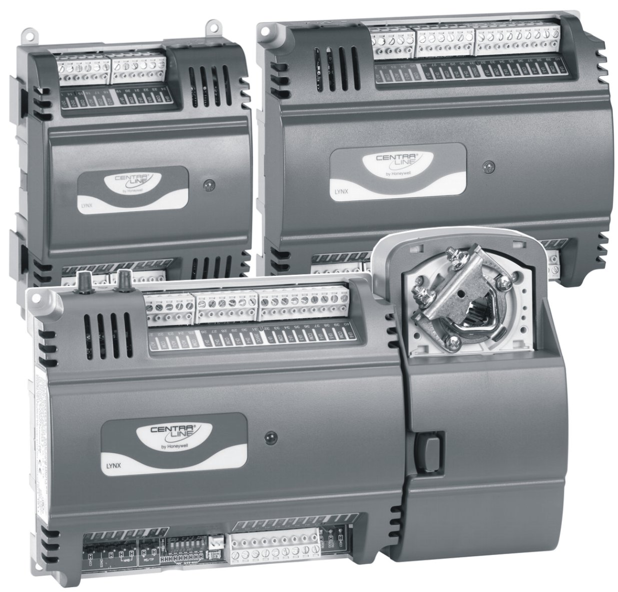
LYNX BACnet® Programmable VAV/Unitary Controllers

Product Data

CENTRA LINE by Honeywell



GENERAL

The BACnet MS/TP LYNX controllers are designed to control HVAC equipment.

LYNX controllers provide many options and advanced system features that allow state-of-the-art commercial building control. Each LYNX controller is programmable and configurable using the COACH^{AX} software.

LYNX BACnet controllers require the LYNX BACnet Programmable Feature to be licensed in COACH^{AX}.

LYNX controllers are designed for use in VAV (Variable Air Volume) and Unitary HVAC control applications. Each controller contains a host microcontroller to run the main HVAC application and a second microcontroller for BACnet MS/TP network communications. Each controller has flexible, universal inputs for wall modules, digital inputs, and a mix of analog and digital triac outputs (see Table 1). The models CLLYVB6436AS, CLLYVB0000AS, and CLLYVB4022AS include an actuator.

Table 1. Controller configurations

model	type	Universal Inputs (UI)	Digital Inputs (DI)	Analog Outputs (AO)	Digital Outputs (DO)	velocity pressure sensor (Microbridge)	floating actuator
CLLYUB1012S	unitary	1[A]	0	1	2	NO	NO
CLLYUB4024S	unitary	4[A]	0	2	4	NO	NO
CLLYUB6438S	unitary	6	4	3	8	NO	NO
CLLYVB0000AS	VAV	0	0	0	0	YES	YES
CLLYVB4022AS	VAV	4[A]	0	2	2	YES	YES
CLLYVB4024NS	VAV	4[A]	0	2	4	YES	NO
CLLYVB6436AS	VAV	6	4	3	6	YES	YES
CLLYVB6438NS	VAV	6	4	3	8	YES	NO
[A] One Universal Input (UI-1*) is selectable as a fast digital pulse meter.							

All of the LYNX controllers communicate via an EIA-485 BACnet MS/TP communication network, capable of baud rates of between 9.6 and 115.2 kbits/sec.

The LYNX controllers are field-mountable to either a panel or a DIN rail.

TECHNICAL DATA

GENERAL SPECIFICATIONS

Rated voltage:	20 … 30 Vac; 50/60 Hz
Power consumption:	100 VA for controller and all connected loads (incl. actuator on AS-models)
Controller-only load:	5 VA max. (S- and NS-models)
Controller + actuator load:	9 VA max. (AS-models)
Wall modules power output:	20 Vdc ± 10% at 75 mA, max.

VAV OPERATING & STORAGE TEMPERATURE AMBIENT RATING

VAV models:	0 … +50 °C
Unitary models:	-40 … +65.5 °C
Relative humidity:	5 … 95%, non-condensing
LED:	Provides status for normal operation, controller download process, alarms, manual mode, and error conditions

VELOCITY PRESSURE SENSOR (VAV MODELS)

Operating range:	0 … 374 Pa

FLOATING ACTUATOR (AS-models)

Rotation stroke:	95° ± 3° for CW/CCW-opening dampers
Torque rating:	5 Nm
Runtime for 90° rotation:	90 sec at 60 Hz
Operating temperature:	-20 … +60 °C

REAL-TIME CLOCK

Operating range:	24-hr, 365-day, multi-year calendar, incl. day of week and configuration for automatic daylight savings time adjustment to occur at 2:00 a.m. local times on configured start and stop dates
Power failure back-up:	24 hrs at 0 … +38 °C, 22 hrs at 38 … 50 °C
Accuracy:	±1 minute per month at 25 °C

DIGITAL INPUT (DI) CIRCUITS

Voltage rating:	0 … 30 Vdc open circuit
Input type:	Dry contact to detect open / closed circuit
Operating range:	Open circuit = FALSE, closed circuit = TRUE
Resistance:	Open circuit > 3k Ω, closed circuit < 500 Ω

DIGITAL TRIAC OUTPUT (DO) CIRCUITS

Voltage rating:	20 … 30 Vac at 50/60 Hz
Current rating:	25 … 500 mA continuous, and 800 mA (AC rms) for 60 ms.

ANALOG OUTPUT (AO) CIRCUIT

Configuration for current / voltage:	Up to 3 analog outputs can be individually configured for current or voltage.
Configuration as digital outputs:	FALSE (0%) -> 0 Vdc (0 mA) TRUE (100%) -> max., 11 Vdc (22 mA)

Analog current outputs

Current output range:	4 … 20 mA
Output load resistance:	550 Ω, max.

Analog voltage outputs

Voltage output range:	0 … 10 Vdc
Max. output current:	10.0 mA

UNIVERSAL INPUT (UI) CIRCUITS

See Table 2 for UI circuit specifications.

Table 2. Universal input circuit specifications

input type	sensor type	operating range
Room/Zone Discharge Air Outdoor Air Temp.	NTC 20kOhm	-40 ... +93 °C
Outdoor Air Temperature	PT1000 (IEC751 3850)	-40 ... +93 °C
Resistive Input	Generic	100 Ω …100 kΩ
Voltage Input	Transducer, Controller	0 … 10 Vdc
Discrete Input	Dry Contact closure	OpenCircuit ≥ 3000 Ω ClosedCircuit < 3000 Ω
Pulse Input[A]	Counter/Meter	Max. frequency: 15 Hz Min. pulse width: 20 ms

[A] One Universal Input (UI-1*) is selectable as a fast digital pulse meter.

NTC 20kOhm are recommended for use with these controllers, due to improved resolution and accuracy when compared to the PT1000.

BEFORE INSTALLATION

The controller is available in eight models (see Table 1).

Before installing the controller, review the power, input, and output specifications in section “Technical Data”.

- Hardware driven by Triac outputs must have a min. current draw, when energized, of 25 mA and a max. current draw of 500 mA.
- Hardware driven by the analog current outputs must have a max. resistance of 550 Ω, resulting in a max. voltage of 11 V when driven at 20 mA. If resistance exceeds 550 Ω, voltages up to 18 Vdc are possible at the analog output terminal.

⚠ WARNING

Electrical Shock Hazard.
Can cause severe injury, death or property damage.
To prevent electrical shock or equipment damage, disconnect power supply before beginning wiring or making wiring connections.

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 Fig. 12).

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. See Fig. 4 and Fig. 6 for mounting dimensions.

In the case of the AS-models, first the actuator and then the controller is mounted. For the other models, see section “Mount Controller” on page 4 to begin the installation.

Mounting Actuator onto Damper Shaft (AS-Models)

The AS-models include the direct-coupled actuator with DECLUTCH button, which is shipped hard-wired to the controller.

The actuator mounts directly onto the VAV box damper shaft and has up to 5 Nm torque, 90° stroke, and 90-sec timing at 60 Hz. The actuator is suitable for mounting onto a 10 to 13 mm square or round VAV box damper shaft. The min. VAV box damper shaft length is 40 mm.

The two mechanical end-limit set screws control the amount of rotation from 12° to 95°. These set screws must be securely fastened in place. To ensure tight closing of the damper, the shaft adapter has a total rotation stroke of 95° (see Fig. 1).

NOTE 1: The actuator is shipped with the mechanical end limit set screws set to 95° of rotation. Adjust the two set screws closer together to reduce the rotation travel. Each “hash mark” indicator on the bracket represents approximately 6.5° of rotation per side.

NOTE 2: The DECLUTCH button, when pressed, allows you to rotate the universal shaft adapter (see Fig. 1).

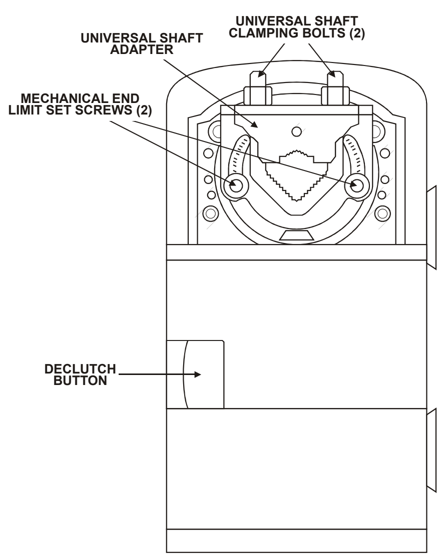


Fig. 1. Floating actuator

IMPORTANT

Determine the damper rotation and opening angle prior to installation. See Fig. 2 and Fig. 3 for examples.

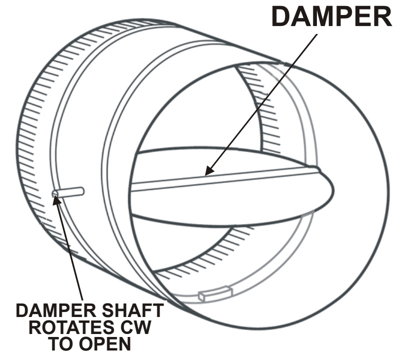


Fig. 2. Damper with 90° clockwise rotation to open

IMPORTANT

Mount actuator flush with damper housing or add a spacer between the actuator mounting surface and damper box housing.

Before Mounting Actuator onto Damper Shaft (AS-Models)

Tools required:

- Phillips #2 screwdriver - end-limit set screw adjustment
- 8 mm wrench - centering clamp

Before mounting the actuator onto the VAV box damper shaft, determine the following:

1. Determine the damper shaft diameter. It must be 10…13 mm.
2. Determine the length of the damper shaft. If the length of the VAV box damper shaft is less than 40 mm, the actuator cannot be used.
3. Determine the direction the damper shaft rotates to open the damper (CW or CCW) (see Fig. 3). Typically, there is an etched line on the end of the damper shaft indicating the position of the damper. In Fig. 2, the indicator shows the damper open in a CW direction.
4. Determine the damper full opening angle (45, 60, or 90°). In Fig. 2, the damper is open to its full open position of 90°.

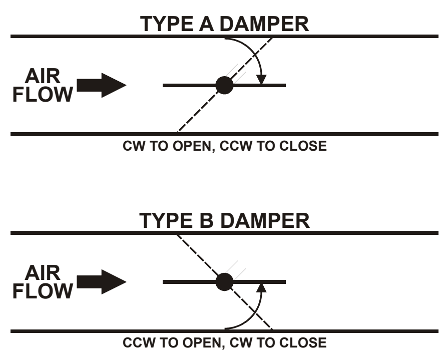


Fig. 3. Determining rotation direction (CW or CCW) for damper opening

Mounting Actuator Onto Damper Shaft (AS-Models)

The unit is shipped with the actuator set to rotate open in the clockwise (CW) direction to a full 95°. The extra 5° ensures a full opening range for a 90° damper.

The installation procedure varies depending on the damper opening direction and angle:

1) If the damper rotates CW to open, and the angle of the damper open-to-closed is 90°:
   a) Manually open the damper fully (rotate CW).
   b) Using the DECLUTCH button, rotate the universal shaft adapter fully CW.
   c) Mount the actuator to the VAV damper box and shaft.
   d) Tighten the two bolts on the centering clamp (8 mm wrench; 8...10 Nm torque). When the actuator closes, the damper rotates CCW 90° to fully close.
2) If the damper rotates CW to open, and the angle of the damper open-to-closed is 45 or 60°:
   a) Manually open the damper fully (rotate CW).
   b) The actuator is shipped with the mechanical end-limits set at 95°. Adjust the two mechanical end-limit set screws to provide the desired amount of rotation. Adjust the two set screws closer together to reduce the rotation travel.
   c) Tighten the two mechanical end-limit screws (Phillips #2 screwdriver; (3.0-3.5 Nm torque).
   d) Using the DECLUTCH button, rotate the universal shaft adapter fully CW.
   e) Mount the actuator to the VAV damper box and shaft.
   f) Tighten the two bolts on the centering clamp (8 mm wrench; 8...10 Nm torque).
   g) When the actuator closes, the damper rotates CCW either 45 or 60° to fully close.
3) If the damper rotates CCW to open, and the angle of the damper open-to-closed is 90°:
   a) Manually open the damper fully (rotate CCW).
   b) Using the DECLUTCH button, rotate the universal shaft adapter fully CCW.
   c) Mount the actuator to the damper box and shaft.
   d) Tighten the two bolts on the centering clamp (8 mm wrench; 8...10 Nm torque). When the actuator closes, the damper rotates CW 90° to fully close.
4) If the damper rotates CCW to open, and the angle of the damper open-to-closed is 45 or 60°:
   a) Manually open the damper fully (rotate CCW).
   b) The actuator is shipped with the mechanical end-limits set at 95°. Adjust the two mechanical end-limit set screws to provide the desired amount of rotation. Adjust the two set screws closer together to reduce the rotation travel.
   c) Tighten the two mechanical end-limit screws (Phillips #2 screwdriver; (3.0-3.5 Nm torque).
   d) Using the DECLUTCH button, rotate the universal shaft adapter fully CCW.
   e) Mount the actuator to the VAV damper box and shaft.
   f) Tighten the two bolts on the centering clamp (8 mm wrench; 8...10 Nm torque).
   g) When the actuator closes, the damper rotates CW either 45 or 60° to fully close.

IMPORTANT

Special precautions must be taken for dampers that open in a CCW direction. The actuator is shipped with its rotation direction set to CW to open, which applies to the damper direction in steps 1 and 2 above. If the damper shaft rotates in the CCW direction to open, the controller software must be programmed to change the rotation to "Reverse to Open," which applies to the damper direction in steps 3 and 4 above.

IMPORTANT

To avoid the possibility of over-pressurizing the duct work on fan start-up, it is advisable to leave the dampers in an open position after installation. To prevent over-pressurization in the duct work on fan start-up, use the DECLUTCH button (see Fig. 1) to open the box damper on powered-down controllers. To declutch, press and hold the DECLUTCH button, thus disengaging the motor. Turn the damper shaft until the damper is open and then release the DECLUTCH button. When power is restored to the controller, the controller synchronizes the damper actuator, so that the damper is in the correct position upon start-up.

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 (see section "Wiring" on page 6).

See Fig. 4 and Fig. 6 for panel mounting dimensions. See Fig. 7 for DIN rail mounting.

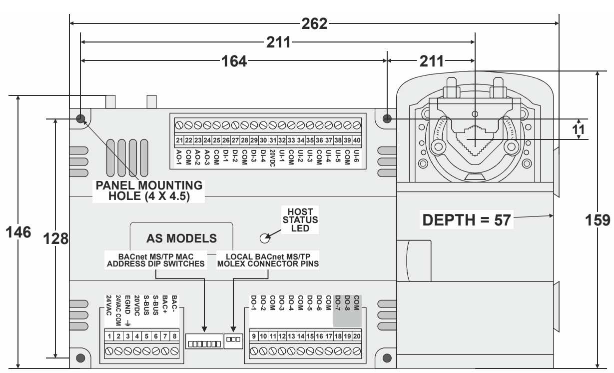


Fig. 4. Duct mounting, dimensions in mm (AS-models)

Panel Mounting

The controller enclosure is constructed of a plastic base plate and a plastic factory-snap-on cover.

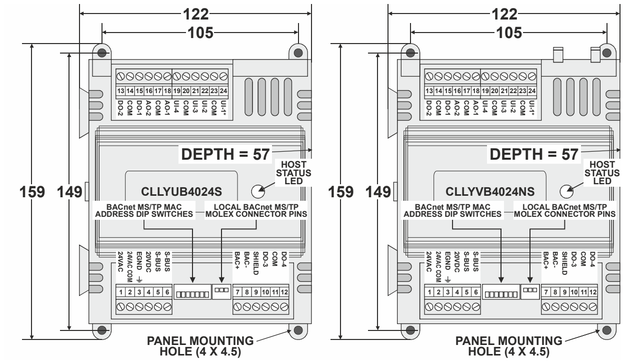


Fig. 5. Panel mounting – dimensions (mm) for CLLYUB1012S, CLLYUB4024S, and CLLYVB4024NS, only (CLLYUB4024S and CLLYVB4024NS shown)

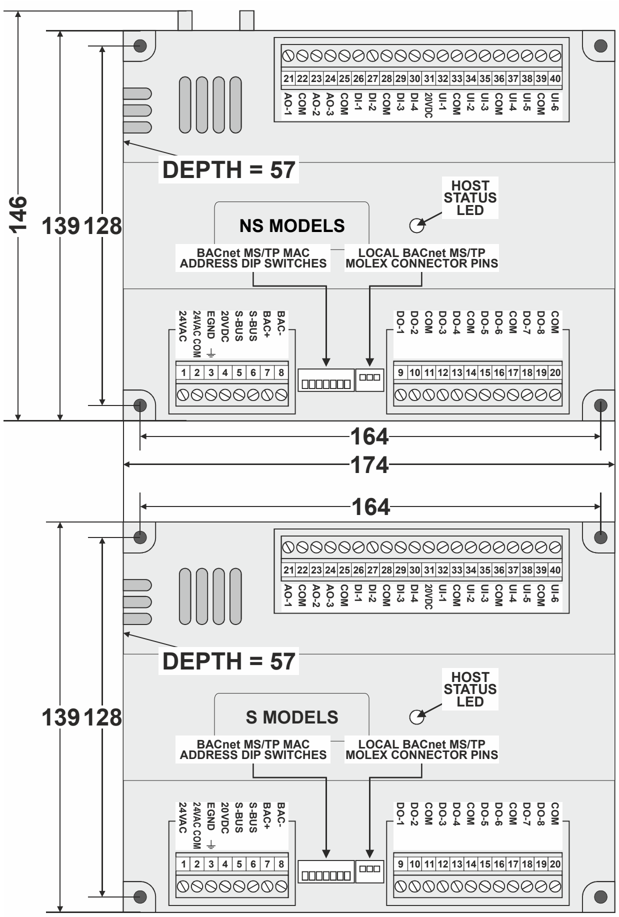


Fig. 6. Panel mounting, dimensions in mm (S- and NS-models)

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 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 (S- and NS-models)

To mount the S- and NS-models onto a DIN rail, see Fig. 7 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.

IMPORTANT

To remove the controller from the DIN rail, perform the following:
1. Push straight up from bottom to release 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.

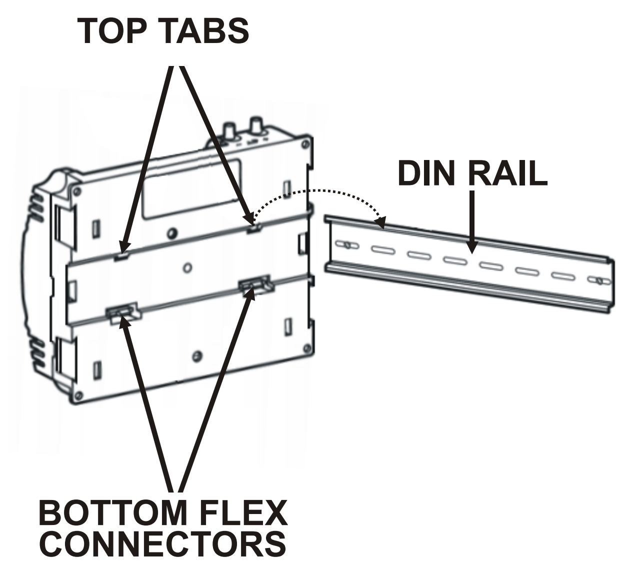


Fig. 7. Controller DIN rail mounting (S- and NS-models)

Piping (AS- and NS-models)

Air Flow Pick-Up

For AS- and NS-models, connect the air flow pickup to the two restrictor ports on the controller (see Fig. 8).

NOTE 1: Use tubing with 6 mm outside diameter and 1 mm wall thickness.

NOTE 2: Always use a fresh cut on the end of the tubing that connects to the air flow pickups and the restrictor ports on the controller.

Connect the high-pressure or upstream tube to the plastic restrictor port labeled (+), and the low-pressure or down-stream tube to the restrictor port labeled (-). See labeling in Fig. 8. When twin tubing is used from the pickup, split the pickup tubing a short length to accommodate the connections.

NOTE 1: If controllers are mounted in unusually dusty or dirty environments, an inline, 5-micron disposable air filter (use 5-micron filters compatible with pneumatic controls) is recommended for the high-pressure line (marked as +) connected to the air flow pickup.

NOTE 2: The tubing from the air flow pickup to the controller should not exceed 1 m. Any length greater than this will degrade the flow sensing accuracy.

NOTE 3: Use caution when removing tubing from a connector. Always pull straight away from the connector or use diagonal cutters to cut the edge of the tubing attached to the connector. Never remove by pulling at an angle.

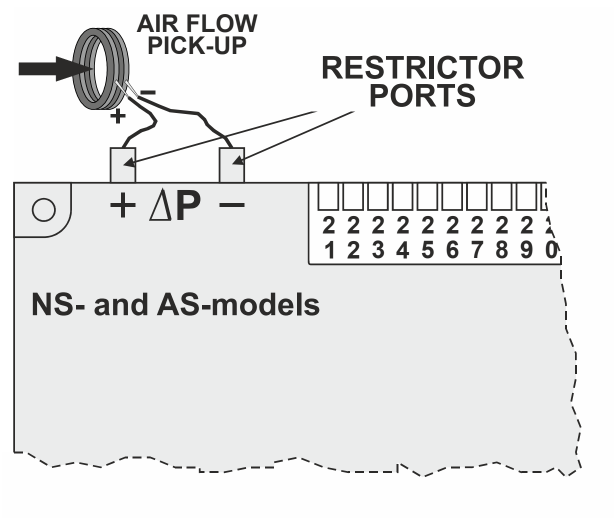


Fig. 8. Air flow pick-up connections

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. See Fig. 14 through Fig. 20 for typical controller wiring configurations.

The application engineer 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 controllers that are required for optimum system wide operation. Typical examples include the outdoor air temperature, the demand limit control signal, and the smoke control mode signal.

It is important to understand these interrelationships early in the job engineering process, to ensure proper implementation when configuring the controllers. See the controller Application Guides.

Power Budget

A power budget must be calculated for each device to determine the required transformer size for proper operation. A power budget is simply the sum of the max. 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 and various contactors and transducers.

IMPORTANT

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 (see Fig. 10).

Half-wave devices and full-wave devices must not use the same AC transformer. If a LYNX controller is to 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.

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.

⚠ WARNING

Electrical Shock Hazard.
Can cause severe injury, death or property damage.
To prevent electrical shock or equipment damage, disconnect power supply before beginning wiring or making wiring connections.

NOTE 1: 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 controller. Controller configurations will not necessarily be 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 and wiring recommendations, See section “Power” on page 6. The earth ground terminal (terminal 3) must be connected to a verified earth ground for each controller in the group (see Fig. 10).

NOTE 2: All loads on the controller must be powered by the same transformer powering the controller itself. A controller can use separate transformers for controller power and output power.

NOTE 3: A jumper should be installed between 24 VAC COM (term. 2) and EGND (term. 3). Further, EGND (term. 3) should be connected to a verified earth ground, and kept as short as possible.

NOTE 4: Do not connect the universal input COM terminals, analog output COM terminals or the digital input/output COM terminals to earth ground. See Fig. 13 through Fig. 18 for wiring examples.

The 24 Vac power from an energy limited Class II power source must be provided to the controller. To conform to Class II restrictions (U.S., only), the transformer must not be larger than 100 VA.

Fig. 9 depicts a single controller using one transformer.

IMPORTANT

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.

IMPORTANT

Use the heaviest gauge wire available, up to 2.0 mm^2, with a min. of 1.0 mm^2, for all power and earth ground wiring.
Screw-type terminal blocks are designed to accept up to one 2.0 mm^2 conductor or up to two 1.0 mm^2 conductors. More than two wires that are 2.0 mm^2 can be connected with a wire nut. Include a pigtail with this wire group and attach the pigtail to the terminal block.

IMPORTANT

Connect terminal 2, (the 24 Vac common [24 VAC COM] terminal) to earth ground (see Fig. 9).

NOTE: Unswitched 24 Vac power wiring can be run in the same conduit as the BACnet MS/TP cable.

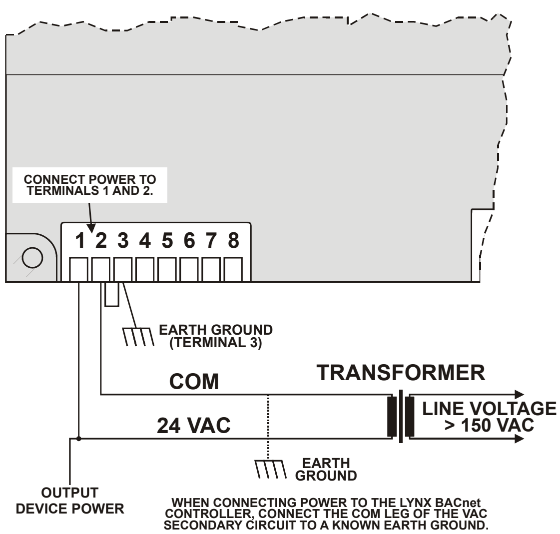


Fig. 9. Power wiring details for one LYNX controller per transformer

More than one controller can be powered by a single transformer. Fig. 10 shows power wiring details for multiple controllers.

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 section “Power” on page 6.

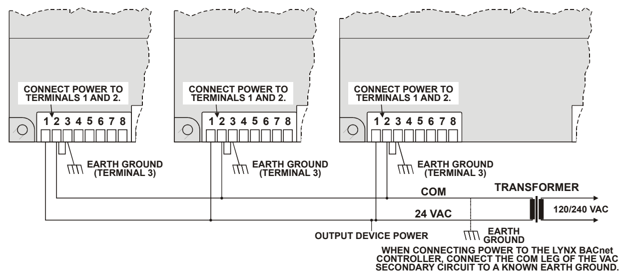


Fig. 10. Power wiring details for two or more LYNX controllers per transformer

Communications

Each LYNX 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 standard capable of the following baud rates: 9.6, 19.2, 38.4, 76.8 or 115.2 kilobits per sec (configured at global controller). The LYNX controllers are master devices on the MS/TP network. Each LYNX controller uses a high-quality EIA-485 transceiver and exerts ¼ 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 of 100…130 Ω. Distributed capacitance between conductors shall be less than 100 pF per meter. Distributed capacitance between conductors and shield shall be less that 200 pF per meter. 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 max. BACnet MS/TP network Bus segment length is 1,219 m using recommended wire. Repeaters must be used when making runs longer than 1,219 m. A max. of three repeaters can be used between any two devices.

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 LYNX controller are used to set the controller's MAC address.

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

1. Find an unused MAC address on the MS/TP network to which the LYNX controller connects.
2. Locate the DIP switch bank on the LYNX for addressing. This is labeled “MAC Address.”
3. With the LYNX 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 Table 3. For example, if only DIP switches 1, 3, 5, and 7 are enabled, the MAC address would be 85 (1 + 4 + 16 + 64 = 85).

NOTE: See Fig. 12 for DIP switch orientation and arrangement.

Table 3. DIP switch values for MS/TP MAC address

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

Setting the Device Instance Number

The Device Instance Number must be unique across the entire BACnet system network because it is used to uniquely identify the BACnet devices. It may be used to conveniently identify the BACnet device from other devices during installation. The LYNX controller’s Device Instance Number is automatically set when it is added to a WEBStation-AX project.

The Device Instance Number can be changed by the user, which may be necessary when integrating with a third party or when attempting to replace an existing controller and it is desired to maintain the existing Device Instance Number.

To edit the Device Instance Number using WEBs AX:

1. Identify an unused Device Instance Number on the BACnet Network, in the range of 0 - 4194302.
2. Open the LYNX BACnet Device Mgr View
   a. Double click on the BACnet Network located in the navigation tree.
   b. Select the LYNX controller to be modified.
   c. Click on the Edit button.
   d. Enter an unused value in the Device ID field.
   e. Select OK
3. Right click on the LYNX Controller and select “Actions > Write Device Instance” to complete the update.

Termination Resistors

Matched terminating resistors are required at each end of a segment bus wired across (+) and (-). Use matched precision resistors rated ¼ W ±1% / 80…130 Ω. Ideally, the value of the terminating resistors should match the rated characteristic impedance of the installed cable. E.g., if the installed MS/TP cable has a listed characteristic impedance of 120 Ω, install 120 Ω matched precision resistors.

NOTE: LYNX controllers do not provide network biasing.

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, on the router end). Tie the shield through using the SHLD (terminal 4) on the LYNX 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 LYNX Tool for COACH^{AX}.

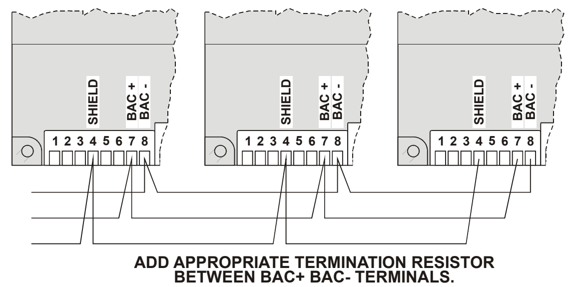


Fig. 11. Termination modules (BACnet MS/TP daisy chain connections)

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 max. 11 Vdc (22 mA)

The wiring connection terminals described in Table 4 are shown in Fig. 12.

IMPORTANT

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. See installation diagrams for specific wiring.

All controllers have terminal arrangements similar to the example shown in Fig. 12 as described in Table 4.

Table 4. Description of wiring terminals (CLLYUB6438S, CLLYVB6436AS, and CLLYVB6438S)

TERMINAL	LABEL	CONNECTION
INPUT POWER & GROUND		
1	24 VAC	24 VAC POWER
2(A	24 VAC COM	24 VAC POWER
3(A	EGND	EARTH GROUND
4	SHLD	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(B	DO-7	DIGITAL OUTPUT
19(B	DO-8	DIGITAL OUTPUT
20(B	COM	COMMON
ANALOG OUTPUTS(C		
21	AO-1	ANALOG OUTPUT
22	COM	COMMON
23	AO-2	ANALOG OUTPUT
24	AO-3	ANALOG OUTPUT
25	COM	COMMON
DIGITAL INPUTS(D		
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 A jumper should be installed between 24 VAC COM (term. 2) and EGND (term. 3). Further, EGND (term. 3) should be connected to a verified earth ground.
(B In the case of the CLLYVL6436AS controller, only, terminals 18, 19, and 20 (DO-7, DO-8, and COM) are not present. The actuator is internally hardwired to these terminals.
(C Analog outputs may be configured as digital outputs and operate as follows: FALSE (0%) -> 0 Vdc (0 mA), TRUE (100%) -> the max. 11 Vdc (22 mA)
(D Digital inputs: open circuit = FALSE, closed circuit = TRUE
*UI-1 is selectable as a fast digital pulse meter.

Table 5. Description of wiring terminals (CLLYVB0000AS, CLLYVB4022AS, and CLLYVB6436AS)

TERMINAL	LABEL	CONNECTION
INPUT POWER & GROUND		
1	24 VAC	24 VAC POWER
2(A	24 VAC COM	24 VAC POWER
3(A	EGND	EARTH GROUND
4	20VDC	20 VDC
5	SBUS 1	SYLK
6	SBUS 2	SYLK
NETWORK CONNECTIONS		
7	BAC+	BACnet COMMUNICATIONS
8	BAC-	BACnet COMMUNICATIONS
9	SHIELD	SHIELD
DIGITAL OUTPUTS		
10	DO-3	DIGITAL OUTPUT
11	COM	COMMON
12	DO-4	DIGITAL OUTPUT
13	DO-2	DIGITAL OUTPUT
14	COM	COMMON
15	DO-1	DIGITAL OUTPUT
ANALOG OUTPUTS		
16	AO-2	ANALOG OUTPUT
17	COM	COMMON
18	AO-1	ANALOG OUTPUT
UNIVERSAL INPUTS		
19	UI-4	UNIVERSAL INPUT
20	COM	COMMON
21	UI-3	UNIVERSAL INPUT
22	UI-2	UNIVERSAL INPUT
23	COM	COMMON
24	UI-1*	UNIVERSAL INPUT

(A A jumper should be installed between 24 VAC COM (term. 2) and EGND (term. 3). Further, EGND (term. 3) should be connected to a verified earth ground.
*UI-1 is selectable as a fast digital pulse meter.

MS/TP MAC Address DIP Switches

The MS/TP MAC address DIP switches are used to set the unit's MAC address. Each LYNX controller 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).

MS/TP Service Connector Pins

Local device MS/TP network connection is provided via the molex connector pins.

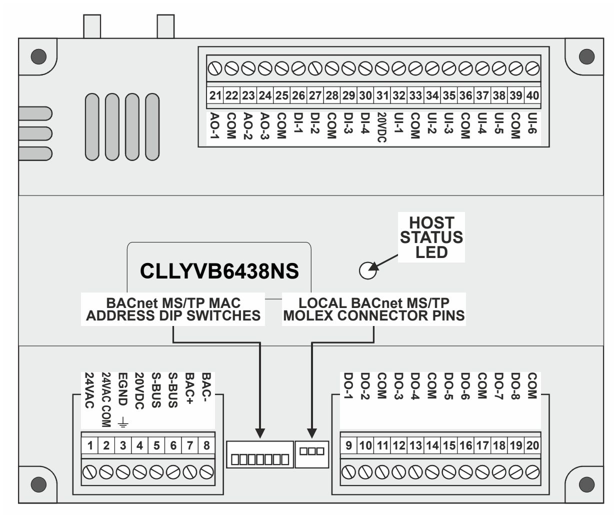


Fig. 12. LED, service, network, and terminal connections (CLLYVB6438NS shown)

Wiring Applications (Examples)

Fig. 13 through Fig. 19 illustrate controller wiring for the following configurations.

- Typical controller wiring for VAV application using the CLCM4T111 Wall Module and an LF20 Air Temperature Sensor (see Fig. 13).
- Typical controller wiring for VAV application with staged reheat (see Fig. 14).
- Typical controller wiring for PWM reheat and PWM peripheral heat valve actuator (see Fig. 15).
- Typical controller wiring for AHU application (see Fig. 16).
- Typical controller wiring for 4…20 mA enthalpy sensors and digital inputs (see Fig. 17).
- Typical controller wiring for 4…20 mA heating, cooling, and model ML6161 floating motor control (see Fig. 18).
- Typical controller wiring for a pneumatic transducer, model RP7517B (see Fig. 19).

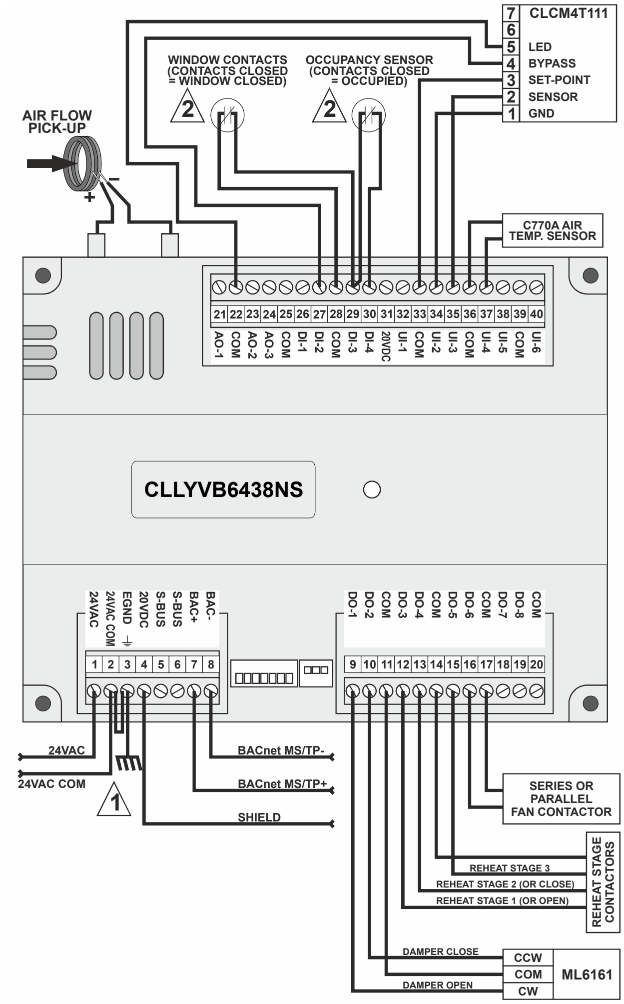


Fig. 13. Controller wiring diagram (CLLYVB6438NS shown) for typical VAV application

NOTE 1: Earth ground wire length should be held to a minimum. Use the heaviest gauge wire available, up to 14 AWG (2.0 mm^2), with a minimum of 18 AWG (1.0 mm^2), for earth ground wire.

NOTE 2: Contacts must be suitable for dry switching, 5 V at 10 mA. Use sealed type, gold-flashed, or pimpled contacts.

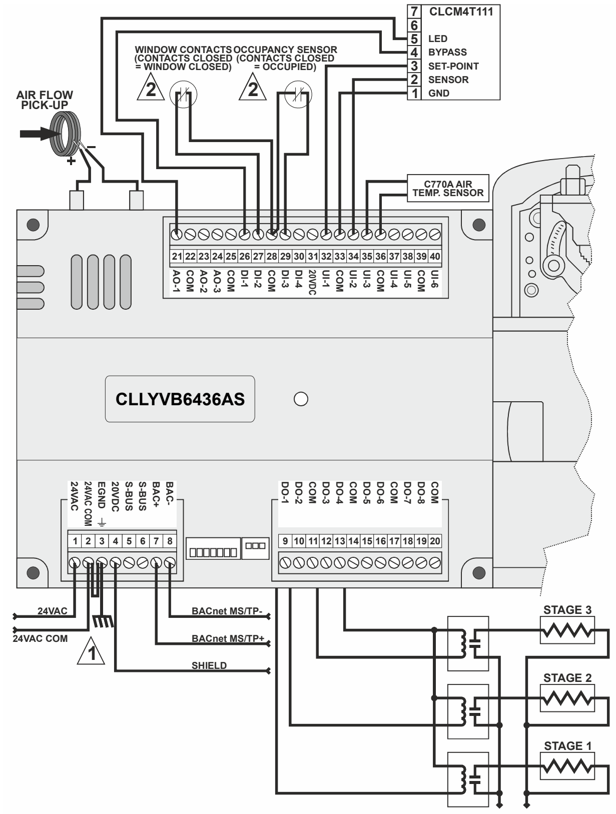


Fig. 14. Controller wiring diagram (CLLYVB6436AS shown) for typical VAV application with staged reheat

NOTE 1: Earth ground wire length should be held to a minimum. Use the heaviest gauge wire available, up to 14 AWG (2.0 mm^2), with a minimum of 18 AWG (1.0 mm^2), for earth ground wire.

NOTE 2: Contacts must be suitable for dry switching, 5 V at 10 mA. Use sealed type, gold-flashed, or pimpled contacts.

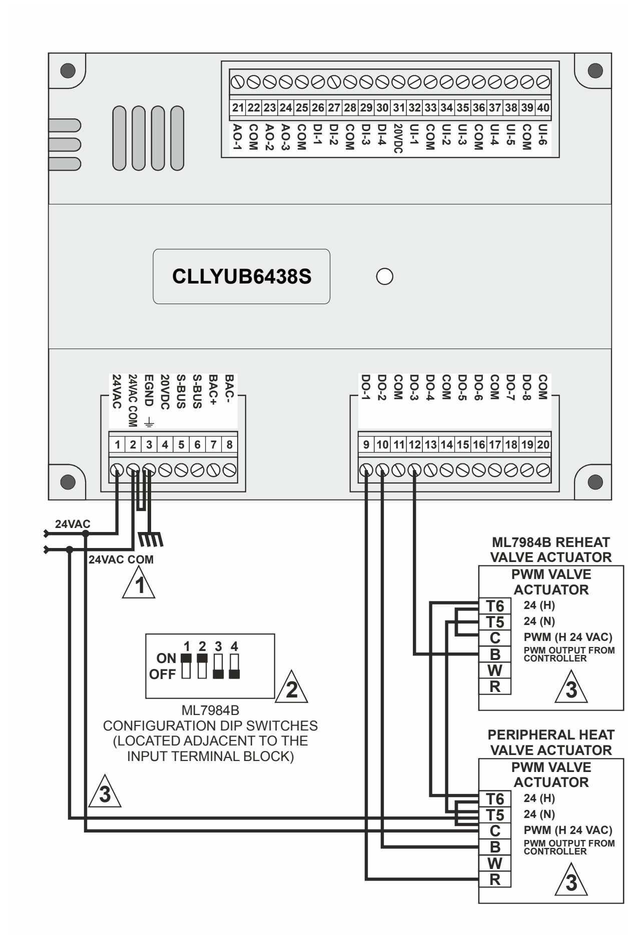


Fig. 15. Controller wiring diagram (CLLYUB6438S shown) for typical PWM heat and PWM peripheral heat valve actuator

Ensure that the Configuration DIP Switch is set as shown in Fig. 15. Switches 1 through 3 set the timing of the ML7984B valve actuator to match the controller outputs (min. 0.1 sec; max. 25.6 sec). Switch 4 determines the action of the actuator (OFF = direct acting, ON = reverse acting).

NOTE 1: Earth ground wire length should be held to a minimum. Use the heaviest gauge wire available, up to 14 AWG (2.0 mm^2), with a minimum of 18 AWG (1.0 mm^2), for earth ground wire.

NOTE 2: Turn power OFF before setting the DIP switches.

NOTE 3: Ensure that all transformer / power wiring is as shown. Reversing terminations will result in equipment malfunction.

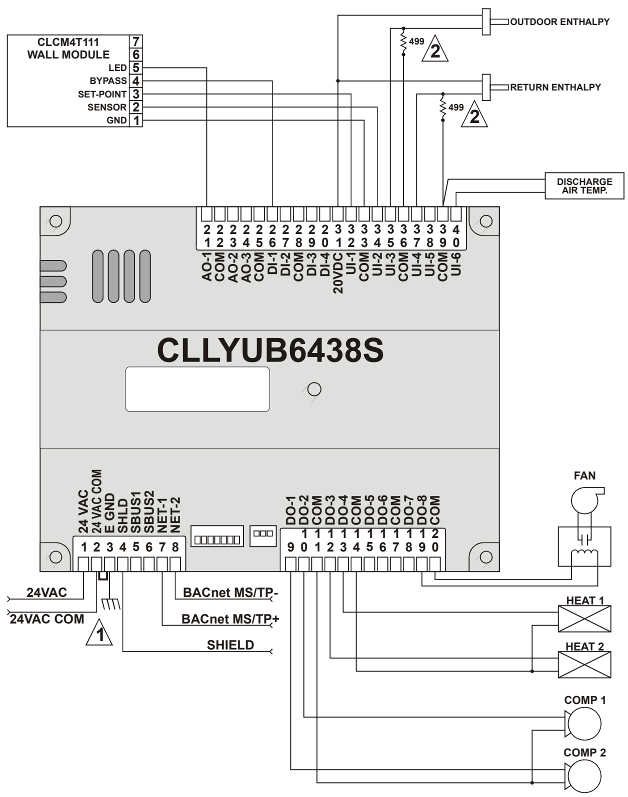


Fig. 16. Controller wiring diagram (CLLYUB6438S shown) for typical AHU application

NOTE 1: Earth ground wire length should be held to a minimum. Use the heaviest gauge wire available, up to 14 AWG (2.0 mm^2), with a minimum of 18 AWG (1.0 mm^2), for earth ground wire.

NOTE 2: Analog outputs from sensor are 4…20 mA signals. A 499 Ω 1% tolerance (or better) precision resistor is required to drive this and other 4…20 mA signal devices. Place this resistor as close as possible to the driven device.

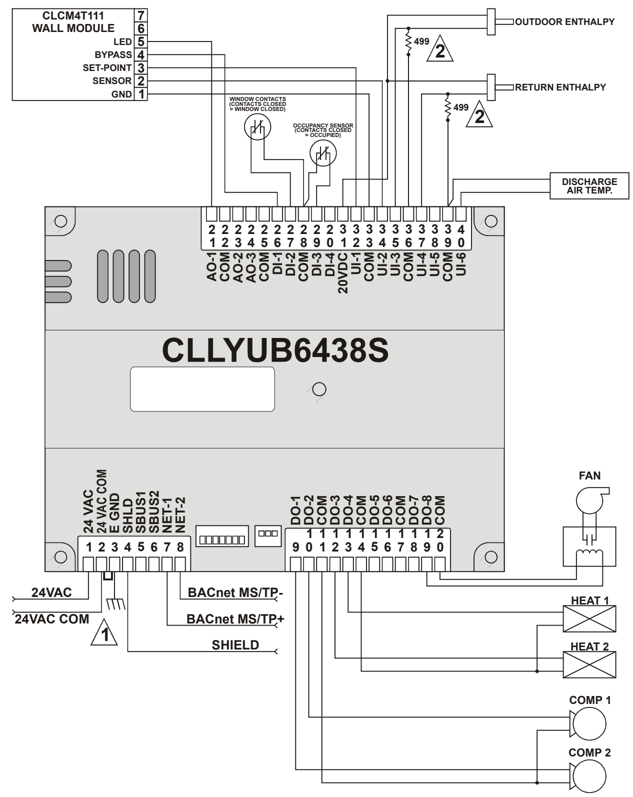


Fig. 17. Controller wiring diagram (CLLYUB6438S shown) with 4…20 mA enthalpy sensors and digital inputs

NOTE 1: Earth ground wire length should be held to a minimum. Use the heaviest gauge wire available, up to 14 AWG (2.0 mm^2), with a minimum of 18 AWG (1.0 mm^2), for earth ground wire.

NOTE 2: Analog outputs from sensor are 4…20 mA signals. A 499 Ω 1% tolerance (or better) precision resistor is required to drive this and other 4…20 mA signal devices. Place this resistor as close as possible to the driven device.

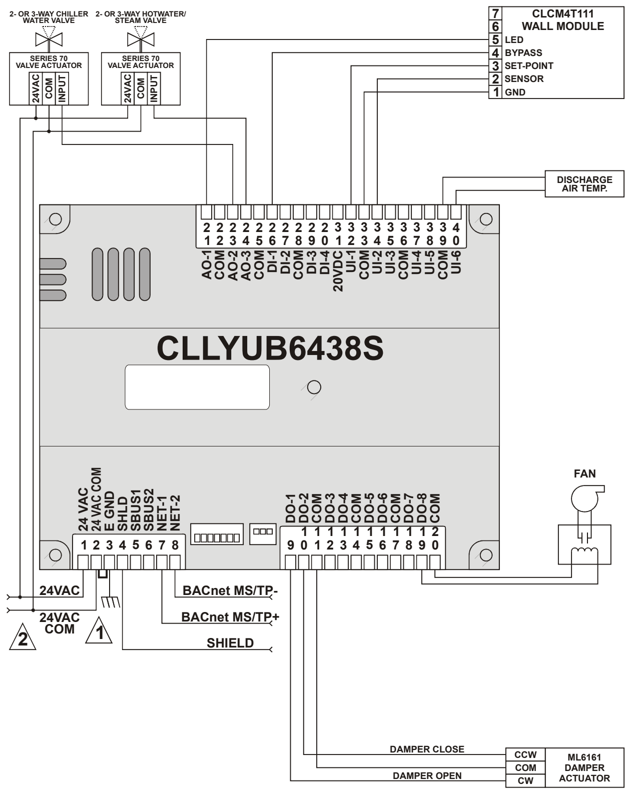


Fig. 18. Controller wiring diagram (CLLYUB6438S shown) with 4…20 mA heating, cooling, and ML6161 damper actuator

NOTE 1: Earth ground wire length should be held to a minimum. Use the heaviest gauge wire available, up to 14 AWG (2.0 mm^2), with a minimum of 18 AWG (1.0 mm^2), for earth ground wire.

NOTE 2: Ensure that all transformer / power wiring is as shown. Reversing terminations will result in equipment malfunction.

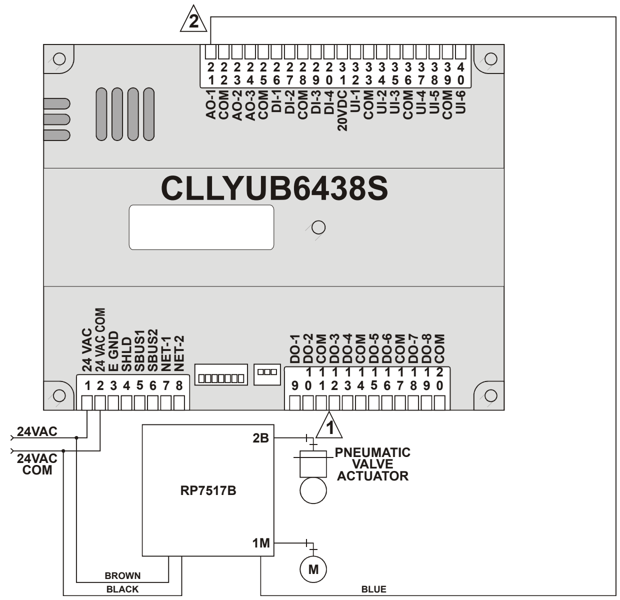


Fig. 19. Controller wiring diagram (CLLYUB6438S shown) for RP7517B pneumatic transducer

NOTE 1: Use 6 mm tubing. Minimum branch line must be 1.8 m or longer.

NOTE 2: Terminals 21, 23, and 24 are analog outputs.

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 Fig. 10). 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).
- Ensure 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 2.0 mm^2 with a min. of 1.0 mm^2 for each controller in the group (see Fig. 10).
- 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 Fig. 11).
- 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 section “Power” on page 6.

Verify End-of-Line Termination Resistor Placement

The installation wiring diagrams should indicate the locations for placement of the end of line termination resistors. See Fig. 11.

Correct placement of the end-of-line termination resistors is required for proper BACnet MS/TP Bus communications.

Step 2. Startup

See Fig. 20 and the following text for startup information.

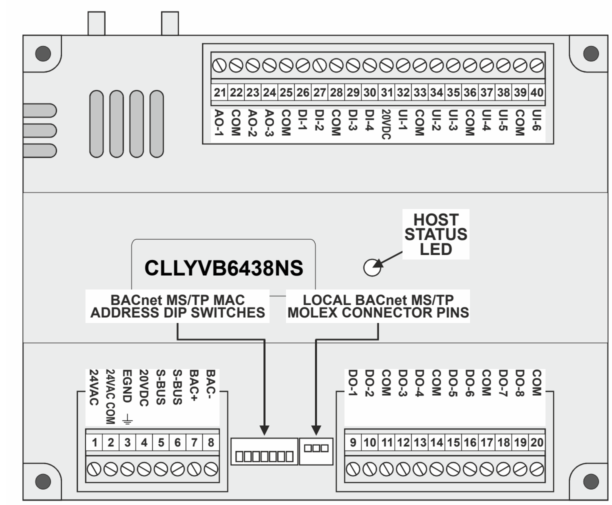


Fig. 20. LED, service, network, and terminal connections (CLLYVB6438NS shown)

Set the MS/TP MAC Address

The MS/TP MAC address DIP switches are used to set the unit's MAC address. Each LYNX controller 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 Table 6.

Table 6. Status LED states

LED state	blink rate	status or condition
OFF	not applicable	No power to CPU, LED damaged, low voltage to board, first sec of power-up, or loader damaged.
ON	ON steadily, not blinking	CPU not operating. Application Program CRC being checked. This takes 1-2 sec and occurs on each restart (power-up, reset, and reflash, and following configuration file download).
very slow blink (continuous)	1 sec ON, 1 sec OFF	Controller is operating normally.
slow blink (continuous)	0.5 sec ON, 0.5 sec OFF	Controller alarm is active or controller in process of configuration file download.
medium blink (continuous)	0.3 sec ON, 0.3 sec OFF	Controller is in reflash mode or awaiting / receiving reflash data via BACnet.

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 Table 7.

Table 7. 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 three times 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 CPU, 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 three times 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 NIAGARA FRAMEWORK® application (run on a PC) is used to configure the I/O and functions of the controller. Refer to the Programming Tool User Guide, form no. 63-2662, for controller configuration and programming details.

CONTROLLER REPLACEMENT

There are no serviceable or repairable parts inside the controller.

⚠ WARNING

Fire, Explosion, or Electrical Shock Hazard.
Can cause severe injury, death or property damage.
Do not attempt to modify the physical or electrical characteristics of this device in any way. If troubleshooting indicates a malfunction, replace the controller.

⚠ WARNING

Electrical Shock Hazard.
Can cause severe injury, death or property damage.
To prevent electrical shock or equipment damage, disconnect power supply before beginning controller replacement.

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 Fig. 21 and refer to the following procedure:

IMPORTANT

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. To prevent damage to the terminal block alignment pins on the controller circuit board, insert the screwdriver blade no more than 3 mm.

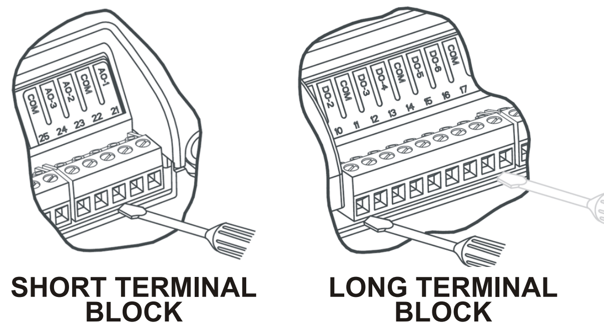


Fig. 21. Removing terminal blocks

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.
   b. For long terminal blocks (6 or more terminals), insert screwdriver blade on one side of the terminal block and gently rotate the blade ¼ turn. Then, move to the other side of the terminal block and do the same. Repeat until the terminal block is evenly raised from its alignment pins.
2. Once the terminal block is raised 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 (AS-models)

For AS-models (which are hard-wired to an actuator), perform the following actions to replace the complete assembly (controller and actuator):

1) Remove all power from the controller.
2) Remove the two air flow pickup connections from the pressure sensor.
3) Remove the terminal blocks (see section “Terminal Block Removal”).
4) Remove the old controller and actuator assembly from its mounting.
   a) Loosen the two bolts on the actuator clamp to release the actuator from the shaft.
   b) Remove the controller’s mounting screws.
   c) Gently pull the controller and actuator assembly straight out, until the assembly is clear of the actuator shaft.
5) Mount the new controller and actuator assembly (see section “Installation” on page 2).
6) Reconnect the two air flow pickup tubes to the pressure sensor (see section “Piping (AS- and NS-models)” on page 5).
7) Replace the terminal blocks:
   a) Insert each terminal block onto its alignment pins.
   b) Press straight down to firmly seat it.
   c) Repeat for each terminal block.
8) Restore power to the controller.
9) Perform procedure described in section “Checkout” on page 14.

Controller Replacement (NS-models)

To replace NS-models, proceed as follows:

1) Remove all power from the controller.
2) Remove the two air flow pickup connections from the pressure sensor.
3) Remove the terminal blocks (see section “Terminal Block Removal”).
4) Remove the old controller from its mounting.

IMPORTANT
(IN THE CASE OF 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 (see Fig. 7).

5) Mount the new controller (see section “Installation” on page 2).
6) Reconnect the two air flow pickup tubes to the pressure sensor (see section “Piping (AS- and NS-models)” on page 5).
7) Replace the terminal blocks:
   a) Insert each terminal block onto its alignment pins.
   b) Press straight down to firmly seat it.
   c) Repeat for each terminal block.
8) Restore power to the controller.
9) Perform procedure described in section “Checkout” on page 14.

Controller Replacement (S-models)

To replace S-models, proceed as follows:

1) Remove all power from the controller.
2) Remove the terminal blocks (see section “Terminal Block Removal”).
3) Remove the old controller from its mounting.

IMPORTANT
(IN THE CASE OF 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 (see Fig. 7).

4) Mount the new controller (see section “Installation” on page 2).
5) Replace the terminal blocks:
   a) Insert each terminal block onto its alignment pins.
   b) Press straight down to firmly seat it.
   c) Repeat for each terminal block.
6) Restore power to the controller.
7) Perform procedure described in section “Checkout” on page 14.

Manufactured for and on behalf of the Environmental and Combustion Controls Division of Honeywell Technologies Sàrl, Rolle, Z.A. La Pièce 16, Switzerland by its Authorized Representative:

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