# UBM Installation Instructions

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## Introduction

The UBM is a fully programmable BACnet MS/TP network device designed to control HVAC equipment. These controllers provide many options and advanced system features that allow state-of-the-art commercial building control. Each controller is programmable and configurable through software.


**Figure 1 UBM Controller**

The UBM is designed for use in Unitary and advanced HVAC control applications. Each controller has flexible, universal inputs for external sensors, digital inputs, and a combination of analog and digital triac outputs. All the models are described in controller configurations.

This document provides instructions for wiring and mounting the programmable controller.

**Table 1. Controller configurations.**

| Controller Model | Programmable Type | Universal Inputs (UI) | Digital Inputs (DI) | Analog Outputs (AO) | Digital Outputs (DO) |
|---|---|---|---|---|---|
| UBM-P-6438 | Unitary | 6 | 4 | 3 | 8 |

The controller communicates via an EIA-485 BACnet MS/TP communications network, capable of baud rates between 9.6 and 115.2 kbits/s. Controllers are field-mountable to either a panel or a DIN rail.

## Specifications

### General Specifications

Rated Voltage: 20–30 Vac; 50/60 Hz
Power Consumption: 100 VA for controller and all connected loads
Controller Only Load: 5 VA maximum
Controller and Actuator Load: 9 VA maximum
External Sensors Power Output: 20 Vdc ±10% @ 75 mA maximum.
Unitary Operating & Storage Temperature Ambient Rating:
Minimum -40 ºF (-40 ºC); Maximum 150 ºF (65.5 ºC)
Relative Humidity: 5% to 95% non-condensing
LED: Provides status for normal operation, controller download process, alarms, manual mode, and error conditions

### Real Time Clock

Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic daylight savings time adjustment to occur at 2:00 a.m. local time on configured start and stop dates
Power Failure Backup: 24 hours at 32°F to 100°F (0°C to 38°C), 22 hours at 100°F to 122°F (38°C to 50°C)
Accuracy: ±1 minute per month at 77 °F (25 °C)

### Digital Input (DI) Circuits

Voltage Rating: 0 to 30 Vdc open circuit
Input Type: Dry contact to detect open and closed circuit
Operating Range: Open circuit = False; Closed circuit = True
Resistance: Open circuit > 3,000 Ohms; Closed circuit < 500 Ohms

### Digital Triac Output (DO) Circuits

Voltage Rating: 20 to 30 Vac @ 50/60Hz
Current Rating: 25 mA to 500 mA continuous, and 800 mA (AC rms) for 60 milliseconds

### Analog Output (AO) Circuits

Analog outputs can be individually configured for current or voltage.

**Analog Current Outputs:**

Current Output Range: 4.0 to 20.0 mA
Output Load Resistance: 550 Ohms maximum

**Analog Voltage Outputs:**

Voltage Output Range: 0.0 to 10.0 Vdc
Maximum Output Current: 10.0 mA
Analog outputs may be configured as digital outputs and operate as follows:

– False (0%) produces 0 Vdc, (0 mA)
– True (100%) produces the maximum 11 Vdc, (22 mA)

**Universal Input (UI) Circuits**

See Universal input circuit specifications. for the UI circuit specifications and Direct Connection devices.

**Table 2. Universal input circuit specifications.**

| Input Type/ Device | Sensor Type | Operating Range |
|---|---|---|
| N-TR23 Setpoint Potentiometer | 500 Ohm to 10,500 Ohm | -8 to +7 °F (-4 to +4 °C)<br>Or 50 to 90 °F (10 to 32 °C) |
| N-TR21 | 20K Ohm Non-linear | 45 to 99 °F (7 to 37 °C) |
| N-C7632A1004,<br>N-H7655A1001 | CO2<br>Humidity | 32 to 122 °F (0 to 50 °C)<br>32 to 125 °F (0 to 52 °C) |
| N-C7041B2005 | 20K Ohm NTC | -40 to 250 °F |
| N-TR71 | Temperature | 30 to 110 °F (-1 to 43 °C) |
| N-TR71-H | Temperature<br>Humidity | 30 to 110 °F (-1 to 43 °C)<br>5% to 95% non-condensing |
| Resistive Input | Generic | 100 Ohms to 100K Ohms |
| Voltage Input | Transducer, Controller | 0–10 Vdc |
| Discrete Input | Dry Contact closure | Open Circuit > 3000 Ohms<br>Closed Circuit < 3000 Ohms |

## Before Installation

Review the power, input, and output specifications on before installing the controller.

Hardware driven by Triac outputs must have a minimum current draw, when energized, of 25 mA and a maximum current draw of 500 mA.

Hardware driven by the analog current outputs must have a maximum resistance of 550 Ohms, resulting in a maximum voltage of 11 volts when driven at 20 mA.

If resistance exceeds 550 Ohms, voltages up to 18 Vdc are possible at the analog output terminal.

**CAUTION!**

Disconnect power supply before beginning wiring or making wiring connections to prevent equipment damage.

## Installation

The controller must be mounted in a position that allows clearance for wiring, servicing, removal, connection of the BACnet MS/TP Molex connector and access to the MS/TP MAC address DIP switches. (See Figure 8)

The controller may be mounted in any orientation.

**IMPORTANT**

Avoid mounting in areas where acid fumes or other deteriorating vapors can attack the metal parts of the controller, or in areas where escaping gas or other explosive vapors are present.

### *Mount Controller*

**NOTE!**

The controller may be wired before mounting to a panel or DIN rail.

Terminal blocks are used to make all wiring connections to the controller. Attach all wiring to the appropriate terminal blocks.

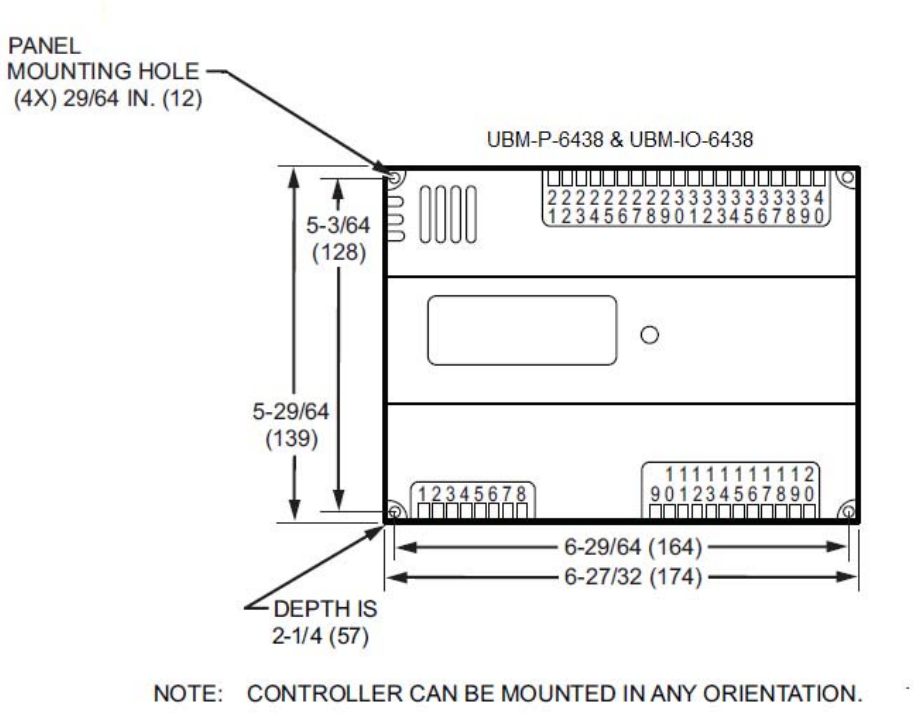



**Figure 2 Panel mounting - controller dimensions in inches (mm)**

### Panel Mounting

The controller enclosure consists of a plastic base plate and a plastic snap-on cover.

**NOTE!**

The controller is designed so that the cover does not need to be removed from the base plate for either mounting or wiring.

The controller mounts using four screws inserted through the corners of the base plate. Fasten securely with four No. 6 or No. 8 machine or sheet metal screws.

The controller can be mounted in any orientation. Ventilation openings are designed into the cover to allow proper heat dissipation, regardless of the mounting orientation.

### DIN Rail Mounting

To mount the controller on a DIN rail [standard EN50022; 1-3/8 in. x 9/32 in. (7.5 mm x 35 mm)], refer to Figure 3 Controller DIN rail

mounting and perform the following steps:

1. Holding the controller with its top tilted in towards the DIN rail, hook the two top tabs on the back of the controller onto the top of the DIN rail.
2. Push down and in to snap the two bottom flex connectors of the controller onto the DIN rail.

**NOTE!**

To remove the controller from the DIN rail, perform the following:

1. Push straight up from the bottom to release the top tabs.

2. Rotate the top of the controller out towards you and pull the controller down and away from the DIN rail to release the bottom flex connectors.

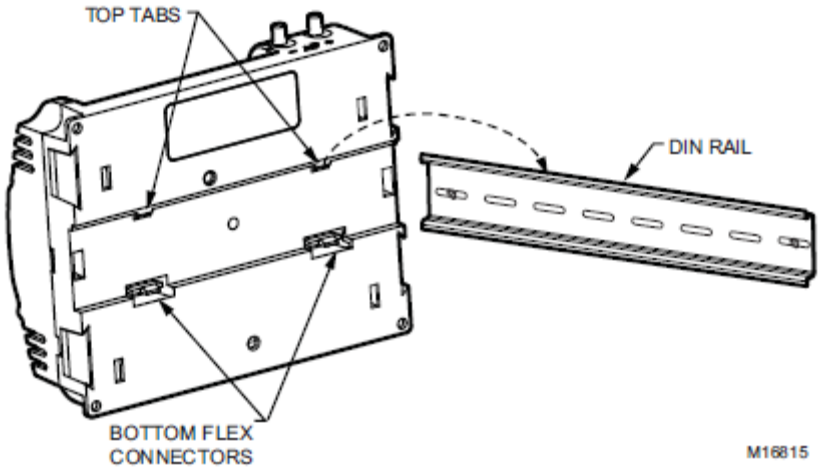



**Figure 3 Controller DIN rail mounting**

## Power

Before wiring the controller, determine the input and output device requirements for each controller used in the system. Select input and output devices compatible with the controller and the application. Consider the operating range, wiring requirements, and the environment conditions when selecting input/output devices. When selecting actuators for modulating applications consider using floating control. In direct digital control applications, floating actuators will generally provide control action equal to or better than an analog input actuator for lower cost.

Determine the location of controllers, sensors, actuators and other input/output devices and create wiring diagrams.

The programmer must review the control job requirements. This includes the sequences of operation for the controller, and for the system as a whole. Usually, there are variables that must be passed between the controller and other UBM BACnet controller(s) that are required for optimum system wide operation. Typical examples are the TOD, Occ/Unocc signal, the outdoor air temperature, the demand limit control signal, and the smoke control mode signal.

### *Power Budget*

The transformer for a UBM supplies power, not only to its electronics, but also for any device connected to the outputs of the UBM. A power budget must be calculated for each device to determine the required transformer size for proper operation. A power budget is simply the summing of the maximum power draw ratings (in VA) of all the devices to be controlled. This includes the controller itself and any devices powered from the controller, such as equipment actuators ( Honeywell ML6161 or other motors) and various contactors and transducers.

**NOTE**

When multiple controllers operate from a single transformer, connect the same side of the transformer secondary to the same power input terminal in each device. The earth ground terminal (terminal 3) must be connected to a verified earth ground for each controller in the group .

Half-wave devices must not share the same AC transformer with full-wave devices. If a UBM controller will share its power supply with another device, make sure the other device utilizes a half-wave rectifier and that the polarity of the wiring is maintained.

**Table 4. VA ratings for transformer sizing.**

| Device | Description | VA |
|---|---|---|
| UBM-P-6438 | Controller | 5.0 |

For contactors and similar devices, the in-rush power ratings should be used as the worst case values when performing power budget calculations. Also, the application engineer must consider the possible combinations of simultaneously energized outputs and calculate the VA ratings accordingly. The worst case, which uses the largest possible VA load, should be determined when sizing the transformer.

Each controller requires 24 Vac power from an energy-limited Class II power source. To conform to Class II restrictions (U.S. only), transformers must not be larger than 100 VA. A single transformer can power more than one controller.

***Guidelines for power wiring:***

- For multiple controllers operating from a single transformer, the same side of the transformer secondary must be connected to the same power input terminal in each device. The earth ground terminal must be connected to a verified earth ground for each controller in the group. Controller configurations are not necessarily limited to three devices, but the total power draw, including accessories, cannot exceed 100 VA when powered by the same transformer (U.S. only).
- See Figure 5 for controller power wiring used in UL 1995 equipment (U.S. only).
- Many controllers require all loads to be powered by the same transformer that powers the controller.
- Keep the earth ground connection wire run as short as possible.
- Do not connect earth ground to the controller's digital or analog ground terminals.

## Line-Loss

Controllers must receive a minimum supply voltage of 20 Vac. If long power or output wire runs are required, a voltage drop due to Ohms Law (I x R) line-loss must be considered. This line-loss can result in a significant increase in total power required and thereby affect transformer sizing. The following example is an I x R line-loss calculation for a 200 ft. (61m) run from the transformer to a controller drawing 37 VA and using two 18 AWG (1.0 sq mm) wires.

The formula is:
Loss = [length of round-trip wire run (ft.)] x [resistance in wire (ohms per ft.)] x [current in wire (amperes)]

From specification data:
18 AWG twisted pair wire has a resistance of 6.52 ohms per 1000 feet.
Loss = [(400 ft.) x (6.52/1000 ohms per ft.)] x [(37 VA)/(24V)] = 4.02 volts

This means that four volts are going to be lost between the transformer and the controller. To assure the controller receives at least 20 volts, the transformer must output more than 24 volts. Because all transformer output voltage levels depend on the size of the connected load, a larger transformer outputs a higher voltage than a smaller one for a given load.

In the preceding I x R loss example, even though the controller load is only 37 VA, a standard 40 VA transformer is not sufficient due to the

line-loss. A 40 VA transformer is just under 100 percent loaded (for the 37 VA controller) and has a secondary voltage of 22.9 volts. (Use the lower edge of the shaded zone in Figure 4, NEMA Class 2 transformer voltage output limits that represents the worst case conditions.) When the I x R loss of four volts is subtracted, only 18.9 volts reaches the controller. This is not enough voltage for proper operation.

In this situation, the engineer has three alternatives:
1. Use a larger transformer. For example, if an 80 VA model is used, an output of 24.4 volts, minus the four volt line-loss, supplies 20.4V to the controller. Although acceptable, the four-volt line-loss in this example is higher than recommended.

**NOTE!**

No installation should be designed where the line-loss is greater than two volts. This allows for nominal operation if the primary voltage drops to 102 Vac (120 Vac minus 15 percent).

2. Use heavier gauge wire for the power run. 14 AWG (2.0 sq mm) wire has a resistance of 2.57 ohms per 1,000 ft. Using the preceding formula results in a line-loss of only 1.58 volts (compared with 4.02 volts). This would allow a 40 VA transformer to be used. 14 AWG (2.0 sq mm) wire is the recommended wire size for 24 Vac wiring.

3. Locate the transformer closer to the controller. This reduces the length of the wire run, and the line-loss.

The issue of line-loss is also important in the case of the output wiring connected to the Triac digital outputs. The same formula and method are used. Keep all power and output wire runs as short as practical. When necessary, use heavier gauge wire, a bigger transformer, or install the transformer closer to the controller.

To meet the National Electrical Manufacturers Association (NEMA) standards, a transformer must stay within the NEMA limits. The chart shows the required limits at various loads.

With 100 percent load, the transformer secondary must supply between 23 and 25 volts to meet the NEMA standard. When a purchased transformer meets the NEMA standard DC20-1986, the transformer voltage regulating ability can be considered reliable. Compliance with the NEMA standard is voluntary.

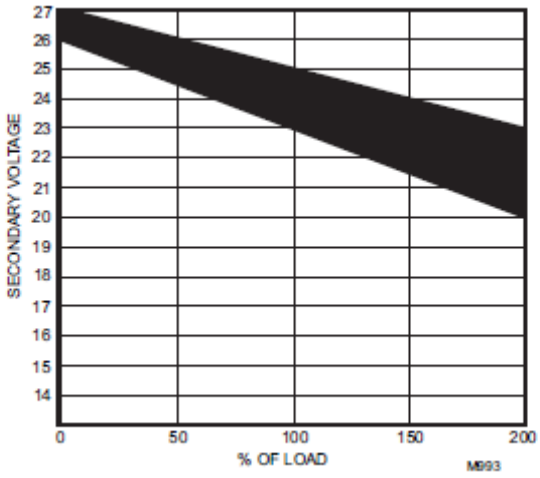



**Figure 4 NEMA Class 2 transformer voltage output limits.**

The Novar transformers listed in the table below meet the NEMA standard DC20-1986.

**Table 5. Transformers that meet NEMA standard DC20-1986.**

| Transformer Type | VA Rating |
|---|---|
| Novar 730090000 | 40 |
| Novar 770067000 | 95 |

## Wiring

All wiring must comply with applicable electrical codes and ordinances, or as specified on installation wiring diagrams. Controller wiring is terminated to the screw terminal blocks located on the top and the bottom of the device.

**CAUTION!**

Disconnect power supply before beginning wiring or making wiring connections to prevent equipment damage.

The figure below depicts a single controller using one transformer.

**NOTE!**

Power must be off prior to connecting to or removing connections from the 24 Vac power (24 Vac/24 Vac COM), earth ground (EGND), and 20 Vdc power (20 Vdc) terminals.

Use the heaviest gauge wire available, up to 14 AWG (2.0 sq mm), with a minimum of 18 AWG (1.0 sq mm), for all power and earth ground wiring.

Screw-type terminal blocks are designed to accept up to one 14 AWG (2.0 sq mm) conductor or up to two 18 AWG (1.0 sq mm) conductors. More than two wires that are 18 AWG (2.0 sq mm) can be connected with a wire nut. Include a pigtail with this wire group and attach the pigtail to the terminal block.

Connect terminal 2, (the 24 Vac common [24 VAC COM] terminal) to earth ground (see Figure 5 Power wiring details for one controller per tr).

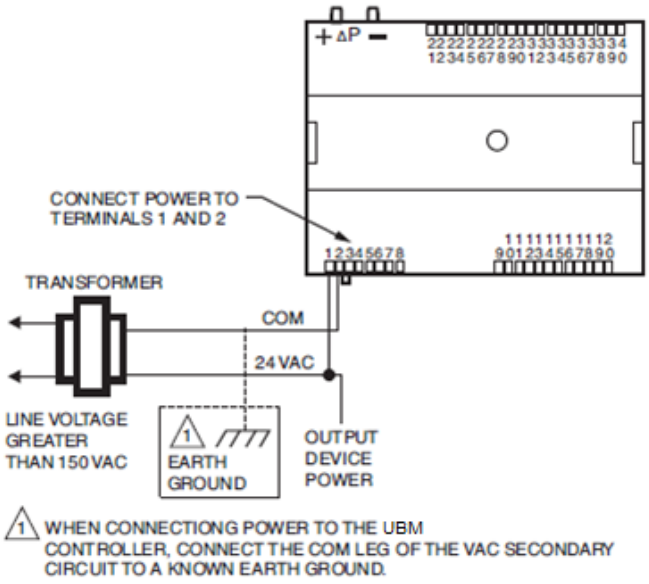



**Figure 5 Power wiring details for one controller per transformer.**

More than one controller can be powered by a single transformer.

**NOTE!**

Controller configurations are not necessarily limited to three devices, but the total power draw, including accessories, cannot exceed 100 VA when powered by the same transformer (U.S. only). For power wiring recommendations, see *Power* section.

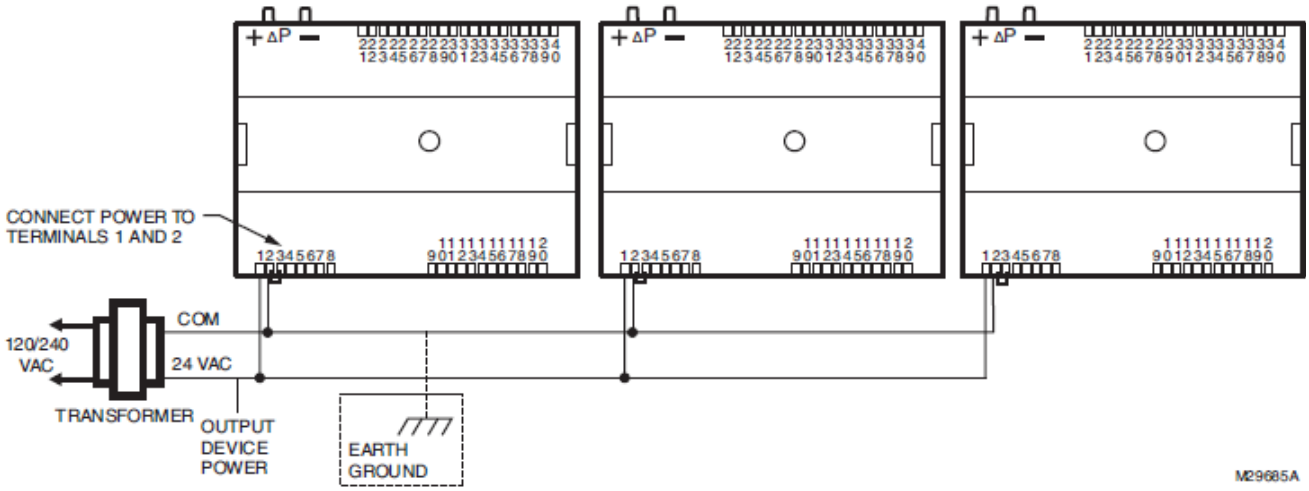



**Figure 6 Power wiring details for two or more controllers per transformer.**

### *Wiring Method*

**CAUTION!**

Disconnect power supply before beginning wiring or making wiring connections to prevent or equipment damage.

**NOTE!**

When attaching two or more wires to the same terminal, other than 14 AWG (2.0 sq mm), be sure to twist them together. Deviation from this rule can result in improper electrical contact.

Each terminal can accommodate the following gauges of wire:

- Single wire: from 22 AWG to 14 AWG solid or stranded
- Multiple wires: up to two 18 AWG stranded, with 1/4 watt wire-wound resistor

Prepare wiring for the terminal blocks, as follows:

1. Strip 1/2 in. (13 mm) insulation from the conductor.
2. Cut a single wire to 3/16 in. (5 mm). Insert the wire in the required terminal location and tighten the screw.

3. If two or more wires are being inserted into one terminal location, twist the wires together a minimum of three turns before inserting them.
4. Cut the twisted end of the wires to 3/16 in. (5 mm) before inserting them into the terminal and tightening the screw.
5. Pull on each wire in all terminals to check for good mechanical connection.

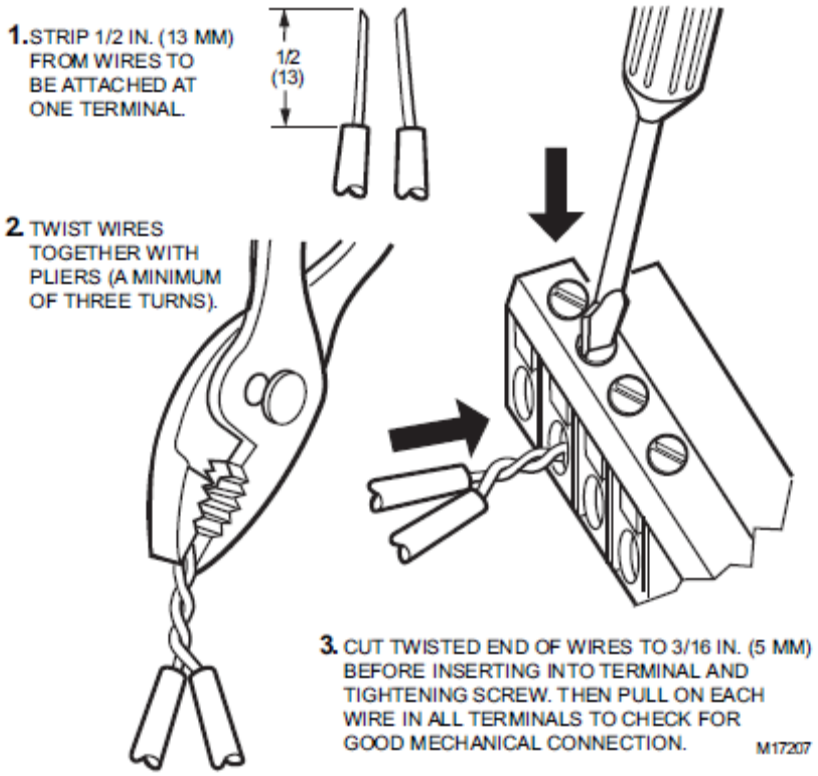



**Figure 7 Attaching two or more wires at terminal blocks.**

### *Wiring Details*

Each controller is shipped with the digital outputs, which switch the 24 Vac to the load (High Side).

- The three analog outputs (AO) are used to control modulating heating, cooling and economizer equipment. Any AO may be used as a digital output, as follows:
  - False (0%) produces 0 Vdc, (0 mA)
  - True (100%) produces the maximum 11 Vdc (22 mA)

**Table 7. Description of wiring terminal connections**

| Terminal | Label | Connection |
|---|---|---|
| INPUT POWER & GROUND | | |
| 1 | 24 Vac | 24 Vac Power |
| 2 | 24 Vac COM | 24 Vac Power |
| 3 | EGND | Earth Ground |
| 4 | SHLD | MS/TP Shield |
| 5 | SBUS 1 | Sylk |
| 6 | SBUS 2 | Sylk |
| NETWORK CONNECTIONS | | |
| 7 | BAC + | BACNET+ communications |
| 8 | BAC - | BACNET- communications |
| DIGITAL OUTPUTS | | |
| 9 | DO-1 | Digital Output |
| 10 | DO-2 | Digital Output |
| 11 | COM | Common |
| 12 | DO-3 | Digital Output |
| 13 | DO-4 | Digital Output |
| 14 | COM | Common |
| 15 | DO-5 | Digital Output |
| 16 | DO-6 | Digital Output |
| 17 | COM | Common |
| 18 | DO-7 | Digital Output |
| 19 | DO-8 | Digital Output |
| 20 | COM | Common |
| ANALOG OUTPUTS[a] | | |
| 21 | AO-1 | Analog Output |
| 22 | COM | Common |
| 23 | AO-2 | Analog Output |
| 24 | AO-3 | Analog Output |
| 25 | COM | Common |
| DIGITAL INPUTS[b] | | |
| 26 | DI-1 | Digital Input |
| 27 | DI-2 | Digital Input |
| 28 | COM | Common |
| 29 | DI-3 | Digital Input |
| 30 | DI-4 | Digital Input |
| ATTACHED DEVICE(S) POWER | | |
| 31 | 20 Vdc | 20 Vdc Power |
| UNIVERSAL INPUTS | | |
| 32 | UI-1 | Universal Input |
| 33 | COM | Common |
| 34 | UI-2 | Universal Input |
| 35 | UI-3 | Universal Input |
| 36 | COM | Common |
| 37 | UI-4 | Universal Input |
| 38 | UI-5 | Universal Input |
| 39 | COM | Common |
| 40 | UI-6 | Universal Input |

a Analog outputs may be configured as digital outputs and operate as follows:
– False (0%) produces 0 Vdc, (0 mA)
– True (100%) produces the maximum 11 Vdc (22 mA)

b Digital inputs: Open circuit = False; Closed circuit = True

**NOTE!**

If the controller is not connected to a good earth ground, the controller's internal transient protection circuitry is compromised and the function of protecting the controller from noise and power line spikes cannot be fulfilled. This could result in a damaged circuit board and require replacement of the controller. Refer to installation diagrams for specific wiring.

All controllers have the terminal arrangements similar to the example shown in Figure 8. A description of the wiring terminals is shown in Table 7.

### *Sylk*

The following Zio SylkBus-connected sensors may be applied to UBM products.

| Novar OS# | Description |
|---|---|
| N-TR71 | ZIO™ LCD wall module- zone temperature |
| N-TR71-H | ZIO™ LCD wall module- zone temperature and humidity |

### *MS/TP MAC ADDRESS DIP SWITCHES*

The MS/TP MAC address DIP switches are used to set the unit's MAC address. Each UBM BACnet on an MS/TP network must have a unique MAC address in the range of 0-127 (address 0 should be avoided as it is the Novar factory default MAC address for all MS/TP devices).

### *MS/TP SERVICE CONNECTOR PINS*

Local device MS/TP network connection is provided via the Molex connector pins (0.100-in. Molex connector—Molex part number: 22-01-2035).

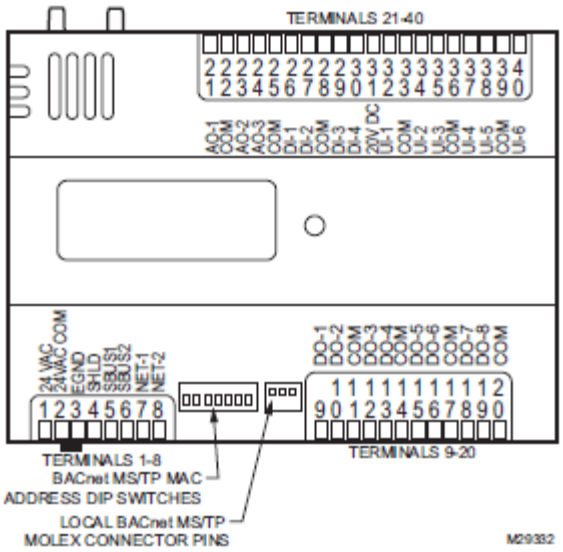



**Figure 8 Controller Terminal Connections, MS/TP MAC address DIP switches, MS/TP service connector pins, and BACnet Status LED for the UBMs.**

### *Wiring Applications (Examples)*

The following figures represent the controller wiring for the following configurations.

- Typical controller wiring for PWM reheat and PWM peripheral heat valve actuator.
- Typical controller wiring for AHU application.
- Typical controller wiring for 4 to 20 mA enthalpy sensors and digital inputs

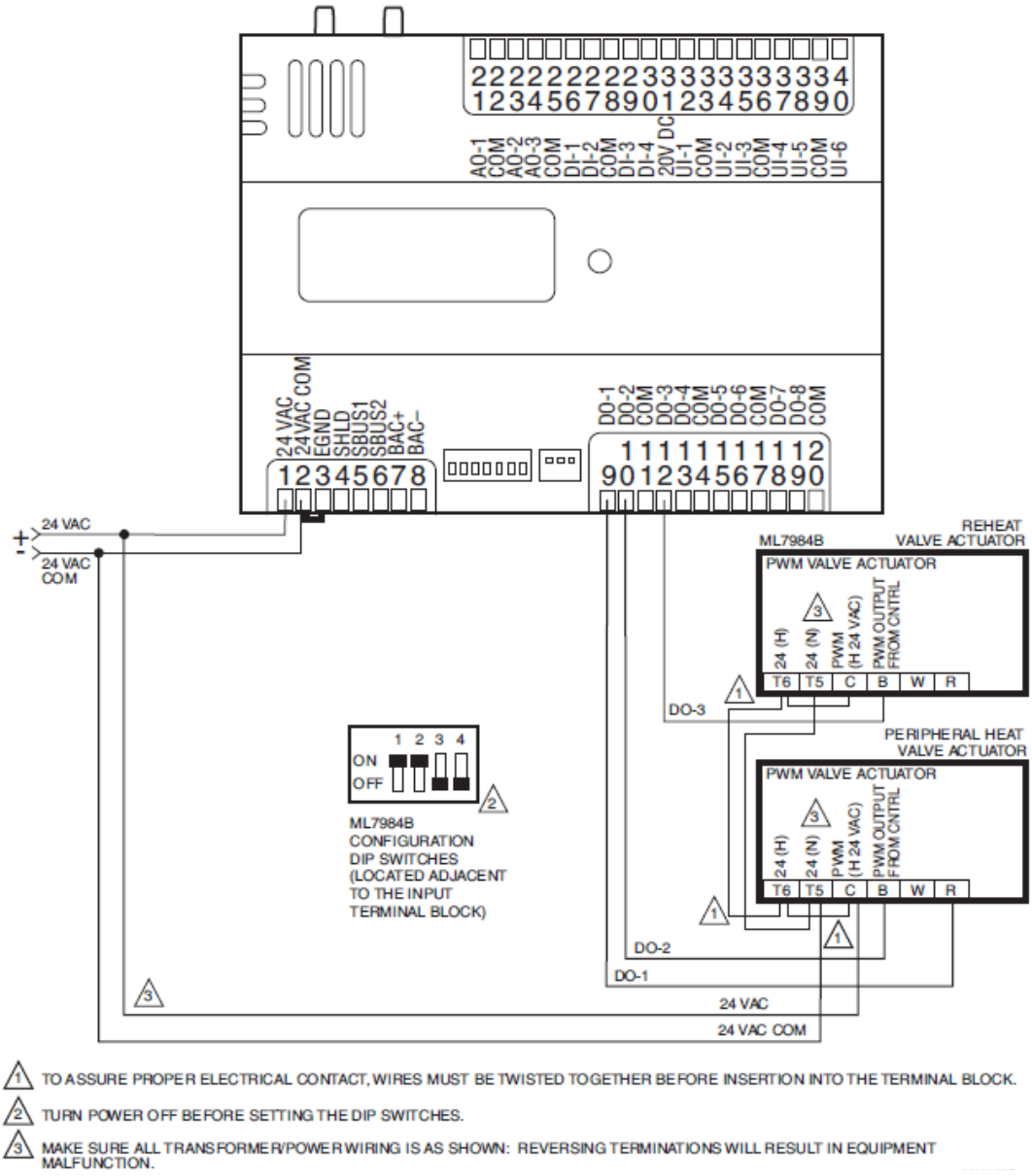



**Figure 9 Controller wiring diagram (model UBM-P-6438 shown) for typical PWM reheat and PWM peripheral heat valve actuator.**

**(Example)**

**NOTE!**

Make sure to set the Configuration DIP Switch. Switches 1 through 3 set the timing of the Honeywell ML7984B valve actuator to match the controller outputs (0.1 second minimum with a maximum time of 25.6 seconds). Switch 4 determines the action of the actuator (Off = Direct Acting, On = Reverse Acting).

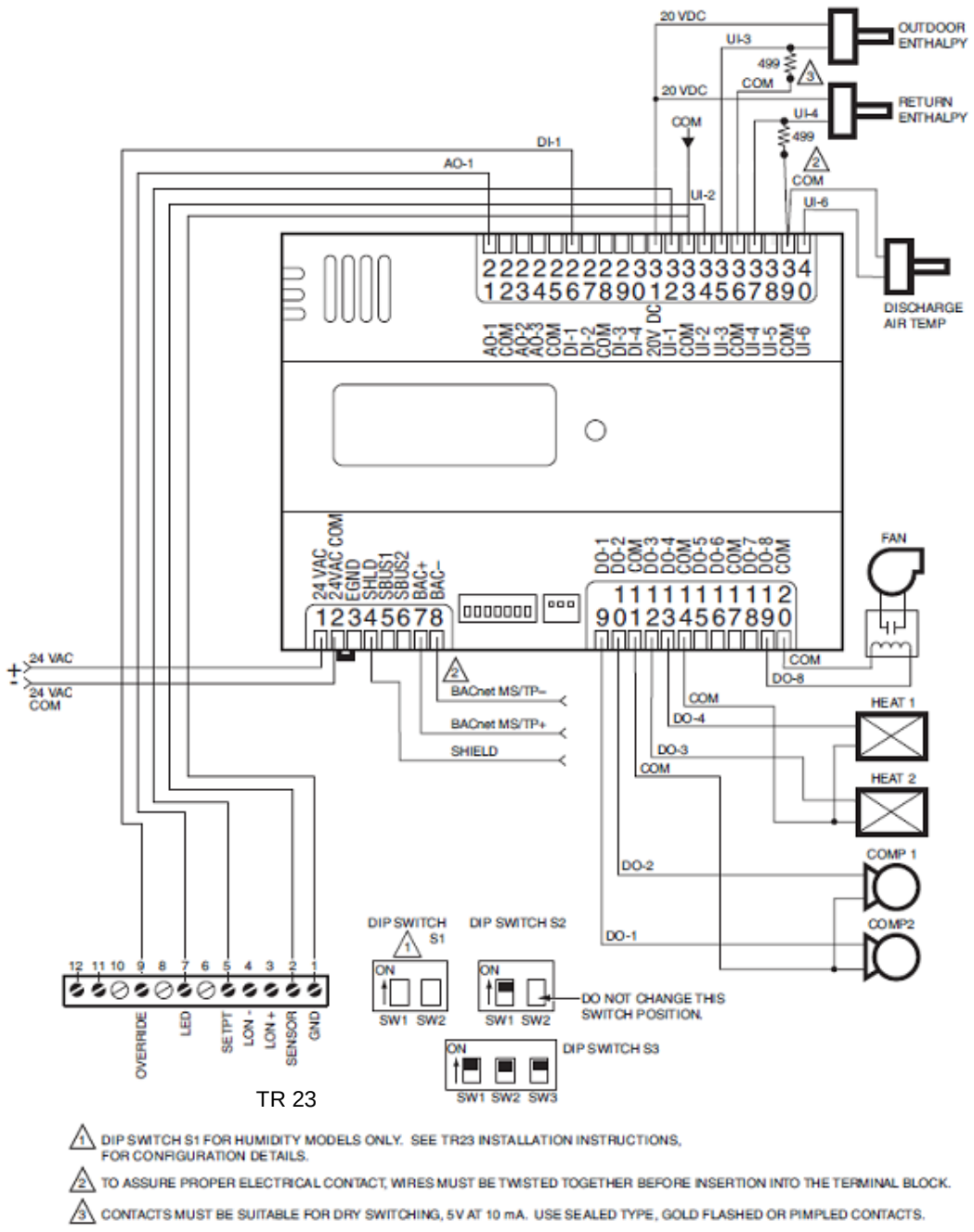



**Figure 10 Controller wiring diagram (model UBM-P-6438 shown) for typical AHU application.**

**(Example)**

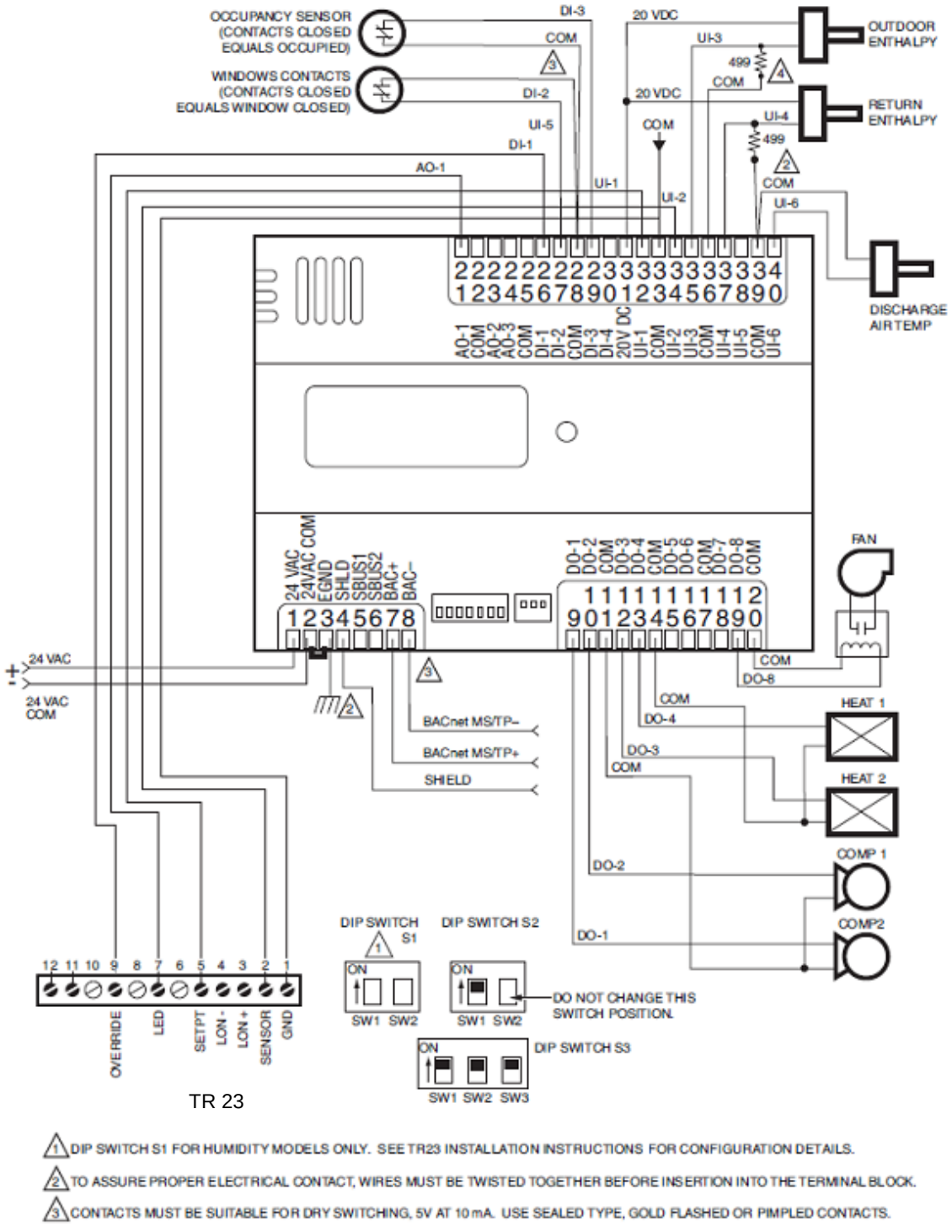
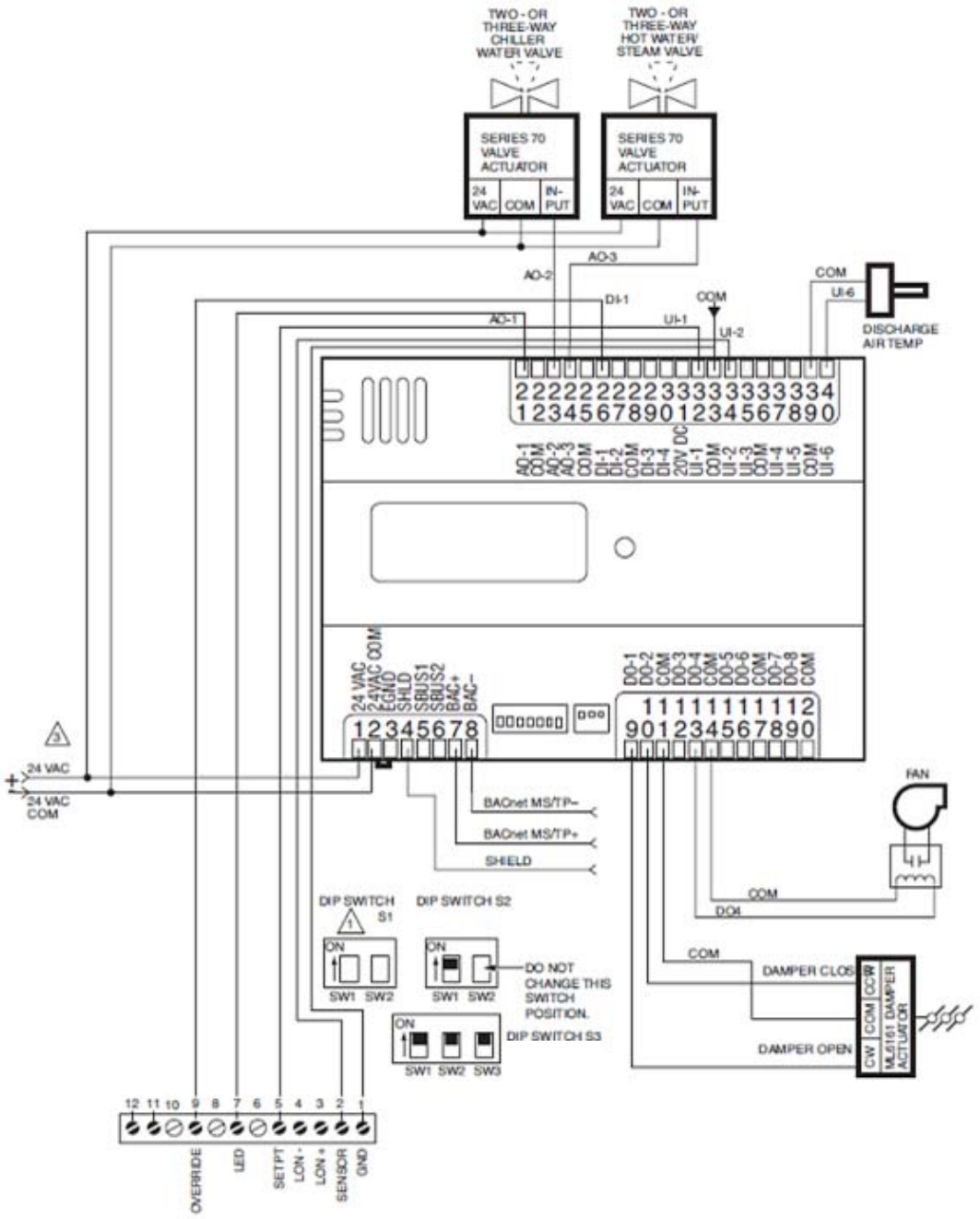



**Figure 11 Controller wiring diagram (model UBM-P-6438 shown) with 4 to 20 mA enthalpy sensors and digital inputs.**

**(Example)**




TR 23

1. DIP SWITCH S1 FOR HUMIDITY MODELS ONLY. SEE TR23 INSTALLATION INSTRUCTIONS, FOR CONFIGURATION DETAILS.
2. EARTH GROUND WIRE LENGTH SHOULD BE HELD TO A MINIMUM. USE THE HEAVIEST GAUGE WIRE AVAILABLE, UP TO 14 AWG (2.0 MM²) WITH A MINIMUM OF 18 AWG (1.0 MM²), FOR EARTH GROUND WIRE.
3. TO ASSURE PROPER ELECTRICAL CONTACT, WIRES MUST BE TWISTED TOGETHER BEFORE INSERTION INTO THE TERMINAL BLOCK.
4. CONTACTS MUST BE SUITABLE FOR DRY SWITCHING, 5V AT 10 mA. USE SEALED TYPE, GOLD FLASHED OR PIMPLED CONTACTS.

**Figure 12 Controller wiring diagram (model UBM-P-6438 shown) with 4 to 20 mA heating, cooling, and Honeywell model ML6161 damper actuator.**

**(Example)**

## Communications

Each controller uses a BACnet MS/TP communications port. The controller's data is presented to other controllers over a twisted-pair MS/TP network, which uses the EIA-485 signaling capable of the following baud rates: 9.6, 19.2, 38.4, 76.8 or 115.2 kilobits per second. The UBM BACnet controllers are master devices on the MS/TP network. Each UBM BACnet controller uses a slew rate limited EIA-485 transceiver and exerts 1/4 unit load on the MS/TP network.

Cabling should be selected that meets or exceeds the BACnet Standard which specifies the following: An MS/TP EIA-485 network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 130 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot). Distributed capacitance between conductors and shield shall be less that 200 pF per meter (60 pF per foot). Foil or braided shields are acceptable. The Honeywell tested and recommended MS/TP cable is Honeywell Cable 3322 (18 AWG, 1-Pair, Shielded, Plenum cable), alternatively Honeywell Cable 3251 (22 AWG, 1-Pair, Shielded, Plenum cable) is available and meets the BACnet Standard requirements (www.honeywellcable.com).

The maximum BACnet MS/TP network Bus segment length is 4,000 ft. (1,219 m) using recommended wire. Repeaters must be used when making runs longer than 4,000 ft. (1,219 m). A maximum of three repeaters can be used between any two devices.

**NOTE!**

The controller does not provide any network biasing.

## Setting the MS/TP MAC address

The MS/TP MAC address for each device must be set to a unique value in the range of 0-127 on an MS/TP network segment (address 0, 1, 2, & 3 should be avoided as they are commonly used for the router, diagnostic tools, and as spare addresses). DIP switches on the UBM BACnet controller are used to set the controller's MAC address.

To set the MS/TP MAC address of a UBM BACnet controller:

1. Find an unused MAC address on the MS/TP network to which the UBM BACnet controller connects.
2. Locate the DIP switch bank on the UBM BACnet for addressing. This is labeled MAC Address

3. With the UBM BACnet Controller powered down, set the DIP switches for the MAC Address you want. Add the value of DIP switches set to ON to determine the MAC address. See DIP Switch Values For MS/TP MAC Address.. Example, if only DIP switches 1, 3, 5, and 7 are enabled the MAC address would be 85 (1 + 4 + 16 + 64 = 85).

**Table 6. DIP Switch Values For MS/TP MAC Address.**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **DIP** | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| **VALUE** | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

### *Shield Terminating*

Following proper MS/TP cabling shield grounding procedures is important to minimize the risk of communication problems and equipment damage caused by capacitive coupling. Capacitive coupling is caused by placing MS/TP cabling close to lines carrying higher voltage. The shield should be grounded on only one end of the MS/TP segment (typically the xcm). Tie the shield through using the SHLD (terminal 4) on the UBM BACnet Controller.

### *Sylk™ Bus*

Sylk is a two wire, polarity insensitive bus that provides both 18 VDC power and communications between a Sylk-enabled sensor and a Sylk-enabled controller. Using Sylk-enabled sensors saves I/O on the controller and is faster and cheaper to install since only two wires are needed and the bus is polarity insensitive. Sylk sensors are configured using the latest release of the UBM tool.

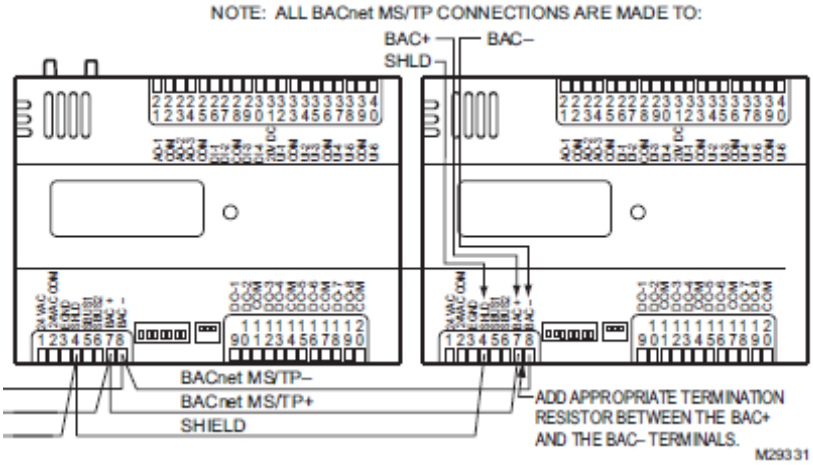



**Figure 13 Termination modules.**

## Checkout

### *Step 1.*

#### Check Installation and Wiring

Inspect all wiring connections at the controller terminals, and verify

compliance with installation wiring diagrams. If any wiring changes are required, *first* be sure to remove power from the controller *before* starting work. Pay particular attention to:

- 24 Vac power connections. Verify that multiple controllers being powered by the same transformer are wired with the transformer secondary connected to the same input terminal numbers on each controller. Use a meter to measure 24 Vac at the appropriate terminals (see Figure 6 Power wiring details for two or more controllers per transformer. ). Controller configurations are not necessarily limited to three devices, but the total power draw, including accessories, cannot exceed 100 VA when powered by the same transformer (U.S. only).
- Be sure that each controller has terminal 3 wired to a verified earth ground, using a wire run as short as possible with the heaviest gauge wire available, up to 14 AWG (2.0 sq mm) with a minimum of 18 AWG (1.0 sq mm) for each controller in the group (see Figure 6 Power wiring details for two or more controllers per transformer. ).
- Check that the MS/TP network polarity has been connected properly on each controller. BACnet MS/TP is polarity sensitive; communication will be lost for the entire segment if one controller is connected improperly (see Figure 13 Termination modules.).
- Verify that Triac wiring of the digital outputs to external devices uses the proper load power and 24 Vac common terminal (digital output common terminals) for High-Side switching.

**NOTE!**

All wiring must comply with applicable electrical codes and ordinances or as specified on installation wiring diagrams.

For guidelines for wiring run lengths and power budget, see the section on *Power*.

***Step 2.***

**Startup**

Refer to the figure below and the following text for startup information.

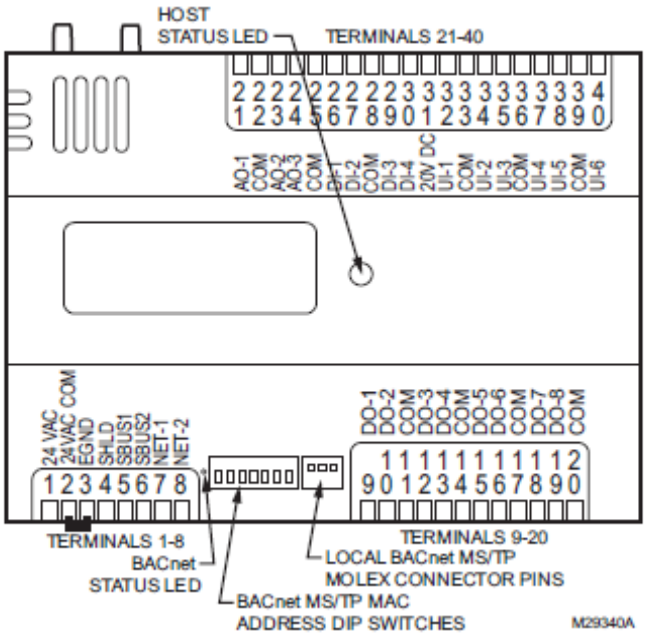



**Figure 14 LED, service, and network connection locations.**

### SET THE MS/TP MAC ADDRESS

The MS/TP MAC address DIP switches are used to set the unit's MAC address. Each UBM BACnet on an MS/TP network must have a unique MAC address in the range of 0-127 (address 0 should be avoided as it is the Honeywell factory default MAC address for all MS/TP devices).

### Controller Status LED:

The LED on the front of the controller provides a visual indication of the status of the device. When the controller receives power, the LED appears in one of the following allowable states, as described in status LED section.

**Table 8. Status LED States.**

| LED State | Blink Rate | Status or Condition |
|---|---|---|
| OFF | Not applicable | No power to processor, LED damaged, low voltage to board, first second of power up or loader damaged. |
| ON | ON steady; not blinking | Processor not operating. Application Program CRC being checked. This takes 1-2 seconds and occurs on each restart (power up, reset and reflash, and following configuration file download). |
| Very Slow Blink (continuous) | 1 second ON, 1 second OFF | Controller is operating normally. |
| Slow Blink (continuous) | 0.5 second ON, 0.5 second OFF | Controller alarm is active or controller in process of configuration file download. |
| Medium Blink (continuous) | 0.3 second ON, 0.3 second OFF | Controller is in reflash mode or awaiting/receiving reflash data via the BACnet network. |

### BACnet Status LED:

**The LED on the front of the controller, between the BACnet MS/TP terminals and MAC Address DIP Switches, provides a visual indication of the BACnet MS/TP communication status. When the controller receives power, the LED appears in one of the following allowable states, as described in BACnet status LED states table.**

**BACnet Status LED States**

| BACnet LED Status | Status or Condition |
|---|---|
| Solid on | Controller has power, loader is not running. |
| Solid on, blinking off once in 2.5 sec. | Controller is in reflash mode, no MS/TP communication. |
| Solid on, blinking off twice in 2.5 sec. | Controller is in reflash mode, MS/TP communication present. |
| Solid on, blinking off thrice in 2.5 sec | Controller is in reflash mode, MS/TP communication data transfer in progress. |
| Solid off, there is no power | No power to processor, LED damaged, low voltage to board, or loader damaged. |
| Solid off, blinking on once in 2.5 sec. | Controller is running, no MS/TP communication. |
| Solid off, blinking on twice in 2.5 sec. | Controller is running, MS/TP communication present. |
| Solid off, blinking on thrice in 2.5 sec | Controller is running, MS/TP communication data transfer in progress. |

***Step 3.***

### Checkout Completion

At this point the controller is installed and powered. To complete the checkout, the Opus application (run on a PC) is used to configure the I/O and functions of the controller. Refer to the *UBM User Guide* for controller configuration and programming details.

### Controller Replacement

There are no serviceable or repairable parts inside the controller.

**CAUTION!**

Do not attempt to modify the physical or electrical characteristics of this device in any way. Replace the controller if troubleshooting indicates a malfunction.

**CAUTION!**

Disconnect power supply before beginning wiring or making wiring connections to prevent equipment damage.

### Terminal Block Removal

To simplify controller replacement, all terminal blocks are designed to be removed with the wiring connections intact and then re-installed on the new controller. See Figure 15 Removing Terminal Blocks. and refer to the following procedure:

**NOTE!**

To prevent bending or breaking the alignment pins on longer terminal blocks, insert the screwdriver at several points to evenly and gradually lift up the terminal block.

Insert the screwdriver blade no more than 1/8 in. (3 mm) to prevent damage to the terminal block alignment pins on the controller circuit board.

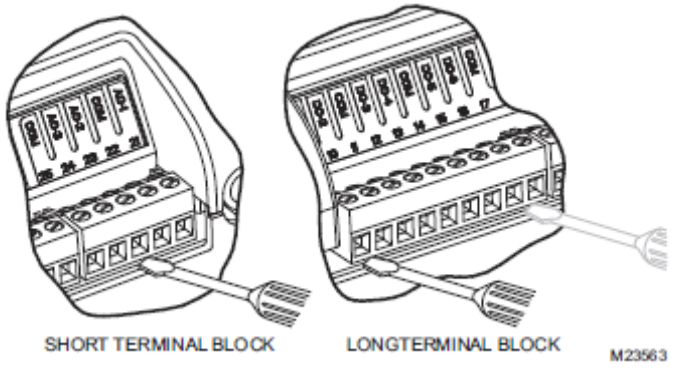



**Figure 15 Removing Terminal Blocks.**

1. Use a thin-bladed screwdriver to evenly raise the terminal block from its alignment pins:
    a. For short terminal blocks (1 to 5 terminals), insert screwdriver blade in the center of the terminal block and use a back and forth twisting motion to gently raise the terminal block from its alignment pins 1/4 in. (6.35 mm).
    b. For long terminal blocks (6 or more terminals), insert screwdriver blade on one side of the terminal block and gently rotate the blade 1/4 turn. Then, move to the other side of the terminal block and do the same. Repeat until the terminal block is evenly raised 1/4 in. (6.35 mm) from its alignment pins.
2. Once the terminal block is raised 1/4 in. (6.35 mm) from its alignment pins, grasp the terminal block at its center (for long terminal blocks grasp it at each end) and pull it straight up.

## Controller

## Replacement
### *(UBM-P-6438 and UBM-IO-6438)*

Perform the following to replace the UBM-P-6438 controller:

1. Remove all power from the controller.
2. Remove the terminal blocks (See *Terminal Block Removal*).
3. Remove the old controller from its mounting.

**NOTE!**

(For controllers mounted to a DIN rail):

1. Push straight up from the bottom to release the top pins.

2. Rotate the top of the controller outwards to release the bottom flex connectors.

4. Mount the new controller.
5. Replace the terminal blocks:
6. Insert each terminal block onto its alignment pins.
7. Press straight down to firmly seat it.
8. Repeat for each terminal block.
9. Restore power to the controller.
10. Perform checkout ( see *Checkout*.)

## Model & Part Numbers

Part numbers that should be used to order the necessary Novar parts.

**Table 1. Novar Part Numbers**

| Product | Model No. | Part No. |
|---|---|---|
| UBM Fully Programmable Controller | UBM-P-6438 | UBM-P-6438 |

# Regulatory Compliance

## *Agency Approvals*

Listed device: CUL/UL E90949 Series UBM
Standard used: UL 916

## *Electromagnetic Compatibility (EMC)*

## *Federal Communications Commission (FCC)*

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

**NOTE:**

This device has been tested and found to comply with the limits established for Class B digital devices. It is intended to be used in a commercial environment. Operation of this equipment in residential environments may cause harmful interference, in which case the user may be required to correct the interference at his own expense.

**CAUTION!**

Any changes or modifications not expressly approved by Novar could void your authority to operate this equipment.

**Industry Canada**

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled Digital Apparatus, ICES-003, of Industry Canada.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B préscrites dans la norme sur le matériel brouiller: Appareils Numériques, NMB-003, édictée par l'Industrie Canada.

## *CE*

Device meets EN61000-6-3 (EU Emissions) and ENG1000-1 (EU Immunity).

**NOTE!**

To maintain international compliance, the device must be powered by a CE–certified, UL Class 2 transformer.

### *Waste Electrical & Electronic Equip*

**NOTE!**

Customers are advised to dispose of this product at the end of its useful life according to applicable local laws, regulations, and procedures**.**



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