Marvair®
An ACS Brand

MPC-10
Marvair PLC Controller 10 Unit

MANUAL/PRODUCT DATA SHEET

System Controller for Up To 10 PLC Based HVAC Systems

General Description

The Marvair MPC-10 is an HVAC system controller designed to control up to ten PLC-equipped air conditioners, that can be either single or dual compressor, for equipment enclosures. In addition to the control of the air conditioners, the MPC-10 provides alarms remotely, through BACnet or Modbus, and locally using a built-in Human Machine Interface (HMI). The controller is factory programmed with standard industry set points, but can be configured on site or remotely. Settings are retained indefinitely in the event of a power loss.

➤ Control 2-Stage or 5-Stage A/C Units

The Marvair MPC-10 HVAC controller can control up to:

- Six 2-Stage A/C units using CAT5/6 ethernet connections
- Ten 2-Stage A/C units using RS485 (3-Wire) connections
- Four 5-Stage A/C units using an CAT5/6 ethernet connection

➤ Ease of Control and Configuration

The MPC-10 comes standard with a approximately 4-inch color touchscreen HMI which provides a user-friendly interface. From the main screen of the HMI the user can see room conditions, HVAC status for each unit, and change cooling/heating set points. The statuses that can be displayed for each unit are as follows: Cooling, Heating, Blower, Fault, and T-Stat status. The Alarm screen displays a description of the alarm, the time/date at which it occurred, and the current status of the alarm. The alarms will be maintained until the fault is fixed and the alarm is cleared.

The initial setup of the MPC-10 will be done from the built-in HMI. The wide range of access to parameters gives the end users the ability to change setpoints, calibrate sensors, view unit status and more.

➤ Marvair Part Numbers

MPC10 HVAC Controller – 2-Stage A/C Units	K/40119-2
MPC10 HVAC Controller – 5-Stage A/C Units	K/40119-5
Additional Humidity & Dry Bulb Sensor (1 Included, Up to 4 Max)	70676
Dry Bulb Sensor	70916

Features and Benefits

Programmable Logic Board with Lead/Lag Control

- *Balanced Use of Conditioning Equipment*
- *Sequence the Operation of up to 10 PLC Based Units*
- *Ensures Maximum Efficiency*
- *Independent Economizer Control*
- *Remote Communication (BACnet/Modbus)*

Alarms and Lockouts

- *High Pressure Lockout (Both Circuits If Applicable)*
- *Low Pressure Lockout (Both Circuits If Applicable)*
- *Communication Alarm*
- *Emergency Shutdown Alarm*
- *High Shelter Temperature Alarm*
- *Low Shelter Temperature Alarm*

Specifications/Features

➤ Remote Communication Protocol

The Marvair MPC-10 comes standard with both BACnet and Modbus TCP/IP communication protocols and can be user selected in the initial setup menu. Using these communication protocols allows the user to access and change various data points.

Read Only Access

- Room Temperature
- Room Humidity
- Lead Unit
- High Pressure Refrigeration Circuit A (For Each Unit)
- High Pressure Refrigeration Circuit B (For Each Unit)
- High Temperature Cut-Off (For Each Unit)
- High Temperature Alarm
- Low Temperature Alarm
- Phase Fault (For Each Unit)
- Low Pressure Refrigeration Circuit A (For Each Unit)
- Low Pressure Refrigeration Circuit B (For Each Unit)
- Emergency Shutdown (For Each Unit)

Read/Write Access

- Cooling Set Point
- Continuous Blower
- Cooling Stage Differential
- Low Temperature Alarm Set Point
- Y Fan Purge Time
- Anti-Short Cycle Time
- Thermostat Offset
- Heating Set Point
- Lead Swap
- Heating Stage Differential
- High Temperature Alarm Set Point
- W Fan Purge Time
- Lead Swap Period
- AC Unit Shutdown (For Each Unit)

➤ Thermostat

- Cooling Set Point: 35°F through 95°F (1.7°C through 35°C) in 1° increments
- Heating Set Point: 35°F through 95°F (1.7°C through 35°C) in 1° increments

➤ Differential

- Cooling Stage Differential: 1°F through 5°F (1°C through 3°C) in 1° increments
- Heating Stage Differential: 1°F through 5°F (1°C through 3°C) in 1° increments

➤ Incoming Power

- 100-240 VAC

➤ Ambient Temperature During Operation

- Minimum: 30°F (0°C)
- Maximum: 122°F (50°C)

➤ Unit Weight

- 27 lbs (12.25 kg)

➤ Ease of Installation

The use of MODBUS RTU or BACnet-MSTP communication makes wiring simple. All communication between the HVAC units and the controller is handled over CAT 5/6 cables, and/or RS485 (3-wire) cable depending on whether it's controlling 2-Stage or 5-Stage A/C units, or to control more than 6 A/C units. The MPC-10 has ten ethernet ports located at the bottom of the controller, one for each unit and one for remote communication. The order in which the units are connected does not matter.

➤ Lead/Lag Operation

User selectable changeover from 12 hours to 10 days in 1-hour increments. If the lead unit loses power, the next available unit automatically becomes the lead unit with all the set points of the lead unit. Once a unit is locked out or losses power it is removed from the list of available units and will not be called for by the controller. When the unit is repaired/regains power it will be added back to the list of available units and can be called for by the controller. Additionally, a lead swap button can be found on the HMI allowing service techs to easily check the operation of each unit.

➤ Alarms

Alarms can be viewed remotely via BACnet/Modbus, through an on-screen alarm window, or on the display screen of the respective unit. There are two classifications of alarms. Unit alarms are specific to the unit. Shelter alarms apply to the entire building. These alarms include high/low temperature alarms and emergency shutdown.

Unit Alarms

- *High Pressure Switch A* – The refrigerant pressure on side "A" has exceeded the set point pressure twice in a cooling cycle. The air conditioner will shut down and notification will be sent that there is a high-pressure "A" alarm.
- *Low Pressure Switch A* – The refrigerant pressure on side "A" has dropped below the set point pressure twice in a cooling cycle. The air conditioner will shut down and notification will be sent that there is a low-pressure "A" alarm.
- *High Pressure Switch B (If Applicable)* – The refrigerant pressure on side "B" has exceeded the set point pressure twice in a cooling cycle. The air conditioner will shut down and notification will be sent that there is a high-pressure "B" alarm.
- *Low Pressure Switch B (If Applicable)* – The refrigerant pressure on side "B" has dropped below the set point pressure twice in a cooling cycle. The air conditioner will shut down and notification will be sent that there is a low-pressure "B" alarm.
- *Emergency Shutdown* – This alarm is activated when the unit is shut down by the user via remote access or thru the HMI.
- *Communication* – This is activated when a unit loses communication to the main controller. If this alarm is activated the alarm window on the HMI will pop-up and have a message reading "Unit X Communication Fault". In the event of this alarm the controller will not call for the affected unit.

Shelter Alarms

- *Low Building Temperature* – Activated if the temperature in the building drops to the selected temperature. Factory default is 50°F but can be changed from the parameters page of the HMI in 1° increments between 30°F and 95°F. If this alarm is activated the alarm window on the HMI will pop-up and have a message reading "Low Temperature Alarm".
- *High Building Temperature* – Activated if the temperature in the building reaches the selected temperature. Factory default is 90°F but can be changed from the parameters page of the HMI in 1° increments between 30°F and 95°F. If this alarm is activated the alarm window on the HMI will pop-up and have a message reading "High Temperature Alarm".

Important Safety Precautions

⚠ WARNING

ALWAYS TURN OFF POWER AT THE MAIN POWER SUPPLY BEFORE INSTALLING, CLEANING, OR REMOVING THERMOSTAT.

- Do not short across terminals of system control to test operation; this will damage your controller and may void your warranty.
- All wiring must conform to local and national electrical and building codes. Please follow provided wiring diagrams.
- Use this controller only as described in this manual.

To Install MPC-10 System Controller

⚠ WARNING ELECTRICAL SHOCK HAZARD

TURN OFF POWER AT THE MAIN SERVICE PANEL BY REMOVING THE FUSE OR SWITCHING THE APPROPRIATE CIRCUIT BREAKER TO THE OFF POSITION BEFORE REMOVING THE EXISTING THERMOSTAT.

IMPORTANT

Marvair MPC-10 installation must conform to local and national building and electrical codes and ordinances.

Note: Mount the MPC-10 about five feet above the floor. Do not mount the MPC-10, in direct sunlight, behind a door, or in an area affected by a vent or duct. The MPC-10 is designed for interior use only.

1. Turn off power to the heating and cooling system by removing the fuse or switching off the appropriate circuit breaker.
2. Put controller against the wall where you plan to mount it (Be sure wires will feed through the wire opening in the base of the MPC-10).
3. Mark the placement of the mounting holes.
4. Using a drill bit, drill holes in the places you have marked for mounting.
5. Use screws to mount MPC-10 to wall.
6. Feed wires through the bottom left cable gland.
7. Insert stripped, labeled wires in matching wire terminals. See Wiring Diagrams. CAUTION! Be sure exposed portion of wires do not touch other wires.
8. Gently tug wire to be sure of proper connection. Double check that each wire is connected to the proper terminal.
9. Tighten the cable gland to make a water tight seal.
10. Close the cover on the MPC-10.
11. Plug in ethernet cables from each unit to the bottom of the MPC-10.
12. Turn on power to the system at the main service panel.
13. Test MPC-10 operation as described in “Testing the MPC-10”.

Remote Sensor Installation

1. Remove cover from the remote sensor housing
2. Select an appropriate location for mounting the remote sensor
3. Mount remote sensor unit using hardware provided
4. Install 4 wires between remote sensor and MPC-10 (use shielded cable that is adequately grounded)
   a. Use provided wiring diagrams to wire sensors

Operating the MPC-10

The purpose of this document is to explain how to navigate through the interface along with describing the function of each selectable option on the screen.

Note: Failure to observe the instructions contained in this document may result in personal injury and/or property damage along with voiding warranty. Read this manual before installing, replacing or using the product.

Prerequisites

1. **Power to controller**
   The MC-10 controller requires 100-240 VAC 1PH power supply input to operate. Note that the typical power supply has a 100-240 VAC 1PH input requirement and sourcing this input would be the user's responsibility If independent power is required.
2. **Network Wiring**
   System needs to be appropriately wired to facilitate proper communication. Please follow wiring diagram provided and manufacturers best practice recommendation. Deviation from instructions/guidelines could result in poor or interrupted communication between devices.
3. **HVAC Unit PLC Setup**
   Communication between each unit is predefined in the controller and it requires the end user to manually set the unique MODBUS IP ADDRESS on each unit that is being controlled. See table below

UNIT	MODBUS ID
1	10.0.0.120 (Factory Default)
2	10.0.0.121
3	10.0.0.122
4	10.0.0.123
5	10.0.0.124

Note:

1. Connection between each unit requires CAT 5/6 Cable or RS485 (3-Wire). This is supplied by the end user.
2. "Star" communication topology is used. Ethernet switch in this controller is central node.

HMI Interface Navigation

➤ HOME Screen

This is the second page that is populated when the HMI is powered up. This page allows the user to set:

1. **T-Stat Mode** – Use the Left and Right arrows to scroll between modes.
   a. OFF – Turns the Thermostat "Off". No Air conditioning operation can be active.
   b. COOL – Allows the cooling process ONLY. Heating will remain inactive irrespective of setpoint.
   c. HEAT – Allows the heating process ONLY. Cooling will remain inactive irrespective of setpoint.
   d. AUTO – Allows both the Cooling and Heating process with respect to User defined setpoint.
5. **Space Temperature** – This variable displays the measured temperature of the space.
6. **Space Humidity** – This variable displays the measured humidity of the space.
7. **Date and Time** – Values displayed here are set on the first screen that is displayed on startup of the device.
8. **Setpoint Adjust** – This digital button displays the "Cooling Setpoint", "Heating Setpoint" and "Humidity Setpoint". These values remain visible on the main screen for 2 minutes after "ADJUST" is pressed. See "Figure 2" below.
9. **Parameter Page** – This button opens the "Parameter" page. See "Figure 3"

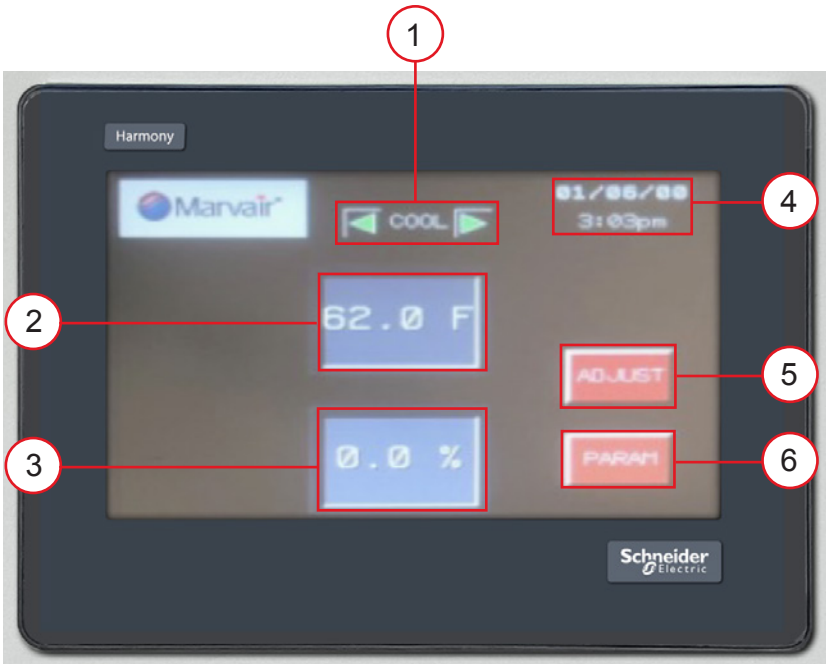


Figure 1 – "Home" Screen. See description above for further details

1	T-Stat Mode
2	Space Temperature
3	Space Humidity
4	Date and Time
5	Setpoint Adjust
6	Parameter

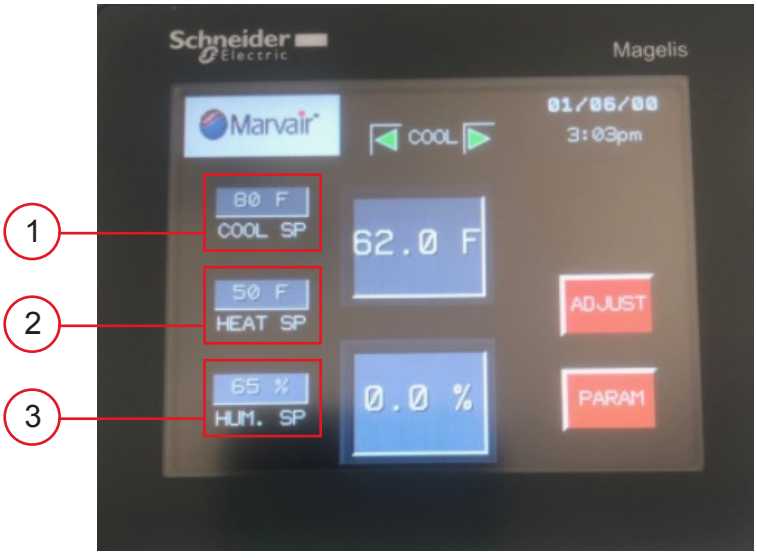


Figure 2 – "Home" Screen after the "*Adjust*" button is selected

1	Cooling Setpoint
2	Heating Setpoint
3	Humidity Setpoint

➤ Parameter Screen

Figure 3 – "Parameter" Screen

This screen provides the user with the ability to setup basic variables for operation. Each variable is described below.

1. **Cooling Differential (*COOL DIF*)** – This variables dictates when the subsequent stage is energized in the cooling process. For example, if the "Cool SP" = 80 and "Cool Dif" = 2. The first cooling stage is energized at 80, the second cooling stage is energized at 82, the third cooling stage is energized at 84 and so on.
2. **Heating Differential (*HEAT DIF*)** – This variable dictates when the subsequent stage is energized in the heating process. For example, if the "Heat SP" = 50 and "Heat Dif" = 4. The first hgeating stage is energized at 50, the second heating stage is energized at 46, the third heating stage is energized at 42 and so on.
3. **Number of Units (*# of UNITS*)** – This variable give the user the ability to dictate the number of units that is being controlled. ONly these units can be A "LEAD" unit (see variable below for explanation).
4. ***LEAD*** – This variable displays the unit that will come on first if any operation is requested.
5. ***LEAD PERIOD*** – This variable provides the user with the ability to set how long a unit should remain as a "LEAD". This allows all systems being controlled to get equal runtime. Number at the top is multiplied with the variable underneath. The variable underneath gives the user the ability to select "DAYS", "HOURS" or "MINU" (minutes). For example, if the number above equals 7.0 and the variable underneath is set to days, the lead will be incremented (+1) every 7 days.
6. ***BLOWER MODE*** – This allows the user to dictate how the Indoor Motors should operate. It provides 3 selections:
   a. AUTO (DEFAULT) – This option only brings on the Indoor Blower when there is an active request for an air conditioning operation. The Indoor Blower goes off once the setpoint for the respective operation is satisfied.
   b. ON – This option can be described as continuous blower operation. That is, the Indoor blower does stays On, irrespective of a air conditioning request.
   c. Cycle – This option provides the user with the ability to have the Indoor blower cycle ON and OFF for a user defined period in minutes. Note that during an air conditioning request, the blower runs continuously and will not cycle.
7. ***SYSTEM BWR OP*** – This variable controls whether the "BLOWER MODE" operation occurs on all units or just on the lead unit. For example, if "BLOWER MODE" = ON and "SYSTEM BWR OP" = LEAD, then only the lead unit blower would run continuously. All other unit indoor blower would come on based on a request for the blower. However, if "BLOWER MODE" = ON and "SYSTEM BWR OP" = ALL, then all blowers would run continuously and not just the lead unit blower.
8. ***ALARM*** – This variable dictates when the respective alarm contact is triggered.
   a. High – Setpoint for the space high temperature alarm
   b. Low – Setpoint for the space low temperature alarm
9. **Buttons** – Each button opens a different page. Each page will be described in their respective sections.
   a. ADVANCED
   b. STATUS
   c. ALARM LOG
   d. HOME

➤ Advanced Screen

On this screen, more advanced modification, calibrations and functionality can altered to the users comfort or equipment performance. Each button will take the user to a different screen to view/modify the respective variables. Each page and its contents are described in details below.

1. ***TEMP SENSOR*** – Allows user to properly calibrate the temperature sensors if necessary.
2. ***HUM SENSOR*** – Allows user to properly calibrate the humidity sensor if necessary.
3. ***ECONOMIZER*** – Allows usere to setup economizer operation in the units. Note that each setting is replicated on all units. This is only applicable in units with economizers.
4. ***SYSTEM CONFIG*** – Allows user to access bios settings of the HMI. Modifcations in the bios can render the system inoperable.
5. ***HOME*** – Brings user back to the "HOME" screen.
6. ***MOTOR SPEED*** - Allows the end user to configure the speed of the indoor motor for the various stages of cooling and other air conditioning operation.
7. **Communication** – Allows the end user to configure the RS 485-1 Slave port for remote communication.

➤ TEMP SENSOR Screen

Figure 4 – "Temperature Sensor" Screen

1. **Range**
   - ***MAX*** – This variable represents the maximum value of the range of the temperature sensor. The manufacturers value for the sensor must be multiplied by 10 for correct scaling.
   - ***MIN*** – This variable represents the minimum value of the range of the temperature sensor. The manufacturers value for the sensor must be multiplied by 10 for correct scaling

   For example, if the manufacturer lists the range for the sensor as 32-122, the maximum value the user would input is 1220 and the minimum value would be 320.
2. ***OFFSET*** – This variable allows the end user to alter the measured temperature by the amount placed in this variable.
3. ***VALUE*** – This variable displays the temperature value for all the associated sensors. Note that sensors that are not normally used should have an offset of "-32".
4. ***NO. of Sensors*** – This variable allows the user to define the number of sensors being used by the controller. Note that the "VALUE" tab for all sensor not being used should be equal to "0". The "OFFSET" variable of the respective sensor should be used to alter the "VALUE" of the sensor in question to 0. This is critical for calculation.
5. ***HIGHEST/AVERAGE*** – This variable allows the user to select if the "HIGHEST" temperature measured should take priority in operation or "AVERAGE" temperature of the sensors should take priority. It is critical that the instructions in "No. of Sensors" above is followed.
6. ***PARAM*** – This button opens the "PARAMETER" screen. See above for description.

➤ HUMIDITY SENSOR Screen

Figure 5 – "HUMIDITY SENSOR" Screen.

1. ***OFFSET*** – This variable allows the end user to alter the measured space humidity by the amount placed in this variable.
2. ***VALUE*** – This variable displays the space humidity that the controller is using for operation. It is the same value being shown on the "HOME" screen.
3. ***NO. of Sensors*** – This variable allows the user to define the number of sensors being used by the controller. Note that the "VALUE" tab for all sensor not being used should be equal to "0". The "OFFSET" variable of the respective sensor should be used to alter the "VALUE" of the sensor in question to 0. This is critical for calculation.
4. ***HIGHEST/AVERAGE*** – This variable allows the user to select if the "HIGHEST" temperature measured should take priority in operation or "AVERAGE" temperature of the sensors should take priority. It is critical that the instructions in "No. of Sensors" above is followed.
5. ***PARAM*** – This button opens the "PARAMETER" screen. See above for description.

➤ ECONOMIZER Screen

Figure 6 – "ECONOMIZER" Screen.

1. ***Cool Option*** – This variable allows the user to select if the system should run the free cooling feature (Economize) first or go directly to mechanical cooling.
   a. ECONOMIZE – If the outdoor conditions are satisfied, the system attemps to satisfy the cooling requirement by bringing in outside air. Note that if outside air is not desired, this feature should NOT be selected.
   b. DX (DIRECT EXPANSION) – This feature energizes the compressor(s) to satisfy the cooling requirement. It will NOT bring in outside air to satisfy the cooling requirement.
2. ***Sensor Type*** – This allows the end user to select what psychrometric properties (in this case, Temperature or Enthalpy) should be used to energize the free cooling feature.
   a. DRYBULB – If "DRYBULB" is selected, only the Temperature property is considered when deciding to economize. See "Temp Setpoint" below.

b. TEMP/HUM – If "TEMP/HUM" is selected, both the temperature setpoint and humidity setpoint must be satisfied for the system to economize. See "Temp Setpoint" and "Hum Setpoint" below.

3. ***Temp Setpoint*** – This is the maximum temperature at which the outdoor air will be allowed to be used for free cooling. Basically, the maximum temperature at which the economizer opens.
4. ***Hum Setpoint*** – This is the maximum humidity that the unit would economize.
5. ***Capacity OP*** – This describes the staging of the unit during operation
   a. FULL – The unit runs at full cooling capacity at all times. That is, all cooling stages in the unit will be energized. No partial capacity or economizer operation will be allowed.
   b. VARIABLE ¬– Only used on units with two (qty), staged compressors. It is critical that "Capacity OP" on the controller is NOT set to variable if the 4th character in the model number is not a "7". This allows the end user to achieve 5 stages of cooling operation during. ****Special Controller Needed*****
   c. STAGE – This setting allows the unit to operate with 2 distinct stages. Note that the unit much be equipped with stage compressors or two single stage compressors which can be operated independently.
6. ***ADVANCED*** – This opens the "ADVANCED" screen. Details addressed earlier in this document .
7. ***DAMPER*** – his opens the "DAMPER" screen. See below for details.

➤ DAMPER

Figure 7 – "DAMPER" Screen.

1. ***Damper Control*** – This dictates how the dampers will function during the economizer process.
   a. AUTO – If "AUTO" is selected, the damper would modulate to maintain a pre-defined mixed air temperature of 55 OF.
   b. MANUAL – If "MANUAL" is selected, when there is a request for econmizer, the damper will open to a user defined position [*Set Damper Pos %*].
2. ***Override Damper*** – This allows the end user to open the damper irrespective of a cooling request. Basically, the damper remains open continuously at a user defined position [*Set Damper Pos %*].
3. ***Pos. Requested*** – TBD
4. ***Set Damper Pos %*** - This allows the user to set the dampers to a user defined position. Note that this only works if "*Override Damper*" is set to "*ON*" or if there is an active request for economizer cooling and "*Damper Control*" is set to "*MANUAL*".
5. ***Damper Max Pos %*** - This is the maximum position (0-100) that the damper will be allowed to open to during operation. This number is user defined.
6. ***Damper Min Pos %*** - This is the minimun position (0-100) that the damper will close to during operation. This number is user defined.
7. ***ECONOMIZER*** – This opens the "ECONOMIZER" screen. Previously addressed in this document.

NOTE: ALL ECONOMIZER AND DAMPER SETTINGS ARE REPLICATED ON ALL DEVICES. THAT IS, EACH SYSTEM CANNOT BE SETUP INDEPENDENTLY FROM THE CONTROLLER.

➤ UNIT STATUS Screen

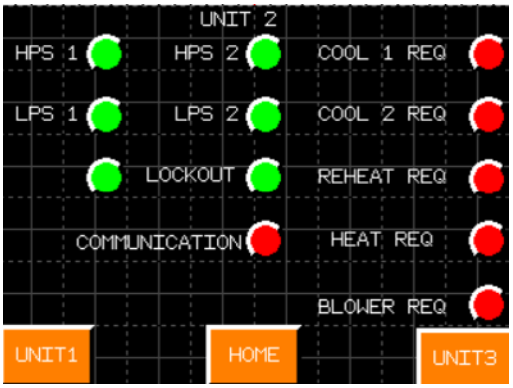


Figure 8 – "UNIT STATUS" Screen.

This screens illustrates the basic status of the respective unit. The unit number is identified top center of the screen. To go to the next or previous unit screen, use the "*UNIT #*" is located at the bottom corners of the screen. The center botton [HOME], will open the "*HOME*" screen.

ALARM STATUS

1. ***HPS 1*** – High Pressure Fault on Circuit 1 of the respective unit. Solid "Green" means OK. Flashing "RED" means Fault.
2. ***HPS 2*** – High Pressure Fault on Circuit 2 of the respective unit. Solid "Green" means OK. Flashing "RED" means Fault.
3. ***LPS 1*** – Low Pressure Fault on Circuit 1 of the respective unit. Solid "Green" means OK. Flashing "RED" means Fault.
4. ***LPS 2*** – Low Pressure Fault on Circuit 2 of the respective unit. Solid "Green" means OK. Flashing "RED" means Fault.
5. ***LOCKOUT*** – Signifies a lockout in the unit. Left light Flashing "Red" means lockout on circuit 1. Right light Flashing "Red" means lockout on circuit 2. Solid Green signifies "NO LOCKOUT PRESENT".
6. ***COMMUNICATION*** – "Solid Green" represents communication between the controller and respective unit. "Flashing Red" represent "NO COMMUNICATION".

REQUESTS

NOTE: AN ACTIVE REQUEST IS REPRESENTED BY A "GREEN" LIGHT ADJACENT TO THE RESPECTIVE REQUEST. AN INACTIVE REQUEST IS REPRESENTED BY A "RED" LIGHT ADJACENT TO THE RESPECTIVE REQUEST.

1. ***COOL 1 REQ*** – This represents a stage 1 cooling request from the controller for the unit respectively.
2. ***COOL 2 REQ*** – This represents a stage 2 cooling request from the controller for the unit respectively.
3. ***REHEAT REQ*** – This represents a dehumidifcation request from the controller for the unit respectively.
4. ***HEAT REQ*** – This represents a stage 1 heat request from the controller for the unit respectively.
5. ***BLOWER REQ*** – This represents a request for fan from the controller for the unit respectively.

➤ ALARM LOG Screen

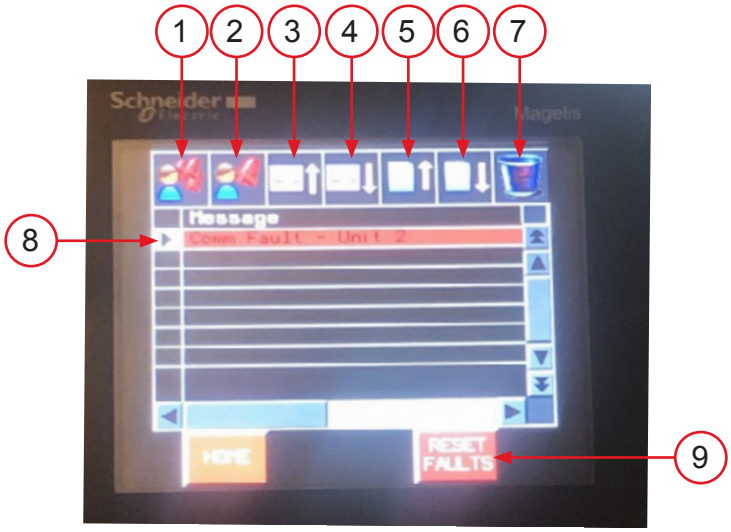


Figure 9 – "Alarm Log" Screen.

1	Acknowledge independent fault
2	Acknowledge all faults
3	Go to previous Page
4	Go to next Page
5	Scroll to previous message
6	Scroll to next message
7	Delete all faults
8	Fault message
9	Remote reset pressure switch lockout faults. ***Press and hold for 5 seconds. The controller will only allow this function if the Cooling Setpoint is satisfied.***

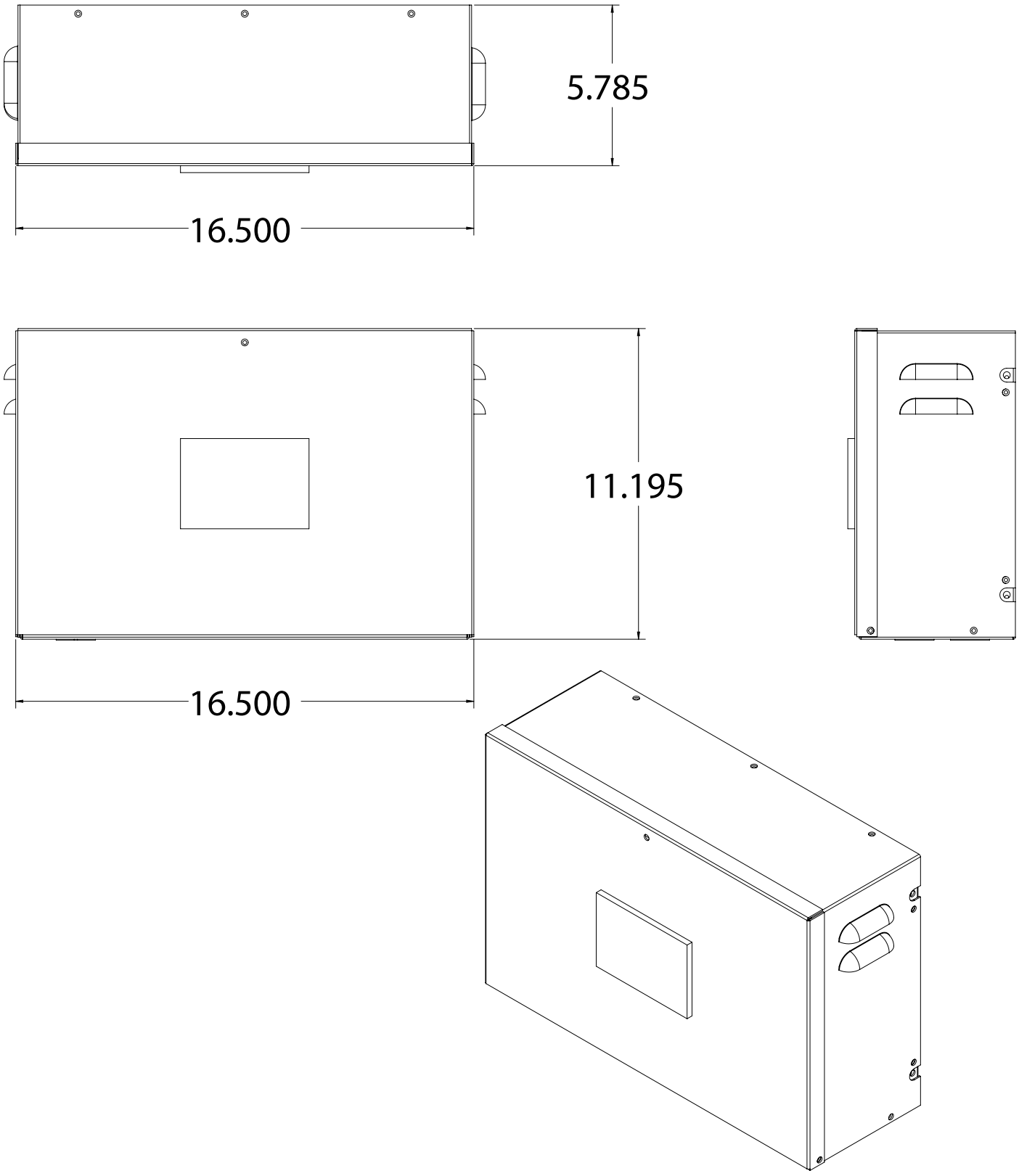
TROUBLESHOOTING COMMUNICATION ISSUES

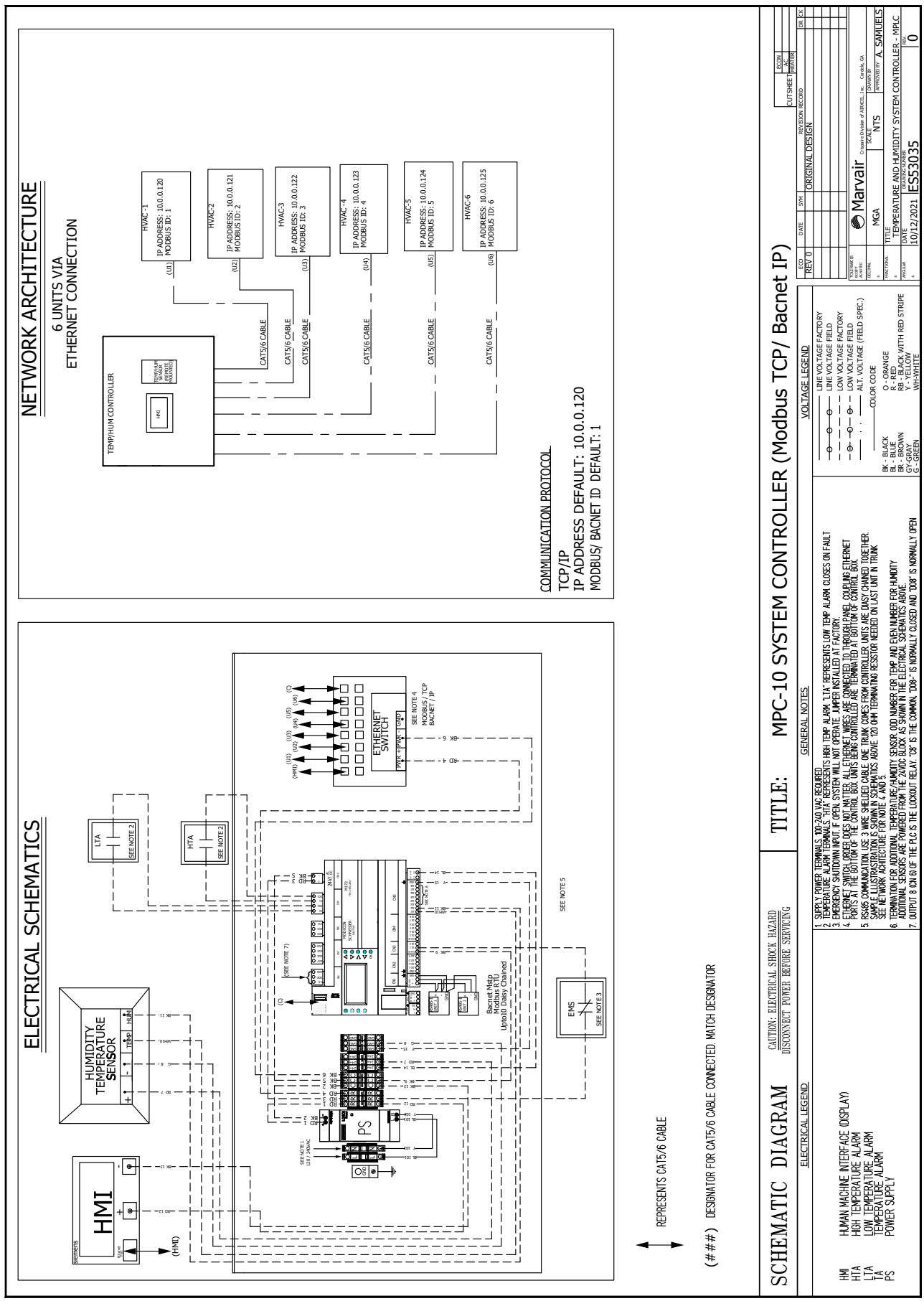
IMPORTANT

Be sure that the crankcase heater (if used) has been energized for at least 24 hours before starting the unit(s). Double-check all electrical connections before applying power. Air conditioners with scroll compressors running on 3Ø power must be checked for proper rotation during the initial start-up. Please refer to the Installation & Operation manual for determining if the 3Ø compressors are rotating correctly. Incorrect rotation can damage the compressor and may not be covered by the warranty.

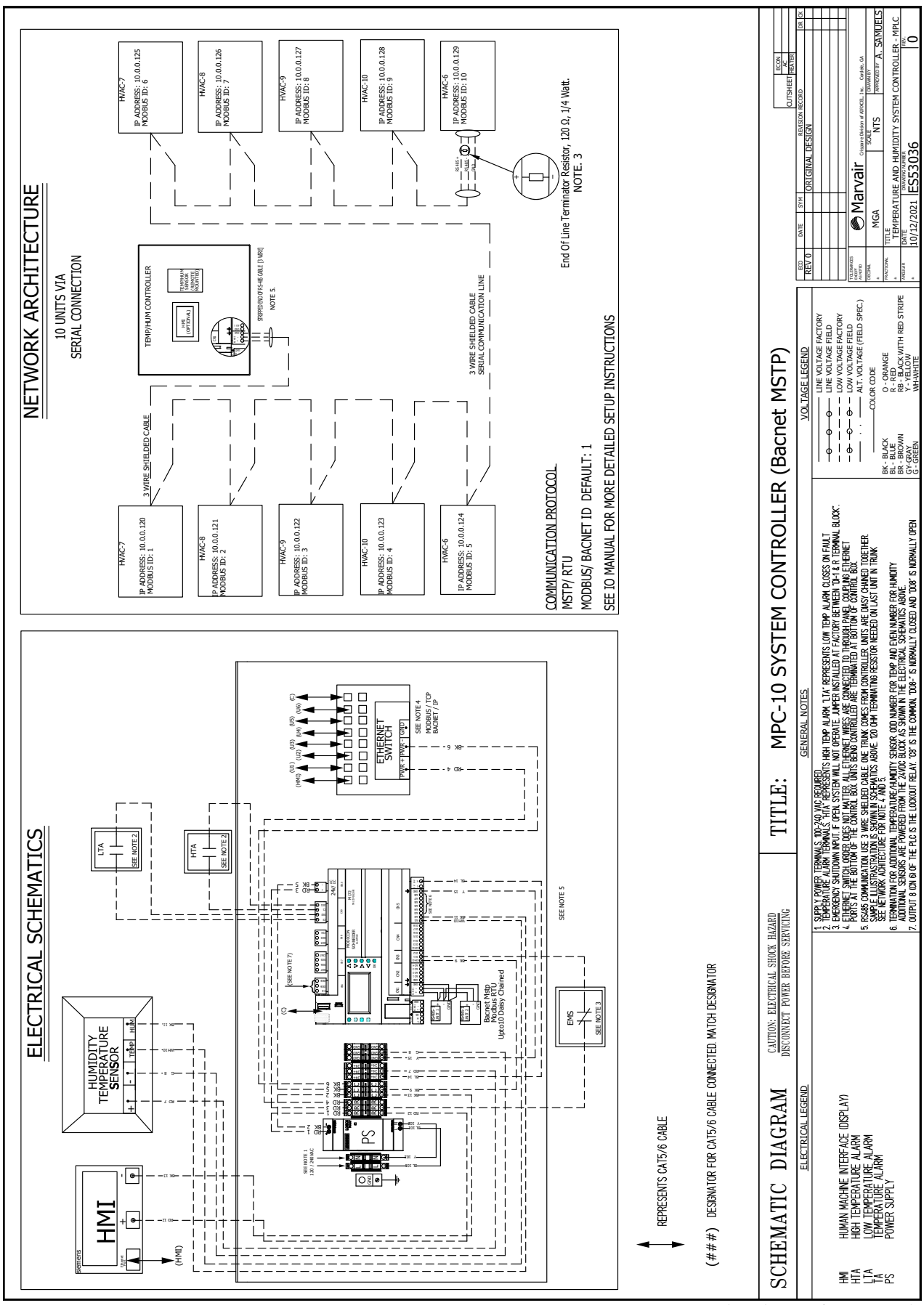
1. Ensure that the wires are terminated correctly based on the wiring diagram provided.
2. Type of communication to HVAC units
   a. If MODBUS TCP (CAT5/6 Cable) is used between the controller and the HVAC units.
      i. Use the appropriate IP address for the respective unit.
      ii. Ensure that the Controller, the HVAC unit and the HMI is on the same subnet (Highlighted in **BLUE**). That is, only the last section of the IP address should be different. For example, Controller IP Address: *10.0.0.100*
          HVAC Unit 1 IP Address: *10.0.0.120*
          HMI IP Address: *10.0.0.150*
   b. If MODBUS RTU (RS 485-2) is used between the controller and the HVAC units.
      i. Use the appropriate MODBUS ID for the respective units
      ii. BAUD rate, Parity, Stop Bit and Data Bit are preconfigured. See "page 2" above for configuration.
3. "***Status***" screen for the respective unit monitors communication between the units. Verify that the communication bubble for the unit in question is "SOLID Green". If it is not connected, the bubble will be flashing RED.
4. If the HMI comes up with exclamation marks (!) beside all the values, that means that the HMI is not communicating with the PLC in the Controller (Not the PLC in the HVAC units).

MPC-10 Dimensions




NETWORK ARCHITECTURE
6 UNITS VIA
ETHERNET CONNECTION
TEMP/HUM CONTROLLER
HMI
HVAC-1
IP ADDRESS: 10.0.0.120
MODBUS ID: 1
HVAC-2
IP ADDRESS: 10.0.0.121
MODBUS ID: 2
HVAC-3
IP ADDRESS: 10.0.0.122
MODBUS ID: 3
HVAC-4
IP ADDRESS: 10.0.0.123
MODBUS ID: 4
HVAC-5
IP ADDRESS: 10.0.0.124
MODBUS ID: 5
HVAC-6
IP ADDRESS: 10.0.0.125
MODBUS ID: 6
CAT5/6 CABLE
COMMUNICATION PROTOCOL
TCP/IP
IP ADDRESS DEFAULT: 10.0.0.120
MODBUS/ BACNET ID DEFAULT: 1
ELECTRICAL SCHEMATICS
HUMIDITY
TEMPERATURE
SENSOR
HMI
LTA
HTA
SEE NOTE 2
ETHERNET
SWITCH
SEE NOTE 4
MODBUS / TCP
BACNET / IP
PS
EMS
SEE NOTE 3
SEE NOTE 5
Bacnet Mstp
Modbus RTU
Upto10 Daisy Chained
REPRESENTS CAT5/6 CABLE
(###) DESIGNATOR FOR CAT5/6 CABLE CONNECTED. MATCH DESIGNATOR
SCHEMATIC DIAGRAM
CAUTION: ELECTRICAL SHOCK HAZARD
DISCONNECT POWER BEFORE SERVICING
TITLE: MPC-10 SYSTEM CONTROLLER (Modbus TCP/ Bacnet IP)
ELECTRICAL LEGEND
HMI HUMAN MACHINE INTERFACE (DISPLAY)
HTA HIGH TEMPERATURE ALARM
LTA LOW TEMPERATURE ALARM
TA TEMPERATURE ALARM
PS POWER SUPPLY
GENERAL NOTES
1. SUPPLY POWER TERMINALS 100-240 VAC REQUIRED
2. TEMPERATURE ALARM TERMINALS "HTA" REPRESENTS HIGH TEMP ALARM, "LTA" REPRESENTS LOW TEMP ALARM CLOSES ON FAULT
3. EMERGENCY SHUTDOWN INPUT. IF OPEN, SYSTEM WILL NOT OPERATE. JUMPER INSTALLED AT FACTORY
4. ETHERNET SWITCH LOCATION DOES NOT MATTER. ALL ETHERNET WIRES ARE CONNECTED TO THROUGH PANEL COUPLING ETHERNET PORTS AT THE BOTTOM OF THE CONTROL BOX UNITS BEING CONTROLLED ARE TERMINATED AT BOTTOM OF CONTROL BOX
5. RS485 COMMUNICATION USE 3 WIRE SHIELDED CABLE. DAISY CHAIN TRUNK COMES FROM CONTROLLER, UNITS ARE DAISY CHAINED TOGETHER
SEE NETWORK ARCHITECTURE FOR NOTE 4 AND 5.
6. TERMINATION FOR ADDITIONAL TEMPERATURE/HUMIDITY SENSOR. ODD NUMBER FOR TEMP AND EVEN NUMBER FOR HUMIDITY
ADDITIONAL SENSORS ARE POWERED FROM THE 24VDC BLOCK AS SHOWN IN THE ELECTRICAL SCHEMATICS ABOVE
7. OUTPUT 8 (DN 6) OF THE P.C IS THE LOCKOUT RELAY. "C8" IS THE COMMON, "D8" IS NORMALLY CLOSED AND "D8" IS NORMALLY OPEN
VOLTAGE LEGEND
LINE VOLTAGE FACTORY
LINE VOLTAGE FIELD
LOW VOLTAGE FACTORY
LOW VOLTAGE FIELD
ALT. VOLTAGE (FIELD SPEC.)
COLOR CODE
BK - BLACK
BL - BLUE
BR - BROWN
GY-GRAY
G - GREEN
R - ORANGE
P - PURPLE
RB - BLACK WITH RED STRIPE
Y - YELLOW
WH-WHITE
ECO
REV 0
DATE
SYM
REVISION RECORD
ORIGINAL DESIGN
DR
CK
TOLERANCES UNLESS NOTED
FRACTIONAL
ANGULAR
Marvair
A Clarus Company
SCALE
NTS
DRAWN BY
APPROVED BY
A. SAMUELS
MGA
TITLE
TEMPERATURE AND HUMIDITY SYSTEM CONTROLLER - MPLC
DATE
10/12/2021
DRAWING NUMBER
ES53035
REV
0
CUTSHEET
ECON
MICROS

MPC-10 Wiring & Connection Diagrams

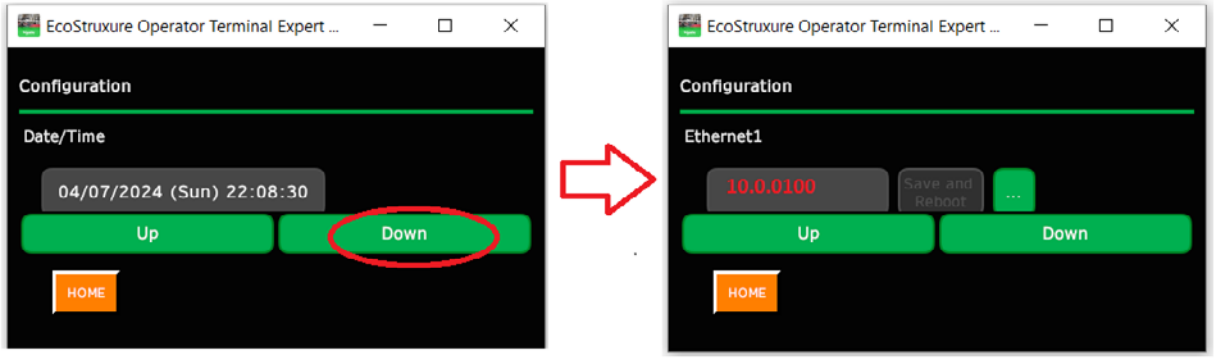


APPENDIX A - NETWORK CONFIGURATION

➤ Network configuration of the MPC-10 and associated HVAC units

1. How to navigate to page that allows IP address configuration

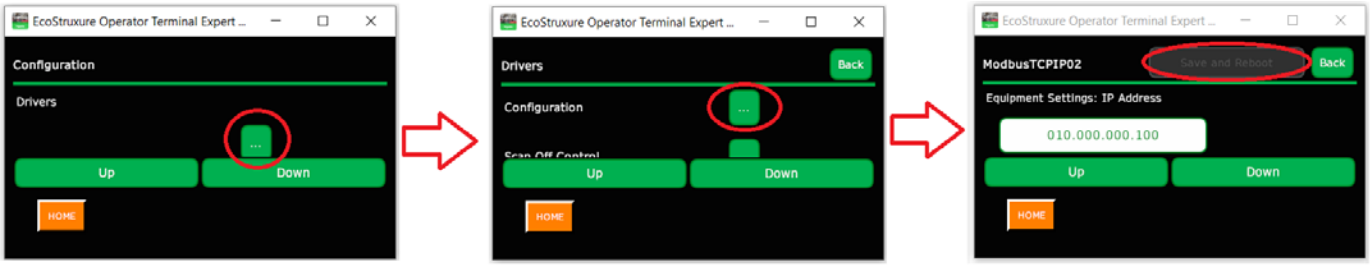
2. How to change the IP address of the HMI



PRESS DOWN UNTIL "ETHERNET1" APPEARS

TYPE THE DESIRED ADDRESS FOR THE HMI HERE. THE "..." ALLOWS CONFIG OF SUBNET MASK AND DEFAULT GATEWAY. SAVE AND REBOOT AFTER MAKING THE NECESSARY CHANGES

3. How to change the IP address of the reference PLC the HMI is communicating with.
   Note: The master PLC's IP address still has to be changed at the PLC.



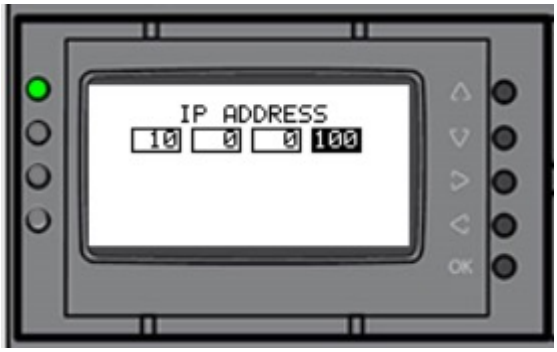
FOLLOW STEP 1 AFTER REBOOT. USE "DOWN" TO GET TO THE SCREEN ABOVE. SELECT THE "..." CIRCLED ABOVE

ON THE "DRIVERS" SCREEN, SELECT THE "..." TO THE LEFT OF CONFIGURATION CIRCLED ABOVE.

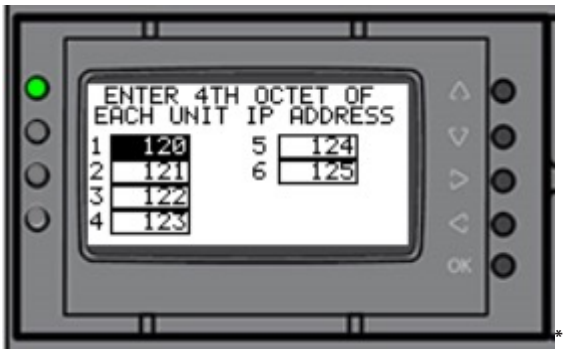
USE "DOWN" TO NAVIGATE TO THE SCREEN ABOVE. THE IP ADDRESS USED HERE SHOULD BE THE SAME IP ADDRESS AS THE PLC IN THE MASTER CONTROLLER. SAVE AND REBOOT.

➤ How to change the IP address on the PLC (master controller)

1. Use buttons on the right of the PLC display to navigate to the "IP ADDRESS" screen. Note that the IP address used here should be same IP address used in "Step 3" for the HMI configuration above



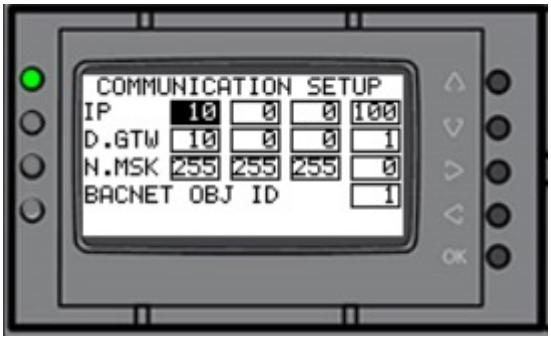
2. The fourth octet of the IP address associated to each HVAC unit PLC's need to be configured on the screen below.



Note: The PLC is located inside the MPC-10 controller behind the HMI

➤ How to change the IP address on the PLC in the HVAC units

1. Use buttons on the right of the plc display to navigate to the "IP ADDRESS" screen.



➤ General notes concerning network architecture

1. Each device on the network must have a unique IP address
2. All devices must be on the same subnet. That is, the first 3 octets must be the same for all devices. If the IP address is **10.0.0.**100, the bold and underlined portion of the IP address must be same for all devices on that network for them communicate.
3. Building management systems also need to be on the same subnet in order to establish communication. See "*2*." For explanation of subnet

APPENDIX B - MODBUS MAP

➤ General Notes for Correct Addressing

1. Use Big Endian - byte swap
2. OFFSET of "1" might be necessary for correct addressing

Address	Name	Type	Read/ Write	Default Value	Min	Max	Description
8969	SpaceTempMEM	REAL (32 BIT)	RO				Reference Space temperature used for operation
9016	Lead Unit	INT (16 BIT)	RW	1	1	10	Lead Unit. This values changes based on Lead/Lag cycle
9024	MOD_Unit1_HPS1	Bool (1 BIT)	RO	0			Circuit 1 High Pressure Switch Status - Unit 1
9025	MOD_Unit1_HPS2	Bool (1 BIT)	RO	0			Circuit 2 High Pressure Switch Status - Unit 1
9026	MOD_Unit1_LPS1	Bool (1 BIT)	RO	0			Circuit 1 Low Pressure Switch Status - Unit 1
9027	MOD_Unit1_LPS2	Bool (1 BIT)	RO	0			Circuit 2 Low Pressure Switch Status - Unit 1
9028	MOD_Unit2_HPS1	Bool (1 BIT)	RO	0			Circuit 1 High Pressure Switch Status - Unit 2
9029	MOD_Unit2_HPS2	Bool (1 BIT)	RO	0			Circuit 2 High Pressure Switch Status - Unit 2
9030	MOD_Unit2_LPS1	Bool (1 BIT)	RO	0			Circuit 1 Low Pressure Switch Status - Unit 2
9031	MOD_Unit2_LPS2	Bool (1 BIT)	RO	0			Circuit 2 Low Pressure Switch Status - Unit 2
9032	MOD_Unit3_HPS1	Bool (1 BIT)	RO	0			Circuit 1 High Pressure Switch Status - Unit 3
9033	MOD_Unit3_HPS2	Bool (1 BIT)	RO	0			Circuit 2 High Pressure Switch Status - Unit 3
9034	MOD_Unit3_LPS1	Bool (1 BIT)	RO	0			Circuit 1 Low Pressure Switch Status - Unit 3
9035	MOD_Unit3_LPS2	Bool (1 BIT)	RO	0			Circuit 2 Low Pressure Switch Status - Unit 3
9036	MOD_Unit4_HPS1	Bool (1 BIT)	RO	0			Circuit 1 High Pressure Switch Status - Unit 4
9037	MOD_Unit4_HPS2	Bool (1 BIT)	RO	0			Circuit 2 High Pressure Switch Status - Unit 4
9038	MOD_Unit4_LPS1	Bool (1 BIT)	RO	0			Circuit 1 Low Pressure Switch Status - Unit 4
9039	MOD_Unit4_LPS2	Bool (1 BIT)	RO	0			Circuit 2 Low Pressure Switch Status - Unit 4
9040	MOD_Unit5_HPS1	Bool (1 BIT)	RO	0			Circuit 1 High Pressure Switch Status - Unit 5
9041	MOD_Unit5_HPS2	Bool (1 BIT)	RO	0			Circuit 2 High Pressure Switch Status - Unit 5
9042	MOD_Unit5_LPS1	Bool (1 BIT)	RO	0			Circuit 1 Low Pressure Switch Status - Unit 5
9043	MOD_Unit5_LPS2	Bool (1 BIT)	RO	0			Circuit 2 Low Pressure Switch Status - Unit 5
9044	MOD_Unit6_HPS1	Bool (1 BIT)	RO	0			Circuit 1 High Pressure Switch Status - Unit 6
9045	MOD_Unit6_HPS2	Bool (1 BIT)	RO	0			Circuit 2 High Pressure Switch Status - Unit 6
9046	MOD_Unit6_LPS1	Bool (1 BIT)	RO	0			Circuit 1 Low Pressure Switch Status - Unit 6
9047	MOD_Unit6_LPS2	Bool (1 BIT)	RO	0			Circuit 2 Low Pressure Switch Status - Unit 6
9048	MOD_Unit7_HPS1	Bool (1 BIT)	RO	0			Circuit 1 High Pressure Switch Status - Unit 7
9049	MOD_Unit7_HPS2	Bool (1 BIT)	RO	0			Circuit 2 High Pressure Switch Status - Unit 7
9050	MOD_Unit7_LPS1	Bool (1 BIT)	RO	0			Circuit 1 Low Pressure Switch Status - Unit 7
9051	MOD_Unit7_LPS2	Bool (1 BIT)	RO	0			Circuit 2 Low Pressure Switch Status - Unit 7
9052	MOD_Unit8_HPS1	Bool (1 BIT)	RO	0			Circuit 1 High Pressure Switch Status - Unit 8
9053	MOD_Unit8_HPS2	Bool (1 BIT)	RO	0			Circuit 2 High Pressure Switch Status - Unit 8
9054	MOD_Unit8_LPS1	Bool (1 BIT)	RO	0			Circuit 1 Low Pressure Switch Status - Unit 8
9055	MOD_Unit8_LPS2	Bool (1 BIT)	RO	0			Circuit 2 Low Pressure Switch Status - Unit 8
9056	MOD_Unit9_HPS1	Bool (1 BIT)	RO	0			Circuit 1 High Pressure Switch Status - Unit 9
9057	MOD_Unit9_HPS2	Bool (1 BIT)	RO	0			Circuit 2 High Pressure Switch Status - Unit 9
9058	MOD_Unit9_LPS1	Bool (1 BIT)	RO	0			Circuit 1 Low Pressure Switch Status - Unit 9
9059	MOD_Unit9_LPS2	Bool (1 BIT)	RO	0			Circuit 2 Low Pressure Switch Status - Unit 9
9060	MOD_Unit10_HPS1	Bool (1 BIT)	RO	0			Circuit 1 High Pressure Switch Status - Unit 10
9061	MOD_Unit10_HPS2	Bool (1 BIT)	RO	0			Circuit 2 High Pressure Switch Status - Unit 10
9062	MOD_Unit10_LPS1	Bool (1 BIT)	RO	0			Circuit 1 Low Pressure Switch Status - Unit 10
9063	MOD_Unit10_LPS2	Bool (1 BIT)	RO	0			Circuit 2 Low Pressure Switch Status - Unit 10

Address	Name	Type	Read/ Write	Default Value	Min	Max	Description
9104	MOD_Y1_REQ_ UNIT1	Bool (1 BIT)	RO	0			Request for Stage 1 Compressor Operation_Unit 1
9105	MOD_Y1_REQ_ UNIT2	Bool (1 BIT)	RO	0			Request for Stage 1 Compressor Operation_Unit 2
9106	MOD_Y1_REQ_ UNIT3	Bool (1 BIT)	RO	0			Request for Stage 1 Compressor Operation_Unit 3
9107	MOD_Y1_REQ_ UNIT4	Bool (1 BIT)	RO	0			Request for Stage 1 Compressor Operation_Unit 4
9108	MOD_Y1_REQ_ UNIT5	Bool (1 BIT)	RO	0			Request for Stage 1 Compressor Operation_Unit 5
9109	MOD_Y1_REQ_ UNIT6	Bool (1 BIT)	RO	0			Request for Stage 1 Compressor Operation_Unit 6
9110	MOD_Y1_REQ_ UNIT7	Bool (1 BIT)	RO	0			Request for Stage 1 Compressor Operation_Unit 7
9111	MOD_Y1_REQ_ UNIT8	Bool (1 BIT)	RO	0			Request for Stage 1 Compressor Operation_Unit 8
9112	MOD_Y1_REQ_ UNIT9	Bool (1 BIT)	RO	0			Request for Stage 1 Compressor Operation_Unit 9
9113	MOD_Y1_REQ_ UNIT10	Bool (1 BIT)	RO	0			Request for Stage 1 Compressor Operation_Unit 10
9124	MOD_Y2_REQ_ UNIT1	Bool (1 BIT)	RO	0			Request for Stage 2 Compressor Operation_Unit 1
9125	MOD_Y2_REQ_ UNIT2	Bool (1 BIT)	RO	0			Request for Stage 2 Compressor Operation_Unit 2
9126	MOD_Y2_REQ_ UNIT3	Bool (1 BIT)	RO	0			Request for Stage 2 Compressor Operation_Unit 3
9127	MOD_Y2_REQ_ UNIT4	Bool (1 BIT)	RO	0			Request for Stage 2 Compressor Operation_Unit 4
9128	MOD_Y2_REQ_ UNIT5	Bool (1 BIT)	RO	0			Request for Stage 2 Compressor Operation_Unit 5
9129	MOD_Y2_REQ_ UNIT6	Bool (1 BIT)	RO	0			Request for Stage 2 Compressor Operation_Unit 6
9130	MOD_Y2_REQ_ UNIT7	Bool (1 BIT)	RO	0			Request for Stage 2 Compressor Operation_Unit 7
9131	MOD_Y2_REQ_ UNIT8	Bool (1 BIT)	RO	0			Request for Stage 2 Compressor Operation_Unit 8
9132	MOD_Y2_REQ_ UNIT9	Bool (1 BIT)	RO	0			Request for Stage 2 Compressor Operation_Unit 9
9133	MOD_Y2_REQ_ UNIT10	Bool (1 BIT)	RO	0			Request for Stage 2 Compressor Operation_Unit 10
9144	MOD_G_REQ_UNIT1	Bool (1 BIT)	RO	0			Request for Blower Operation_Unit 1
9145	MOD_G_REQ_UNIT2	Bool (1 BIT)	RO	0			Request for Blower Operation_Unit 2
9146	MOD_G_REQ_UNIT3	Bool (1 BIT)	RO	0			Request for Blower Operation_Unit 3
9147	MOD_G_REQ_UNIT4	Bool (1 BIT)	RO	0			Request for Blower Operation_Unit 4
9148	MOD_G_REQ_UNIT5	Bool (1 BIT)	RO	0			Request for Blower Operation_Unit 5
9149	MOD_G_REQ_UNIT6	Bool (1 BIT)	RO	0			Request for Blower Operation_Unit 6
9150	MOD_G_REQ_ UNIT7	Bool (1 BIT)	RO	0			Request for Blower Operation_Unit 7
9151	MOD_G_REQ_ UNIT8	Bool (1 BIT)	RO	0			Request for Blower Operation_Unit 8
9152	MOD_G_REQ_ UNIT9	Bool (1 BIT)	RO	0			Request for Blower Operation_Unit 9

Address	Name	Type	Read/ Write	Default Value	Min	Max	Description
9153	MOD_G_REQ_ UNIT10	Bool (1 BIT)	RO	0			Request for Blower Operation_Unit 10
9164	MOD_DEHUM_ REQ_UNIT1	Bool (1 BIT)	RO	0			Request for Stage Dehumidification_Unit 1
9165	MOD_DEHUM_ REQ_UNIT2	Bool (1 BIT)	RO	0			Request for Stage Dehumidification_Unit 2
9166	MOD_DEHUM_ REQ_UNIT3	Bool (1 BIT)	RO	0			Request for Stage Dehumidification_Unit 3
9167	MOD_DEHUM_ REQ_UNIT4	Bool (1 BIT)	RO	0			Request for Stage Dehumidification_Unit 4
9168	MOD_DEHUM_ REQ_UNIT5	Bool (1 BIT)	RO	0			Request for Stage Dehumidification_Unit 5
9169	MOD_DEHUM_ REQ_UNIT6	Bool (1 BIT)	RO	0			Request for Stage Dehumidification_Unit 6
9170	MOD_DEHUM_ REQ_UNIT7	Bool (1 BIT)	RO	0			Request for Stage Dehumidification_Unit 7
9171	MOD_DEHUM_ REQ_UNIT8	Bool (1 BIT)	RO	0			Request for Stage Dehumidification_Unit 8
9172	MOD_DEHUM_ REQ_UNIT9	Bool (1 BIT)	RO	0			Request for Stage Dehumidification_Unit 9
9173	MOD_DEHUM_ REQ_UNIT10	Bool (1 BIT)	RO	0			Request for Stage Dehumidification_Unit 10
9184	MOD_W2_REQ_ UNIT1	Bool (1 BIT)	RO	0			Request for Heater Operation_Unit 1
9185	MOD_W2_REQ_ UNIT2	Bool (1 BIT)	RO	0			Request for Heater Operation_Unit 2
9186	MOD_W2_REQ_ UNIT3	Bool (1 BIT)	RO	0			Request for Heater Operation_Unit 3
9187	MOD_W2_REQ_ UNIT4	Bool (1 BIT)	RO	0			Request for Heater Operation_Unit 4
9188	MOD_W2_REQ_ UNIT5	Bool (1 BIT)	RO	0			Request for Heater Operation_Unit 5
9189	MOD_W2_REQ_ UNIT6	Bool (1 BIT)	RO	0			Request for Heater Operation_Unit 6
9190	MOD_W2_REQ_ UNIT7	Bool (1 BIT)	RO	0			Request for Heater Operation_Unit 7
9191	MOD_W2_REQ_ UNIT8	Bool (1 BIT)	RO	0			Request for Heater Operation_Unit 8
9192	MOD_W2_REQ_ UNIT9	Bool (1 BIT)	RO	0			Request for Heater Operation_Unit 9
9193	MOD_W2_REQ_ UNIT10	Bool (1 BIT)	RO	0			Request for Heater Operation_Unit 10
9569	MOD_LOI_1_UNIT1	Bool (1 BIT)	RO	0			Lockout Circuit 1 _Unit 1
9570	MOD_LOI_1_UNIT2	Bool (1 BIT)	RO	0			Lockout Circuit 1 _Unit 2
9571	MOD_LOI_1_UNIT3	Bool (1 BIT)	RO	0			Lockout Circuit 1 _Unit 3
9572	MOD_LOI_1_UNIT4	Bool (1 BIT)	RO	0			Lockout Circuit 1 _Unit 4
9573	MOD_LOI_1_UNIT5	Bool (1 BIT)	RO	0			Lockout Circuit 1 _Unit 5
9574	MOD_LOI_1_UNIT6	Bool (1 BIT)	RO	0			Lockout Circuit 1 _Unit 6
9575	MOD_LOI_1_UNIT7	Bool (1 BIT)	RO	0			Lockout Circuit 1 _Unit 7
9576	MOD_LOI_1_UNIT8	Bool (1 BIT)	RO	0			Lockout Circuit 1 _Unit 8
9577	MOD_LOI_1_UNIT9	Bool (1 BIT)	RO	0			Lockout Circuit 1 _Unit 9
9578	MOD_LOI_1_ UNIT10	Bool (1 BIT)	RO	0			Lockout Circuit 1 _Unit 10

Address	Name	Type	Read/ Write	Default Value	Min	Max	Description
9589	MOD_LOI_2_Unit2	Bool (1 BIT)	RO	0			Lockout Circuit 2 _Unit 1
9590	MOD_LOI_2_Unit3	Bool (1 BIT)	RO	0			Lockout Circuit 2 _Unit 2
9591	MOD_LOI_2_Unit4	Bool (1 BIT)	RO	0			Lockout Circuit 2 _Unit 3
9592	MOD_LOI_2_Unit5	Bool (1 BIT)	RO	0			Lockout Circuit 2 _Unit 4
9593	MOD_LOI_2_Unit6	Bool (1 BIT)	RO	0			Lockout Circuit 2 _Unit 5
9594	MOD_LOI_2_Unit7	Bool (1 BIT)	RO	0			Lockout Circuit 2 _Unit 6
9595	MOD_LOI_2_Unit8	Bool (1 BIT)	RO	0			Lockout Circuit 2 _Unit 7
9596	MOD_LOI_2_Unit9	Bool (1 BIT)	RO	0			Lockout Circuit 2 _Unit 8
9597	MOD_LOI_2_Unit10	Bool (1 BIT)	RO	0			Lockout Circuit 2 _Unit 9
9598	MOD_LOI_2_Unit11	Bool (1 BIT)	RO	0			Lockout Circuit 2 _Unit 10
9609	SpaceHumidityMem	REAL (32 BIT)	RO	0			Refererence Humidity used to control dehumidification process
9631	SpaceTemp1	REAL (32 BIT)	RO	0			Measured Value Temperature - Sensor 1
9633	SpaceTemp2	REAL (32 BIT)	RO	0			Measured Value Temperature - Sensor 2
9635	SpaceTemp3	REAL (32 BIT)	RO	0			Measured Value Temperature - Sensor 3
9637	SpaceTemp4	REAL (32 BIT)	RO	0			Measured Value Temperature - Sensor 4
9639	SpaceHum1	REAL (32 BIT)	RO	0			Measured Value Humidity - Sensor 1
9641	SpaceHum2	REAL (32 BIT)	RO	0			Measured Value Humidity - Sensor 2
9643	SpaceHum3	REAL (32 BIT)	RO	0			Measured Value Humidity - Sensor 3
9645	SpaceHum4	REAL (32 BIT)	RO	0			Measured Value Humidity - Sensor 4
9680	CommActive_1	Bool (1 BIT)	RO	0			Status of communication [0 : not present | 1: present] - Unit 1
9681	CommActive_2	Bool (1 BIT)	RO	0			Status of communication [0 : not present | 1: present] - Unit 2
9682	CommActive_3	Bool (1 BIT)	RO	0			Status of communication [0 : not present | 1: present] - Unit 3
9683	CommActive_4	Bool (1 BIT)	RO	0			Status of communication [0 : not present | 1: present] - Unit 4
9684	CommActive_5	Bool (1 BIT)	RO	0			Status of communication [0 : not present | 1: present] - Unit 5
9685	CommActive_6	Bool (1 BIT)	RO	0			Status of communication [0 : not present | 1: present] - Unit 6
9686	CommActive_7	Bool (1 BIT)	RO	0			Status of communication [0 : not present | 1: present] - Unit 7
9687	CommActive_8	Bool (1 BIT)	RO	0			Status of communication [0 : not present | 1: present] - Unit 8
9688	CommActive_9	Bool (1 BIT)	RO	0			Status of communication [0 : not present | 1: present] - Unit 9
9689	CommActive_10	Bool (1 BIT)	RO	0			Status of communication [0 : not present | 1: present] - Unit 10
9696	EMS_MEM	Bool (1 BIT)	RO	0			Status of emergency shutdown input [0 :Active | 1: Inactive]
9722	MOD_Emergen-cyVent	Bool (1 BIT)	RO	0			Status of emergency shutdown input [0 : Inactive | 1: Active Request]

Address	Name	Type	Read/ Write	Default Value	Min	Max	Description
10026	OATCel	REAL (32 BIT)	RO	0			Measure Outdoor Air Temperature in Celcius
10028	OADCel	REAL (32 BIT)	RO	0			Measured Outdoor Dewpoint in Celsius
10030	OAE_SI	REAL (32 BIT)	RO	0			Measured Outdoor Enthalpy in kJ/Kg
10032	SpaceEnthalpySI	REAL (32 BIT)	RO	0			Measured Space Enthalpy in KJ/Kg
10034	SpaceTempCel	REAL (32 BIT)	RO	0			Measured Space Temperature in Celsius
10036	CommonUnitAlarm_ Status	Bool (1 BIT)	RO	0			Common Alarm Output. Monitors Pressure and Communication Alarm for all units
10039	OAT_MEM	Signed 16-bit	RO	0			Measured Outdoor Air Temperature
10040	OAH_MEM	Signed 16-bit	RO	0			Measured Outdoor Humidity
10043	SpaceTempHMI	REAL (32 BIT)	RO	0			Reference Space temperature used for triggering the various air conditioning process
10045	HMI_Temp1	REAL (32 BIT)	RO	0			Measured Temperature - Sensor 1
10047	HMI_Temp2	REAL (32 BIT)	RO	0			Measured Temperature - Sensor 2
10049	HMI_Temp3	REAL (32 BIT)	RO	0			Measured Temperature - Sensor 3
10051	HMI_Temp4	REAL (32 BIT)	RO	0			Measured Temperature - Sensor 4
10067	CommStatus_Unit1	Signed 16-bit	RO	0			Communication Status [0 : OK | 1 : FAULT | 2 : DISABLED] - UNIT 1
10068	CommStatus_Unit2	Signed 16-bit	RO	0			Communication Status [0 : OK | 1 : FAULT | 2 : DISABLED] - UNIT 2
10069	CommStatus_Unit3	Signed 16-bit	RO	0			Communication Status [0 : OK | 1 : FAULT | 2 : DISABLED] - UNIT 3
10070	CommStatus_Unit4	Signed 16-bit	RO	0			Communication Status [0 : OK | 1 : FAULT | 2 : DISABLED] - UNIT 4
10071	CommStatus_Unit5	Signed 16-bit	RO	0			Communication Status [0 : OK | 1 : FAULT | 2 : DISABLED] - UNIT 5
10072	CommStatus_Unit6	Signed 16-bit	RO	0			Communication Status [0 : OK | 1 : FAULT | 2 : DISABLED] - UNIT 6
10073	CommStatus_Unit7	Signed 16-bit	RO	0			Communication Status [0 : OK | 1 : FAULT | 2 : DISABLED] - UNIT 7
10074	CommStatus_Unit8	Signed 16-bit	RO	0			Communication Status [0 : OK | 1 : FAULT | 2 : DISABLED] - UNIT 8
10075	CommStatus_Unit9	Signed 16-bit	RO	0			Communication Status [0 : OK | 1 : FAULT | 2 : DISABLED] - UNIT 9
10076	CommStatus_ Unit10	Signed 16-bit	RO	0			Communication Status [0 : OK | 1 : FAULT | 2 : DISABLED] - UNIT 10
10077	CommFault_Unit1	Bool (1 BIT)	RO	0			COMMUNICATION FAULT [0 : OK | 1: FAULT] - UNIT 1
10078	CommFault_Unit2	Bool (1 BIT)	RO	0			COMMUNICATION FAULT [0 : OK | 1: FAULT] - UNIT 2
10079	CommFault_Unit3	Bool (1 BIT)	RO	0			COMMUNICATION FAULT [0 : OK | 1: FAULT] - UNIT 3
10080	CommFault_Unit4	Bool (1 BIT)	RO	0			COMMUNICATION FAULT [0 : OK | 1: FAULT] - UNIT 4
10081	CommFault_Unit5	Bool (1 BIT)	RO	0			COMMUNICATION FAULT [0 : OK | 1: FAULT] - UNIT 5
10082	CommFault_Unit6	Bool (1 BIT)	RO	0			COMMUNICATION FAULT [0 : OK | 1: FAULT] - UNIT 6
10083	CommFault_Unit7	Bool (1 BIT)	RO	0			COMMUNICATION FAULT [0 : OK | 1: FAULT] - UNIT 7
10084	CommFault_Unit8	Bool (1 BIT)	RO	0			COMMUNICATION FAULT [0 : OK | 1: FAULT] - UNIT 8
10085	CommFault_Unit9	Bool (1 BIT)	RO	0			COMMUNICATION FAULT [0 : OK | 1: FAULT] - UNIT 9
10086	CommFault_Unit10	Bool (1 BIT)	RO	0			COMMUNICATION FAULT [0 : OK | 1: FAULT] - UNIT 10
10087	CommsCommon-Alrm	Bool (1 BIT)	RO	0			COMMON COMMUNICATION FAULT

Appendix C - ModBus Read/Write

Address	Variable Name	Data Type	Read/Write	Default	Min	Max	Description
16384	TSTAT_MODE	INT (16 BIT)	RW	0	0	3	0: OFF | 1:COOL ONLY | 2: HEAT ONLY | 3: AUTO
16385	CoolingDifferential	REAL (32 BIT)	RW	2	0.5		Differential Required to energize cooling stages
16387	HeatingDifferential	REAL (32 BIT)	RW	2	0.5		Differential Required to energize heating stages
16389	SP_COOLING	REAL (32 BIT)	RW	80	55		Cooling Setpoint
16391	SP_HEATING	REAL (32 BIT)	RW	50			Heating Setpoint
16393	SP_HUMIDITY	INT (16 BIT)	RW	65			Humidity Setpoint
16394	NumOfUnits	INT (16 BIT)	RW	1	1	10	Number of Units that can be lead.
16395	SwapTimeMultiplier	INT (16 BIT)	RW	0	0	2	Used to select Day[0], Hr[1] or Min[2] option for Swapping
16396	LeadSwapTime	REAL (32 BIT)	RW	7			Variable for setting the length of time a unit remains as lead
16398	IBM_MODE	INT (16 BIT)	RW	0	0	2	0:AUTO, 1:CONTINUOUS, 2:PERIODIC
16399	PeriodicIBM_Multiplier	REAL (32 BIT)	RW	30	10		SETS THE PERIOD FOR PERIODIC BLOWER OPERATION
16401	EvapOP_LeadOnly	BOOL (1 BIT)	RW	0			Run lead unit fan continously
16402	TempOffset_1	REAL (32 BIT)	RW	0			Calibration Variable - Temperature Sensor 1
16404	TempOffset_2	REAL (32 BIT)	RW	0			Calibration Variable - Temperature Sensor 2
16406	TempOffset_3	REAL (32 BIT)	RW	0			Calibration Variable - Temperature Sensor 3
16408	TempOffset_4	REAL (32 BIT)	RW	0			Calibration Variable - Temperature Sensor 4
16410	HumOffset_1	REAL (32 BIT)	RW	0			Calibration Variable - HumiditySensor 1
16412	HumOffset_2	REAL (32 BIT)	RW	0			Calibration Variable - HumiditySensor 2
16414	HumOffset_3	REAL (32 BIT)	RW	0			Calibration Variable - HumiditySensor 3
16416	HumOffset_4	REAL (32 BIT)	RW	0			Calibration Variable - HumiditySensor 4
16418	NumOfTempSensors	INT (16 BIT)	RW	1	1	4	Number of Temperature Sensors being used
16419	NumOfHumSensors	INT (16 BIT)	RW	1	1	4	Number of Humidity Sensors being used
16420	AVG_Highest_Temp	BOOL (1 BIT)	RW	0		1	0 : Reference Temperature is Average | 1: Referance Temperature is Highest Value
16421	AVG_Highest_Hum	BOOL (1 BIT)	RW	0		1	0 : Reference Humidity is Average | : Referance Humidity is Highest Value
16437	LowTempSP	REAL (32 BIT)	RW	40			Low Temperature Setpoint
16438	HighTempSP	REAL (32 BIT)	RW	100			High Temperature Setpoint

APPENDIX D - BACNET ANALOG VARIABLES

PARAMETER Name	Description	Units	Access
BAV1_ThermostatMode	0:OFF, 1:COOL, 2:HEAT, 3:AUTO	Binary	Read/Write
BMS_CoolSetpoint	Cooling Setpoint	Temp (F)	Read/Write
BMS_CoolDifferential	User Defined Differential Between Cooling Stages	Temp (F)	Read/Write
BMS_HeatSetpoint	HeatingSetpoint	Temp (F)	Read/Write
BMS_HeatDifferential	User Defined Differential Between Heating Stages	Temp (F)	Read/Write
BMS_HumiditySetpoint	Humidity Setpoint	RH (%)	Read/Write
BMS_HumidityDifferential	User Defined Differential Between Humidity Stages	RH (%)	Read/Write
BMS_SpaceTemperature	Reference Temperature Used To Control HVAC Units Air-Conditioning Processes	Temp (F)	ReadOnly
BMS_SpaceHumidity	Reference Humidity Used To Control HVAC Units Dehumidification Process	RH (%)	ReadOnly
BMS_NumberOfUnits	Number of Units That Can Be Lead	No Units	Read/Write
BMS_LeadUnit	Lead Unit. This Value Changes Based On Lead/Lag Cycle	No Units	Read/Write
BMS_LeadPeriod	Used to select Day[0], Hr[1] or Min[2] option for Swapping	No Units	Read/Write
BMS_LeadPeriodMultiplier	Multiplier For “BMS_LeadPeriod” Variable	No Units	Read/Write
BMS_IndoorBlowerMode	0:AUTO, 1:CONTINUOUS, 2:PERIODIC	No Units	Read/Write
BMS_PeriodicIBMMultiplier	Sets the Period For When “BMS_IndoorBlowerMode” is set to “2:Periodic”	No Units	Read/Write
BMS_SystemBlowerOption	Controls Blower Operation Of System As A Whole. 0: ALL, 1:LEAD	No Units	Read/Write
BMS_HighTempSetpoint	High Temperature Setpoint	Temp (F)	Read/Write
BMS_LowTempSetpoint	Low Temperature Setpoint	Temp (F)	Read/Write
BMS_NumberOfTempSensors	Number Of Temperature Sensors Being Used	No Units	Read/Write
BMS_NumberOfHumiditySensors	Number Of Humidity Sensors Being Used	No Units	Read/Write
BMS_SupplyAirTempUnit1	Measured Value of the Supply Air Sensor - Unit 1	Temp (F)	ReadOnly
BMS_SupplyAirTempUnit2	Measured Value of the Supply Air Sensor - Unit 2	Temp (F)	ReadOnly
BMS_SupplyAirTempUnit3	Measured Value of the Supply Air Sensor - Unit 3	Temp (F)	ReadOnly
BMS_SupplyAirTempUnit4	Measured Value of the Supply Air Sensor - Unit 4	Temp (F)	ReadOnly
BMS_SupplyAirTempUnit5	Measured Value of the Supply Air Sensor - Unit 5	Temp (F)	ReadOnly
BMS_SupplyAirTempUnit6	Measured Value of the Supply Air Sensor - Unit 6	Temp (F)	ReadOnly

APPENDIX E - BACNET BINARY VARIABLES

PARAMETER Name	Description	Units	Access
BMS_HumidityControl	Dehumidification Functionality Enable/Disable. 1:ENABLE, 0:DISABLE	Binary	Read/Write
BMS_LockOutCircuit1_Unit1	Lock Out Status [0:OK, 1: Fault]Circuit 1 - Unit 1	Binary	ReadOnly
BMS_LockOutCircuit1_Unit2	Lock Out Status [0:OK, 1: Fault]Circuit 1 - Unit 2	Binary	ReadOnly
BMS_LockOutCircuit1_Unit3	Lock Out Status [0:OK, 1: Fault]Circuit 1 - Unit 3	Binary	ReadOnly
BMS_LockOutCircuit1_Unit4	Lock Out Status [0:OK, 1: Fault]Circuit 1 - Unit 4	Binary	ReadOnly
BMS_LockOutCircuit1_Unit5	Lock Out Status [0:OK, 1: Fault]Circuit 1 - Unit 5	Binary	ReadOnly
BMS_LockOutCircuit1_Unit6	Lock Out Status [0:OK, 1: Fault]Circuit 1 - Unit 6	Binary	ReadOnly
BMS_LockOutCircuit2_Unit1	Lock Out Status [0:OK, 1: Fault]Circuit 2 - Unit 1	Binary	ReadOnly
BMS_LockOutCircuit2_Unit2	Lock Out Status [0:OK, 1: Fault]Circuit 2 - Unit 2	Binary	ReadOnly
BMS_LockOutCircuit2_Unit3	Lock Out Status [0:OK, 1: Fault]Circuit 2 - Unit 3	Binary	ReadOnly
BMS_LockOutCircuit2_Unit4	Lock Out Status [0:OK, 1: Fault]Circuit 2 - Unit 4	Binary	ReadOnly
BMS_LockOutCircuit2_Unit5	Lock Out Status [0:OK, 1: Fault]Circuit 2 - Unit 5	Binary	ReadOnly
BMS_LockOutCircuit2_Unit6	Lock Out Status [0:OK, 1: Fault]Circuit 2 - Unit 6	Binary	ReadOnly
BMS_CommunicationStatus_Unit1	Communication Status [0 : Disconnected, 1: Connected] - Unit 1	Binary	ReadOnly
BMS_CommunicationStatus_Unit2	Communication Status [0 : Disconnected, 1: Connected] - Unit 2	Binary	ReadOnly
BMS_CommunicationStatus_Unit3	Communication Status [0 : Disconnected, 1: Connected] - Unit 3	Binary	ReadOnly
BMS_CommunicationStatus_Unit4	Communication Status [0 : Disconnected, 1: Connected] - Unit 4	Binary	ReadOnly
BMS_CommunicationStatus_Unit5	Communication Status [0 : Disconnected, 1: Connected] - Unit 5	Binary	ReadOnly
BMS_CommunicationStatus_Unit6	Communication Status [0 : Disconnected, 1: Connected] - Unit 6	Binary	ReadOnly
BMS_CoolRequestStage1_Unit 1	Monitor the Status Of Cool Stage 1 Request - Unit 1	Binary	ReadOnly
BMS_CoolRequestStage1_Unit 2	Monitor the Status Of Cool Stage 1 Request - Unit 2	Binary	ReadOnly
BMS_CoolRequestStage1_Unit 3	Monitor the Status Of Cool Stage 1 Request - Unit 3	Binary	ReadOnly
BMS_CoolRequestStage1_Unit 4	Monitor the Status Of Cool Stage 1 Request - Unit 4	Binary	ReadOnly
BMS_CoolRequestStage1_Unit 5	Monitor the Status Of Cool Stage 1 Request - Unit 5	Binary	ReadOnly
BMS_CoolRequestStage1_Unit 6	Monitor the Status Of Cool Stage 1 Request - Unit 6	Binary	ReadOnly
BMS_CoolRequestStage2_Unit 1	Monitor the Status Of Cool Stage 2 Request - Unit 1	Binary	ReadOnly
BMS_CoolRequestStage2_Unit 2	Monitor the Status Of Cool Stage 2 Request - Unit 2	Binary	ReadOnly
BMS_CoolRequestStage2_Unit 3	Monitor the Status Of Cool Stage 2 Request - Unit 3	Binary	ReadOnly
BMS_CoolRequestStage2_Unit 4	Monitor the Status Of Cool Stage 2 Request - Unit 4	Binary	ReadOnly
BMS_CoolRequestStage2_Unit 5	Monitor the Status Of Cool Stage 2 Request - Unit 5	Binary	ReadOnly
BMS_CoolRequestStage2_Unit 6	Monitor the Status Of Cool Stage 2 Request - Unit 6	Binary	ReadOnly
BMS_HeatRequest_Unit 1	Monitor the Status Of Heat Request - Unit 1	Binary	ReadOnly
BMS_HeatRequest_Unit 2	Monitor the Status Of Heat Request - Unit 2	Binary	ReadOnly
BMS_HeatRequest_Unit 3	Monitor the Status Of Heat Request - Unit 3	Binary	ReadOnly
BMS_HeatRequest_Unit 4	Monitor the Status Of Heat Request - Unit 4	Binary	ReadOnly
BMS_HeatRequest_Unit 5	Monitor the Status Of Heat Request - Unit 5	Binary	ReadOnly
BMS_HeatRequest_Unit 6	Monitor the Status Of Heat Request - Unit 6	Binary	ReadOnly
BMS_DehumidificationRequest_Unit 1	Monitor the Status Of Dehumidification Request - Unit 1	Binary	ReadOnly
BMS_DehumidificationRequest_Unit 2	Monitor the Status Of Dehumidification Request - Unit 2	Binary	ReadOnly
BMS_DehumidificationRequest_Unit 3	Monitor the Status Of Dehumidification Request - Unit 3	Binary	ReadOnly

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