

BACnet & Modbus Interface Quick Start Guide

Version 1.5.0

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Quick Start with Software Tool

1. Download software from MyLinkDrive.com under the PAC-UKPRC001-CN-1 support page software section
 - a. <http://meus1.mylinkdrive.com/item/PAC-UKPRC001-CN-1.html>
2. Install the MelcoBEMS MINI (A1M) Configure Manager software tool
 - a. Ensure the power is turned off for the Mitsubishi Electric outdoor and indoor units of the system that will be integrated.
3. Before configuring the BACnet & Modbus Interface device, the third party building/home automation system contractor needs to supply the MAC address, device instance number, baud rate and any other network settings needed for the RS-485 communication network.
4. **Make sure dip switches 1, 6, and 7 are ON and the remaining dips switches are OFF when trying to connect to the configuration tool software.** Figure 1 shows the correct dip switch position for this step.



Figure 1

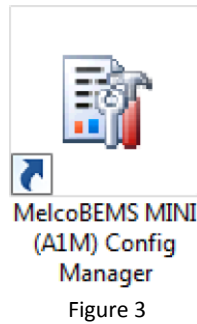
5. Connect the BACnet & Modbus Interface device to connector CN105 on the PCB of the powered off Mitsubishi Electric unit that will be integrated.
 - a. If there are more than one interfaces, continue to plug in the remaining interface devices into the CN105 on the PCB of a powered off Mitsubishi Electric unit.
6. Wire the USB to RS-485 adapter (Figure 2) (+) and (-) terminals to the BACnet & Modbus Interface terminal block respected terminals together with 120 ohm termination resistors at each end.



Figure 2

7. Power up the system.
 - a. Make sure USB to RS-485 adapter is plugged into USB COM port of the computer that has the MelcoBEMS MINI (A1M) Configure Manager software tool before powering up the system.

8. Open the MelcoBEMS MINI (A1M) Configure Manager software by using the shortcut created on the desktop. Figure 3 is the software shortcut icon.



- a. Figure 4 is the window that opens up when opening the software tool.

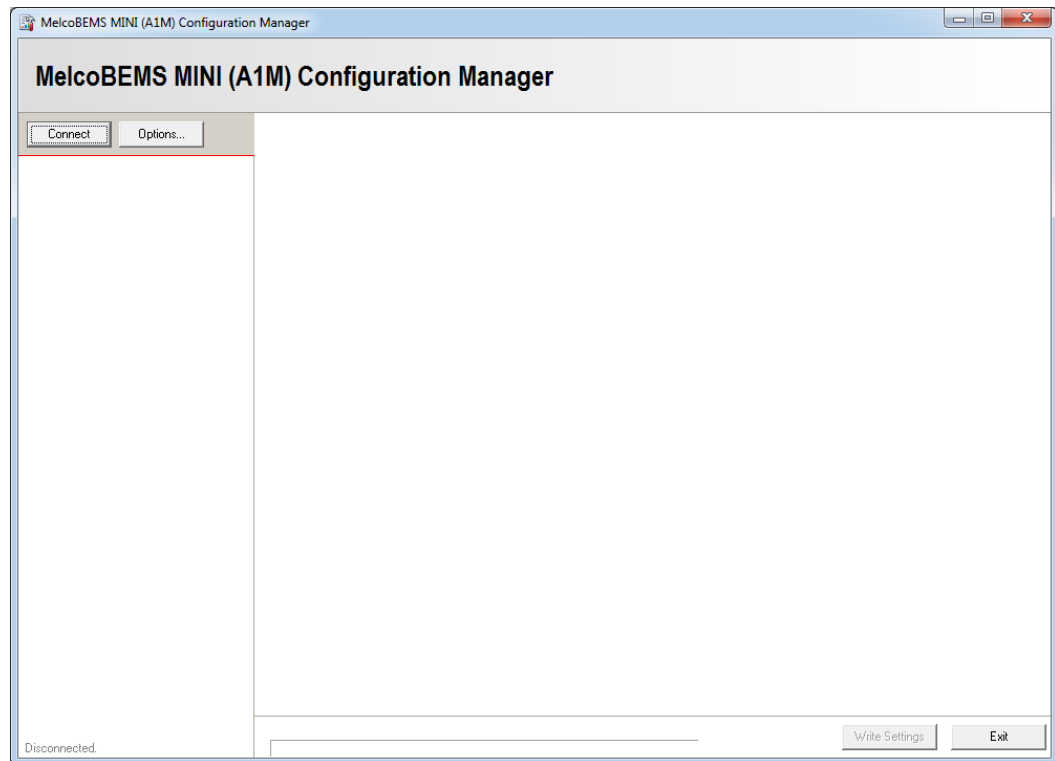


Figure 4

9. Click the button, “Connect”
 - a. Figure 5 is the window that will open.

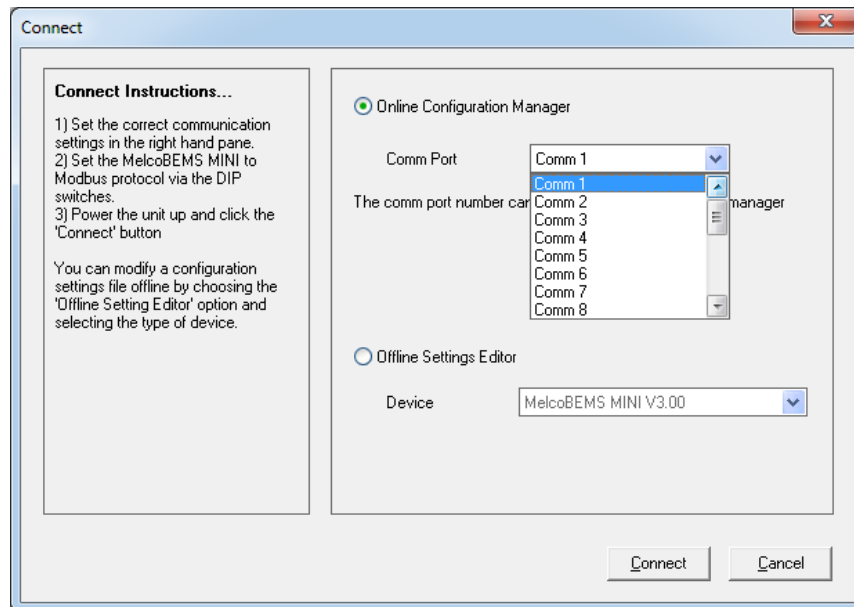


Figure 5

10. To find what COM port number the computer assigned the USB adapter; refer to step 1 in the [Software Tool Additional Configuration](#) section (page 6).
 - a. **Note: Recommended COM Port setting for the Software tool is COM 1-9.**
 - b. To change COM Port settings, refer to step 2 in the [Software Tool Additional Configuration](#) section (page 7).
11. After the correct COM port number has been selected, click the button “Connect”. Figure 6 is the BACnet Settings window that will open when connected to the BACnet & Modbus Interface device.

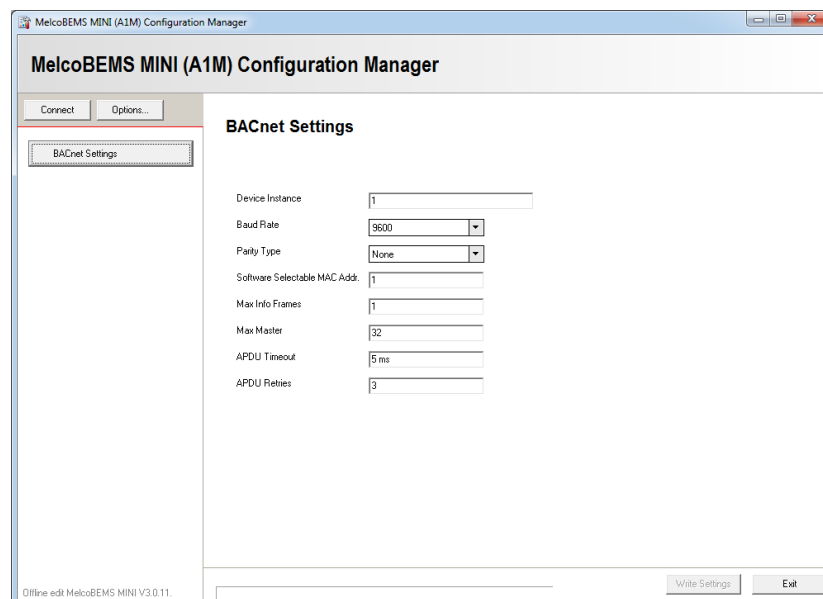


Figure 6

- a. If unable to connect to the BACnet & Modbus Interface device, look back at the previous steps.
 - i. Verify dip switches are set correctly
 - ii. Verify wiring polarity is correct
 - iii. Verify computer USB COM port is correct
12. Enter the settings for each interface into the BACnet Settings window provided by the third party building/home automation system contractor.
13. Click the button “Write Settings” in the lower right hand corner after all the settings have been entered correctly. You will see the Right LED (RS-485 ACK) light blink when clicking the “Write Settings” button.
14. After all interfaces have been configured, power down the system and set the dip switches accordingly to site requirements.
 - a. **When ALL dip switches 1 – 5 are set to the ON position, the BMS system sees the device MAC address that is set in the software.**
 - i. Refer to [Appendix](#) section (page 11) for additional information on dip switch positions.
 - b. Wire all interfaces to the master controller following the BACnet or Modbus communication wiring protocols.
 - i. 2 termination resistors (typically 120 ohms) are required at the start and end of the communication bus.
15. Power up the system.
16. Check each interface to see if there is communication with the indoor unit and master controller by looking at the two acknowledgement LEDs
 - a. Left LED (AC ACK) confirms power and communication to indoor unit by blinking.
 - b. Right LED (RS-485 ACK) confirms RS-485 communication by blinking.
 - i. If the right LED is solid and not blinking, the device is not communicating with the BMS system. Once communication has been established, the RS-485 ACK light will start blinking.
 1. Verify the device settings are setup correctly.
 2. Verify the device is added to the BMS system network.
 3. Verify RS-485 wiring.

Software Tool Additional Configuration

1. To find what COM port number the computer registered the USB adapter, use the following steps:

- a. Open Control Panel and select Device Manager (Figure 7).

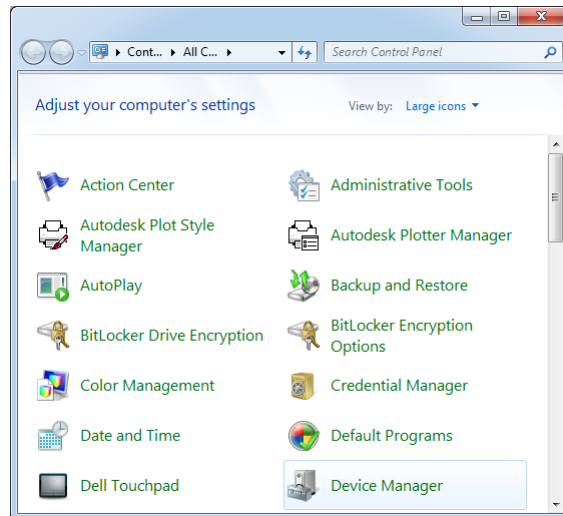


Figure 7

- b. In Device Manager, Expand the Ports section (Figure 8).

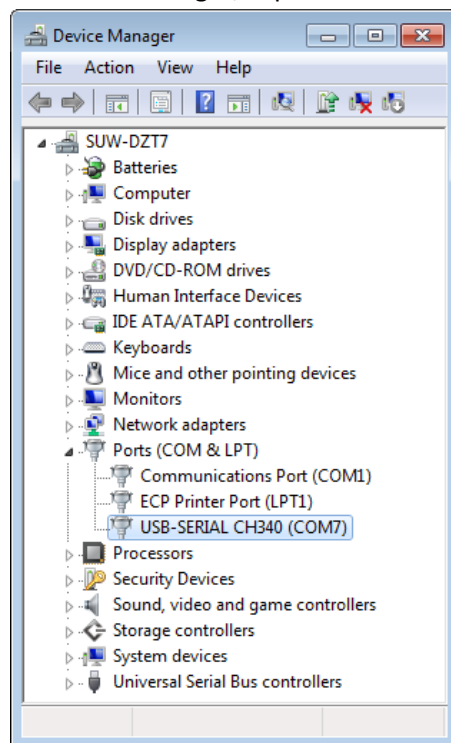


Figure 8

- c. Highlighted in Figure 8 is the COM port the computer assigned the USB adapter.

2. The following steps will show how change the COM port number of the USB to RS-485 adapter connected to the user's computer.

Note: Recommended COM port setting for the Software tool is COM 1-9.

- a. Repeat steps 1a and 1b on the previous page (page 6).
- b. Double click the adapter listed under Ports. The properties window will open (Figure 9).

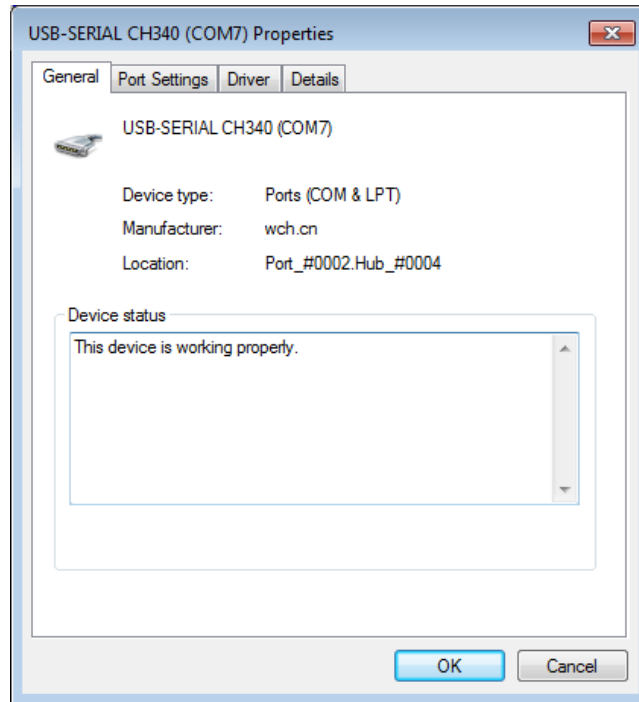


Figure 9

- c. Go to the Port Settings Tab (Figure 10).

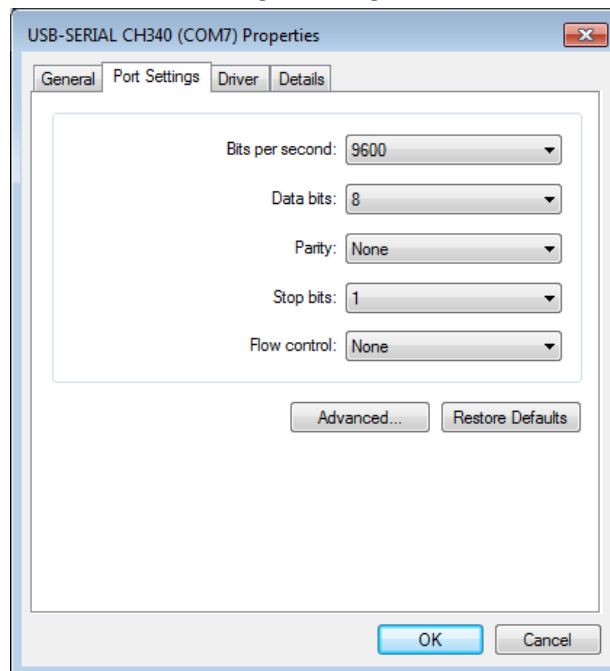


Figure 10

- d. Click the button labeled “Advanced” to open the settings window.
The COM Port Number can be adjusted via the drop down box shown on Figure 11:

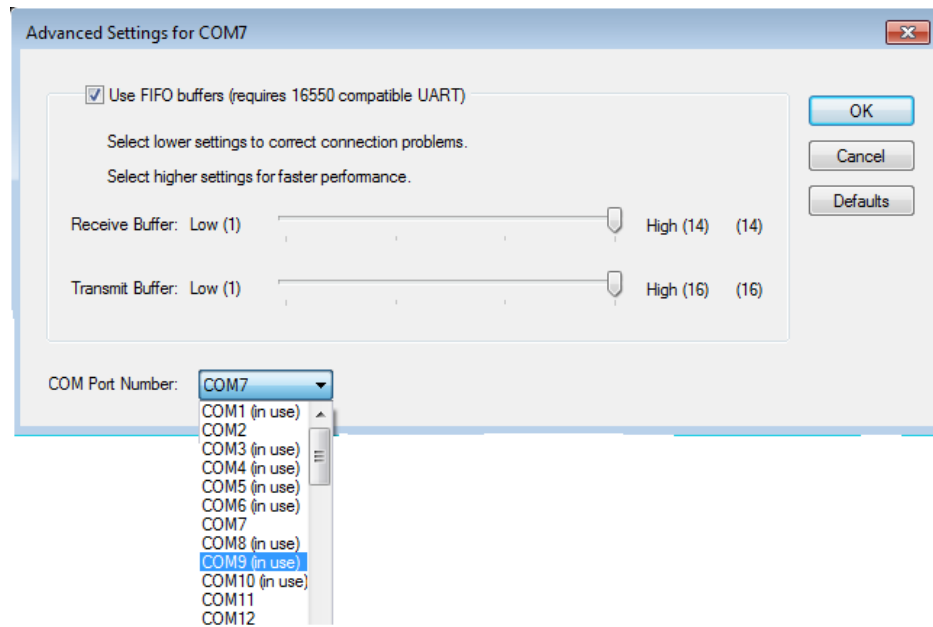


Figure 11

- e. After selecting the new COM port number, just hit the “OK” button.

Procon MelcoBEMS MINI (A1M) Information



Figure 12

Introduction

The BACnet & Modbus Interface (PAC-UKPRC001-CN-1 labeled: Procon MelcoBEMS MINI (A1M)) (Figure 12) can be quickly installed and addressed through dip switches located on the side of the interface. There is no need to configure network settings if the default settings can be used with the third party master controller.

Requirements

- BACnet & Modbus Interface
- Field supplied: 2 conductor with ground wire, and 2 termination resistors (typically 120 ohms)

Default Settings

1. Set the dip switches accordingly to site requirements. Third party building/home automation system contractor needs to supply the MAC address, device instance number, baud rate and any other network settings needed for the RS-485 communication network.
 - a. Dip switches 1-5 need to be adjusted to have a unique MAC address per interface.
(See the [Appendix](#) section (page 11) DIP switch settings sub section RS-485 addressing)
 - b. Dip switch 7 needs to be turned OFF to allow BACnet MS/TP or ON for Modbus RTU.
(See the [Appendix](#) section (page 11) DIP switch settings sub section Protocol selection)
 - c. Default settings: (not changeable via dip switches)

i. Device Instance	= 1	iv. Max Info Frames	= 1
(aka Station ID, Network#)		v. Max Master	= 32
ii. Baud rate	= 9600	vi. APDU Timeout	= 5 ms
iii. Parity Type	= None	vii. APDU Retires	= 3

Procon MelcoBEMS MINI (A1M) Configuration Manager Tool Information

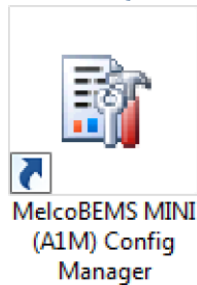


Figure 13



Figure 14

Introduction

The BACnet & Modbus Interface (PAC-UKPRC001-CN-1, labeled: Procon MelcoBEMS MINI (A1M)) (Figure 12) can be configured using the MelcoBEMS MINI (A1M) Configuration Manager (Figure 13) to change the address and network settings to help save time and meet application requirements. Refer to the [Quick Start with Software Tool](#) section (starting on page 2) for the step-by-step on how to configure the BACnet & Modbus Interface device using the software.

This software will be used to help adjust advanced RS-485 network settings from a computer. The following settings can be adjusted from the software tool:

- Device Instance
(aka: Station ID, Network)
- Baud Rate
- Parity Type
- Software Selectable MAC Address
(aka: Device Address)
- Max Info Frames
- Max Master
- APDU Timeout
- APDU Retires

Requirements

- MelcoBEMS MINI (A1M) Configure Manager software (Figure 13)
 - <http://meus1.mylinkdrive.com/item/PAC-UKPRC001-CN-1.html>
- USB to RS-485 adapter
 - Most commonly found adapters will fulfill this requirement. (Figure 14)
- BACnet & Modbus Interface (Powered from Mitsubishi Electric Indoor unit)
- Field supplied: 2 conductor with ground wire, and 2 termination resistors (typically 120 ohms)

Appendix:

DIP switch settings:

RS-485 MAC Addressing:

Any address in the range 1 – 30 can be chosen using dip switches 1 – 5. The address is set in binary, where the switch positions have the following values on Table 1:

DIP switch number	Value when switch is set to ON
1	1
2	2
3	4
4	8
5	16

Table 1

To get the address, add together the value for each switch set ON.

For example, to set address 13, set DIP switches 1, 3 and 4 ON ($1 + 4 + 8 = \text{address } 13$).

When ALL dip switches 1 – 5 are set to the ON position, the BMS system sees the device MAC address that is set in the software. (See Modbus Holding Registers section)

Note: When ALL dip switches 1 – 5 are set to the OFF position an address of 1 is assumed.

Note: Each MelcoBEMS MINI connected on the same RS-485 network must be set to a unique MAC address and instance number.

Communication Settings:

The RS-485 communication settings are set by using DIP switch 6.

When the DIP switch is in the OFF position the Baud Rate and Parity settings are set in software.

(See Modbus Holding Register section). Refer to Table 2 for dip switch breakdown.

DIP switch 6	RS-485 communication settings
OFF	Baud Rate and Parity set in software
ON	9600 baud, no parity

Table 2

Note: The number of data bits is fixed at 8 and the number of stop bits is fixed at 1.

Protocol selection:

The RS485 protocol is set by using DIP switch 7. Refer to Table 3 for dip switch breakdown.

DIP Switch 7	Protocol selection
OFF	BACnet MS/TP
ON	Modbus RTU

Table 3

Deadband mode:

The Deadband feature can be enabled using DIP switch 8. Refer to Table 4 for dip switch breakdown.

DIP Switch 8	Deadband feature
OFF	Disabled
ON	Enabled

Table 4

Note: Refer to manual included in the box to learn how Deadband feature works.

RS-485 Termination:

An RS-485 termination resistor can be enabled on the MelcoBEMS MINI (A1M) PCB using the single jumper labeled J1. Refer to Table 5 for jumper setting breakdown.

Jumper setting	Description
Not fitted	Termination resistor disabled
Fitted	Termination resistor enabled

Table 5

Status LEDs:

There are two status LEDs on the MelcoBEMS MINI (A1M). The LED indications are shown on Table 6:

LED Name	Color	Functionality
AC ACK	Green	Lit when A1M is powered, Flashing indicates valid communication with the indoor unit.
RS-485 ACK	Green	Lit when A1M is powered, Flashing indicates valid Modbus or BACnet communication.

Table 6

Points List:

BACnet Object List:

Object Type	Object ID	Object Name	Notes
Binary Output	BO0	Drive OFF/ON Setup	0 = Drive OFF 1 = Drive ON
Binary Input	BI1	Drive OFF/ON State	0 = Drive OFF 1 = Drive ON
Analog Value	AV2	Setpoint	Value in either °C or °F, depending on the Temperature Units setting
Multi-state Output	MSO3	Mode Setup	1 = Heating 2 = Humidity Reduction 3 = Cooling 4 = Ventilation, clean air operation 5 = Auto Operation
Multi-state Input	MSI4	Mode State	1 = Heating 2 = Humidity Reduction 3 = Cooling 4 = Ventilation, clean air operation 5 = Auto Operation
Multi-state Output	MSO5	Fan Speed Setup	1 = Auto 2 = Quiet 3 = Weak 4 = Strong 5 = Very Strong (SH i)
Multi-state Input	MSI6	Fan Speed State	1 = Auto 2 = Quiet 3 = Weak 4 = Strong 5 = Very Strong (SH i)
Multi-state Output	MSO7	Air Direction Setup	1 = Auto 2 = Position 1 3 = Position 2 4 = Position 3 5 = Position 4 6 = Position 5 7 = Swing
Multi-state Input	MSI8	Air Direction State	1 = Auto 2 = Position 1 3 = Position 2 4 = Position 3 5 = Position 4 6 = Position 5 7 = Swing
Multi-state Output	MSO9*	Temperature Units	1 = °C 2 = °F
Analog Input	AI10	Inlet Temperature	Value in either °C or °F, depending on the Temperature Units setting
Analog Output	AI11	Fault Code	4-digit fault code

*Please power cycle the MelcoBEMS MINI after changing the Present Value property of this object.

Modbus Table – Air-to-Air Systems:

Holding Registers (Analog Outputs)			
Register Name	Addr	Modicon Address	Details
Drive Mode	0	40001	1 = Heating 2 = Humidity Reduction 3 = Cooling 7 = Ventilation, clean air operation 8 = Auto Operation 9 = i-see heating operation* 10 = i-see humidity reduction* 11 = i-see cooling* *indicates a read only value, writing this value will have no effect
Temperature Setpoint	1	40002	Temperature value in °C multiplied by 10. e.g. value 200 = 20°C
Fan Speed	2	40003	0 = Auto 2 = Quiet 3 = Weak 5 = Strong 6 = Very Strong (SH i)
Air Direction	3	40004	0 = Auto 1 = Position 1 2 = Position 2 3 = Position 3 4 = Position 4 5 = Position 5 7 = Swing
Modbus Slave ID	4	40005	Modbus - Values 1-247 valid
BACnet Station ID			BACnet - Values 1-127 valid
Modbus RS-485 Baud Rate	5	40006	0 = 9600 1 = 1200 2 = 2400 3 = 4800 4 = 9600 5 = 14400 6 = 19200 7 = 28800 8 = 38400 9 = 56000 10 = 57600 11 = 115200
BACnet RS-485 Baud Rate			0 = 9600 4 = 9600 6 = 19200 8 = 38400 10 = 57600

Holding Registers (Analog Outputs)			
Register Name	Addr	Modicon Address	Details
RS-485 Parity Type	6	40007	0 = None 1 = Even 2 = Odd
Drive ON/OFF	7	40008	0 = Drive OFF 1 = Drive ON
Room Temperature [READ ONLY]	8	40009	Temperature value in °C multiplied by 10. e.g. value 200 = 20°C
Fault Code (hex) [READ ONLY]	9	40010	0x8000 = No error 0x6999 = Bad communication with indoor unit (Refer to indoor unit documentation for description of other fault code values)
Firmware Version [READ ONLY]	10	40011	A1M firmware version
Modbus Comms Counter [READ ONLY]	11	40012	Value of a counter which increments upon every valid Modbus communication received. Value is automatically reset to zero when value exceeds 65535.
Fault Code (decimal) [READ ONLY]	12	40013	8000 = No error 6999 = Bad communication with indoor unit (Refer to indoor unit documentation for description of other fault code values)
System Type Detected [READ ONLY]	13	40014	0 = ATA 1 = ATW
Deadband Enabled State [READ ONLY]	14	40015	0 = Deadband disabled (DIP switch 8 OFF) 1 = Deadband enabled (DIP switch 8 ON)
BMS Room Temp (signed)	15	40016	Signed temperature value in °C multiplied by 10. 0xFF9C = -10°C...0x01F4 = 50°C
BMS Room Temp	16	40017	Signed temperature value in °C multiplied by 10. 0 = 0°C...500 = 50°C
BMS Virtual Setpoint	17	40018	Signed temperature value in °C multiplied by 10. 100 = 10°C...400 = 40°C
Deadband Heating Setpoint	18	40019	Temperature in °C (default in 19°C). Value must be at least 2°C lower than the Deadband Cooling Setpoint.
Deadband Cooling Setpoint	19	40020	Temperature in °C (default in 23°C). Value must be at least 2°C higher than the Deadband Heating Setpoint.

Holding Registers (Analog Outputs)			
Register Name	Addr	Modicon Address	Details
BACnet Device Instance (most significant 16 bits)	272	40273	Most Significant 16 bits of the 32-bit Device Instance
BACnet Device Instance (least significant 16 bits)	273	40274	Least Significant 16 bits of the 32-bit Device Instance
BACnet Max Master	274	40275	Maximum number of master to search for
BACnet Max Info Frames	275	40276	
BACnet APDU Timeout	276	40277	Timeout value in ms for client requests
BACnet APDU Retires	277	40278	Number of times to retry after timeout

Holding Registers (Analog Inputs)			
Register Name	Addr	Modicon Address	Details
Room Temperature	0	30001	Temperature value in °C multiplied by 10. e.g. value 200 = 20°C
Fault Code (hex)	1	30002	0x8000 = No error 0x6999 = Bad communication with indoor unit (Refer to indoor unit documentation for description of other fault code values)
Firmware Version	2	30004	MelcoBEMS MINI (A1M) firmware version
Modbus Comms Counter	3	30006	Value of a counter which increments upon every valid Modbus command received. Counter is reset to zero when value exceeds 65535.
Fault Code (decimal)	8	30009	8000 = No error 6999 = Bad communication with indoor unit (Refer to indoor unit documentation for description of other fault code values)
System Type Detected	9	30010	0 = ATA 1 = ATW
Deadband Enabled State	10	30011	0 = Deadband disabled (DIP switch 8 OFF) 1 = Deadband enabled (DIP switch 8 ON)

Coils (Digital Outputs)			
Register Name	Addr	Modicon Address	Details
Drive On/Off (Note: Holding register address 7 can also be used to change the Drive)	0	00001	0 = Drive OFF 1 = Drive ON



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