressor, fan or RV not energizing?

A. First wait 5 minutes after startup, if the unit has not yet started, check the out LEDs on the MPC. If they are OFF, make sure that the unit is not in unoccupied mode, if any of them are ON and you still have to activity, verify that you have 'R' wired to the 'R' on the unit controller. If not, jump 24Vac to 'Y', 'O', or 'G' and see if they are energized. If not, contact tech support.

Q. I replaced a CXM/DXM control board and when I applied power the MPC board was destroyed, Why?

A. By default the AL1 and AL2 terminals are powered by R(24Vac) on the CXM/DXM. If the JW1(CXM/DXM2) or JW4(DXM) jumper is not cut BEFORE APPLYING POWER then the 24Vac is going from AL2 (CXM) to Gnd (MPC) and that will destroy the board. Cutting the alarm jumper makes the contact dry thus no voltage will be present when powered. The jumper is pre-cut and this only applies on replaced CXM/DXM/DXM2.

Q. Why does the alarm relay indicate the unit is in an alarm state on the BMS but not at the CXM?

A. The jumper IN1 on the MPC is set to 0-5Vdc instead of dry. Jump back to dry contact to resolve this issue.

Q. My unit is not communicating on the network? Why?

A. Verify that all baud rates, protocol and communication selections are correct. Then verify that the Tx and/or Rx leds are flickering. Make sure that the addressing is correct, unique and not sharing a same address as another controller.

Q. Why is my temperature reading incorrectly than the actual temperature?

A. Make sure that the gain jumper is set in the OFF position. The jumper puts the temperature on a sharper curve meant for water to water applications. Also, make sure that the sensor is in a reasonable location and not right in front of the airway of the unit.

Q. Why is my RNET sensor all buggy?

A. Make sure that you move the jumper from LSTAT to RNET.

Q. Can a thermostat be used with MPC?

A. No, ASW… sensors must be used.

Q. What type/size of wire do the ASW… sensors require?

A. Typical thermostat cable is suitable 22 to 18 gauge. ASW08 sensor requires 5-conductor all others require 4-conductor.

Q. Is temperature averaging available?

A. Yes using the Rnet sensors. Up to five sensors may be daisy chained. One ASW15 and up to 5 ASW13 can be connected. Wire to ASW15 first and then to the ASW13's. Address each ASW13 with a unique address.

Notes

Revision History

Date:	Item:	Action:
3/7/17	All	Misc. Edits
07/14/16	Logo	Updated
05/31/16	First Published	

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97B0031N01