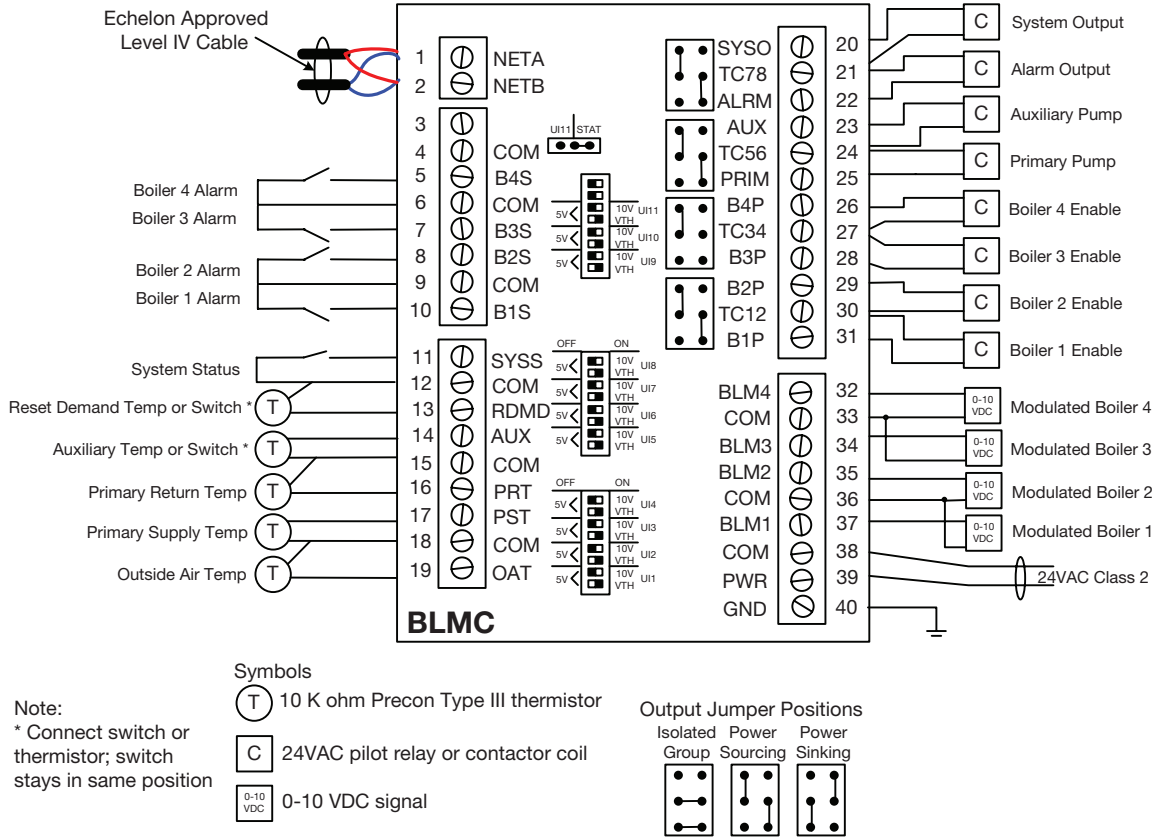


iWorx Hydronic & Radiant Application Wiring Guide

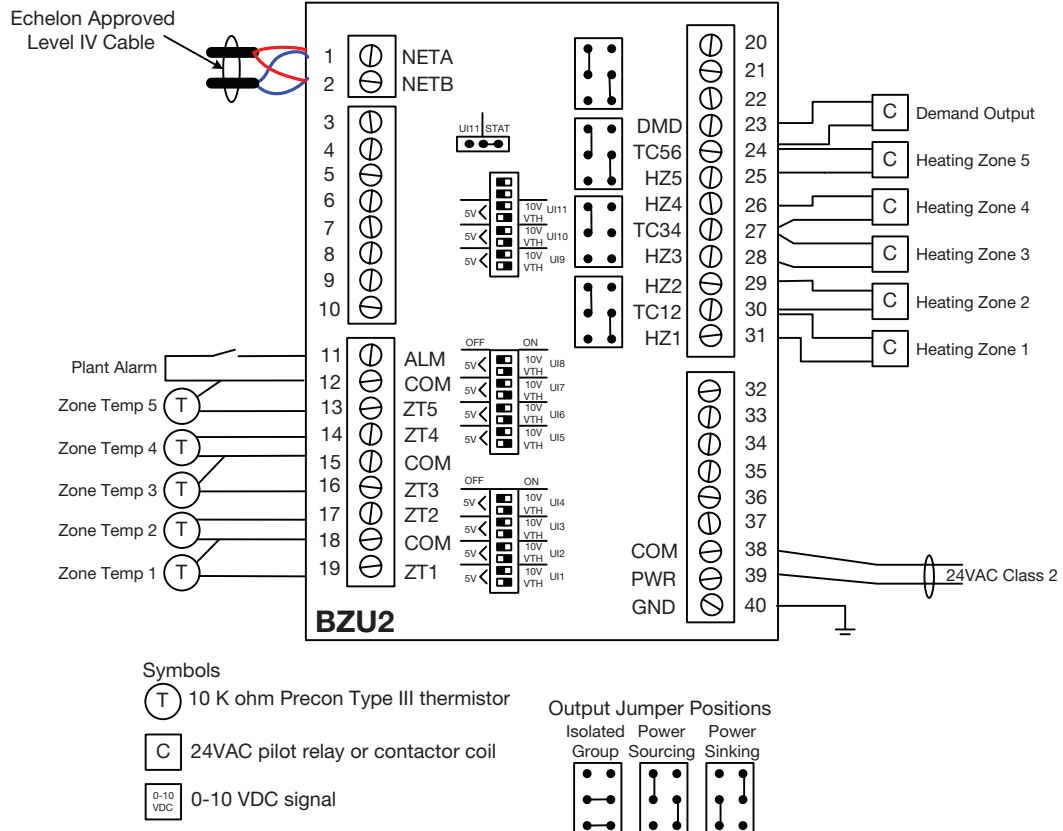
	Pages
Typical Power Sourcing Wiring Diagrams; BLMC, BZU2, ZXU	1 - 2
2 Modulating or On/Off Boilers, 4 Zones and Domestic Hot Water	3 - 4
2 Modulating or On/Off Boilers, 4 High Temp Zones, 4 Low Temp Mixing (pump) Radiant Zones and Domestic Hot Water	5 - 7
2 Modulating or On/Off Boilers, 4 High Temp Zones, 4 Low Temp Mixing (valve) Radiant Zones and Domestic Hot Water	8 - 10
2 Modulating or On/Off Boilers with Snow Melt	11 - 12
2 Modulating or On/Off Boilers with 4 Low Temp Zones and Snow Melt	13 - 15
2 Modulating or On/Off Boilers, 1 High Temp Zone, 4 Radiant Zones and Domestic Hot Water	16 - 17
Multi-Zone Radiant with Zone Dampers	18
Chilled Beam Application	19
Multi Zone Unit with Staged Heating & Cooling and Modulated Economizer; Triac Outputs Wired as Power Sourced	20 - 21
Typical Pressure Dependent VAV box with 1st Stage Radiant Heat	22
Multi-Zone Radiant with Forced Air Cooling	23 - 24
Single Zone Unit with Staged Heating & Cooling and Modulated Economizer	25 - 26
BTU3 Sequence of Operation & Typical Wiring	27 - 29



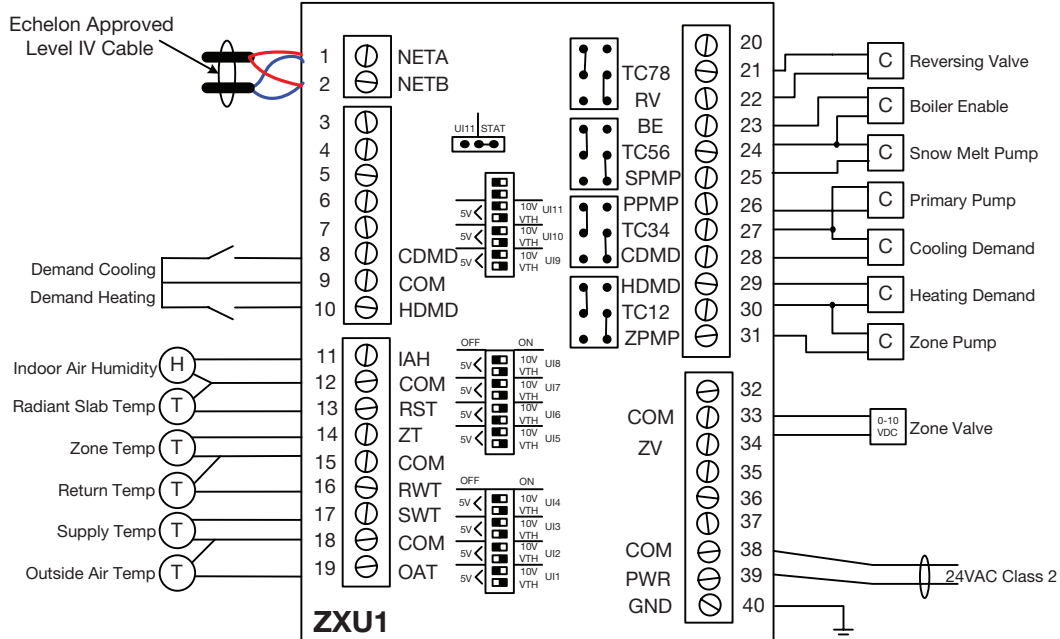
Typical BLMC Power Sourcing



Typical BZU2 Power Sourcing



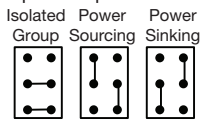
Typical ZXU1 Power Sourcing



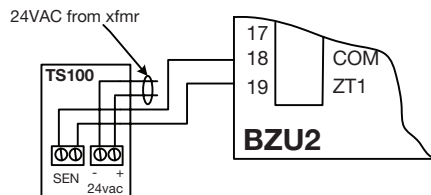
Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal
- 0-10VDC Humidity Sensor

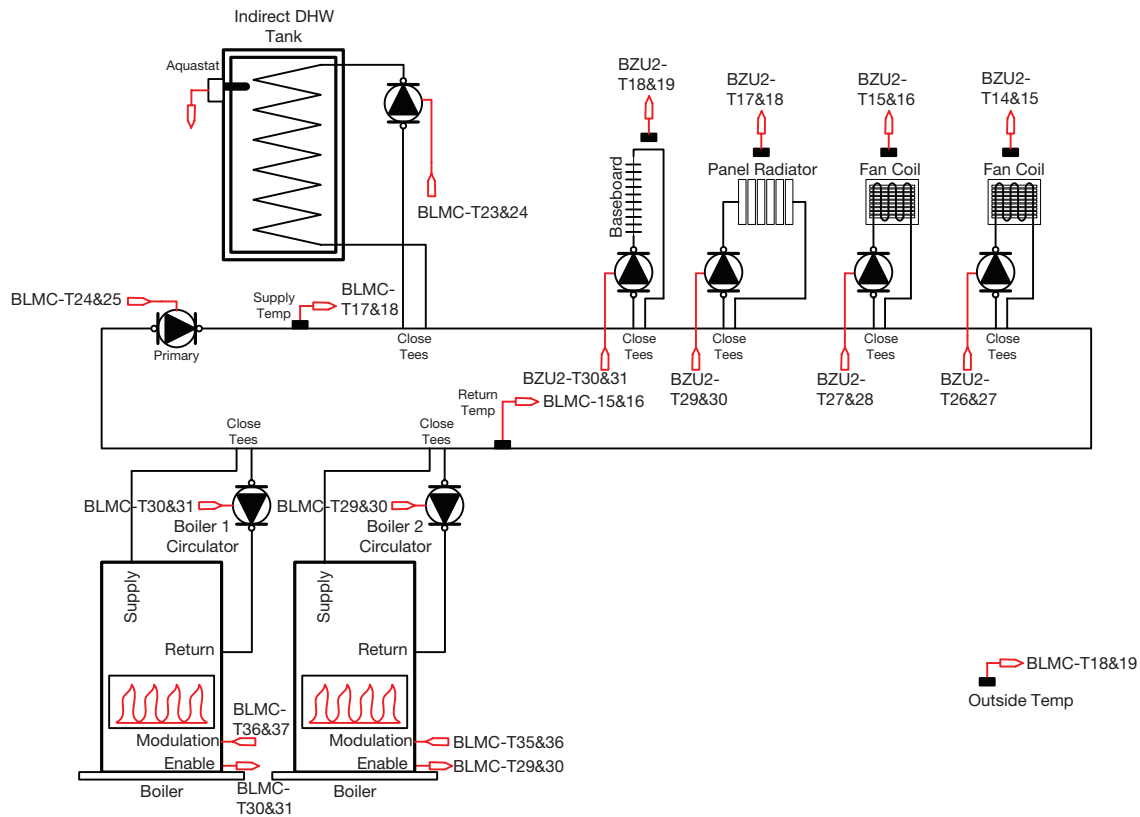
Output Jumper Positions



TS100 Series Wall Sensor Wired to a BZU2 Input



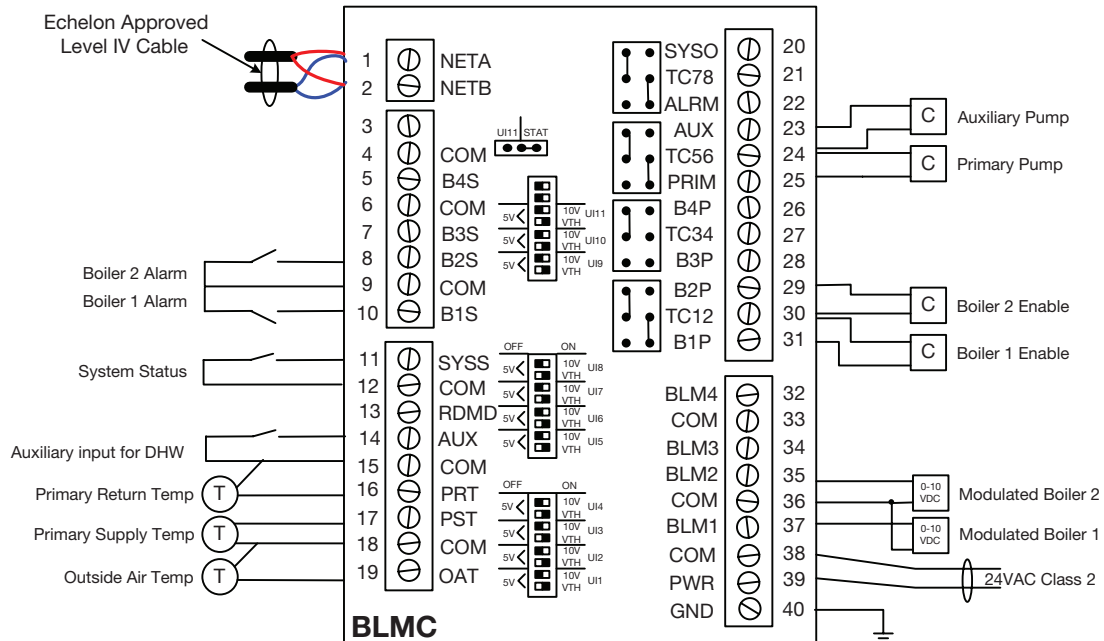
2 Modulating or On/Off Boilers, 4 Zones and Domestic Hot Water



Wiring Tag Description: Controller Type -Terminal Tag Designation

This application drawing is conceptual and only intended for instructional purposes.

2 Modulating or On/Off Boilers with DHW; BLMC



Note:

* Connect switch or thermistor; switch stays in same position

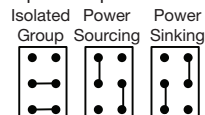
Symbols

(T) 10 K ohm Precon Type III thermistor

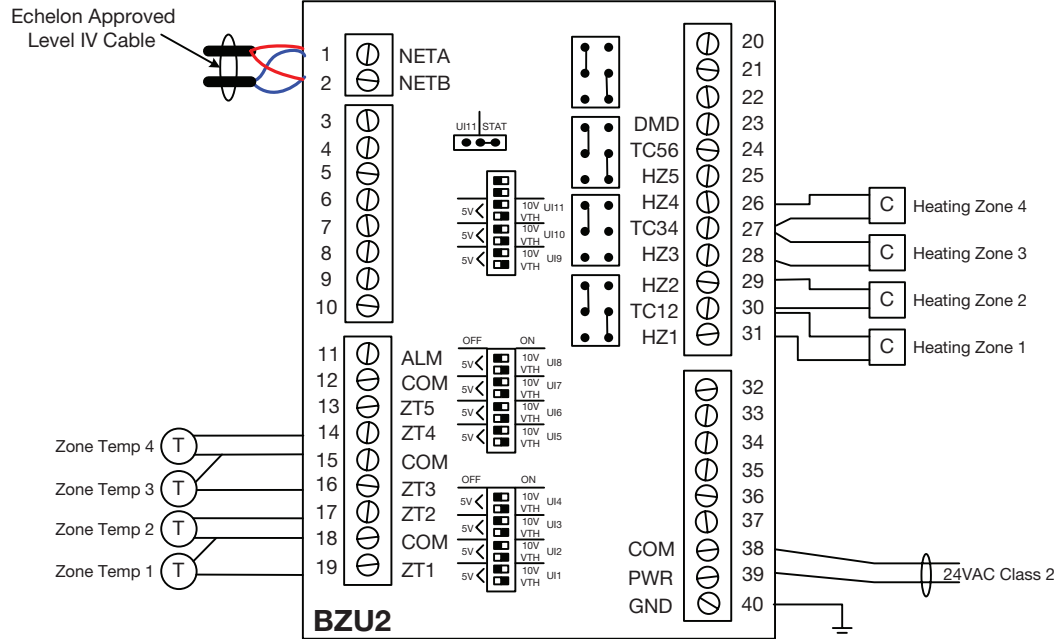
(C) 24VAC pilot relay or contactor coil

(0-10 VDC) 0-10 VDC signal

Output Jumper Positions



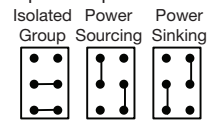
4 Zones off Primary Loop; BZU2



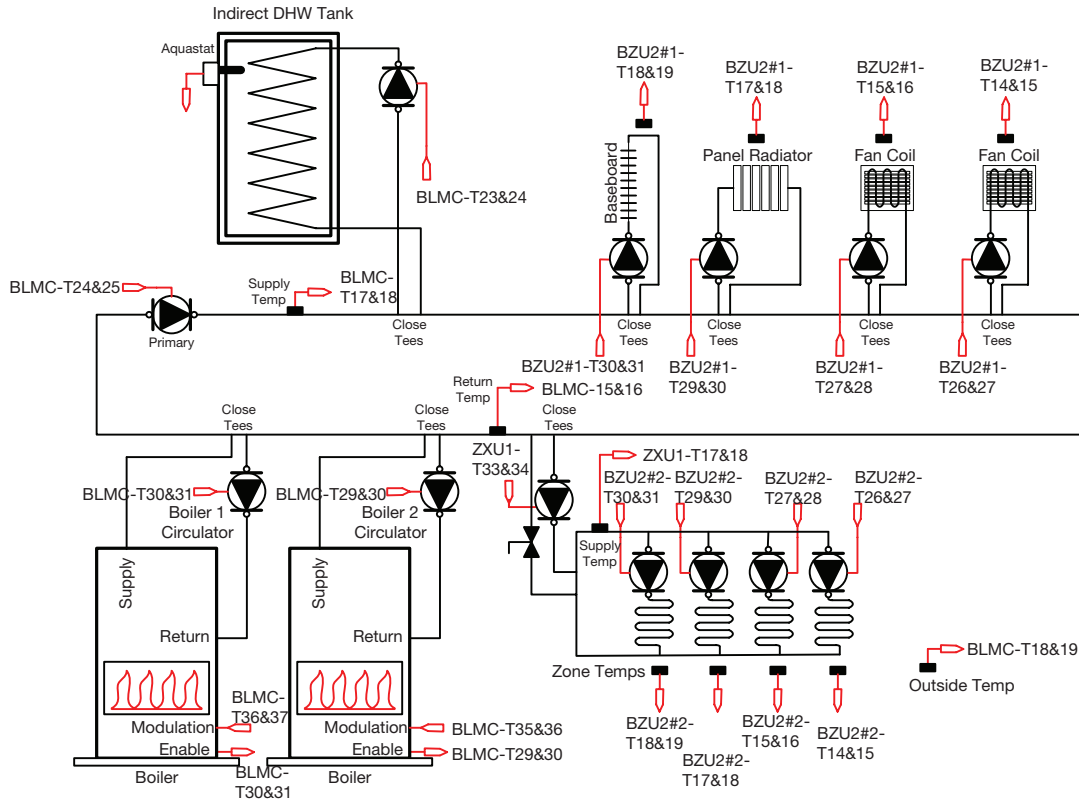
Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal

Output Jumper Positions



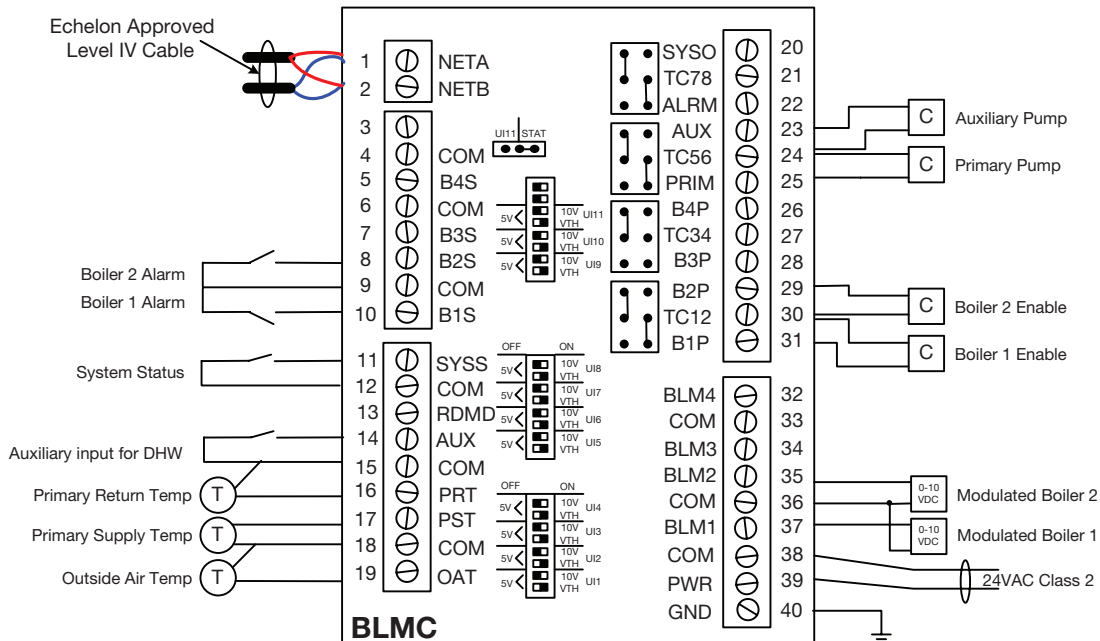
2 Modulating or On/Off Boilers, 4 High Temp Zones, 4 Low Temp Mixing (pump) Radiant Zones and Domestic Hot Water



Wiring Tag Description: Controller Type -Terminal Tag Designation

This application drawing is conceptual and only intended for instructional purposes.

2 Modulating or On/Off Boilers with DHW; BLMC



Symbols

Note:

* Connect switch or thermistor; switch stays in same position

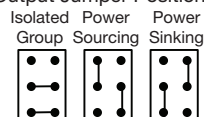


10 K ohm Precon Type III thermistor

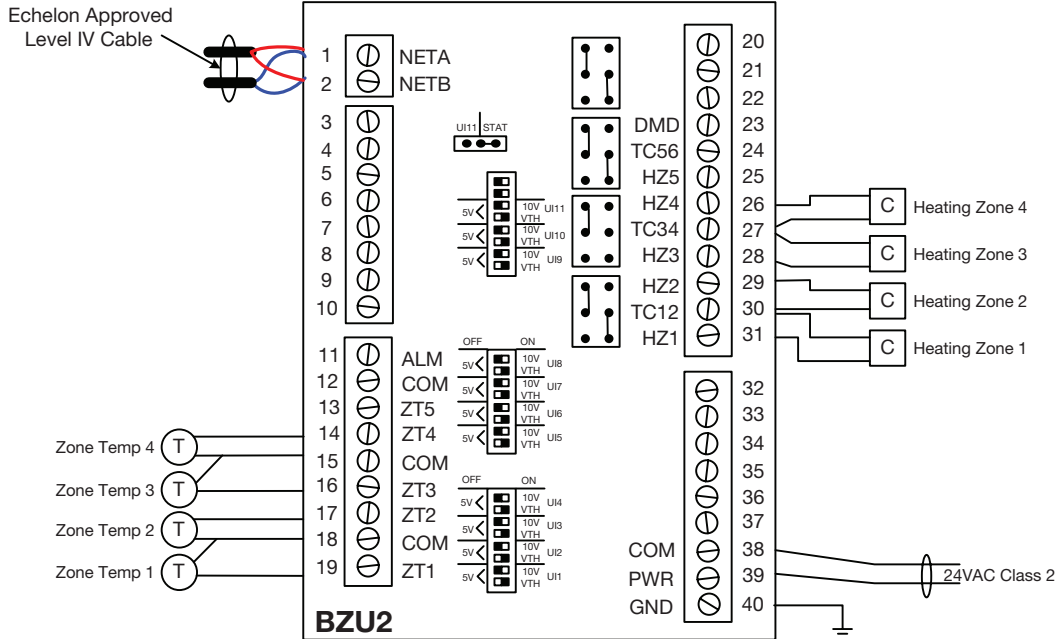
24VAC pilot relay or contactor coil

0-10 VDC signal

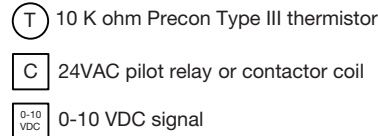
Output Jumper Positions



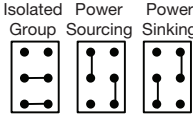
4 High Temp Zones Off Primary Loop; BZU2#1



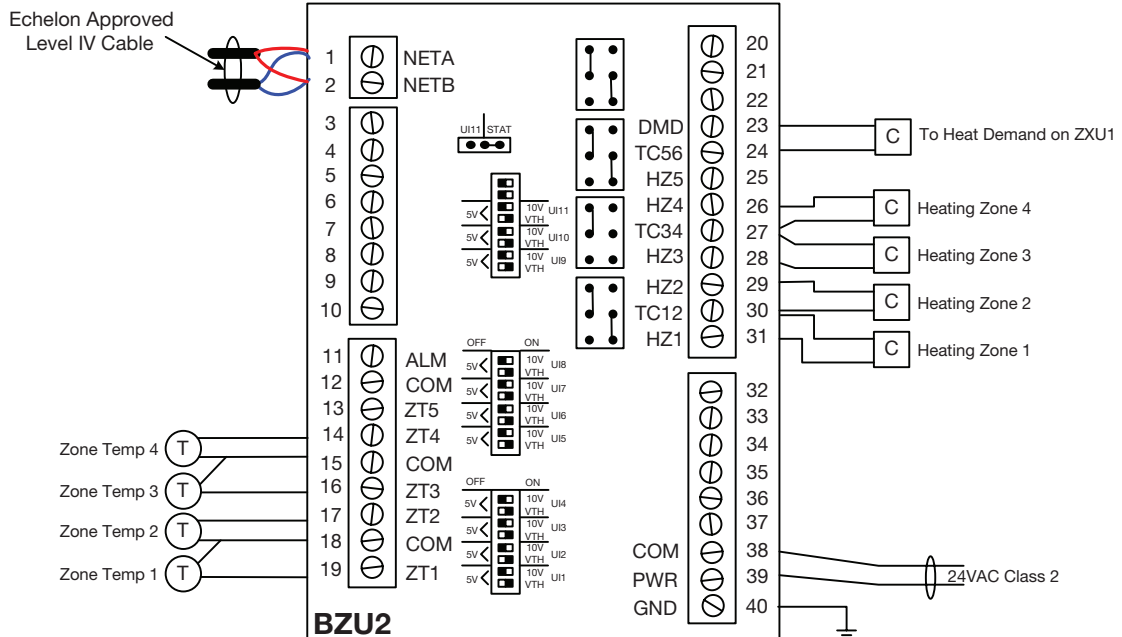
Symbols



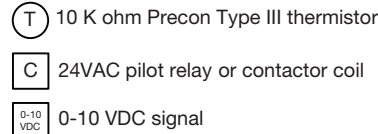
Output Jumper Positions



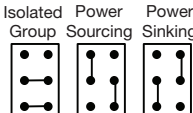
4 Radiant Zones with Demand Output Enabling ZXU1 to Manifold; BZU2#2



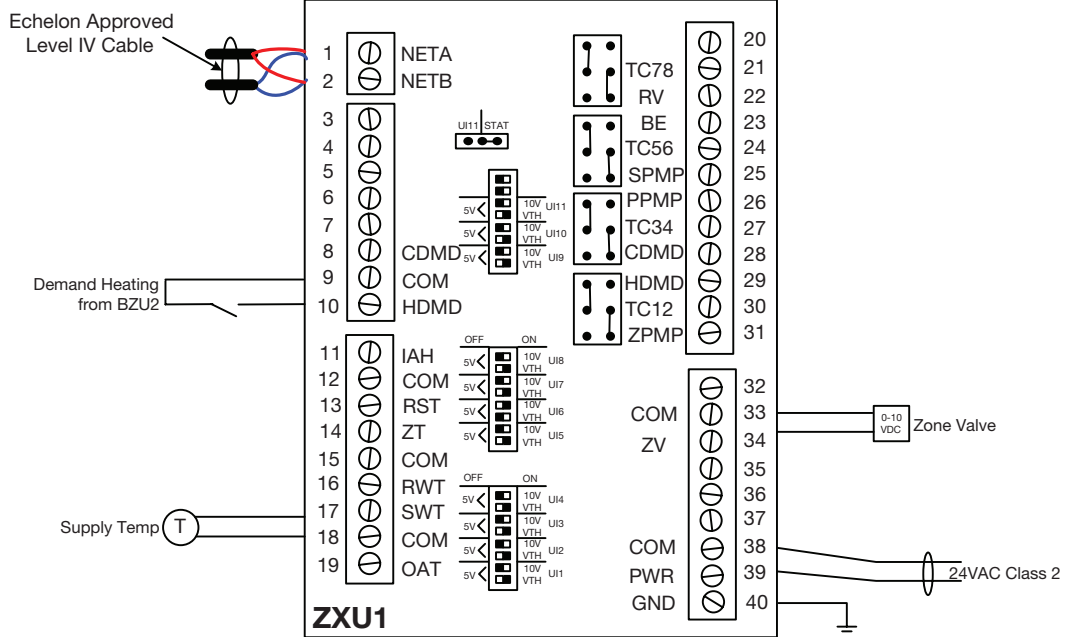
Symbols



Output Jumper Positions



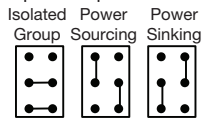
Mixing Pump to Low Temp Radiant Zones; ZXU1



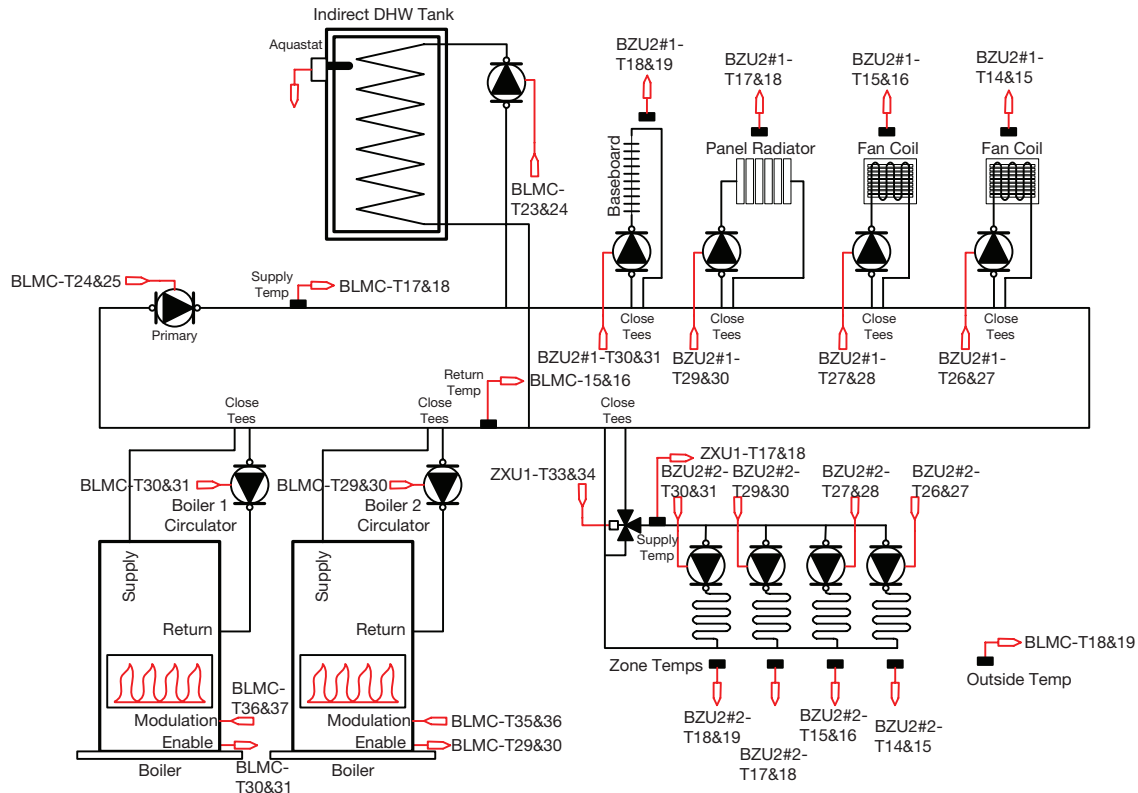
Symbols

- (T) 10 K ohm Precon Type III thermistor
- (C) 24VAC pilot relay or contactor coil
- (0-10 VDC) 0-10 VDC signal
- (H) 0-10VDC Humidity Sensor

Output Jumper Positions



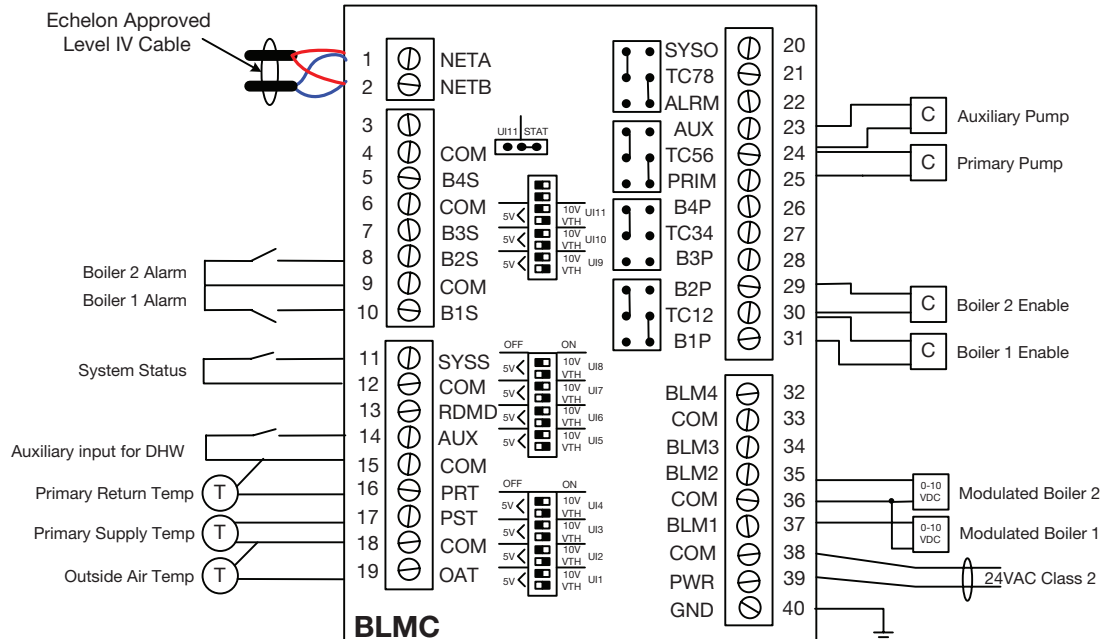
2 Modulating or On/Off Boilers, 4 High Temp Zones, 4 Low Temp Mixing (valve) Radiant Zones and Domestic Hot Water



Wiring Tag Description: Controller Type -Terminal Tag Designation

This application drawing is conceptual and only intended for instructional purposes.

2 Modulating or On/Off Boilers with DHW; BLMC



Symbols

Note:

* Connect switch or thermistor; switch stays in same position

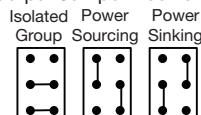


10 K ohm Precon Type III thermistor

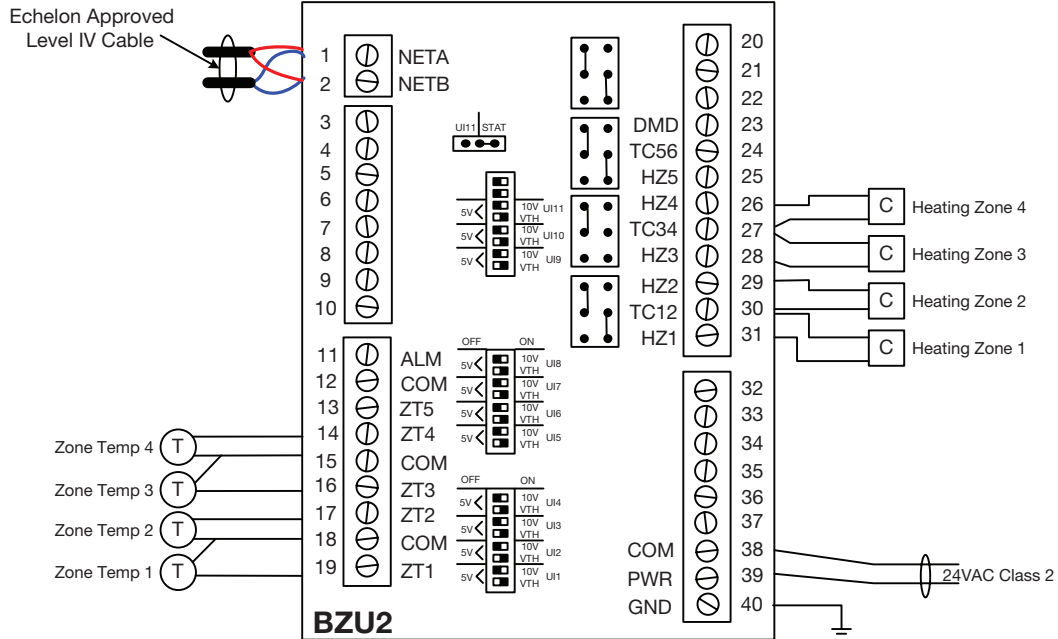
24VAC pilot relay or contactor coil

0-10 VDC signal

Output Jumper Positions



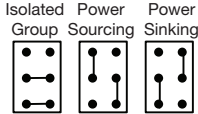
4 High Temp Zones Off Primary Loop; BZU2#1



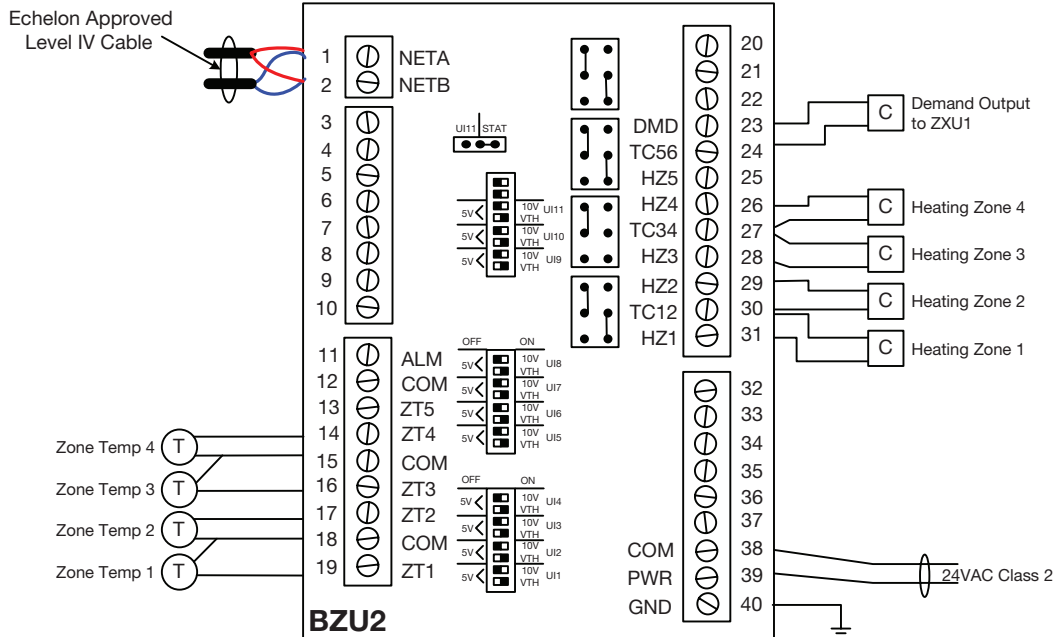
Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal

Output Jumper Positions



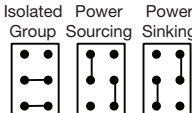
4 Radiant Zones with Demand Output Enabling Mixing Valve to Manifold; BZU2#2



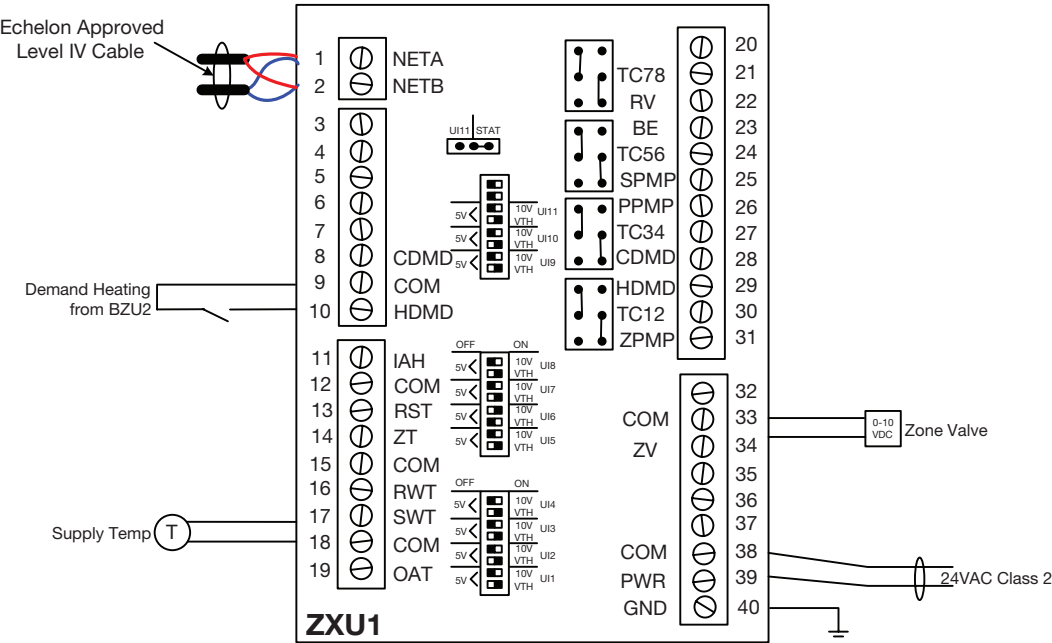
Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal

Output Jumper Positions

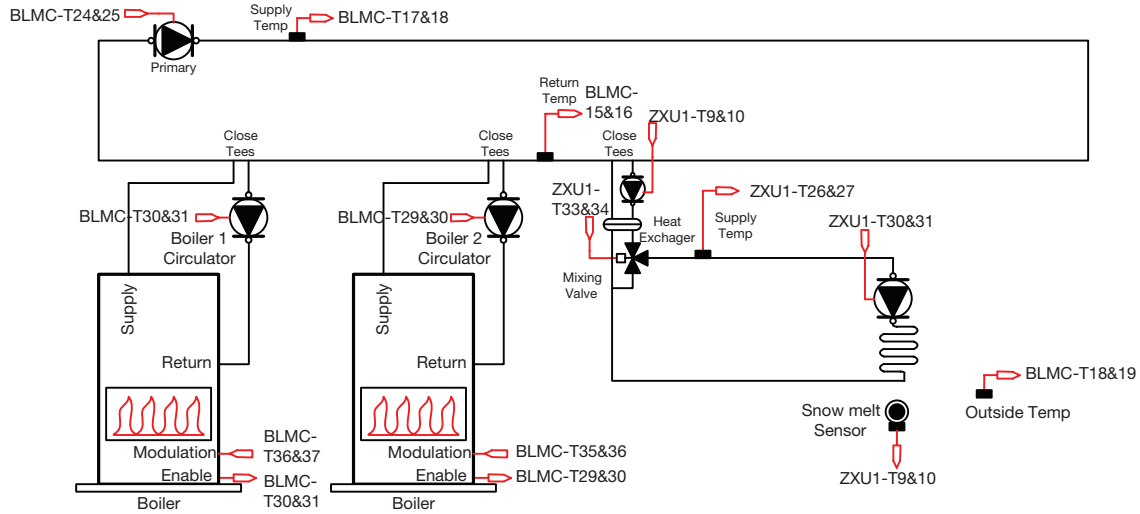


Mixing Valve to Low Temp Radiant Zones; ZXU1



- Symbols**
- 10 K ohm Precon Type III thermistor
 - 24VAC pilot relay or contactor coil
 - 0-10 VDC signal
 - 0-10VDC Humidity Sensor
- Output Jumper Positions**
- | Isolated Group | Power Sourcing | Power Sinking |
|----------------|----------------|---------------|
| | | |

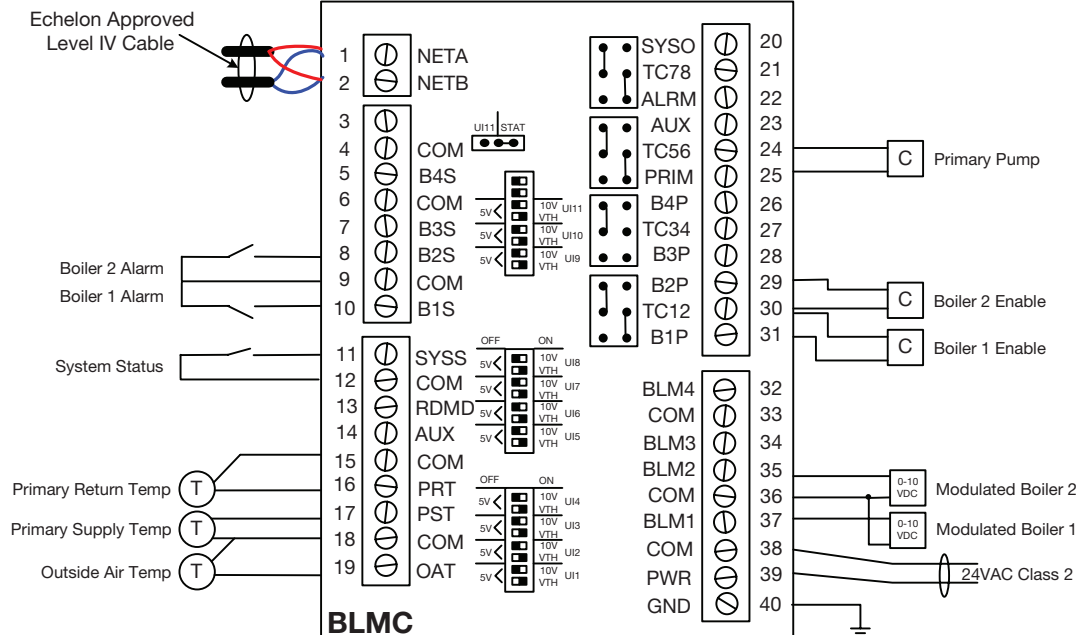
2 Modulating or On/Off Boilers with Snow Melt



Wiring Tag Description: Controller Type - Terminal Tag Designation

This application drawing is conceptual and only intended for instructional purposes.

2 Modulating or On/Off Boilers; BLMC



Note:

* Connect switch or thermistor; switch stays in same position

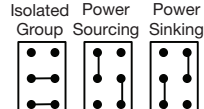
Symbols

10 K ohm Precon Type III thermistor

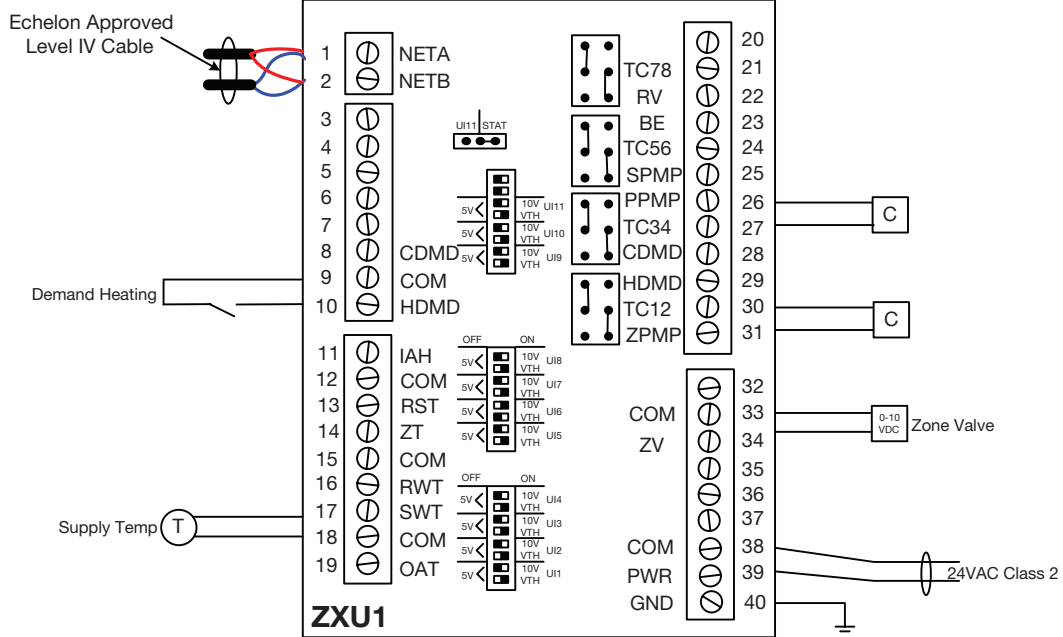
24VAC pilot relay or contactor coil

0-10 VDC signal

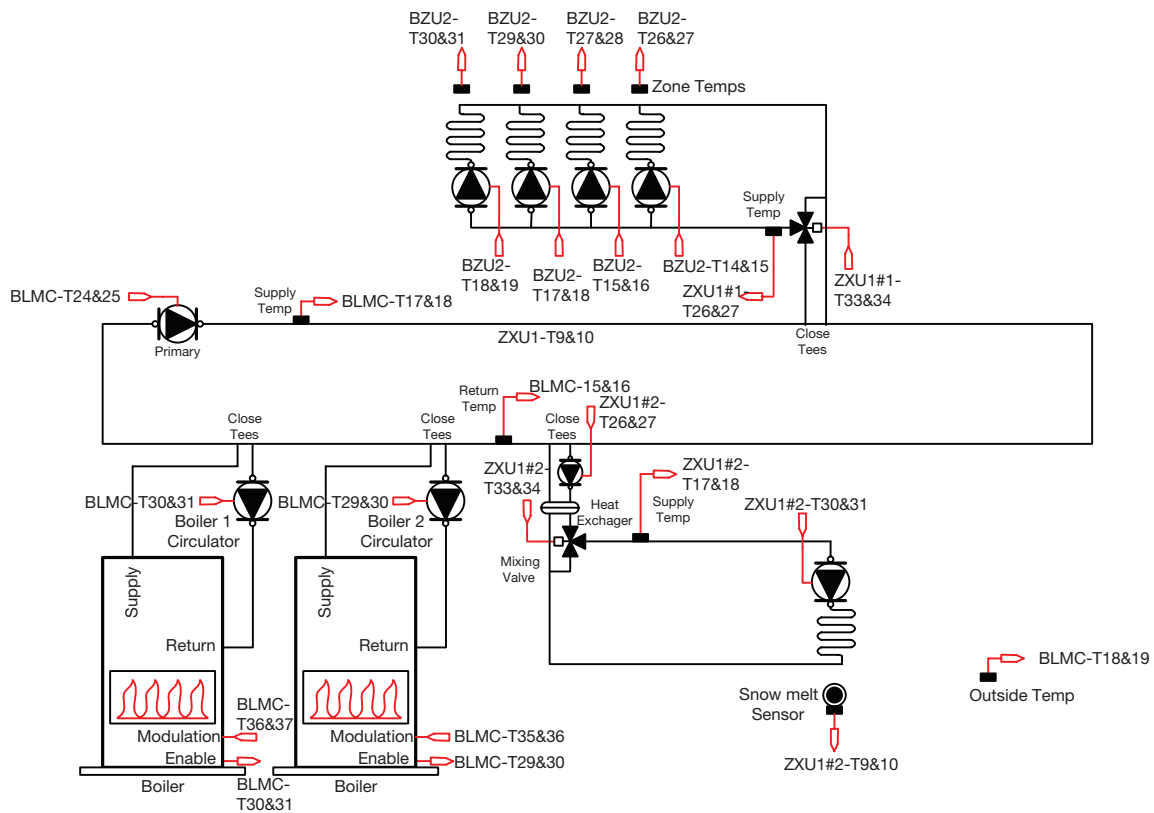
Output Jumper Positions



Snow Melt Control; ZXU1



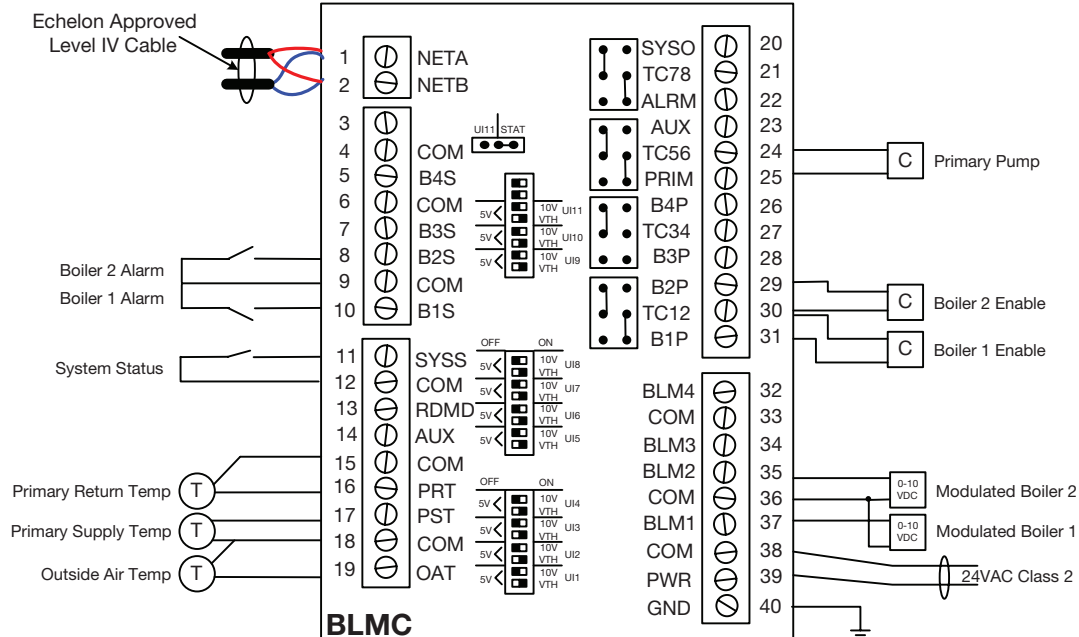
2 Modulating or On/Off Boilers with 4 Low Temp Zones and Snow Melt



Wiring Tag Description: Controller Type -Terminal Tag Designation

This application drawing is conceptual and only intended for instructional purposes.

2 Modulating or On/Off Boilers; BLMC



Note:

* Connect switch or thermistor; switch stays in same position

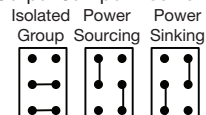
Symbols

⊗ 10 K ohm Precon Type III thermistor

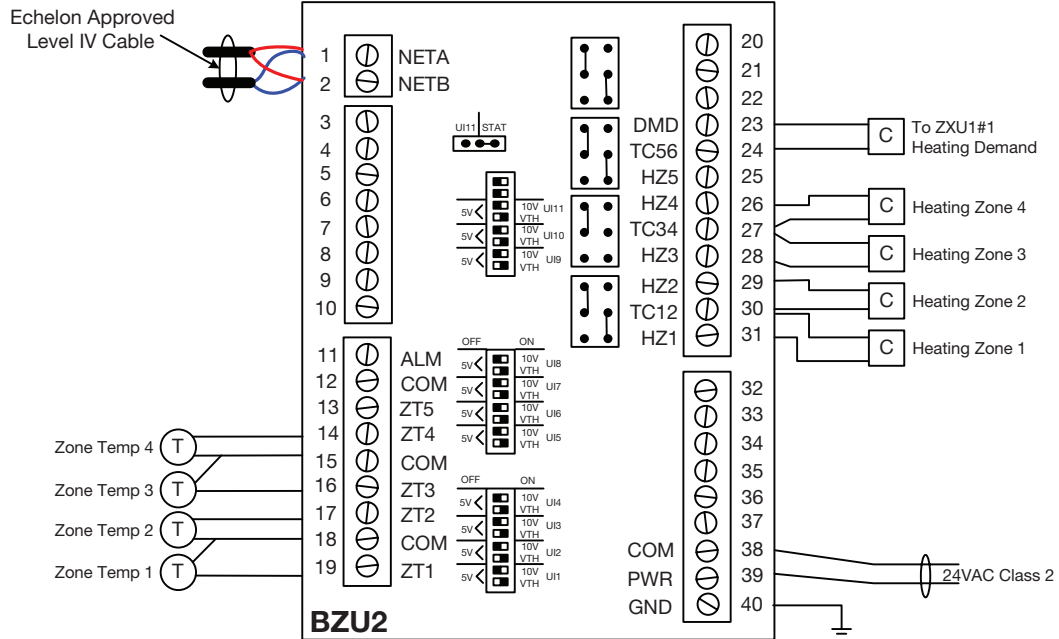
C 24VAC pilot relay or contactor coil

0-10 VDC 0-10 VDC signal

Output Jumper Positions



4 Radiant Zones with Demand Output Enabling Mixing Valve to Manifold; BZU2#1



Symbols



10 K ohm Precon Type III thermistor

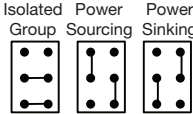


24VAC pilot relay or contactor coil

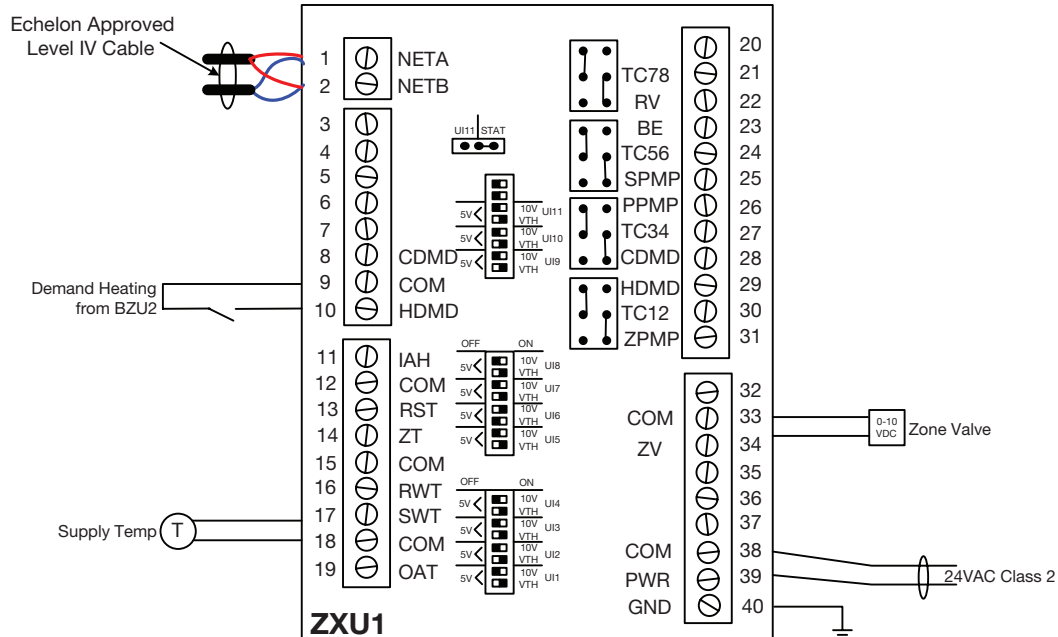


0-10 VDC signal

Output Jumper Positions



Mixing Valve Control for Low Temp Zones; ZXU1#1



Symbols



10 K ohm Precon Type III thermistor



24VAC pilot relay or contactor coil

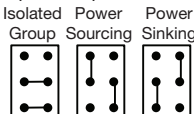


0-10 VDC signal

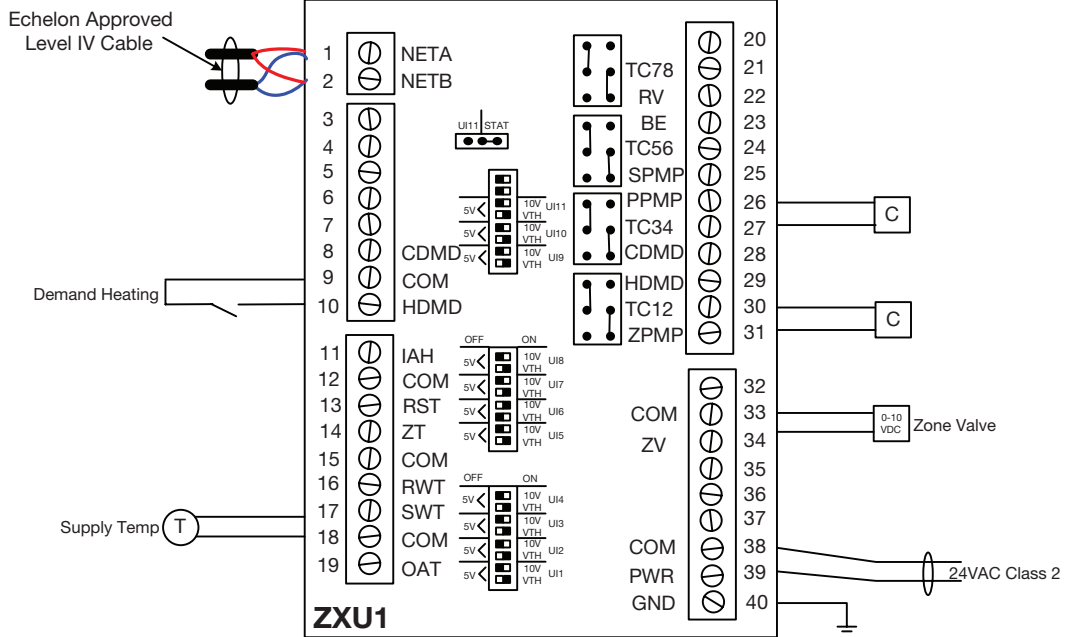


0-10VDC Humidity Sensor

Output Jumper Positions



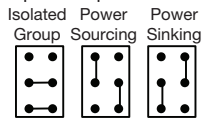
Snow Melt Control; ZXU1#2



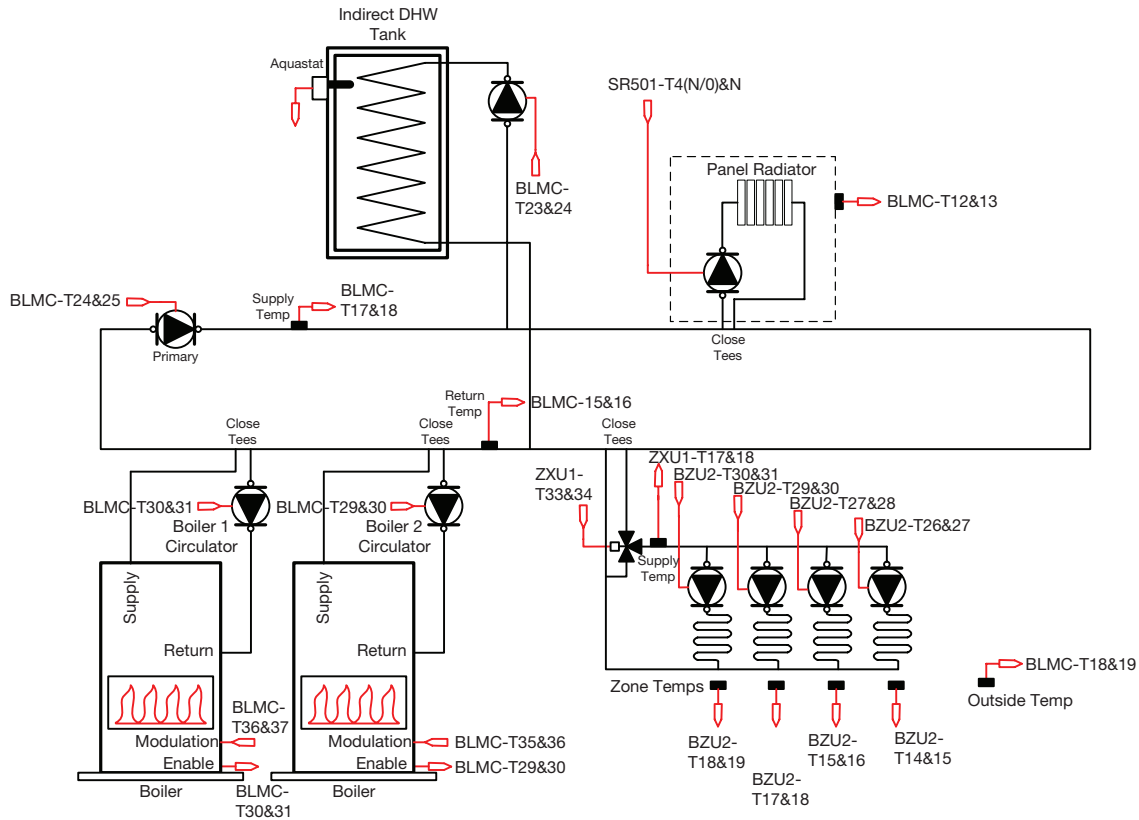
Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal
- 0-10VDC Humidity Sensor

Output Jumper Positions



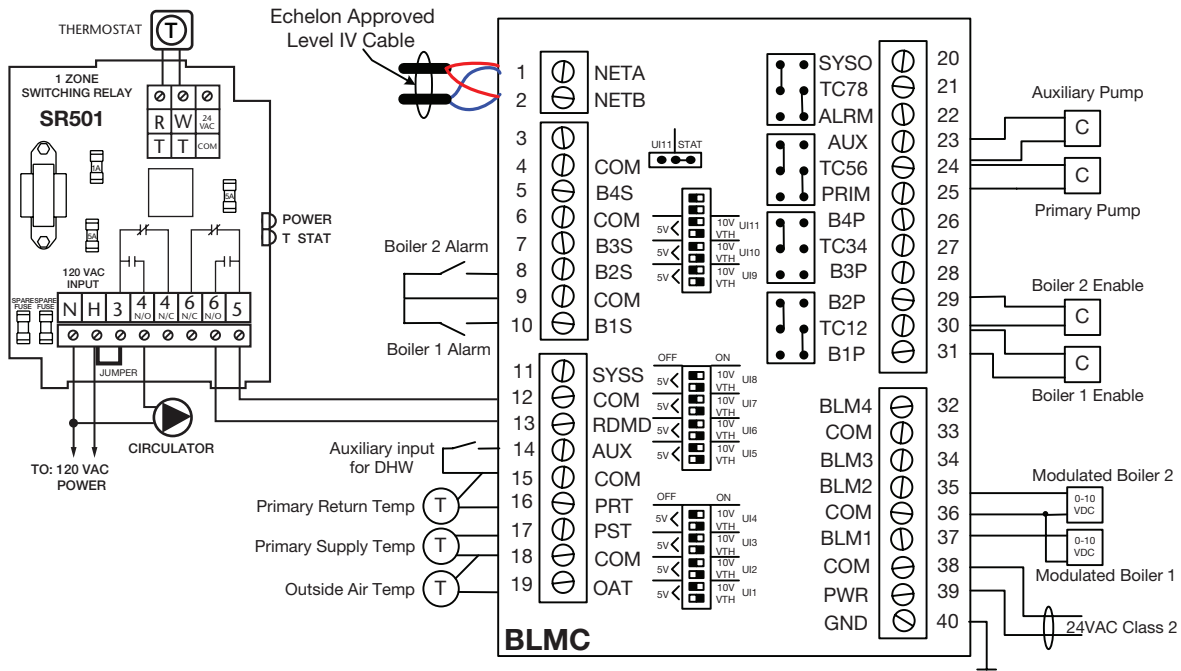
2 Modulating or On/Off Boilers, 1 High Temp Zone, 4 Radiant Zones and Domestic Hot Water



Wiring Tag Description: Controller Type -Terminal Tag Designation

This application drawing is conceptual and only intended for instructional purposes.

2 Modulating or On/Off Boilers with DHW; BLMC



Symbols

Note:

* Connect switch or thermistor; switch stays in same position

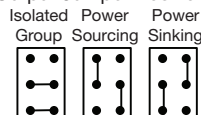


10 K ohm Precon Type III thermistor

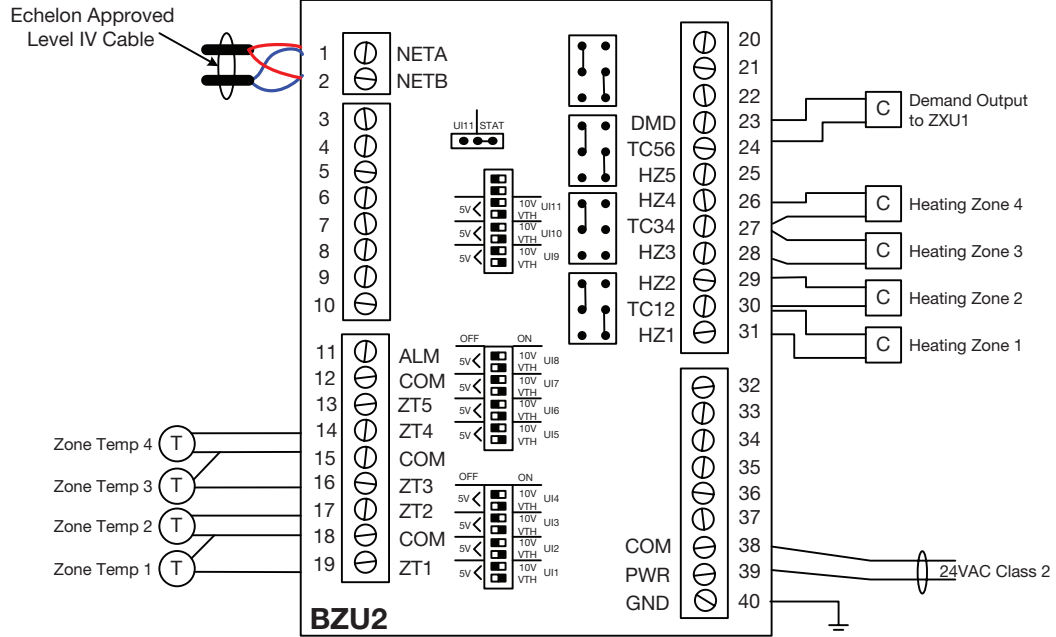
24VAC pilot relay or contactor coil

0-10 VDC signal

Output Jumper Positions



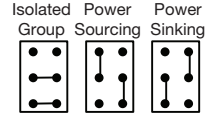
4 Radiant Zones with Demand Output Enabling Mixing Valve to Manifold; BZU2



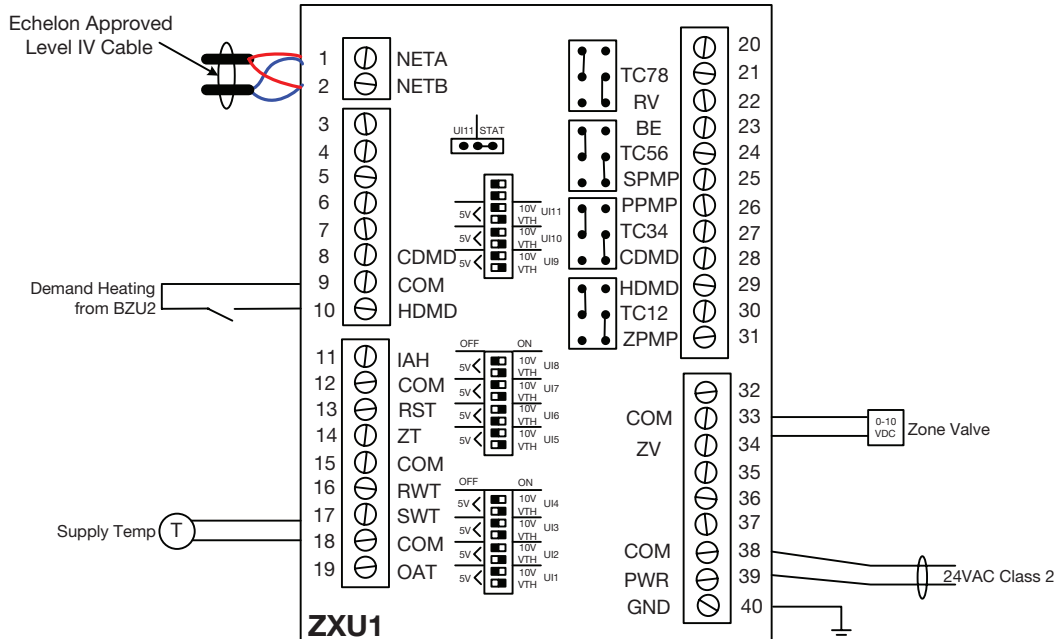
Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal

Output Jumper Positions



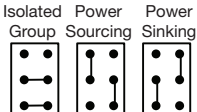
Mixing Valve Control for Low Temp Zones; ZXU1



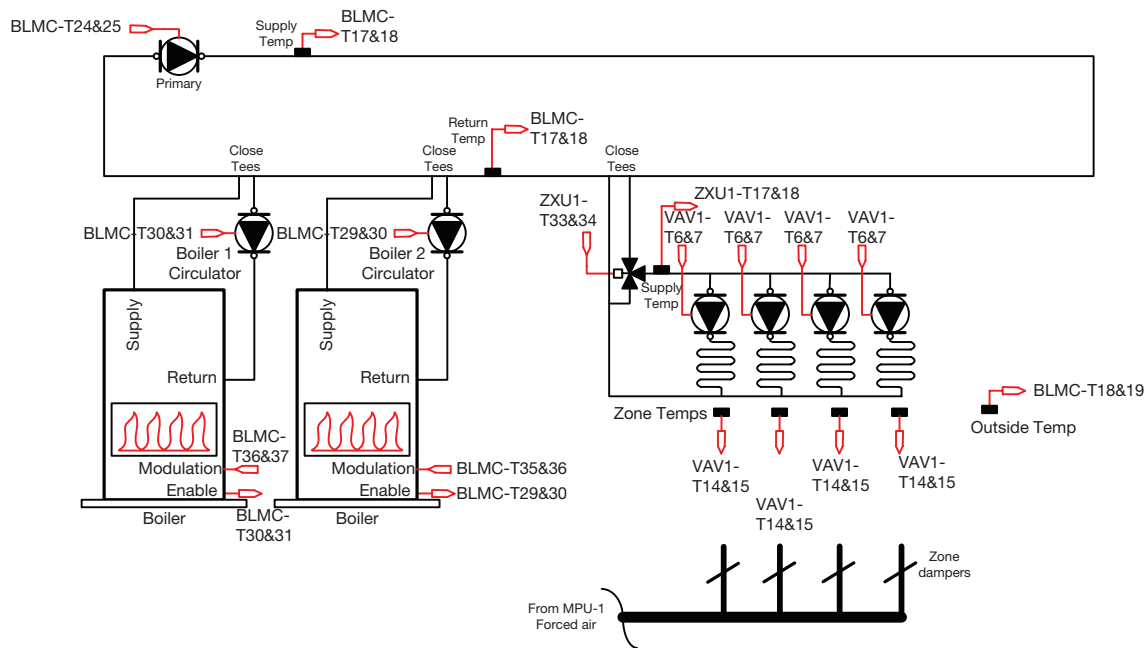
Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal
- 0-10VDC Humidity Sensor

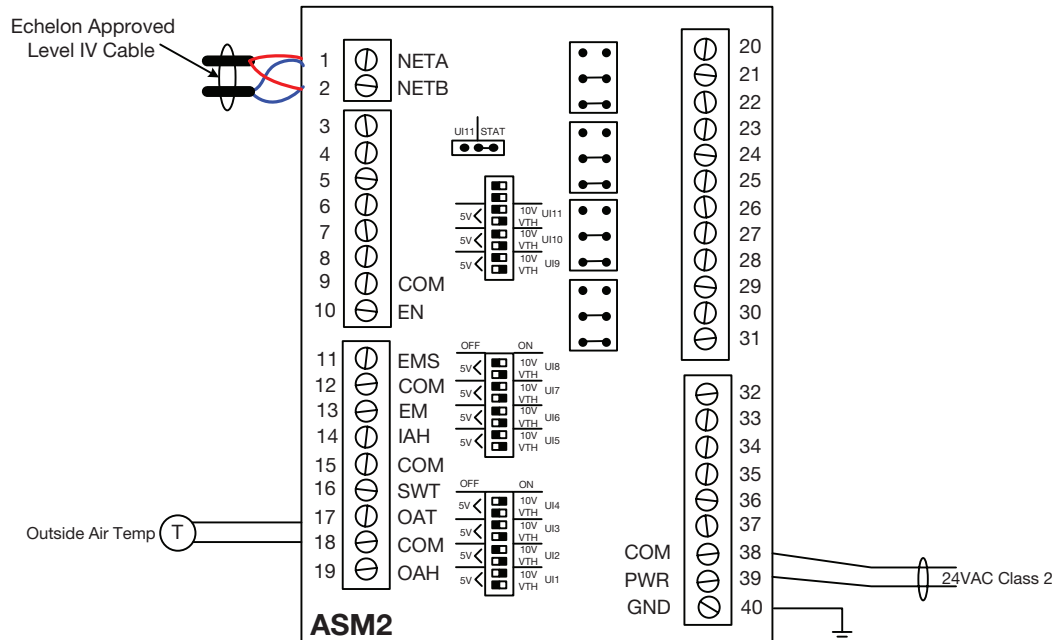
Output Jumper Positions



Multi-Zone Radiant with Zone Dampers



Auxiliary Sensor Module; ASM2



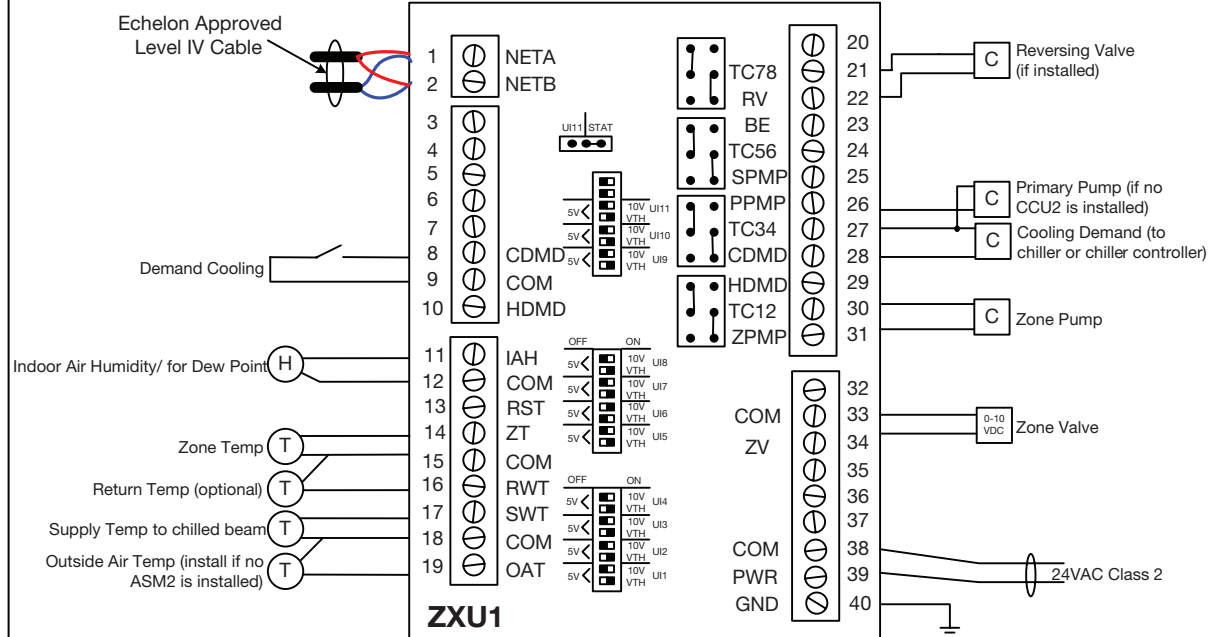
Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal
- 0-10VDC Humidity Sensor

Output Jumper Positions

- Isolated Group
- Power Sourcing
- Power Sinking

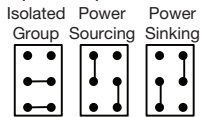
Chilled Beam Application Using the ZXU1



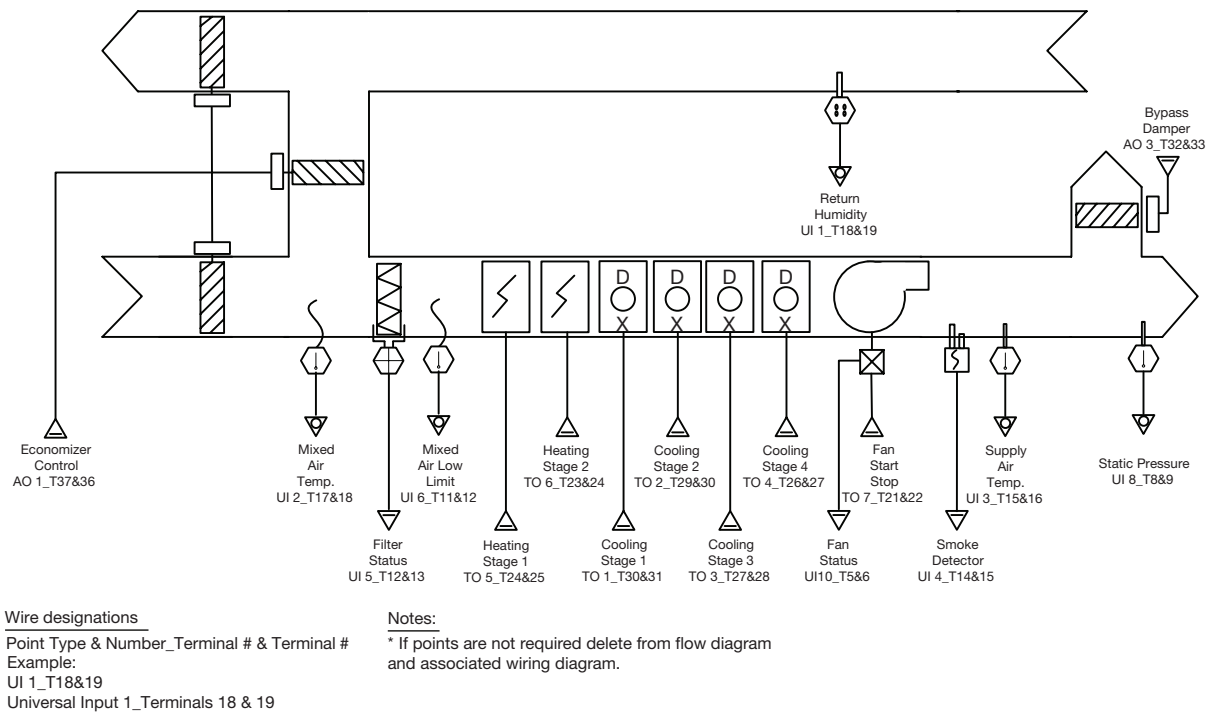
Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal
- 0-10VDC Humidity Sensor

Output Jumper Positions



Multi Zone Unit with Staged Heating & Cooling and Modulated Economizer; Triac Outputs Wired as Power Sourced



Sequence of Operation

When the space temperature drops below the **Occupied Heat SP** the radiant heat (VAV1 fan output) will be enabled as stage 1 without signaling to the MPU2 that heating is required. If the radiant heat does not satisfy the demand within the amount of time entered into the valve travel time, then the MPU2 will be enabled and forced air heating will be supplied to the space as stage 2. The VAV1 will modulate the damper to allow forced air heating into the space, the damper will modulate based on the **Damper Control Band**. Once the space has been satisfied the heating will be disabled and the damper will be modulated to the Minimum Position. During the unoccupied time periods the space will be controlled to the **Unoccupied Heat SP & Unoccupied Cool SP**.

If the outside air temperature as reported by the ASM2 indicates that the outside air temperature is above the MPU2s **OAT Heating Lockout**, forced air heating will not be enabled but radiant heating can still be enabled.

When the space temperature rises above the **Occupied Cool SP** the damper will modulate based on the Damper Control Band. Once the space has been satisfied the damper will close and no demand will be reported to the MPU2.

In both the heating and cooling scenarios; if the MPU2 is in the opposite mode that a zone (VAV1) requires, due to the demand

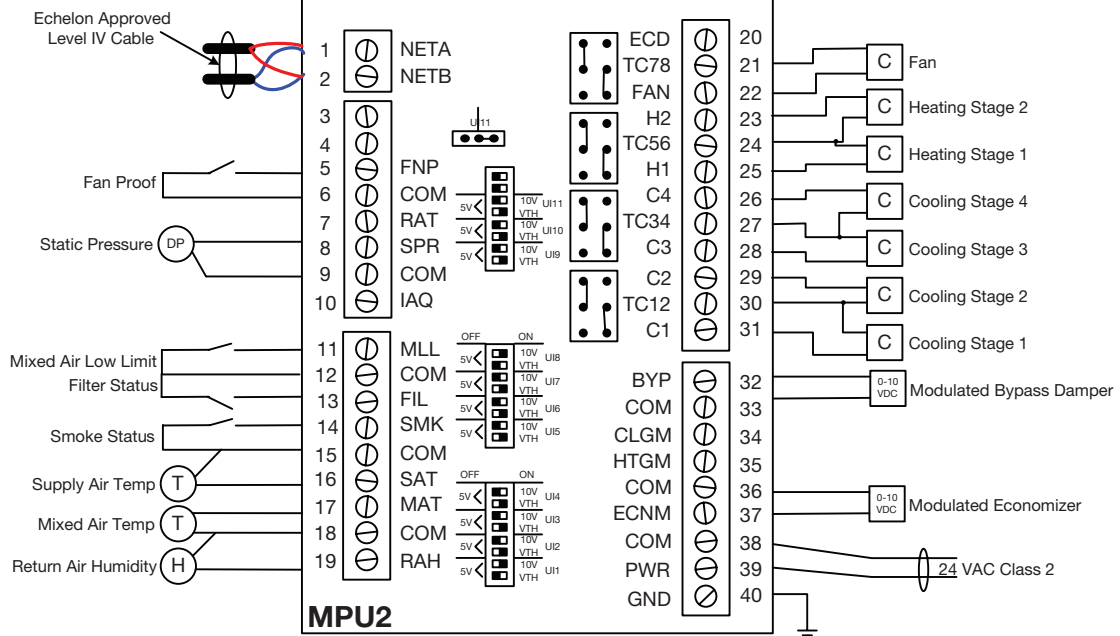
from the other zones, then the damper will remain closed until the MPU2s mode changes to the zones requirements.

The MPU2 determines if heating or cooling is required by scanning all associated zone controllers to collect system demand data. The total heating and cooling demands are accumulated. The greatest demand determines the control mode.

When the system cooling demand is greater than the system heating demand, the system enters cooling mode. The cooling stages are sequenced on and off by the control algorithm. The sequencing is based on the supply air temperature and cooling setpoint. The cooling and heating demands are continually re-evaluated during the cooling mode. The MPU2 is capable of periodically reevaluating the cooling mode and switching to the heating mode when the temperature demand is greater for heating.

When the system heating demand is greater than the system cooling demand, the system enters heating mode. The heating stages are sequenced on and off by the algorithm. The sequencing is based on the supply air temperature and heating setpoint. The MPU2 is capable of periodically re-evaluating the heating mode and switching to the cooling mode when the temperature demand is greater for cooling.

Multi Zone Unit with Staged Heating & Cooling and Modulated Economizer; Triac Outputs Wired as Power Sourced

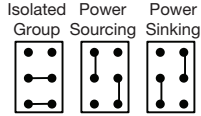


Symbols

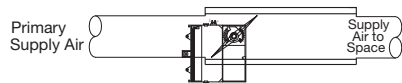
- 10 K ohm Precon Type III Thermistor
- 0-10VDC Humidity Sensor
- 24 VAC Class 2 pilot relay or contactor coil
- 0-10 VDC signal

Note:
Ensure input switches and
output jumpers are in the proper
position!

Output Jumper Positions

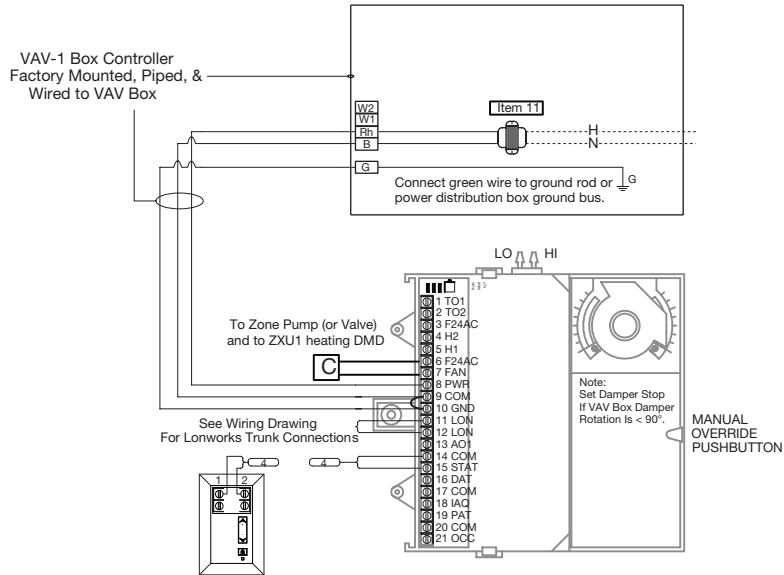


Typical Pressure Dependent VAV Box with 1st Stage Radiant Heat; Typical of 4

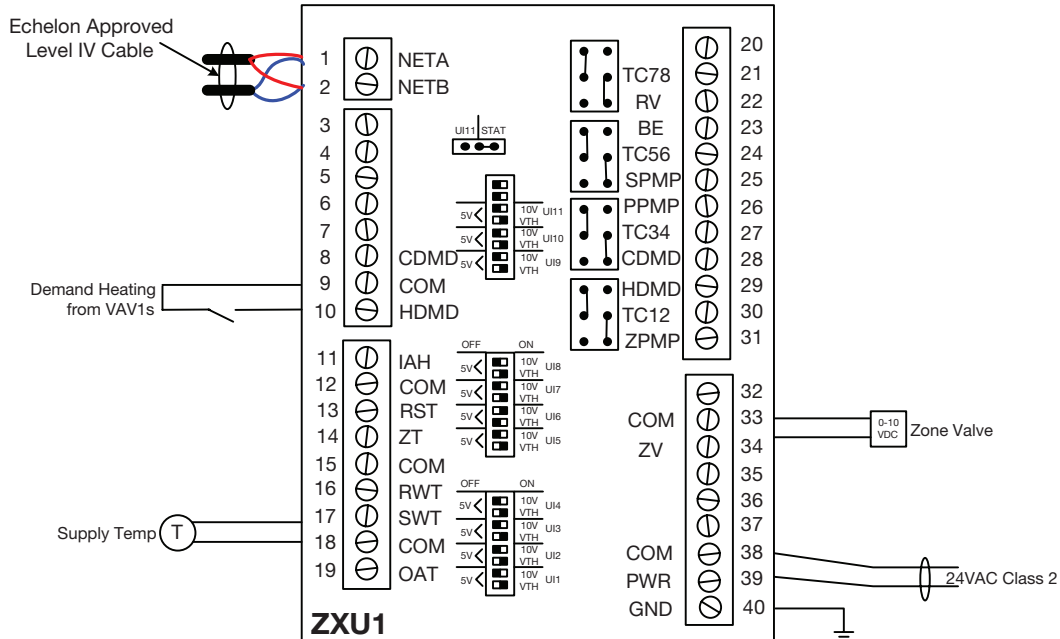


NOTES: * The transformer used must be selected based on the application requirements, taking into consideration the total VA necessary to supply all attached equipment and the primary side voltage available at the terminal box.

** If the contactor coils operate at 24 Vac and require more than 24 VA, pilot duty relays are required.



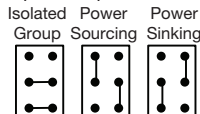
Mixing to Radiant Zones; ZXU1



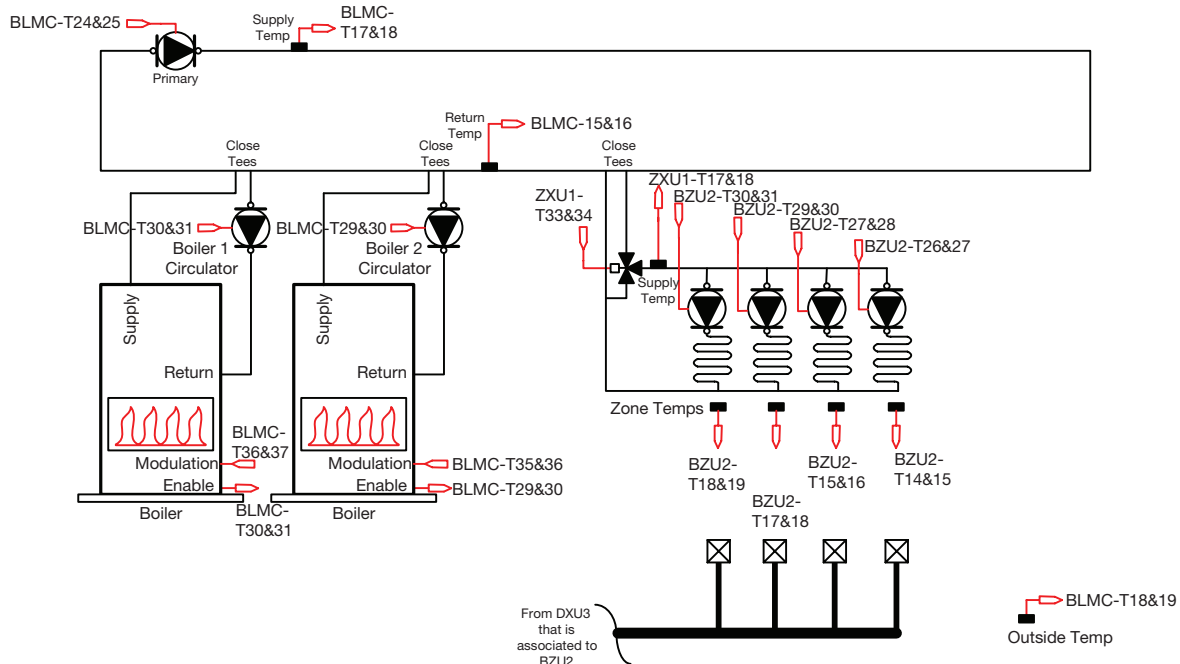
Symbols

- (T) 10 K ohm Precon Type III thermistor
- (C) 24VAC pilot relay or contactor coil
- (0-10 VDC) 0-10 VDC signal
- (H) 0-10VDC Humidity Sensor

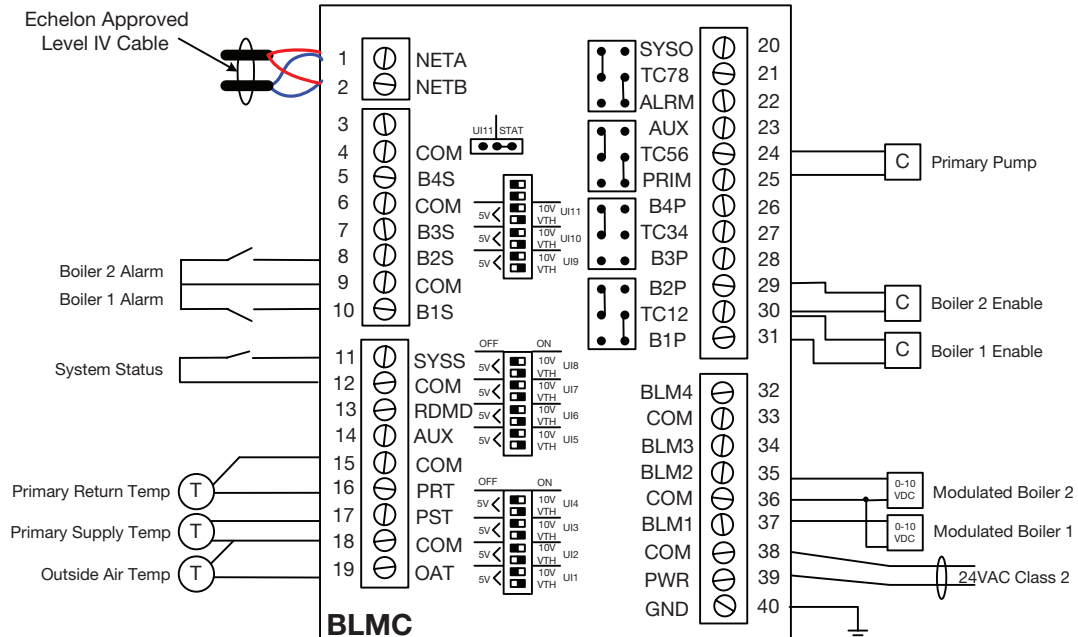
Output Jumper Positions



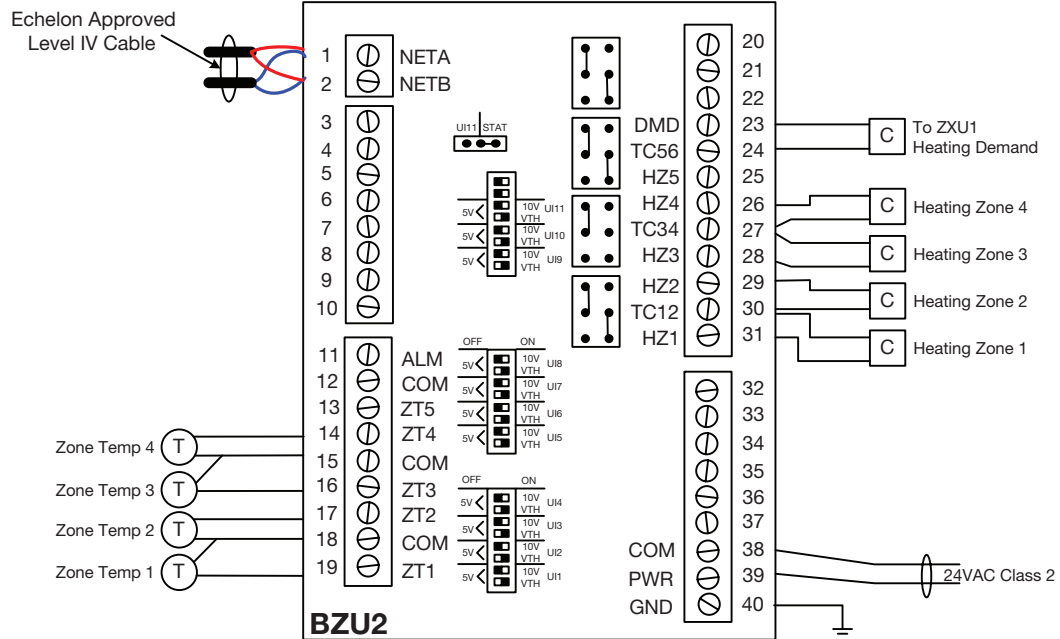
Multi-Zone Radiant with Forced Air Cooling; DXU3 Shares BZU2 Temp Readings



2 Modulating or On/Off Boilers; BLMC



4 Radiant Zones with Demand Output Enabling Mixing Valve to Manifold; BZU2



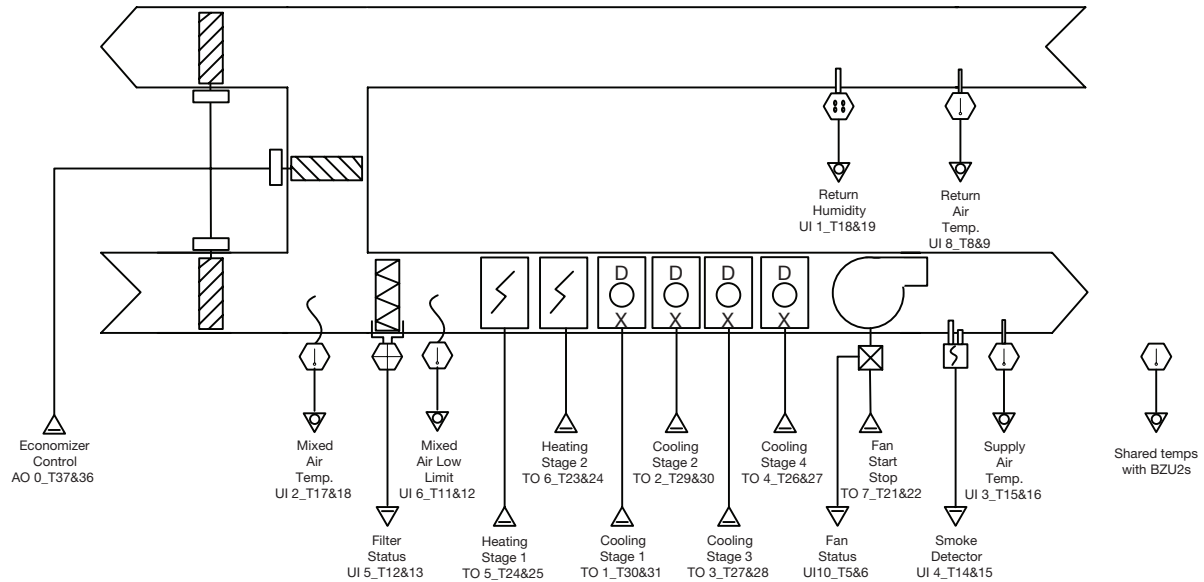
Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal

Output Jumper Positions

- Isolated Group
- Power Sourcing
- Power Sinking

Single Zone Unit with Staged Heating & Cooling and Modulated Economizer; Sharing Zone Temps with BZU2



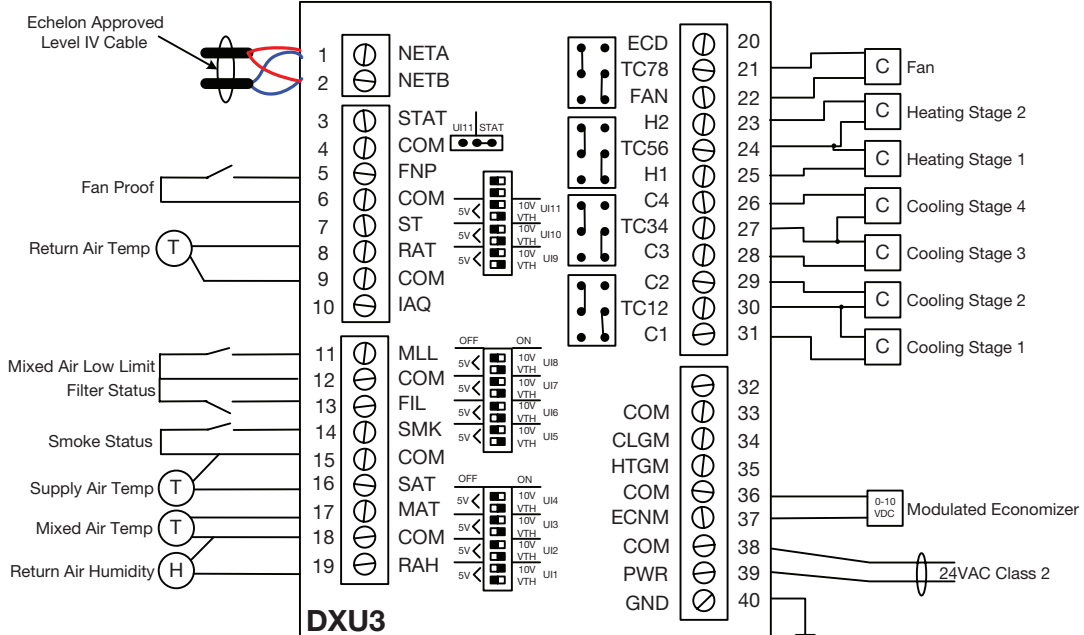
Wire designations

Point Type & Number_Terminal # & Terminal #
Example:
UI 1_T18&19
Universal Input 1_Terminals 18 & 19

Notes:

* If points are not required delete from flow diagram and associated wiring diagram.

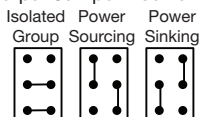
Single Zone Unit with Staged Heating & Cooling and Modulated Economizer; Triac Outputs Wired as Power Sourced



Symbols

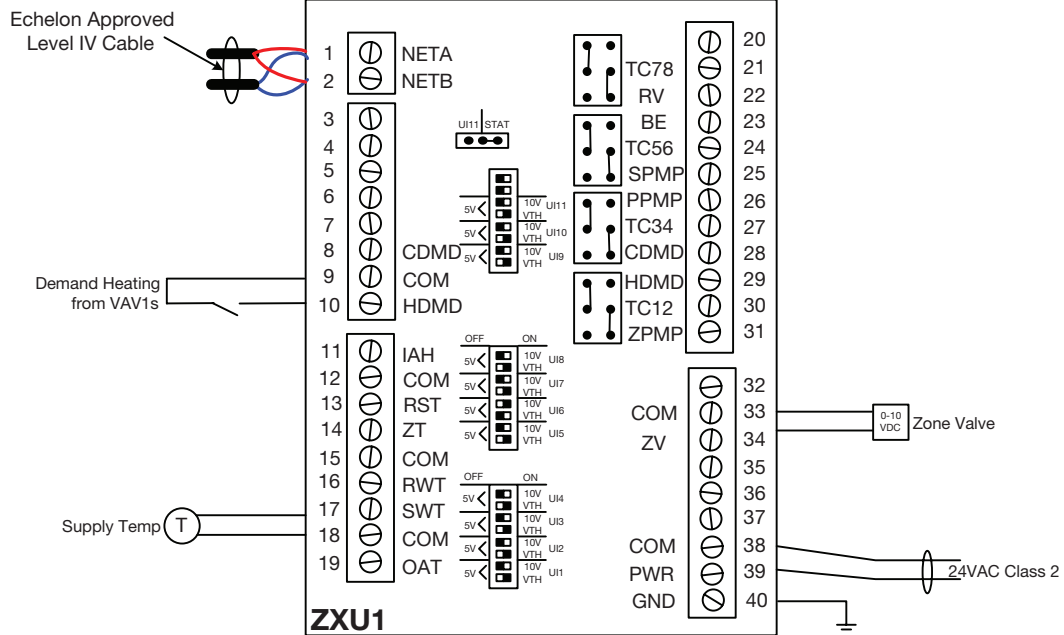
- (T) 10 K ohm Precon Type III thermistor
- (H) 0-10VDC Humidity Sensor
- (C) 24VAC pilot relay or contactor coil
- 0-10 VDC 0-10 VDC signal

Output Jumper Positions



Note:
Ensure input switches and output jumpers are in the proper position!

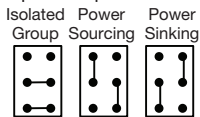
Mixing to Radiant Zones; ZXU1



Symbols

- 10 K ohm Precon Type III thermistor
- 24VAC pilot relay or contactor coil
- 0-10 VDC signal
- 0-10VDC Humidity Sensor

Output Jumper Positions



BTU3 Sequence of Operation

The BTU3 monitors the supply and return temperature as well as the flow of a radiant sub-system. The values are measured every second and every minute an average is calculated. The system then calculates an energy rate value in BTU/Hr, a volume rate in GPM, a daily total heat consumption and a total heat consumption in BTU, a daily total volume and a total volume in gallons.

The heat flow depends on the liquid used in the system as well as the temperature at the time of the measurement. All the calculated values are accumulated until the end of an interval (day). Heat consumption and flow are accumulated and logged for 31 consecutive days. If no log has been requested by the LCI for 31 days, the log will be automatically sent to the LCI and the oldest data remaining in the BTU3 will be overridden.

The system uses the formula:

$$q = (8.01 \times \rho \times cp) \times f \times \Delta T$$

Where:

q = rate of heat flow (Btu/hr)

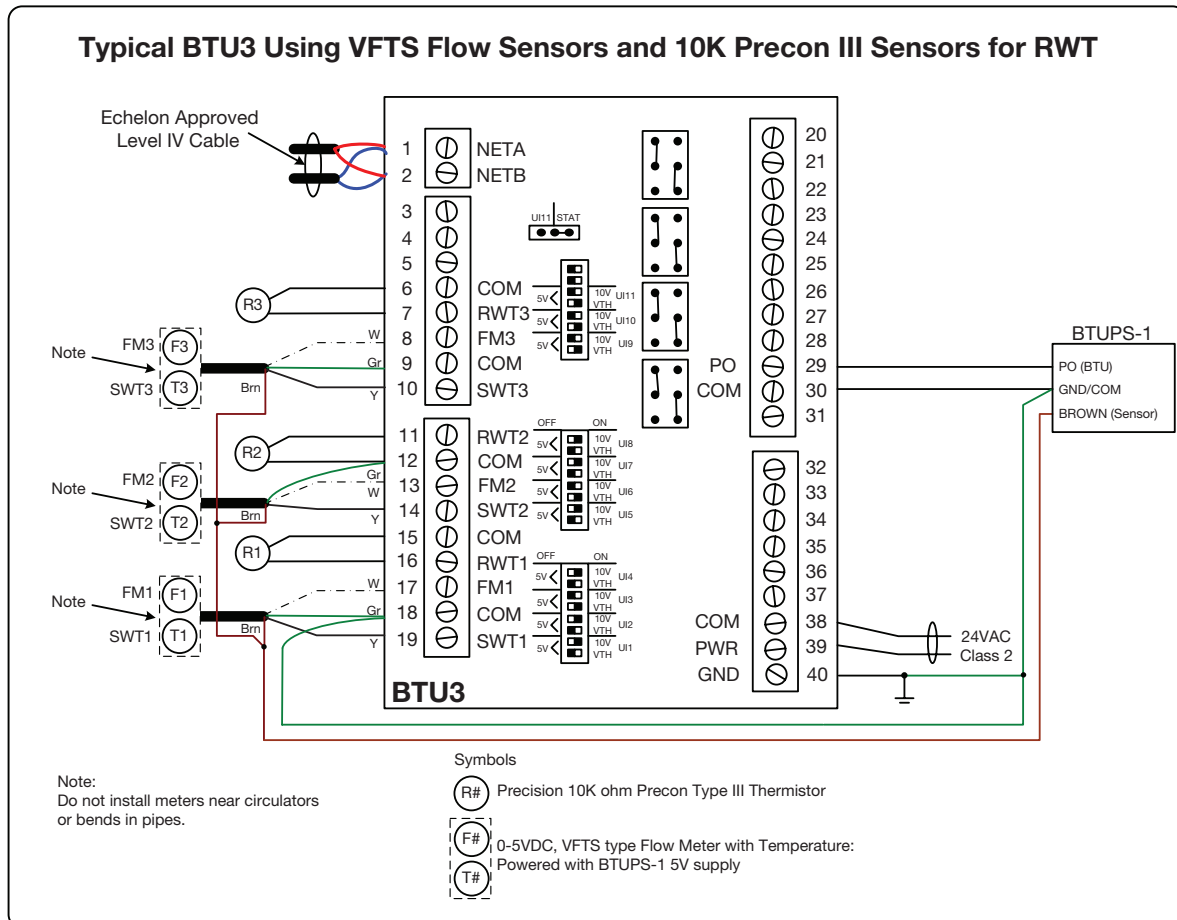
ρ = density (lb/ft³)

cp = specific heat (Btu/lb/°F)

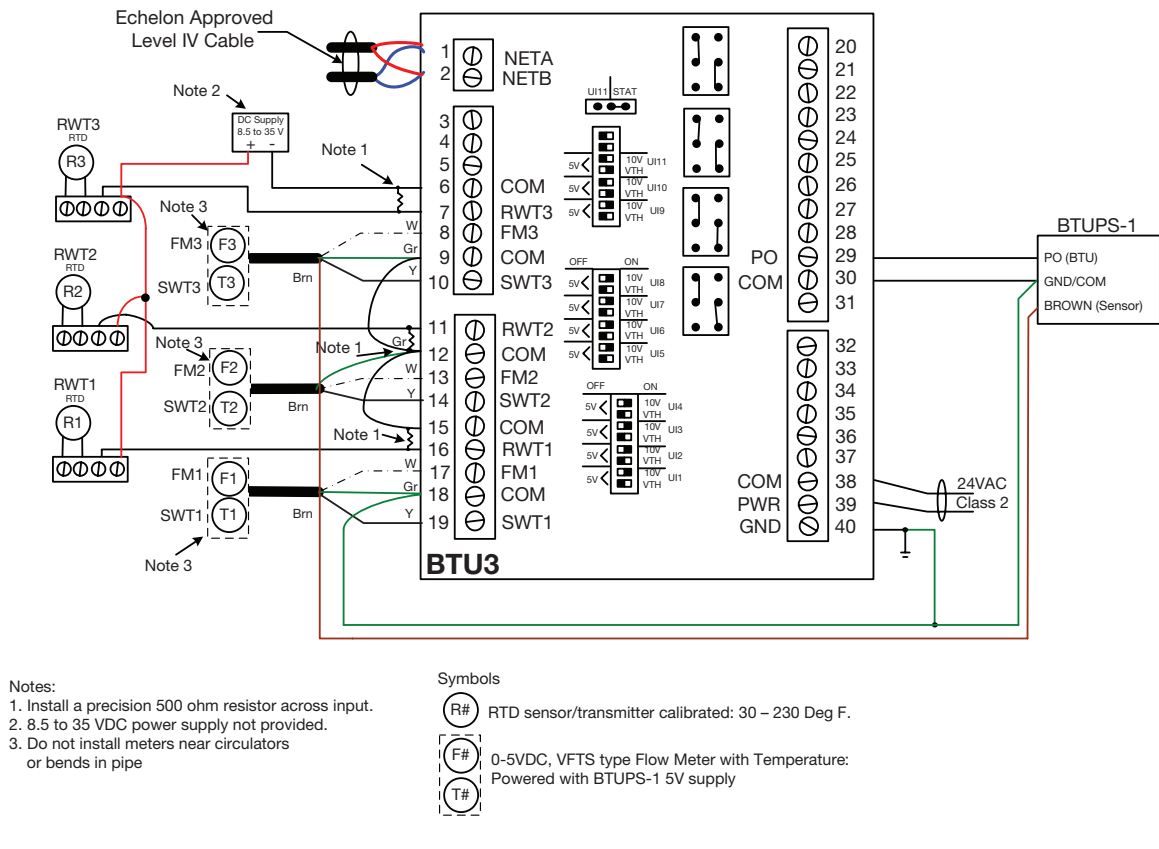
f = flow rate (gpm)

ΔT = temperature change of fluid (°F)

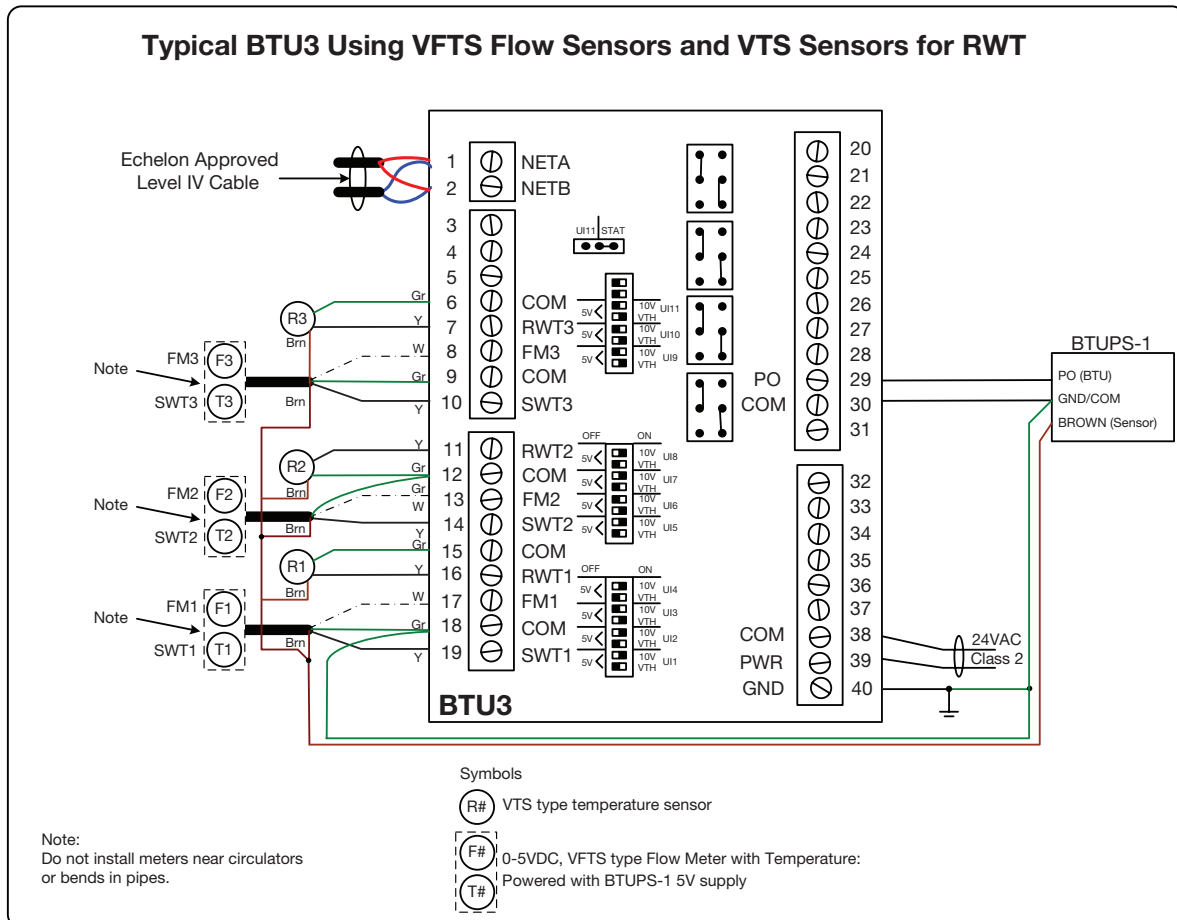
8.01 = units conversion factor



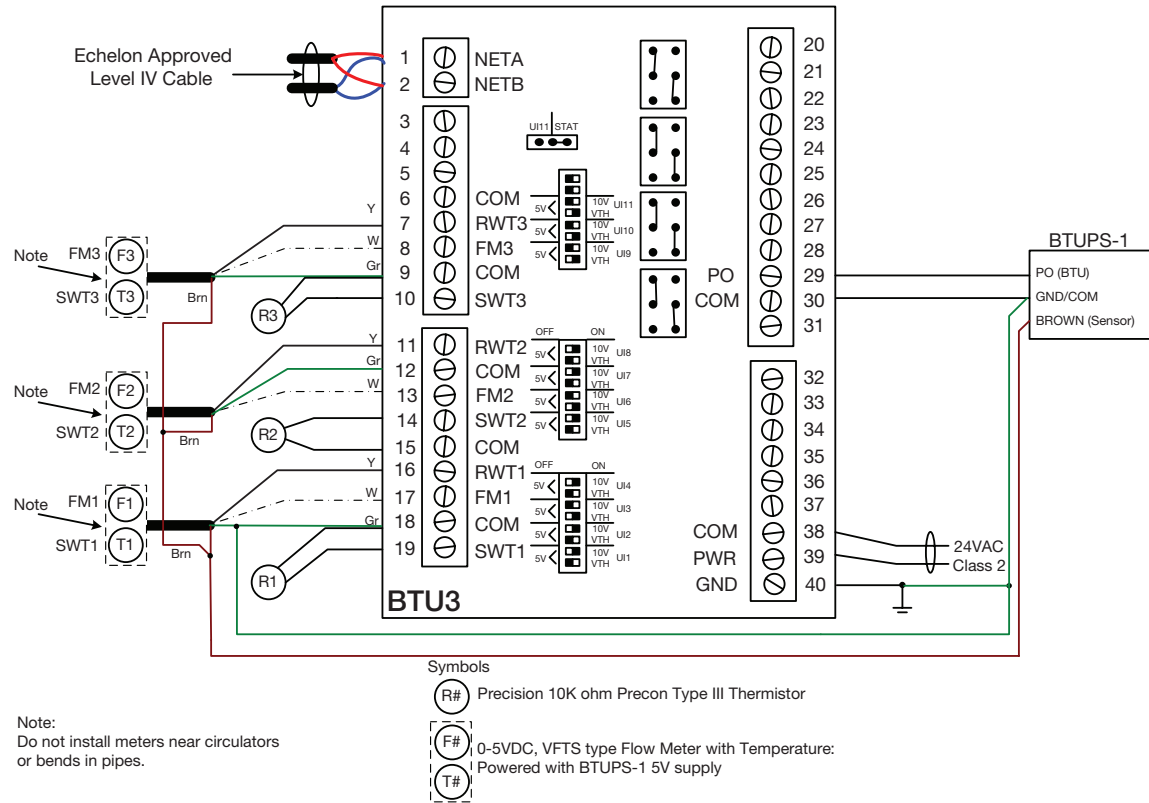
Typical BTU3 Using VFTS Flow Sensors and RTD Sensors for RWT



Typical BTU3 Using VFTS Flow Sensors and VTS Sensors for RWT



Typical BTU3 Using VFTS Flow Sensors in Return Position and 10K Precon III Sensors for SWT



CONTROLS MADE EASY[®]

Taco Electronic Solutions, Inc., 1160 Cranston Street, Cranston, RI 02920
Telephone: (401) 942-8000 FAX: (401) 942-2360.

Taco (Canada), Ltd., 8450 Lawson Road, Unit #3, Milton, Ontario L9T 0J8.
Telephone: 905/564-9422. FAX: 905/564-9436.

Taco Electronic Solutions, Inc. is a subsidiary of Taco, Inc.
Visit our web site at: <http://www.taco-hvac.com>