## Installation and Operation Manual

### Operates a Motorized Tempering Valve and a Solenoid Valve to Regulate Domestic Hot Water Temperature

# ETV Plus

## Electronic Tempering Valve with Safeguard


**⚠ WARNING**

**This Heat-Timer control is strictly an operating control; it should never be used as a primary limit or safety control. All equipment must have its own certified limit and safety controls required by local codes. The installer must verify proper operation and correct any safety problems prior to the installation of this Heat-Timer control.**

HEAT-TIMER® CORPORATION

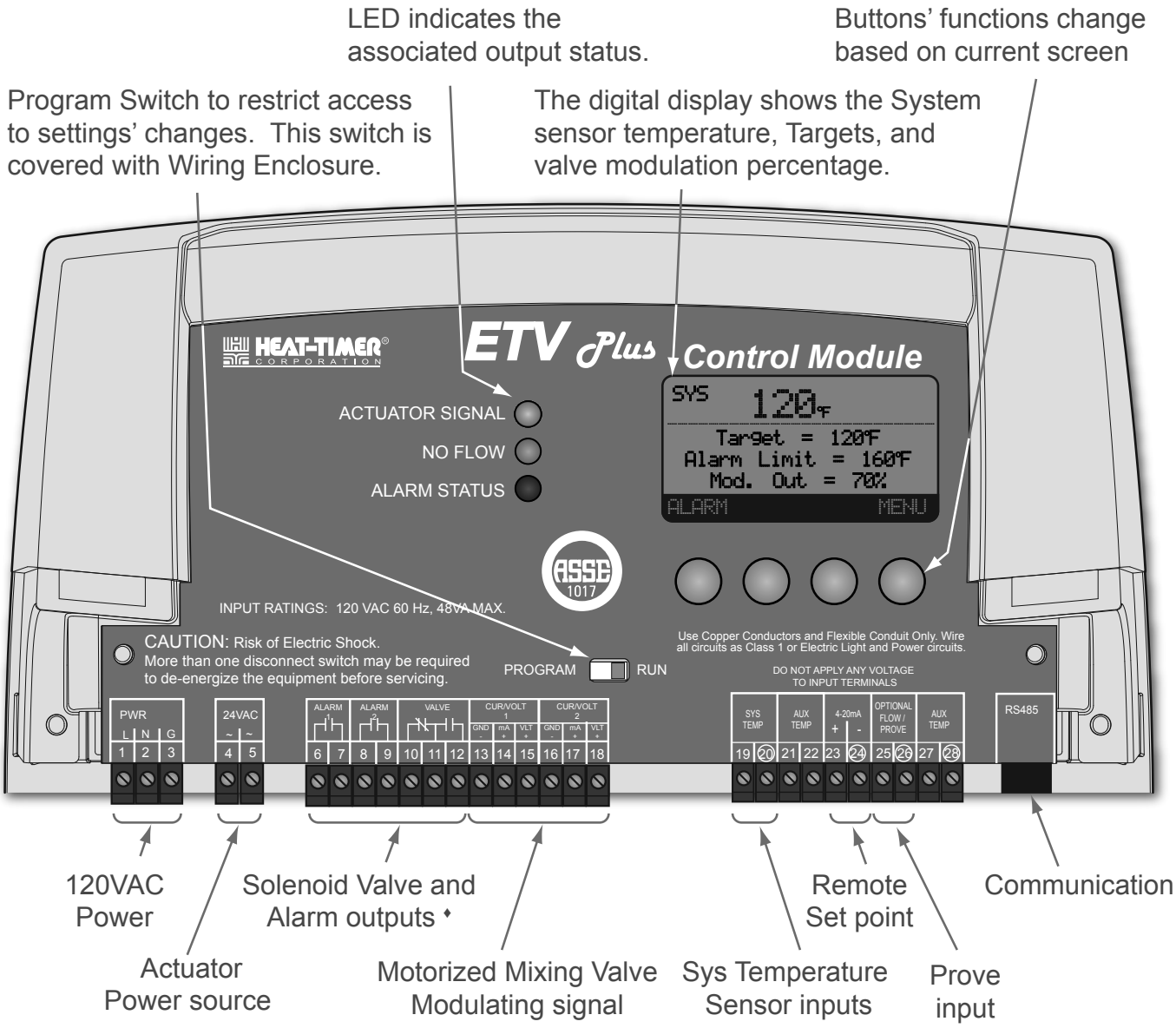
HT# 059304-00 A

# CONTENT



HT# 059304-00 A

# ETV PLUS FUNCTION CHART




♦ Outputs do not source power. A separate power source must be provided.

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# OVERVIEW

The ETV Plus (Electronic Tempering Valve) is a hot water temperature control. It operates one or two electronic motorized mixing valves to regulate the system water temperature. It operates the electronic mixing valves using any of its voltages or a 4-20mA modulation signals. Its modulation PID is designed to respond quickly, which make it suitable for domestic hot water applications.

The ETV Plus consist of four primary components, the ETV Plus control; the electronic motorized actuator; the 3-way mixing valve; and an immersion temperature sensor. Heat-Timer offers two valve materials, bronze or stainless-steel. However, the ETV Plus package uses the Stainless-Steel valves. Depending on the valve material and valve size selected, the actuator used may vary.

For added protection, the ETV Plus control can be configured to close the hot water supply to the mixing valve if the mixed outlet temperature exceeds the Alarm Limit. It does that by operating a solenoid valve mounted on the hot water supply.

# ETV OPERATING CONCEPT

The ETV Plus control modulates the electronic motorized mixing valve to maintain a temperature set point. It does that by mixing two different water temperatures from two different sources; a hot water source and a cold-water source. The hot water source can be a hot water boiler, a hot water coil in a steam boiler, or a hot water storage tank. On the other hand, the cold water comes from the city water system. The cold-water inlet is joined with the circulating loop return pipe to help maintain flow in the valve during no usage periods. The ETV Plus operation requires the use of a circulating loop pump to maintain the loop temperature.

In addition to maintaining the mixed output set point, the ETV Plus helps protect the system from excessive water temperatures. It does that by closing a solenoid valve feeding the mixing valve's hot water supply. When the mixed outlet exceeds the alarming set point for an adjustable delay period, the control closes the solenoid valve blocking all hot water flow to the mixing valve.

To save on energy, the ETV Plus provides a 7-day offset schedule to help reduce the water temperature during low usage periods.

# ETV DESIGN CONSIDERATIONS

### Circulating Loop

The ETV Plus is designed to operate in a system that has a circulating loop equipped with a constantly running circulating pump. This loop's return must mix with the cold water supply to the valve. The circulating return loop temperature must be at least 7°F less than the set point temperature. In addition, the temperature of the hot water entering the valve must be at least 20°F hotter than the set point temperature. These temperature differentials are used to prevent the mixed temperature from rising continuously.

### Thermal Trap

A thermal trap must be used to prevent the higher temperature water in the hot water supply source from backing up and entering the cold-water inlet side of the mixing valve during low flow periods. The Thermal trap can be installed either up or down. Its drop must be a minimum of 32 inches as measured from pipe-center to pipe-center.

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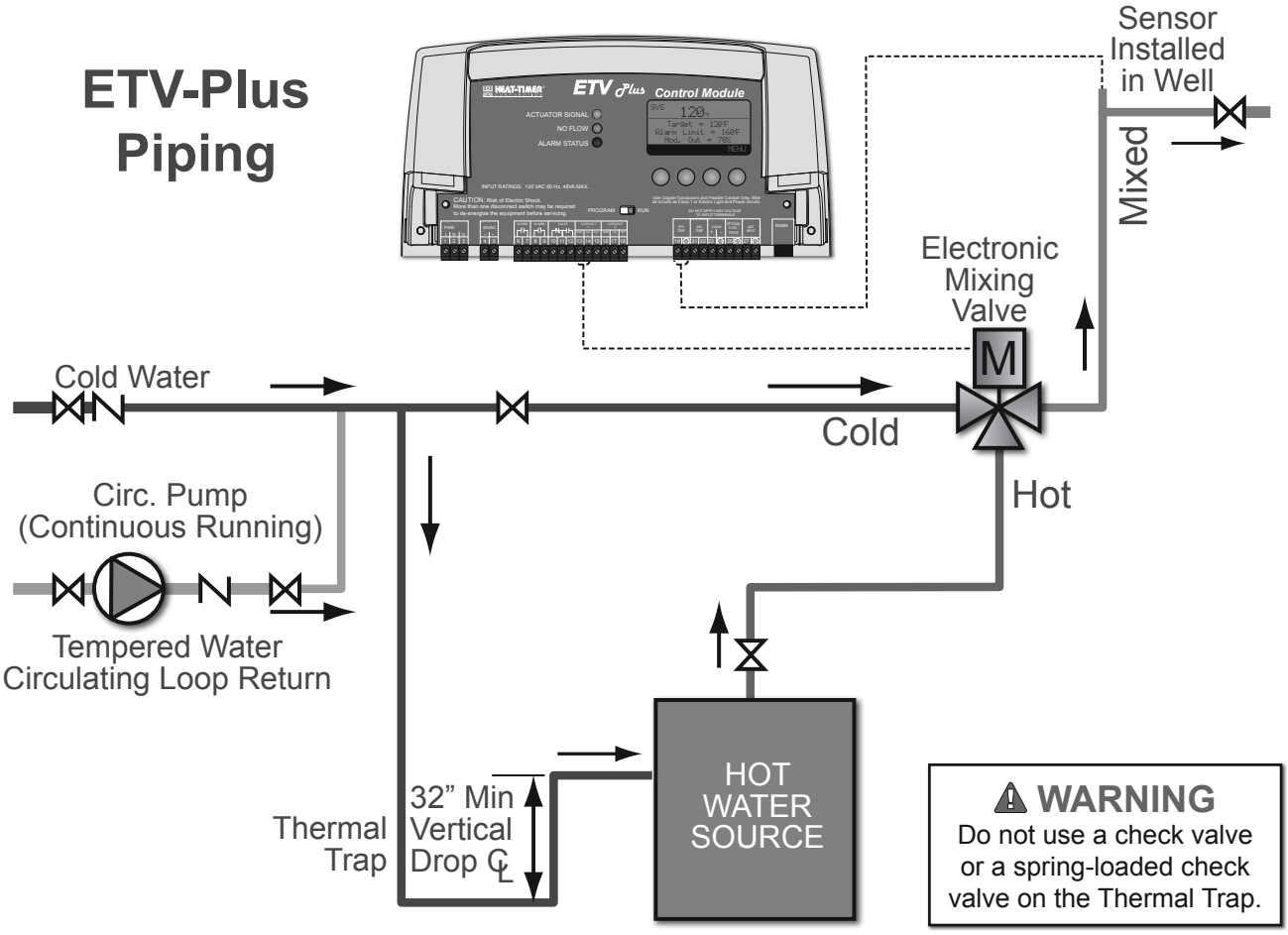
# ETV-Plus Piping

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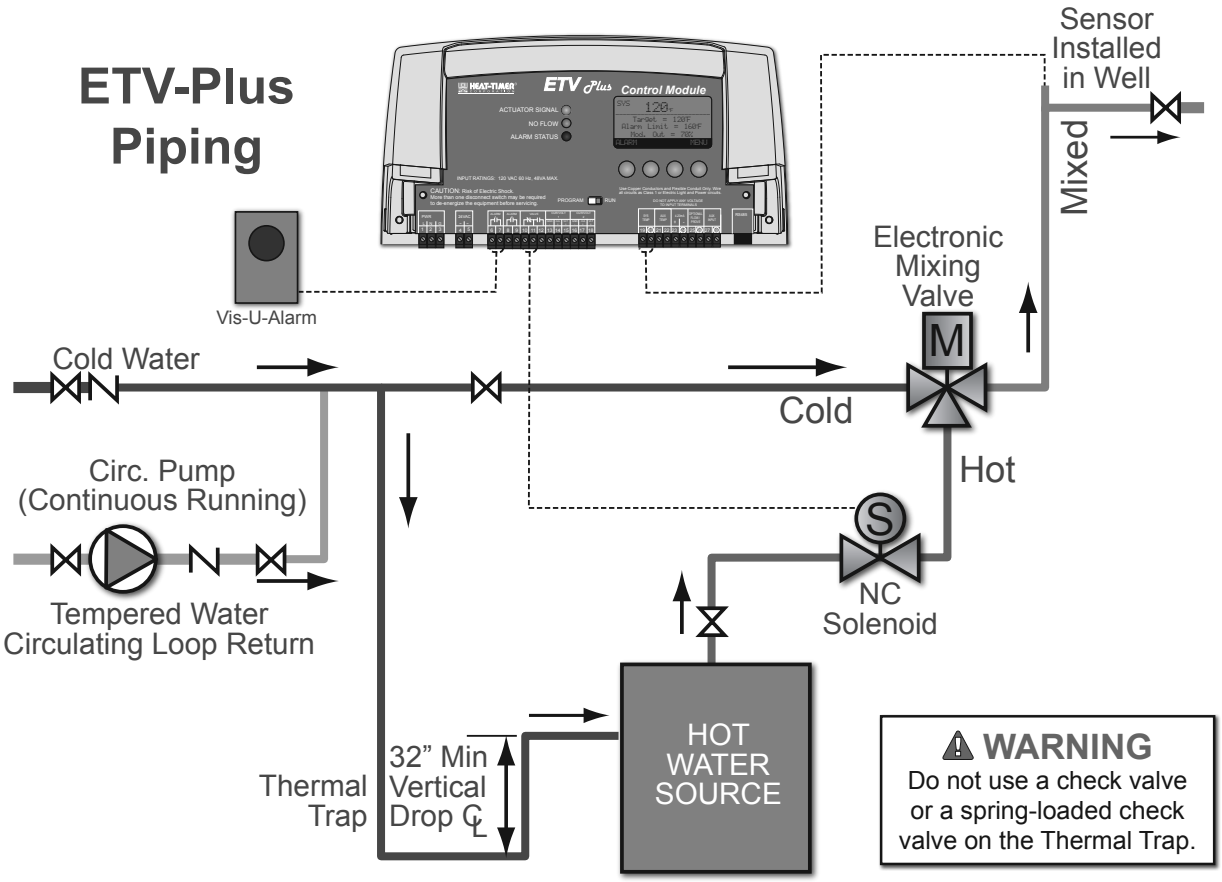
# TMC OPERATING CONCEPT

In addition to maintaining the mixed output set point, the ETV Plus helps protect the system from excessive water temperatures. It does that by closing a solenoid valve feeding the mixing valve's hot water. When the mixed outlet exceeds the alarming temperature set point (See "Alarm Limit" on page 18) for the delayed period (See "Alarm Delay" on page 21), the control closes the solenoid valve blocking all hot water flow to the mixing valve and triggers an alarm.

The ETV provides a multiple scheduled setback per day to help reduce the water temperature during low usage periods to save on energy.




# INSTALLATION STEPS

For best results, follow these steps to make sure that all aspects of the system installation are done:

1. Pipe the valves. See "Piping Diagrams" on page 24.
2. Install the sensor well.
3. Mount the actuator to the mixing valve (ETV modes only). See actuator installation manual.
4. Mount the solenoid coil to the solenoid valve (TMC modes only). See solenoid valve installation manual.
5. Mount the ETV Plus control. See "Mounting The Enclosure" on page 7.
5. Wire the ETV Plus control to the valves and the sensor. See "Wiring Diagrams" on page 28.
6. Set the ETV Plus Set Point and Alarm Limit. See "Set Point" on page 18 and "Alarm Limit" on page 18.
7. Set the ETV Plus Schedules. See "Schedule Settings" on page 20.

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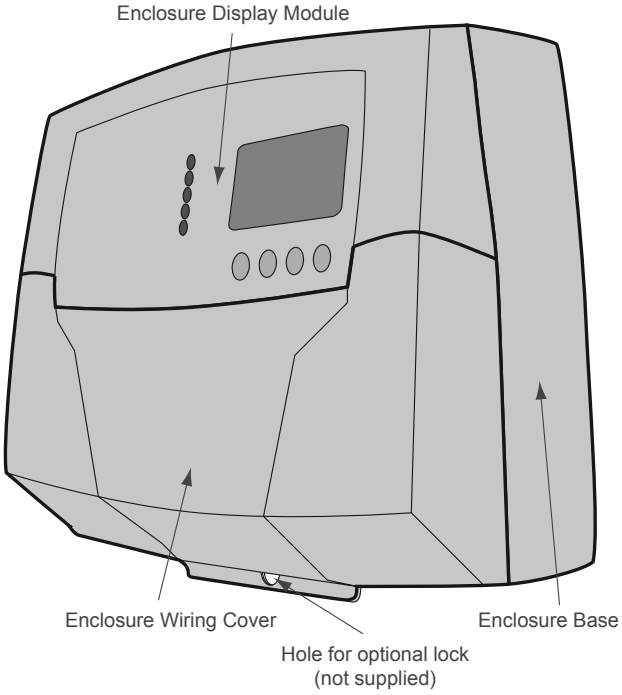
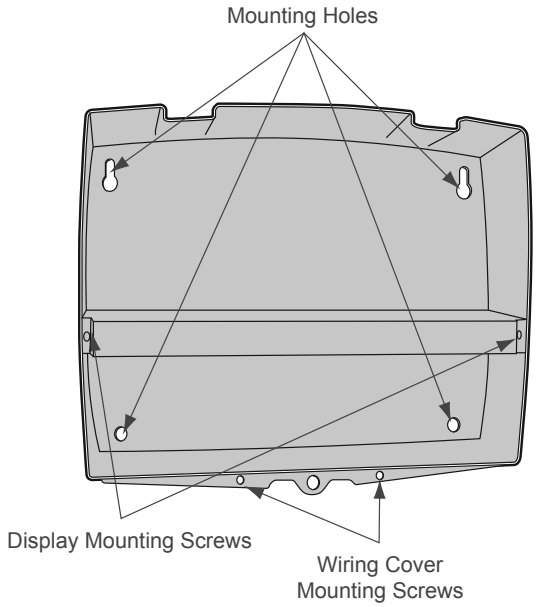
# INSTALLATION

## MOUNTING THE ENCLOSURE

- Select a location near the equipment to be controlled.
- The surface should be flat and sufficiently wide and strong to hold the ETV Plus.
- Keep the control away from extreme heat, cold, or humidity.
- Remove the Enclosure Wiring Cover by removing the two bottom screws.
- Remove the Enclosure Display Module by removing its Mounting Screws.
- Screw the Enclosure Base to the surface using the upper and lower mounting holes.
- Replace the Enclosure Display Module and its Mounting Screws.
- Do not replace the Enclosure Wiring Cover until all wiring is done.
- To secure the enclosure, use a padlock with a maximum shank diameter not greater than ⅛".




## ACTIVATE THE BATTERY

- Turn the Enclosure Display Module over to reveal the circuit board.
- Remove the battery's plastic tab to activate the battery.
- The battery is a coin Lithium battery (CR2032) (HT# 020002-00) that is used to maintain the control's date and time during power outages. This battery can maintain the clock for up to a total of 100 days.

**⚠ ALERT**

Do not install the battery unless you plan to keep the control continuously powered. If the control has no power, the battery will lose its charge in 100 days.

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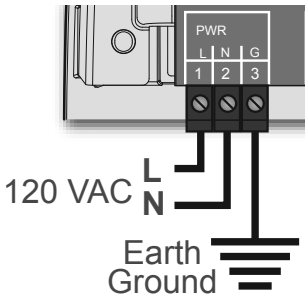
# WIRING

## POWER WIRING

***(Terminals 1, 2, and 3)***




- The ETV Plus is powered using 120 VAC 60 Hz.
- Bring the 120VAC power wires through the enclosure's bottom knockouts.
- Connect the hot line to the Line terminal (1). Connect the neutral line to the Neutral terminal (2). Connect the Ground terminal (3) to Earth Ground.
- Heat-Timer recommends the installation of a surge suppressor and a power switch before the power line connection.

**⚠ ALERT**

- Use a separate circuit breaker for the control. Do not share the control power with other major equipment, pumps, or motors.
- Output relays do not source any power. A separate power source must be used when needed. Use the output relay to enable or disable the equipment.

**⚠ WARNING**

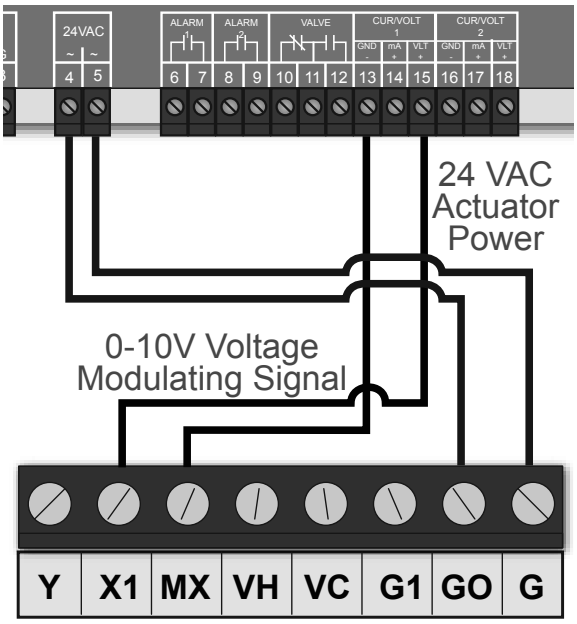
Class 2 voltage wiring (low voltage) must use a different knockout and conduit from any Class 1 voltage wiring (high voltage).

## WIRING THE OUTPUTS

### WIRING THE ACTUATOR

***(Available in ETV or ETV+TMC Control Types Only)***

- When any of the ETV options is selected as the Control Type, the control operates one or more motorized mixing valves to maintain the hot water temperature at the Set Point. It does that by sending 24 VAC power and a modulation signal to the mixing valve.
- Heat-Timer offers two types of actuators that vary by valve size. Some actuators may require the use of an external power source (External Transformer Kit HT# 950023-00). In this case, Heat-Timer packages the kit with the mixing valve. See the actuator installation manual.

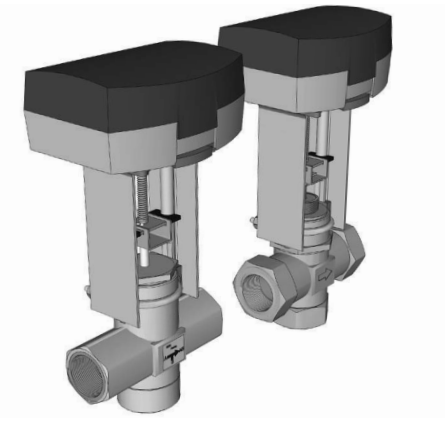



**M800 Actuator Accepts 0-10 Voltage Signal**

### WIRING M800 ACTUATORS

***1st Actuator 24 VAC Power Terminals (4) and (5)***
***1st Actuator voltage-signal terminals (13-) and (15+)***
***2nd Actuator voltage-signal terminals (16-) and (18+)***
***(Available in ETV or ETV+TMC Control Types Only)***

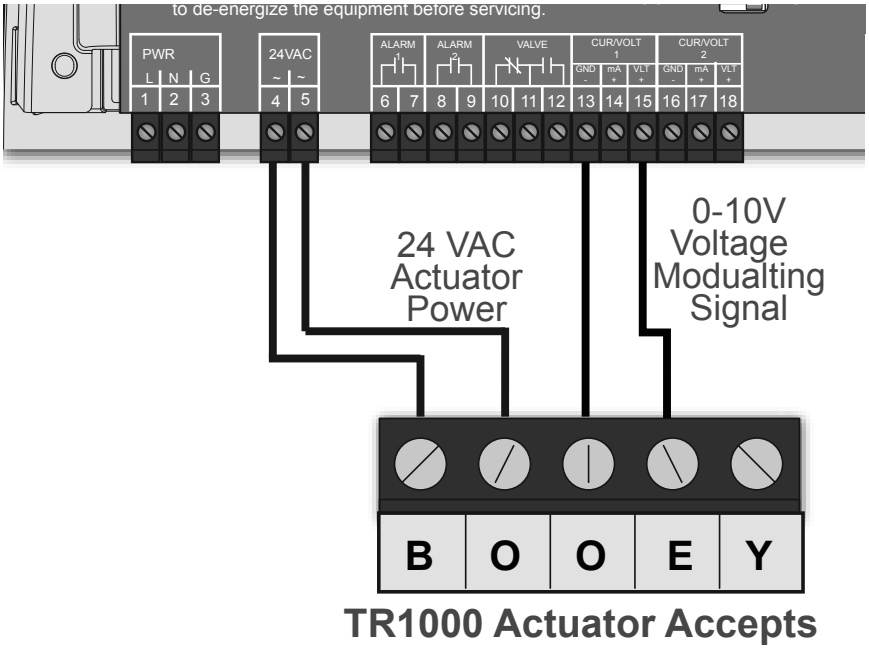
- To power the M800 actuator, connect the actuator (G) and (GO) terminals to the control's 24VAC (4) and (5) terminals.
- Any additional actuator must use the External Transformer Kit for power (HT# 950023-00). Connect the actuators' (G) and (GO) terminals to the transformer's 24VAC terminals.
- The first M800 actuator voltage signal (X1) connects to the control's terminal (15+). The ground (MX) of the actuator voltage connects to the control's terminal (13-).
- If an additional actuator is used, then connect the M800 actuator voltage signal (X1) to the control's terminal (18+). The ground (MX) of the actuator voltage connects to the control's terminal (16-).



## WIRING TR1000 ACTUATORS

***1st Actuator voltage-signal terminals (13-) and (15+)***
***2nd Actuator voltage-signal terminals (16-) and (18+)***
***(Available in ETV or ETV+TMC Control Types Only)***

- The first TR1000 actuator voltage signal (E) connects to the control's (15+) terminal. The ground (O) of the actuator voltage connects to the control's (13-) terminal.
- If an additional actuator is used, then connect the TR1000 actuator voltage signal (E) to the control's (18+) terminal. The ground (O) of the actuator voltage connects to the control's (16-) terminal.
- To power the TR1000 actuator, connect the (B) and (O) terminals to the control's 24VAC (4) and (5) terminals. Any additional actuator must use the External Transformer Kit for power (HT# 950023-00). Connect the actuators' (B) and (O) terminals to the transformer's 24VAC terminals.

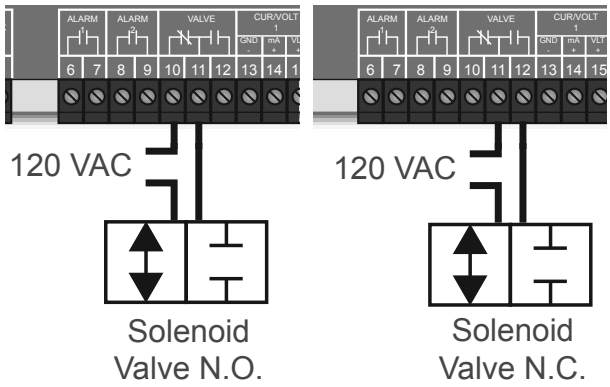



**TR1000 Actuator Accepts**


## WIRING THE SOLENOID VALVE

***Normally Close Solenoid Valves use Terminals (10) and (11)***
***Normally Open Solenoid Valves use Terminals (11) and (12)***
***(Available in TMC or ETV+TMC Control Types Only)***

- When the Control Type is set to any of the TMC options, the ETV Plus control uses a solenoid valve to close the hot water feed to the mixing valve when excessive mixed temperatures exceeds the Alarm Limit. See "Alarm Limit" on page 18.
- The control can manage a Normally Close (N.C.) or a Normally Open (N.O.) solenoid valve. Heat-Timer recommends the use of the N.C. solenoid for better performance during power outages.
- Connect the N.O. solenoid to the control's terminals (10) and (11). An external power source must be connected in series as shown in the diagram.
- Connect the N.C. solenoid to the control's terminals (11) and (12). An external power source must be connected in series as shown in the diagram.




**⚠ ALERT**
An external power source is required to power the solenoid valve.

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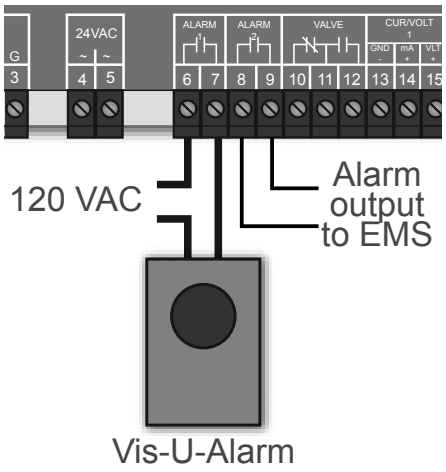
## WIRING THE ALARM

***Alarm 1 Output Terminals (6) and (7)***
***Alarm 2 Output Terminals (8) and (9)***
***(Available in TMC or ETV+TMC Control Types Only)***

- Whenever the System temperature exceeds the Alarm Limit, the ETV Plus energizes both of the Alarm outputs.
- Each of the Alarm output relays can operate up to 1 Amp pilot duty at 120 VAC.
- The Alarm Status LED will be lit whenever the control is in Alarm mode.
- To exit the Alarm mode, the cause of the alarm must end, the System Sensor reading must drop below the Alarm Limit, and the Reset button must be pressed. See "Alarm Menu" on page 19.




## INPUT WIRING

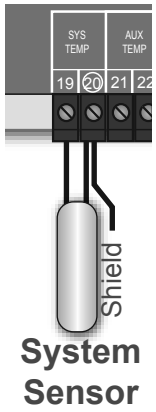
**⚠ WARNING**
To avoid damage to the ETV Plus, NO VOLTAGE can be applied to the ETV Plus input terminals.

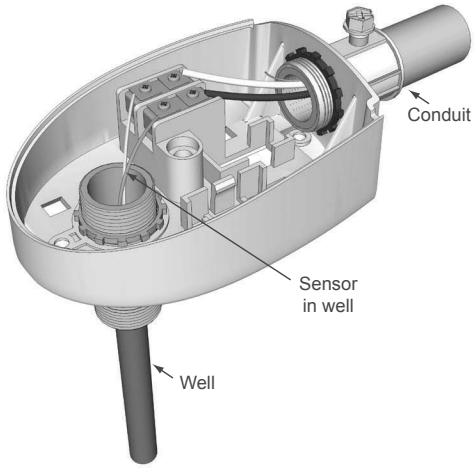
**⚠ WARNING**
Class 2 voltage wiring (low voltage) must use a different knockout and conduit from any Class 1 voltage wiring (high voltage).

## WIRING THE SYSTEM SENSOR

***Terminals 19, 20***

- The ETV Plus is designed to connect to the provided Heat-Timer temperature sensor (HT# 904250-00). The sensor must be inserted into a ⅜ID ½" NPT well (HT# 904011-00).
- Install the well within 6 Ft after the mixed outlet of the motorized mixing valve and before any takeoffs.
- The sensor wires can be extended up to 500' using an 18 AWG shielded 2-conductor cable (Belden #8760 or equivalent).
- Connect the shield to terminal (20). Do not connect the shield at the sensor end.

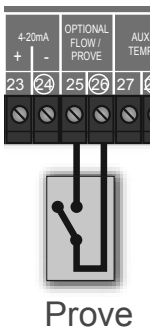



## WIRING THE FLOW/PROVE

***Terminals 25, 26 Dry-Contact***
***(Available in ETV or ETV+TMC Control Types Only when Flow Switch is set to Yes)***

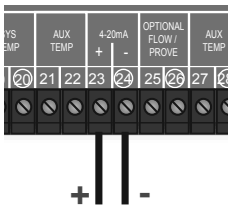
- The Flow/Prove input checks for the flow status before opening the mixing valve. If no flow status exists, the control will keep the mixing valve closed. However, if the no flow status occurs during normal valve operation, the ETV Plus will keep the mixing valve opening position at its latest opening percent.
- A factory installed jumper provides the Flow/Prove signal.



## WIRING THE 4-20MA REMOTE SET POINT

***Terminals 23, 24. EMS Source Voltage***

- This feature can be used whenever it is desirable to set the ETV Plus set point remotely using an EMS system. The Control Input must be set to EMS 4-20mA to utilize this capability. See "Control Input" on page 15.
- If the Control Type was set to any of the ETV options, the 4-20mA Set Point will represent the mixing water target. However, if the Control Type was set to TMC, the 4-20mA Set Point will represent the Alarm Limit. See "Control Type" on page 14.
- The ETV Plus DOES NOT SOURCE POWER to the 4-20mA terminals. The EMS systems must source the excitation voltage.
- Any signal that is less than 2mA or greater than 22mA will close the mixing valve and trigger an alarm. See "Display Messages" on page 13.



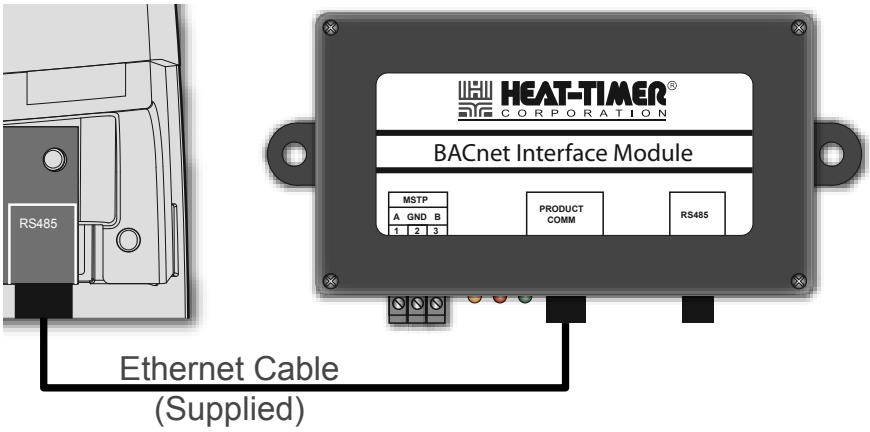

EMS Sources Voltage

**4-20mA Remote Set Point**

## WIRING TO BACNET

***RS485***

- For the ETV Plus to communicate over the BACnet network, the use of the BACnet Interface Module is required. The BACnet Interface Module must be ordered separately (HT# 926781-00).
- Connect the provided CAT-5 cable to both the BACnet Interface Module (Product Comm Ethernet port) and the ETV Plus's (RS485 port). The BACnet Interface Module is powered through the control. See BACnet Interface Module Manual.

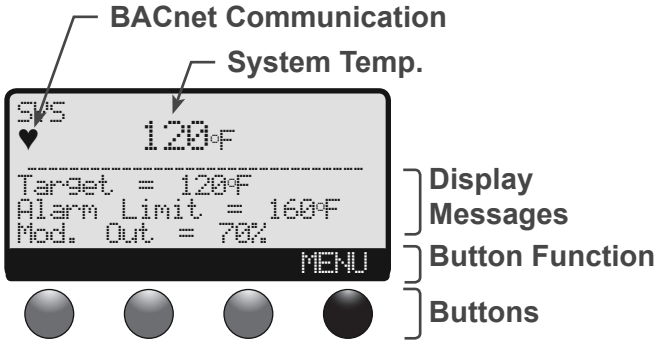



# DISPLAY AND BUTTONS

### Display

The ETV Plus display is bright and can be viewed in virtually any light condition.

- Each of the button functions is presented on the bottom of the display. This area may disappear if button activity stopped for 30 seconds in the ETV+TMC mode.
- The area above the button function displays operation messages. The default display shows the current Set Point, Alarm Limit, or the Modulation Output percentage. See "Display Messages" on page 13.
- The top area displays the system sensor temperature.
- The blinking heart indicates BACnet communication.

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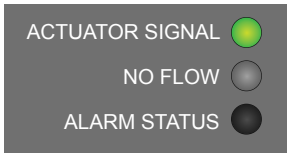
**Button Function Table**

Each of the button functions vary based on the current screen.

| BUTTON | Left | ▲ | ▼ | Right |
|---|---|---|---|---|
| **Default** | Has no function | Has no function | | **MENU** Enters the menu |
| **In Alarm** | **Alarm** Enters the Alarm Reset Menu | | | |
| **Alarm Reset** | **BACK** Goes back one menu step | | | **RESET** Ends current alarm |
| **Menu** | | Scrolls through the menu | | **SELECT** Selects the current menu item |
| **Setting** | | Changes the current setting value. | | **SAVE** Saves the current setting |
| **Configuration** | | | | **NEXT or EXIT** Jumps to next view or exits |

# LEDS

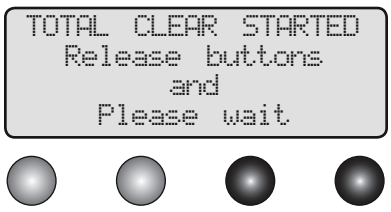
The ETV Plus has three LED lights.




- Actuator Signal: Indicates the change in the mixing valve opening. Hence, whenever the ETV Plus changes the valve opening, the LED will turn on for approximately one second. A steady lit LED means the ETV is sending the actuator a fully open signal.
- No Flow: When lit, it indicates that no flow exists.
- Alarm Status: When lit, it indicates if the control is in alarm mode. See "Alarm Messages" on page 13.

# SETTING THE CONTROL TO FACTORY DEFAULT

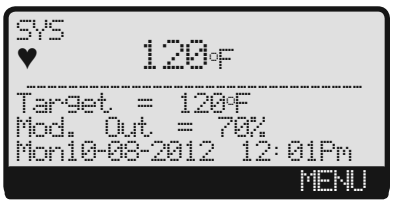
- The ETV Plus can be reset to its original factory default settings. This can be done by holding the two right-most buttons down while powering the control on.
- After resetting the control, the ETV Plus shall go to the Startup menu. See "System Startup Menu" on page 14.



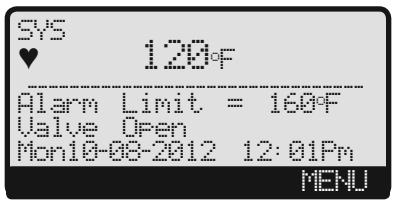

# DEFAULT DISPLAY

- Depending on the Control Type mode selected and the alarm condition, the default display may vary.

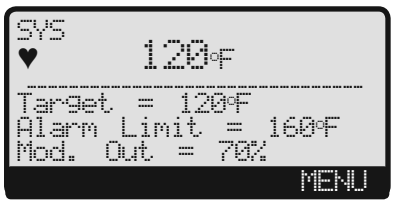
**ETV MODE**




**TMC MODE**




**ETV + TMC MODE**

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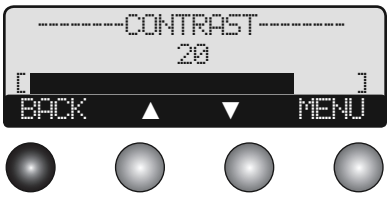
# DISPLAY CONTRAST

***(Available when no alarm is active)***
***Adjustable from 0 to 30*** ***Default: 20***
**LEFT BUTTON (Hold for 3 seconds):** /




- The ETV Plus display contrast is factory set to satisfy the majority of the users. In addition, the control offers contrast adjustment for enhanced viewing under all light conditions.
- To adjust the contrast, go to the default screen and hold down the left button for 3 seconds when no alarm is active.

# DISPLAY MESSAGES

The following is a list of messages the ETV Plus may display:

| | | |
|---|---|---|
| TMC | Alarm Limit = 160°F | The Alarm is set to be triggered when the System temperature exceeds this setting. See "Alarm Limit" on page 18. |
| TMC | Valve Open | The System temperature is below the Alarm Limit. The control opened the solenoid valve. |
| TMC | Valve Close! See Log | The System temperature exceeded the Alarm Limit. The control closed the solenoid valve. See a list of alarm logs by going to <Alarm Log> under the Maintenance Menu. See "Alarm Log" on page 21. When in the ETV+TMC mode, this message will alternate with the "Alarm Limit = 160°F" message. |
| ETV | No Flow! | The control is set to monitor the flow input and the control detects no flow on the input. See "Wiring the Flow/Prove" on page 10. |
| BACnet | ♥ | A blinking heart symbol represents active BACnet communication. |
| BACnet | Communication Lost! | The control is set to communicate over BACnet. No BACnet communication is detected. This message will alternate with the date and time message. |

# ALARM MESSAGES

The ETV Plus logs all alarm messages and the date and time of their occurrence. See "Alarm Log" on page 21. The following is a list of alarm messages the ETV Plus may store in the Alarm Log:

| Alarm Message | Alarm Triggered | Description |
|---|---|---|
| Communication Loss | No | The control is set to communicate over BACnet. However, no communication is active between the control and the BACnet Network. See BACnet Interface Module Manual. |
| EMS Input Failure | **Yes** (In TMC Mode Only) | The control is set to use a 4-20mA remote set point. However, the signal is out of the 4-20mA range. |
| SYS Sensor Failure | **Yes** (In TMC Mode Only) | The system sensor is reading either Short or Open. This situation triggers the Alarm output in any of the TMC modes. |
| SYS Temp Over Limit | **Yes** | The System Sensor reading is above the Alarm Limit setting. |

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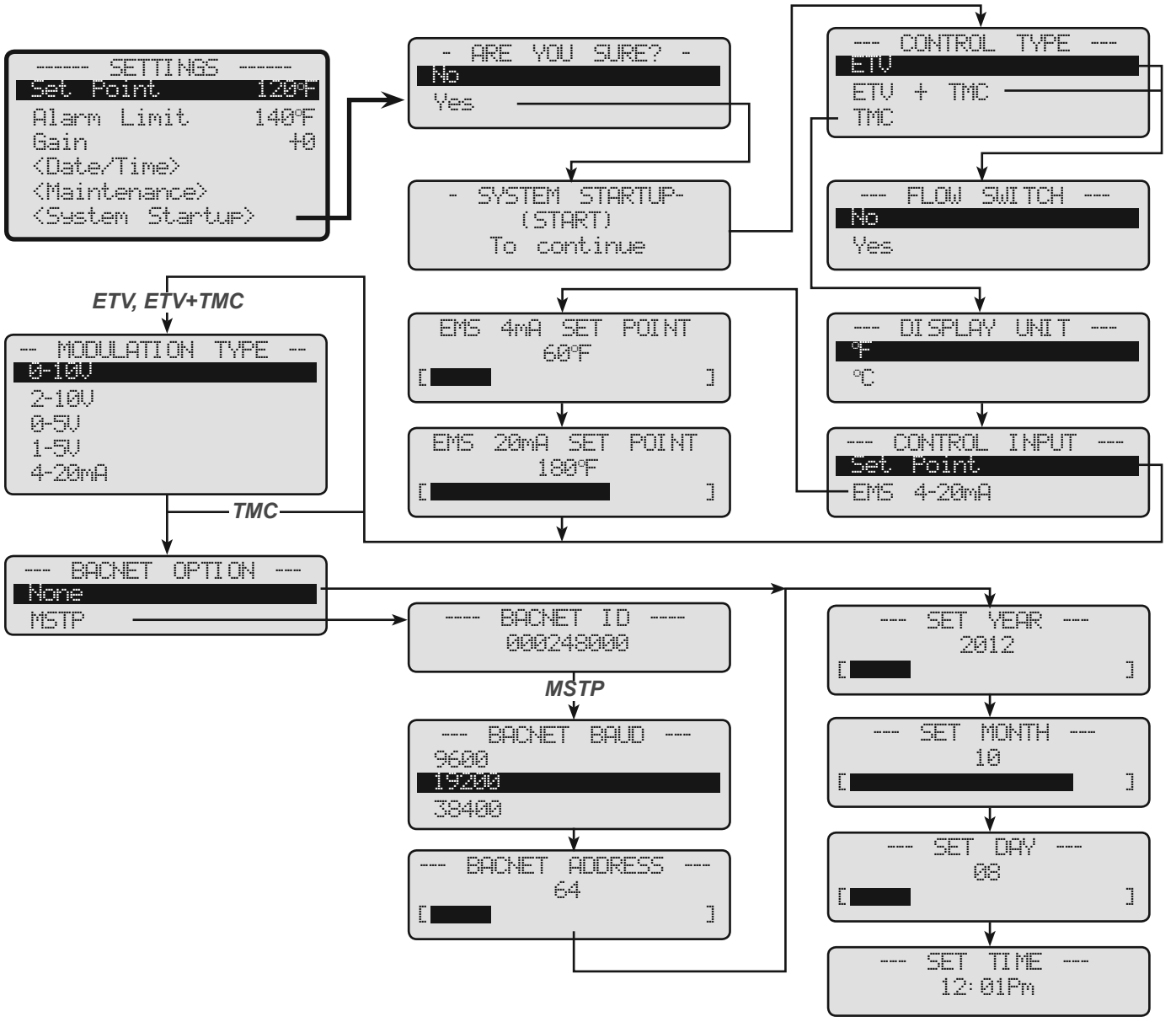
# SYSTEM STARTUP MENU




## SYSTEM STARTUP

**MENU:** */<System Startup>*

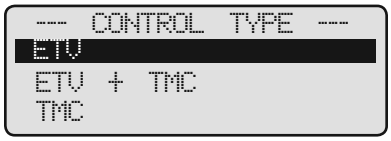
- The System Startup menus are used to match the control logic to the application. On the first control power up, the System Startup menu screens will appear after the control initialization is complete. If it doesn't, the ETV Plus has already been configured. To check the configuration or to make changes, follow the System Startup menu steps.

**⚠ WARNING**
The Startup settings must be set by a qualified installer.

### CONTROL TYPE

***ETV, ETV+TMC, or TMC*** ***Default: ETV***

**MENU:** */<System Startup>/ Control Type*

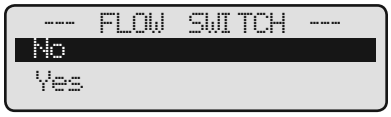



- The ETV mode controls the electronic mixing valve to regulate the water temperature. This mode can also accepts the Flow/Prove input to determine the mixing valve position during no flow periods.

- The TMC mode triggers an alarm and shuts the hot water supply to the system using a solenoid valve when experiencing excessive mixed temperature. This mode does not accept the Flow/Prove input.
- The ETV + TMC mode controls the electronic mixing valve to regulate the water temperature and the solenoid valve and alarm to manage the hot-water inlet. This mode also accepts the Flow/Prove input to determine the mixing valve position during no flow periods. See "Wiring the Flow/Prove" on page 10. Also, see "Flow Switch" below.

## FLOW SWITCH

***(Available in ETV or ETV+TMC Control Types Only)***
***No or Yes*** ***Default: No***
**MENU:** */<System Startup>/ Control Type/ Flow Switch*




- All mixing valves require constant flow for accurate temperature control. Both ETV modes can accept a dry-contact Flow/Prove input through terminals 25 and 26. See "Wiring the Flow/Prove" on page 10.
- When Yes is selected and no flow is detected, the control will stop modulating the mixing valve and will maintain its final modulation signal.

## DISPLAY UNIT

***°F or °C*** ***Default: °F***
**MENU:** */<System Startup>/ Control Type/ Flow Switch/Display Unit*


- This option changes the sensors' display and all temperature settings standard between Fahrenheit and Celsius.

## CONTROL INPUT

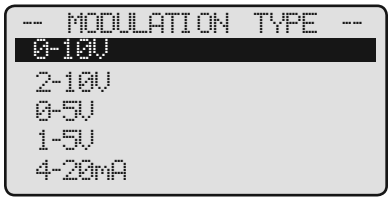
***Set Point or EMS 4-20mA*** ***Default: Set Point***
***4mA range (from 60°F/16°C to 200°F/93°C)*** ***Default: 60°F/16°C***
***20mA range (from 60°F/16°C to 200°F/93°C)*** ***Default: 180°F/82°C***
**MENU:** */<System Startup>/ Control Type/ Flow Switch/Display Unit/Control Input*




- The ETV Plus can maintain a Set Point temperature either by selecting the temperature or by receiving a remote set point temperature as a 4-20mA signal. See "Wiring the 4-20mA Remote Set Point" on page 11.
- If EMS 4-20mA option was selected, the user must set the temperature range using the 4mA and 20mA settings.
- If the Control Type is set to ETV or ETV+TMC options, the EMS 4-20mA will always apply to the ETV Set Point. However, if the Control Type is set to TMC, the EMS 4-20mA will apply to the Alarm Limit.
- Any signal below 2.4mA or above 21.6mA will close the motorized mixing valve in any of the ETV modes. In the TMC mode, it will close the solenoid valve and trigger the alarm. The display will show the message "EMS Open" or "EMS Short." to indicate this status.

## MODULATION TYPE

***(Available in ETV or ETV+TMC Control Types Only)***
**0-10V, 2-10V, 0-5V, 1-5V, 4-20mA** **Default: 0-10V**
**MENU:** */<System Startup>/ Control Type/ .../Control Input/Modulation Type*




- The ETV is capable of operating a variety of electronic mixing valves. Heat-Timer factory-supplied actuators are set to 0-10V signal.
- The modulation signal selected must match actuator modulation signal.

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# BACNET MSTP COMMUNICATION

- To view and change the ETV Plus control settings over BACnet MSTP, a BACnet Interface Module is required and must be ordered separately (HT# 926781-00). See "Wiring to BACnet" on page 11.

## BACNET OPTION

***None, MSTP*** ***Default: None***

**MENU:** */<System Startup>/ Control Type/ .../Control Input/Modulation Type/BACnet Option*


- This option activates the BACnet communication capability.
- If no BACnet communication was detected, the situation will be added to the Alarm Log. See "Alarm Log" on page 21.

## BACNET ID

***(Available Only when MSTP is selected)***

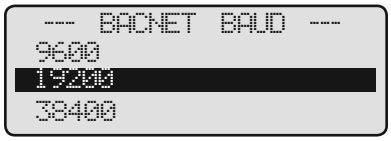
**MENU:** */<System Startup>/ Control Type/ .../Modulation Type/BACnet Option/BACnet ID*


- The BACnet ID is a unique 32 bit number that identifies the control within the BACnet network. No two IDs shall be the same even when dealing across networks. The ID must be provided by the BACnet Administrator.

## BACNET BAUD

***9600, 19200, 38400*** ***Default: 19200***

**MENU:** */<System Startup>/ Control Type/ .../BACnet Option/BACnet ID/BACnet Baud*




- For the control to communicate over a BACnet MSTP network, it must use the same Baud rate as the rest of the network. See "Troubleshooting" on page 22.

## BACNET ADDRESS

***From 1 to 127*** ***Default: 64***

**MENU:** */<System Startup>/ Control Type/ .../BACnet ID/BACnet Baud/ BACnet Address*


- This address must be unique for each device on the same MSTP network.

## BACNET VARIABLE LIST

| Object ID | Name | Description | Type♦ | UOM | Range / States / Special Values | Read Only |
|---|---|---|---|---|---|---|
| Device | MODEL | Model | Device | | | X |
| Device | SNUMBER | Serial Number | | | | |
| Device | VERSION | Version | | | | |
| 100 | OPMODE | Control Type | MV | | 1 = ETV, 2= ETV+TMC, 3= TMC | |
| 200 | SYSTEMP | System Temperature | AV | °F or °C | Temperature, 32000=OPEN, 32001=SHORT | X |
| 300 | SETPNT | Set Point | | | 60 to 180, 32004= OFF | |
| 400 | ALMTEMP | Alarm Temperature | | | 60 to 200, 32004= OFF | |
| 500 | GAIN | Gain | MV | | 1=-10, 2=-9, 3=-8, 4=-7, 5=-6, 6=-5, 7=-4, 8=-3, 9=-2, 10=-1, 11=0, 12=1, 13=2, 14=3, 15=4, 16=5, 17=6, 18=7, 19=8, 20=9, 21=10 | |
| 600 | ALARM | Alarm Relay | BV | | 0 = De-Energized, 1 = Energized | X |
| 700 | FLOWSTAT | Flow Status | | | 0 = No Flow , 1 = Flow | X |
| 800 | VALRLY | Solenoid Valve Relay State | | | 0 = De-Energized, 1 = Energized | X |
| 900 | MOD | Modulation Output | | % | from 0 to 100 | X |
| 1000 | ALRMESS | Alarm Messages | MV | | 0 = Normal, 1= Sensor Fail, 2=EMS Fail, 3 = Over Limit | X |

♦ AV=Analog-Value, BV= Binary-Value, MV=MultiState-Value. Only required BACnet object properties are supported.

# BACNET PICS STATEMENT

| Product | Model Number | Protocol Revision | Software Version | Firmware Version |
|---|---|---|---|---|
| ETV Plus BACnet Control | ETV Plus | 1.5 | 2.xx | |
| **Vendor** | **Vendor ID** | **Address and Phone** | | |
| Heat-Timer Corporation | 248 | 20 New Dutch Ln.Fairfield, NJ 07004 - (973)575-4004 | | |
| **Product Description** | | | | |
| Electronic Tempering Valve Control | | | | |

## BACnet Standardized Device Profile (Annex L)

| Product | Device Profile |
|---|---|
| ETV Plus BACnet Control | BACnet Application Specific Controller (B-ASC) |

## Supported BIBBs (Annex K)

| Supported BIBBs | BIBB Name |
|---|---|
| DS-RP-B | Data Sharing-ReadProperty-B |
| DS-WP-B | Data Sharing-WriteProperty-B |
| DM-DDB-B | Device Management-Dynamic Device Binding-B |
| DM-DOB-B | Device Management-Dynamic Object Binding-B |
| DM-DCC-B | Device Management-DeviceCommunicationControl-B |

## Standard Object Types Supported

| Object Type | Creatable | Deletable |
|---|---|---|
| Analog Value | No | No |
| Binary Value | No | No |
| Multi-State Value | No | No |
| Device | No | No |

## Data Link Layer Options (Annex J)

| Product | Data Link | Options |
|---|---|---|
| ETV Plus BACnet Control | BACnet/IP | |

## Segmentation Capability

| Segmentation Type | Supported | Window Size (MS/TP product limited to 1) |
|---|---|---|
| Able to transmit segmented messages | No | |
| Able to receive segmented messages | No | |

## Device Address Binding

| Product | Static Binding Supported |
|---|---|
| ETV Plus BACnet Control | No |

## Character Sets

| Product | Character Sets supported |
|---|---|
| ETV Plus BACnet Control | ANSI X3.4 |

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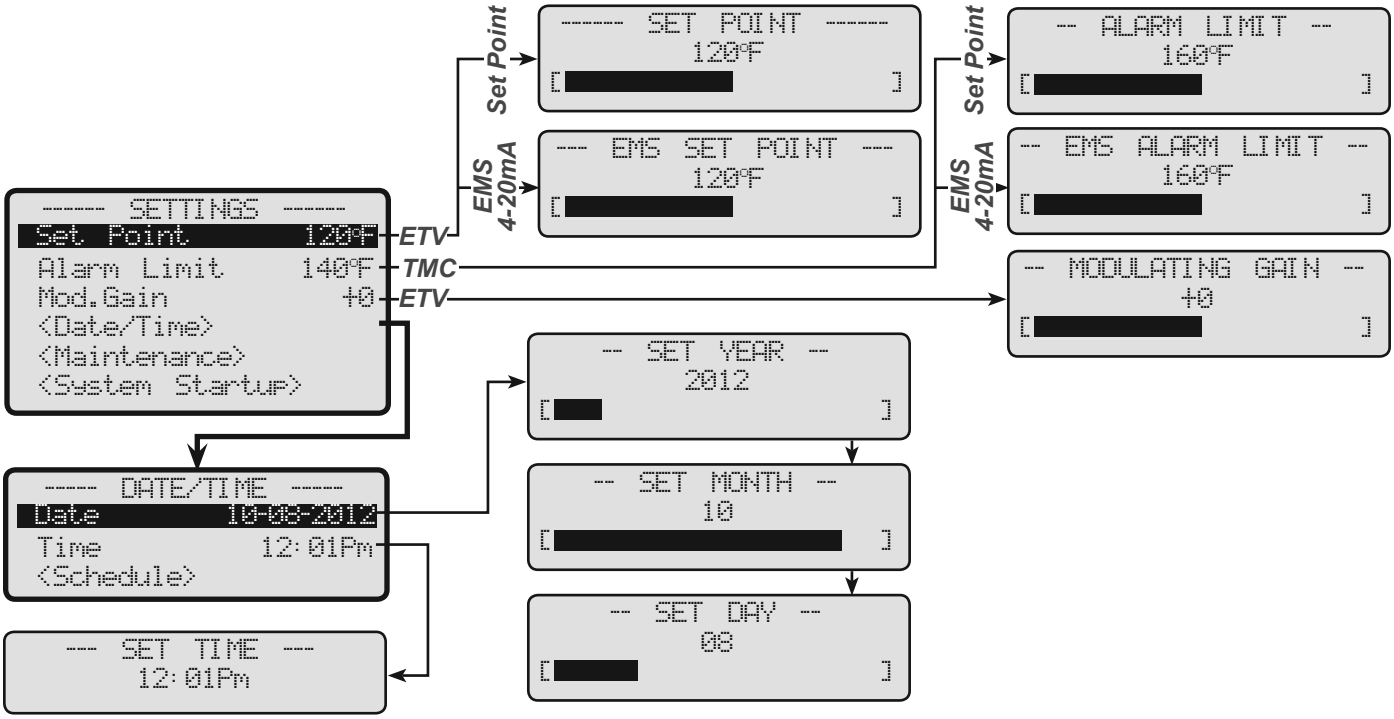
# SETTINGS MENU




## SYSTEM SETTINGS

- System Settings menus adjust and fine-tune the system to match the application specific characteristics.

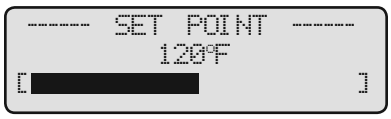
### SET POINT

***(Available in ETV or ETV+TMC Control Types Only)***

***Adjustable from 60ºF/16ºC to 180ºF/82ºC*** ***Default: 120ºF/49ºC***

**MENU:** */Set Point* *in Set Point Control Input*

**MENU:** */EMS Set Point* *in EMS 4-20mA Control Input*




- The Set Point is the mixed valve outlet temperature the ETV will hold during normal operation. The temperature may fluctuate slightly around the Set Point. The amount of fluctuation is controlled by the Gain setting.
- If the Control Input was set to EMS 4-20mA, the set point will be available as read only and can only be changed remotely using the 4-20mA input signal. See "Control Input" on page 15.

Read Only


### ALARM LIMIT

***(Available in TMC or ETV+TMC Control Types Only)***

***Adjustable from 60ºF/16ºC to 200ºF/93ºC*** ***Default: 160ºF/71ºC***

**MENU:** */Alarm Limit* *in Set Point Control Input*

**MENU:** */EMS Alarm Limit* *in EMS 4-20mA Control Input*


- The Alarm Limit is the mixed valve outlet temperature above which the ETV Plus will close the solenoid valve and trigger an alarm. This action prevents the mixed outlet from reaching excessive temperatures. See "Alarm Messages" on page 13. In addition, it will log the event in the Alarm Log. See "Alarm Log" on page 21.

Read Only

- If the Control Input was set to EMS 4-20mA, the Alarm Limit can only be changed remotely using the 4-20mA input signal. It will be available as read only through the control. See "Control Input" on page 15.
- An Alarm Delay can be adjusted to eliminate false alarms. See "Alarm Delay" on page 21.

### MODULATING GAIN

***(Available in ETV or ETV+TMC Control Types Only)***

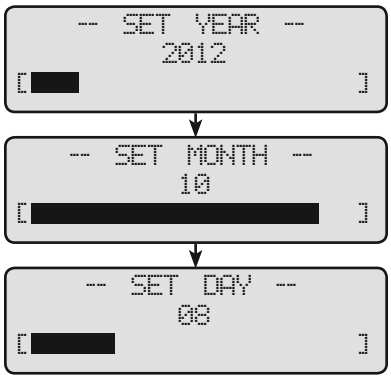
***Adjustable from -10 to +10*** ***Default: +0***

**MENU:** */Gain*


- The Gain adjusts the PID aggressiveness of the control. The higher the Gain, the more aggressive the ETV Plus adjusts the mixing valve based on changes in water temperature.
- If the water temperature tends to oscillate quickly, reduce the Gain. If the water temperature tends to stay consistently below or above the Set Point, increase the Gain.
- Start with a Gain of 0. Before making any additional Gain changes, always wait at the least ten minutes after adjusting the Gain to determine its affect on the system.

### YEAR, MONTH, AND DAY SETTING

**MENU:** */<Date-Time>/Date or Time*




- The date and time are used to regulate the Schedule.
- The control battery is used to maintain the date and time during power outage periods. See "Activate the Battery" on page 7.

## ALARM MENU

- Alarms are only triggered when the control is set to any of the TMC modes. See "Control Type" on page 14.
- Under specific conditions, the control triggers the alarm and logs the event in the Alarm Log menu. See "Display Messages" on page 13.


### ALARM RESET

***(Available in TMC or ETV+TMC Control Types Only)***

**ALARM:** */*


- The Alarm outputs energize whenever the System Temperature rises above the Alarm Limit for the Alarm Delay period.
- To reset the alarm, the conditions causing the alarm must be corrected first. Then, the Alarm can be reset using the Alarm reset menu.
- If the alarm was reset before the conditions are corrected, the alarm output will immediately be re-activated.

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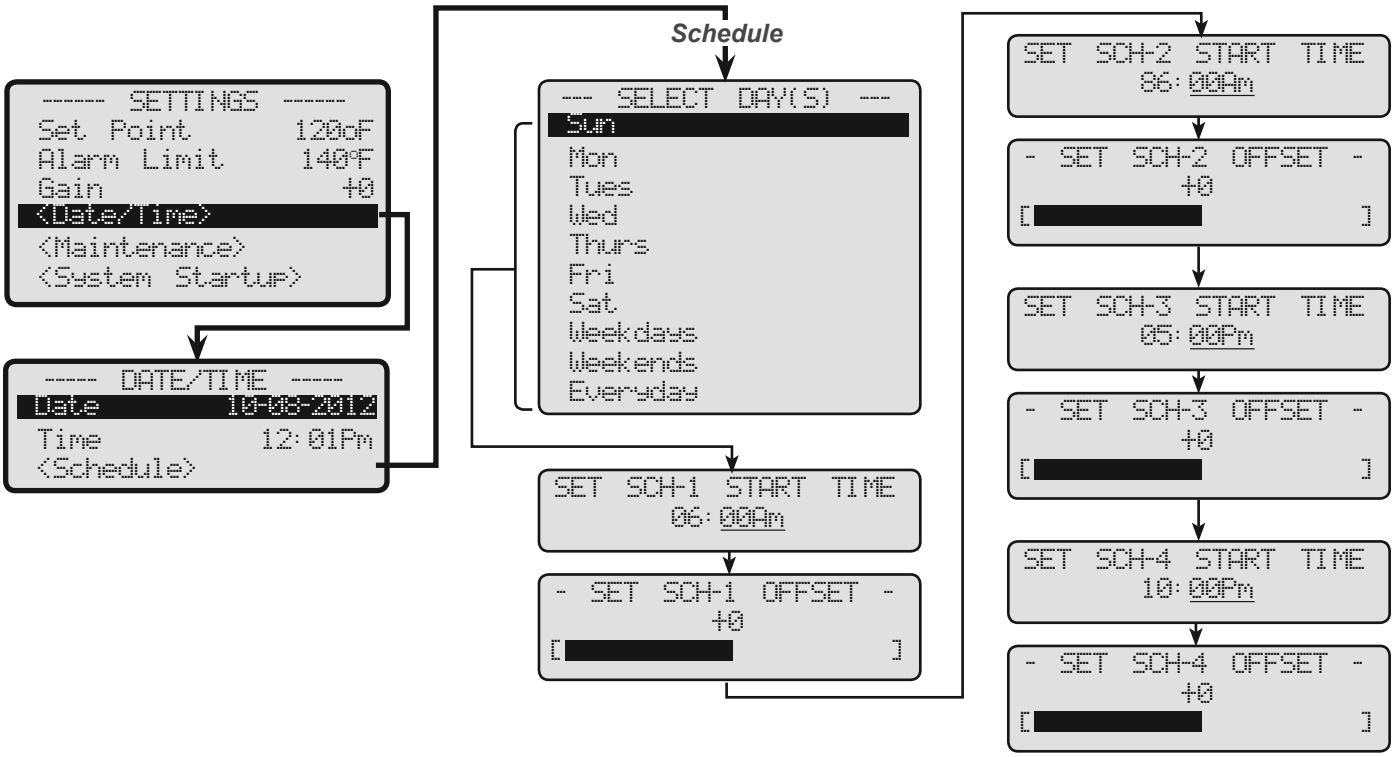
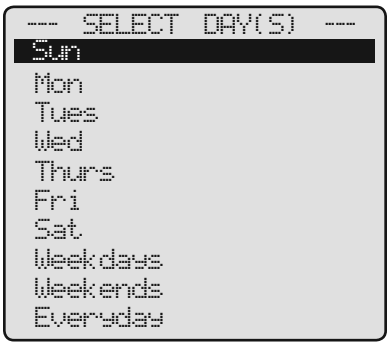
# SCHEDULE MENU




## SCHEDULE SETTINGS

***(Available in ETV or ETV+TMC Control Types Only)***

- The Schedule has 4 offset periods per day. Each period can have its start time and temperature offset. These offset periods are used to adjust the mixed target during low or high load conditions.




## SELECT DAYS

***Weekdays, Weekends, Everyday, or specific days***

**MENU:** */<Date-Time>/<Schedule>/Select Days*

- In this menu, select the days or groups of days (Weekdays, Weekends, Everyday) to apply the offset schedule to.

## SET SCHEDULE START TIME

**MENU:** */<Date-Time>/<Schedule>/Select Days/Set Sch-1 Start Time*


- Each day has 4 Schedule Start Times to be set. Each of the start time has its Offset setting.

## SET SCHEDULE OFFSET

***Adjustable from -50F°/-28C° to +50F°/+28C°*** ***Default: 0F°/0C°***

**MENU:** */<Date-Time>/<Schedule>/Select Days/Set Sch-1 Start Time/Set Sch-1 Offset*


- The Offset value is added or subtracted from the Set Point.
- All the Offsets for each day of the week must be set to guarantee that the default Offset of 0 is replaced.

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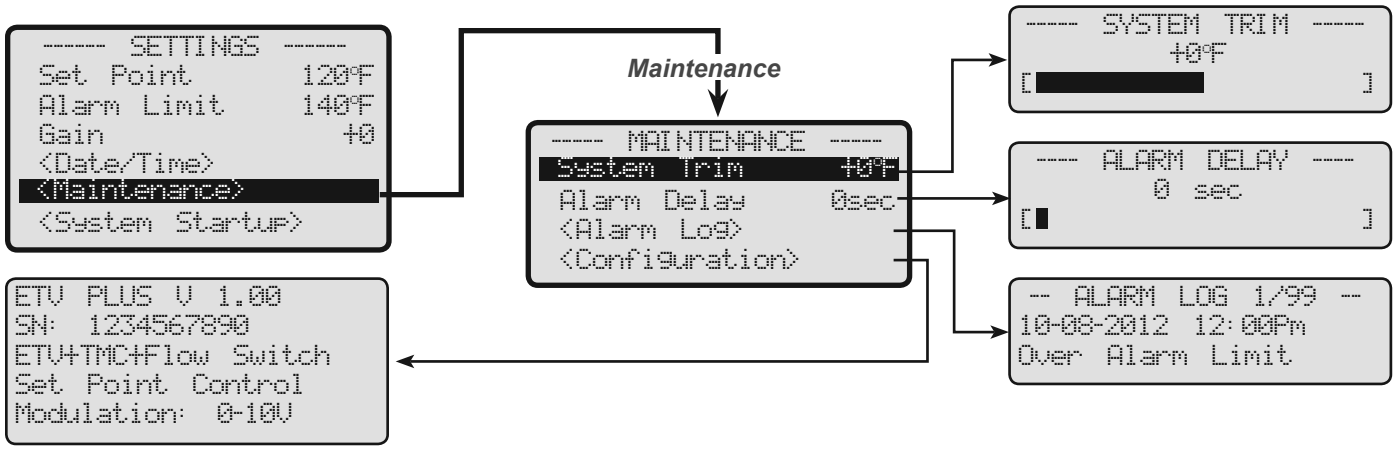
# MAINTENANCE MENU



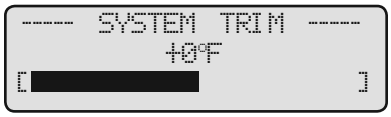

## MAINTENANCE SETTINGS

- The Maintenance menu is used to modify critical system behavior and view previous alarm conditions. It should only be used by system installers.

## SYSTEM TRIM

***Adjustable from -20F°/-11C° to 20F°/11C°*** ***Default: 0F°/0C°***

**MENU:** */<Maintenance>/System Trim*



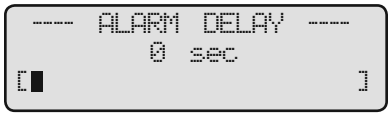

- The Heat-Timer temperature sensors are very accurate, and normally require no calibration. However, sometimes it may be desirable to make small adjustments to the displayed value.

## ALARM DELAY

***(Available in TMC or ETV+TMC Control Types Only)***

***Adjustable from 0 to 60 seconds*** ***Default: 0 seconds***

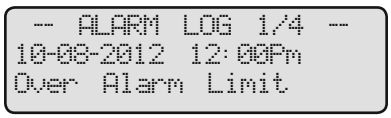
**MENU:** */<Maintenance>/Alarm Delay*




- The delay stops the alarm from being triggered and the solenoid valve from closing unless the alarming situation is maintained for the full delay period. This helps eliminate false alarm situations that normally may only last for a few seconds.

## ALARM LOG

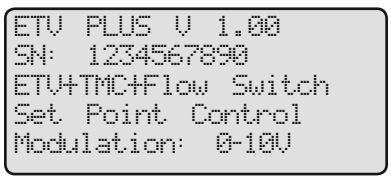
**MENU:** */<Maintenance>/<Alarm Log>*




- The control keeps a log of the last 99 alarms and their date and time.
- Use the two middle buttons to scroll through the alarm list.
- For a list of possible Alarms in the Alarm Log see "Alarm Messages" on page 13.

## CONFIGURATION

**MENU:** */<Maintenance>/<Configuration>*




- This menu display the controls software version, serial number, startup settings, and communication settings.
- To view additional information press the Next button

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# TROUBLESHOOTING

### No Display, or Distorted Display

- Check the power to the ETV. The ETV requires 120 VAC power to terminal 1 and 2 and Earth ground wiring to terminal 3. Turn the power off and back on.

### SENSOR INPUTS

### Display shows Sensor OPEN or SHORT

- If the sensor reads Open, short the sensor input terminals. The display should read Short. If it does, then the problem is with the sensor wiring. If it doesn't, then the control may be damaged.
- If the sensor reads Short, remove the wires from the input terminals. The display should read Open. If it does, then the problem is with the sensor wiring. If it doesn't, the control may be damaged.

### System Reads an Incorrect Temperature

- Remove the wires from the input terminals. The display should change to read Open. If it doesn't, the ETV Plus may be damaged.
- Otherwise, take an ohm reading across the detached sensor wires. The reading should correspond to the Temperature Sensor Chart. If the difference is within 5°F adjust the System Trim. See "System Trim" on page 21. Otherwise, the sensor may be damaged.

**Temperature Sensor Chart**

| TEMPERATURE | | Value (in Ohms) |
|---|---|---|
| °F | °C | |
| OPEN | | 150000 |
| -30 | -34 | 117720 |
| -20 | -29 | 82823 |
| -10 | -23 | 59076 |
| 0 | -18 | 42683 |
| 10 | -12 | 31215 |
| 20 | -7 | 23089 |
| 25 | -4 | 19939 |

| TEMPERATURE | | Value (in Ohms) |
|---|---|---|
| °F | °C | |
| 30 | -1 | 17264 |
| 35 | 2 | 14985 |
| 40 | 4 | 13040 |
| 45 | 7 | 11374 |
| 50 | 10 | 9944 |
| 55 | 13 | 8714 |
| 60 | 16 | 7653 |
| 70 | 21 | 5941 |
| 80 | 27 | 4649 |

| TEMPERATURE | | Value (in Ohms) |
|---|---|---|
| °F | °C | |
| 90 | 32 | 3667 |
| 100 | 38 | 2914 |
| 110 | 43 | 2332 |
| 120 | 49 | 1879 |
| 130 | 54 | 1524 |
| 140 | 60 | 1243 |
| 150 | 66 | 1021 |
| 160 | 71 | 842 |
| 170 | 77 | 699 |

| TEMPERATURE | | Value (in Ohms) |
|---|---|---|
| °F | °C | |
| 180 | 82 | 583 |
| 190 | 88 | 489 |
| 200 | 93 | 412 |
| 210 | 99 | 349 |
| 220 | 104 | 297 |
| 230 | 110 | 253 |
| 240 | 116 | 217 |
| 250 | 121 | 187 |
| SHORT | | 100 |

### No Hot Water

- If Flow Switch was set to Yes and the flow input was open, the mixing valve may be marginally closed. See "Flow Switch" on page 15.

### ETV Does Not Move the Floating Motorized Valve

- First check the valve wiring - Make sure that the wiring to the actuator power terminals has between 20 to 24 VAC. If the voltage is higher or lower, the actuator may stop moving or get damaged.
- Valve Modulating Signal - Make sure that the ETV Modulating Signal is set to 0-10V to match the actuator's signal. Use a DC voltmeter to read the modulation signal on terminals 13 and 15. If the Modulation Output % was at 40%, then the signal should read 4VDC. If it did not, the ETV control is damaged. See "Default Display" on page 12.

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### Outlet Temperature Fluctuates

- **Check the Circulating Loop Piping -** The ETV Plus requires the use of a circulating loop with a constantly running pump. The loop temperature must be at least 7°F lower than the set point. If the loop is insulated, its temperature may not be much lower than the set point during low usage periods. This will cause the mixed temperature oscillation on the starting of demand. To reduce the oscillation, install an aquastat on the circulating loop to operate the circulating pump. Set the aquastat to more than 10°F below the ETV Plus set point less than the largest offset. That is, if the Set Point = 130°F and the largest Offset = 20°F, then set the circulating pump aquastat to a maximum of 100°F (130°F - 20°F -10°F). See "Circulating Loop" on page 4.

### No Alarm Output

- The control outputs do not source power to the alarms. An external power source must be used. See "Wiring the Alarm" on page 10.

### No Communication

- **Check the Baud Rate -** BACnet MSTP communication relies on having a single baud rate for all the devices on the same MSTP network. Check that the control baud rate matches the rest of the network.
- **Check BACnet Interface Module LED -** See the troubleshooting section of the BACnet Interface Module Manual.

## WARRANTY

WARRANTIES AND LIMITATIONS OF LIABILITY AND DAMAGE: Heat-Timer Corporation warrants that it will replace, or at its option, repair any Heat-Timer Corporation manufactured product or part thereof which is found to be defective in material workmanship within one year from the date of installation only if the warranty registration has been properly filled out and returned within 30 days of the date of installation. Damages to the product or part thereof due to misuse, abuse, improper installation by others or caused by power failure, power surges, fire, flood or lightning are not covered by this warranty. Any service, repairs, modifications or alterations to the product not expressly authorized by Heat-Timer Corporation will invalidate the warranty. Batteries are not included in this warranty. This warranty applies only to the original user and is not assignable or transferable. Heat-Timer Corporation shall not be responsible for any maladjustments of any control installed by Heat-Timer Corporation. It is the users responsibility to adjust the settings of the control to provide the proper amount of heat or cooling required in the premises and for proper operation of the heating or cooling system. Heat-Timer Corporation shall not be required to make any changes to any building systems, including but not limited to the heating system, boilers or electrical power system, that is required for proper operation of any controls or other equipment installed by Heat-Timer Corporation or any contractor. Third Party products and services are not covered by this Heat-Timer Corporation warranty and Heat-Timer Corporation makes no representations or warranties on behalf of such third parties. Any warranty on such products or services is from the supplier, manufacturer, or licensor of the product or service. See separate Terms and Conditions of Internet Control Management System (“ICMS”) services, including warranties and limitations of liability and damages, for ICMS services.

THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED AND HEAT-TIMER CORPORATION SPECIFICALLY DISCLAIMS ANY AND ALL WARRANTIES OF MERCHANTABILITY FOR A PARTICULAR PURPOSE. UNDER NO CIRCUMSTANCES SHALL HEAT-TIMER CORPORATION, ITS AUTHORIZED REPRESENTATIVES, AFFILIATED OR SUBSIDIARY COMPANIES BE LIABLE FOR SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES, EXCEPT AS SPECIFICALLY STATED IN THESE TERMS AND CONDITIONS OF SALE. THE SOLE REMEDY WITH RESPECT TO ANY PRODUCT OR PART SOLD OR INSTALLED BY HEAT-TIMER CORPORATION SHALL BE LIMITED TO THE RIGHT TO REPLACEMENT OR REPAIR F.O.B. FAIRFIELD, NJ. HEAT-TIMER CORPORATION SHALL NOT BE LIABLE OR RESPONSIBLE FOR LOSS OR DAMAGE OF ANY KIND RESULTING FROM DELAY OR INABILITY TO DELIVER FOR ANY REASON, INCLUDING BUT NOT LIMITED TO FIRE, FLOOD, LIGHTNING, POWER FAILURE OR SURGES, UNAVAILABILITY OF PARTS, STRIKES OR LABOR DISPUTES, ACCIDENTS AND ACTS OF CIVIL OR MILITARY AUTHORITIES.

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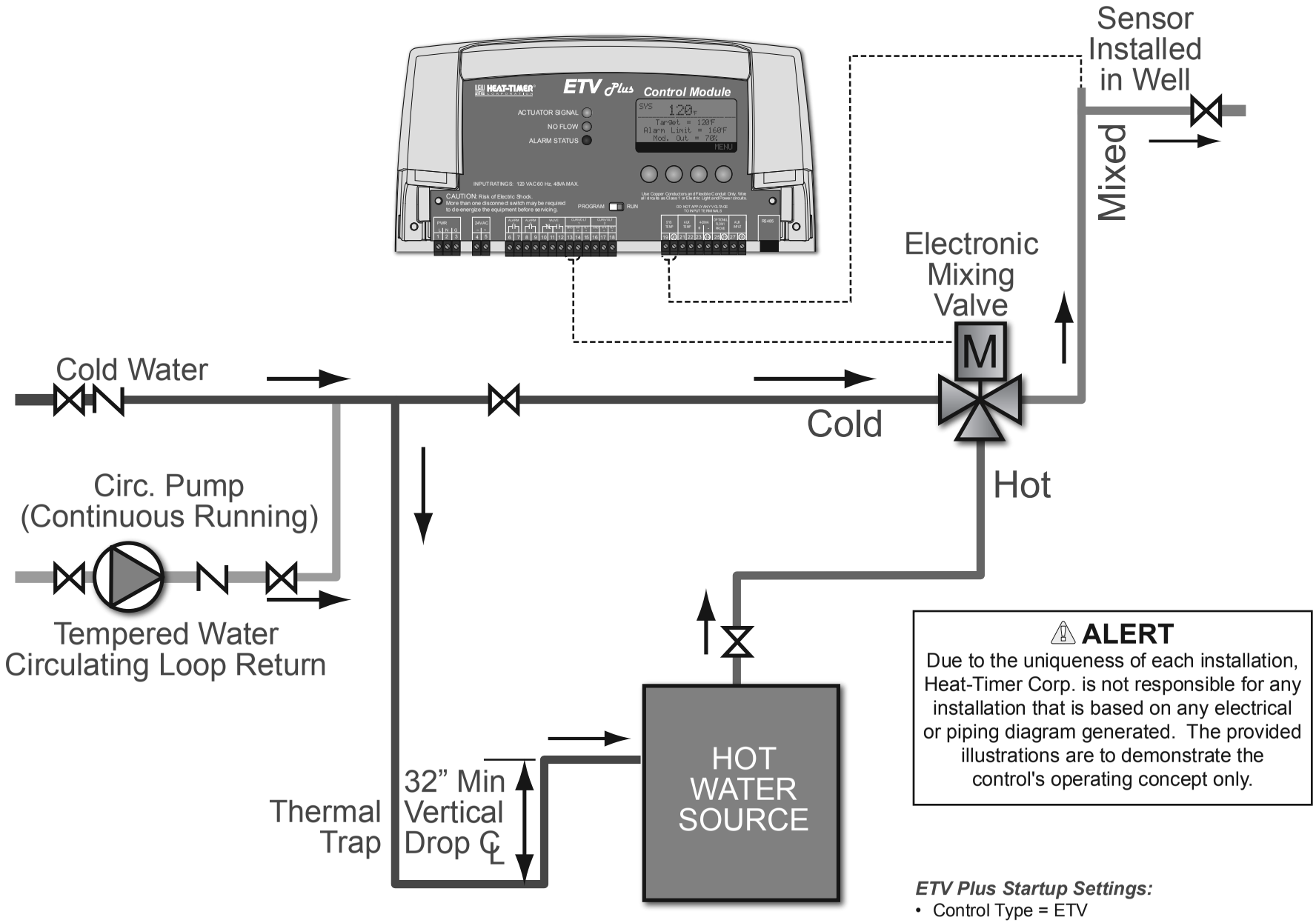
# PIPING DIAGRAMS

## PIPING ETV PLUS USING ONE MIXING VALVE




**⚠ ALERT**

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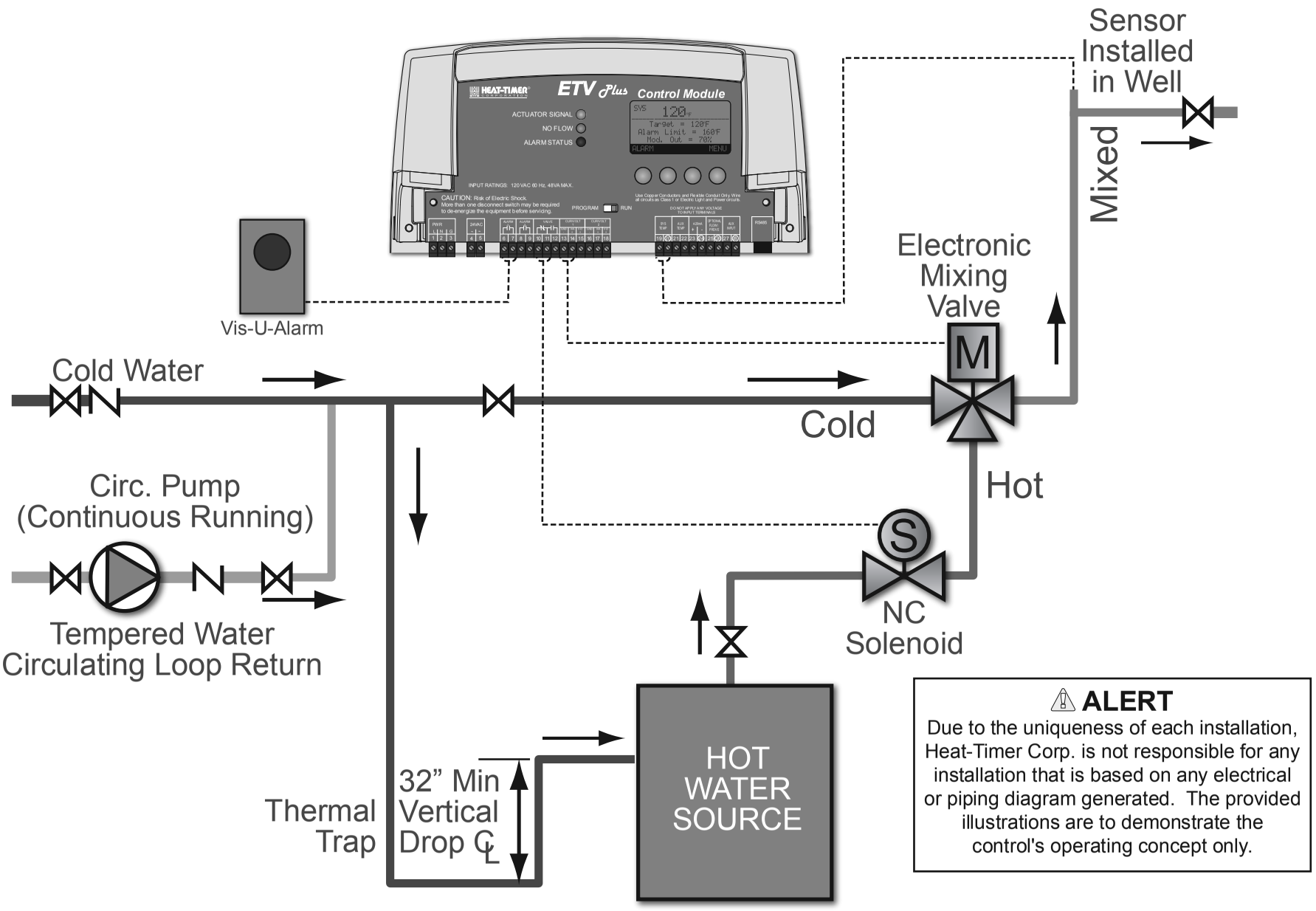
***ETV Plus Startup Settings:***

- Control Type = ETV

# PIPING ETV PLUS USING ONE MIXING VALVE AND A SOLENOID VALVE

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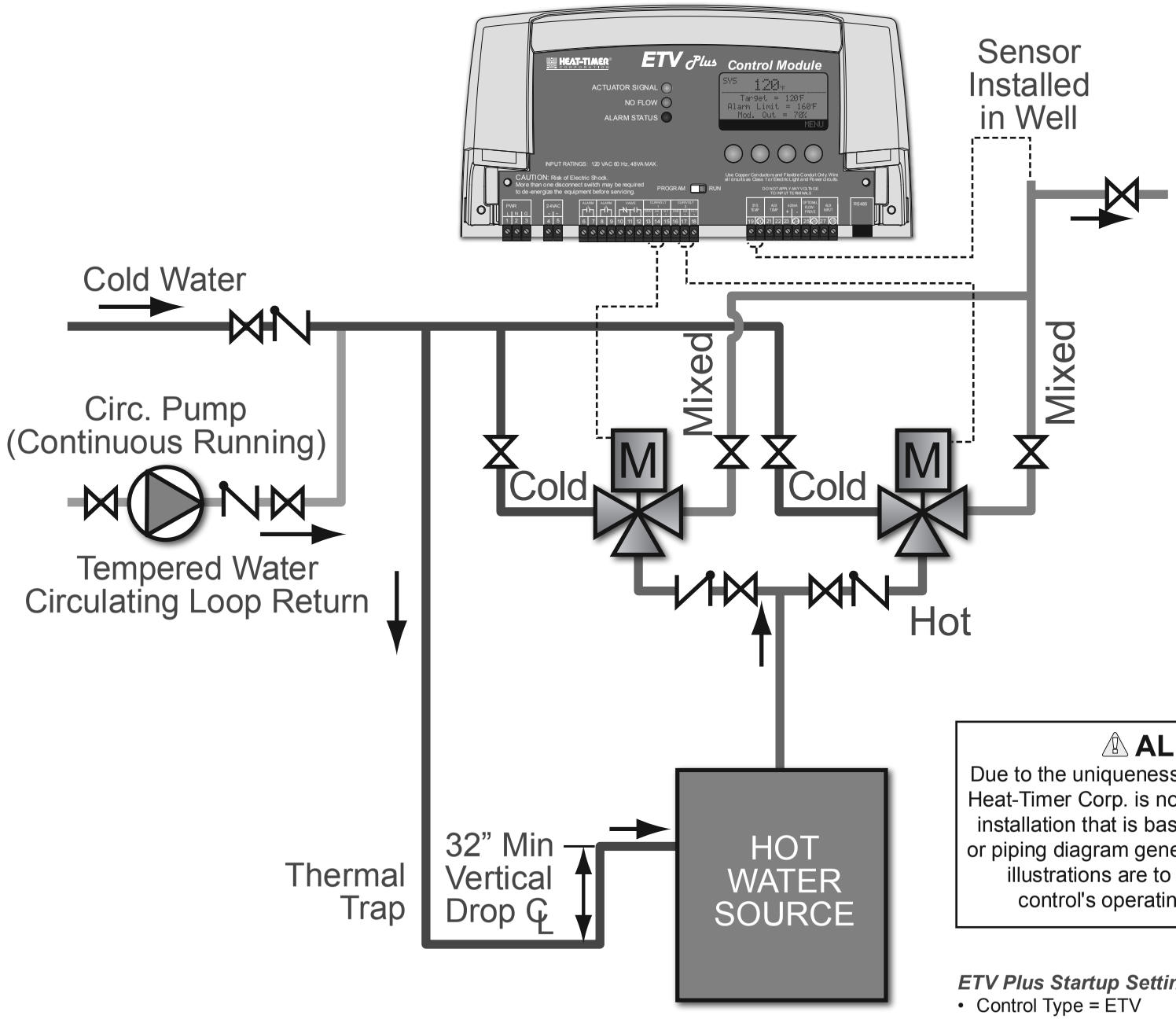
***ETV Plus Startup Settings:***

- Control Type = ETV + TMC

# PIPING ETV PLUS USING TWO MIXING VALVES

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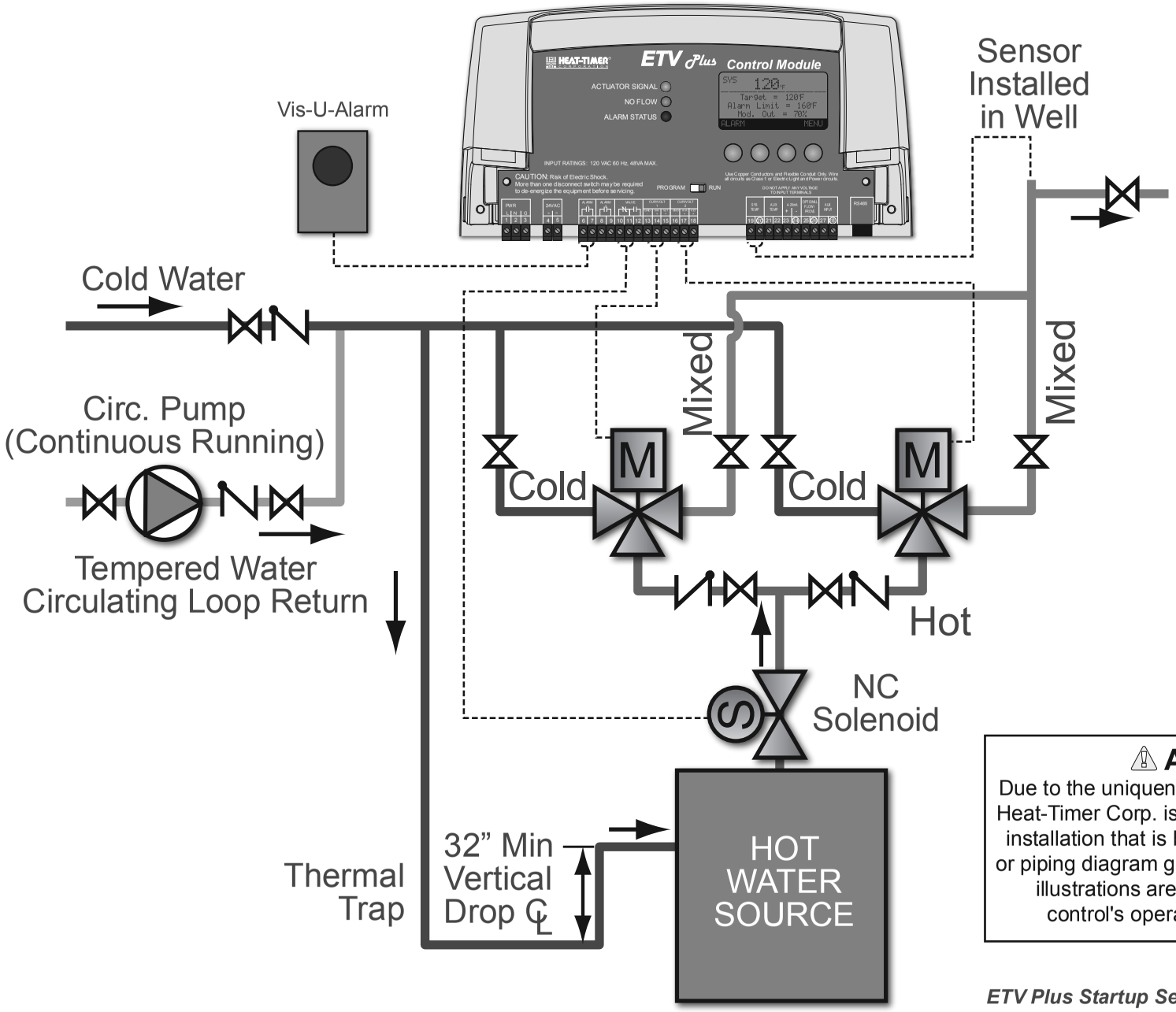
***ETV Plus Startup Settings:***

- Control Type = ETV

# PIPING ETV PLUS USING TWO MIXING VALVES AND A SOLENOID VALVE

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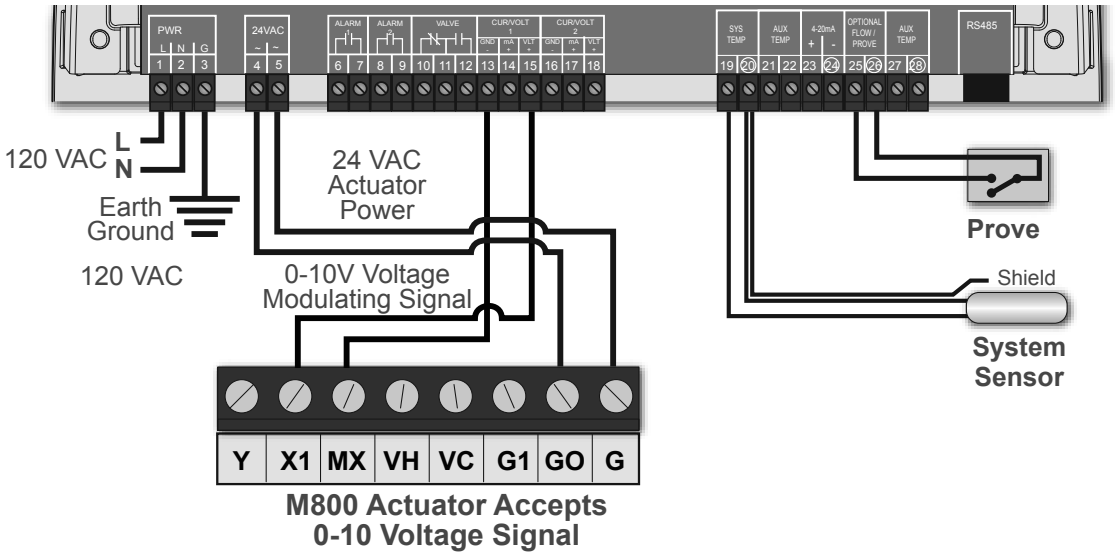
***ETV Plus Startup Settings:***

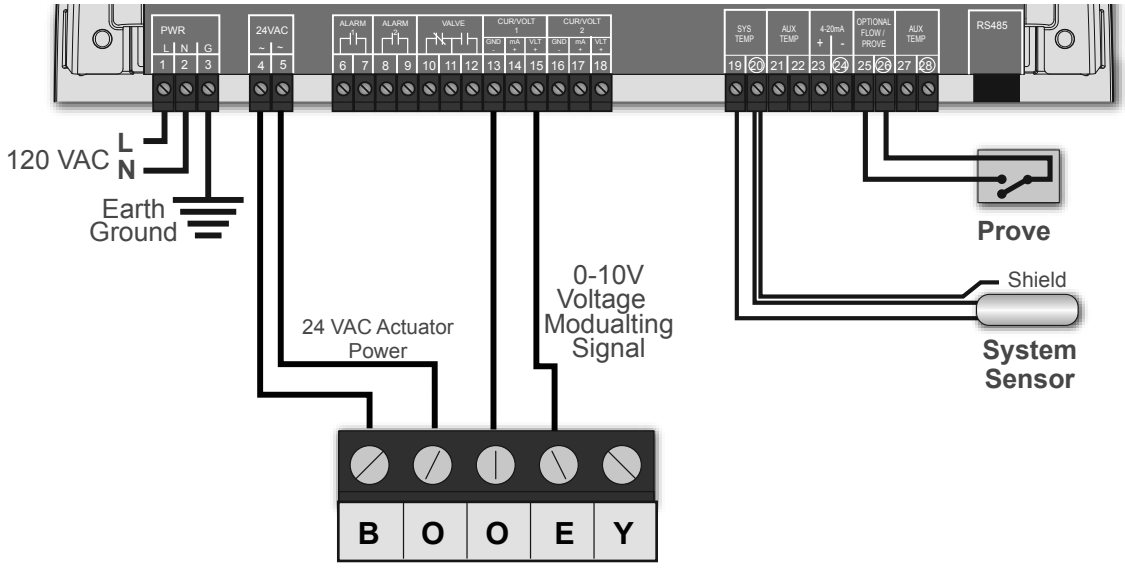
- Control Type = ETV + TMC

# WIRING DIAGRAMS

## WIRING ETV PLUS USING ONE MIXING VALVE




**M800 Actuator Accepts 0-10 Voltage Signal**




**TR1000 Actuator Accepts 0-10 Voltage Signal**

***ETV Plus Startup Settings:***

- Control Type = ETV
- Flow Switch = Yes
- Control Input = Set Point
- Modulation Type = 0-10V

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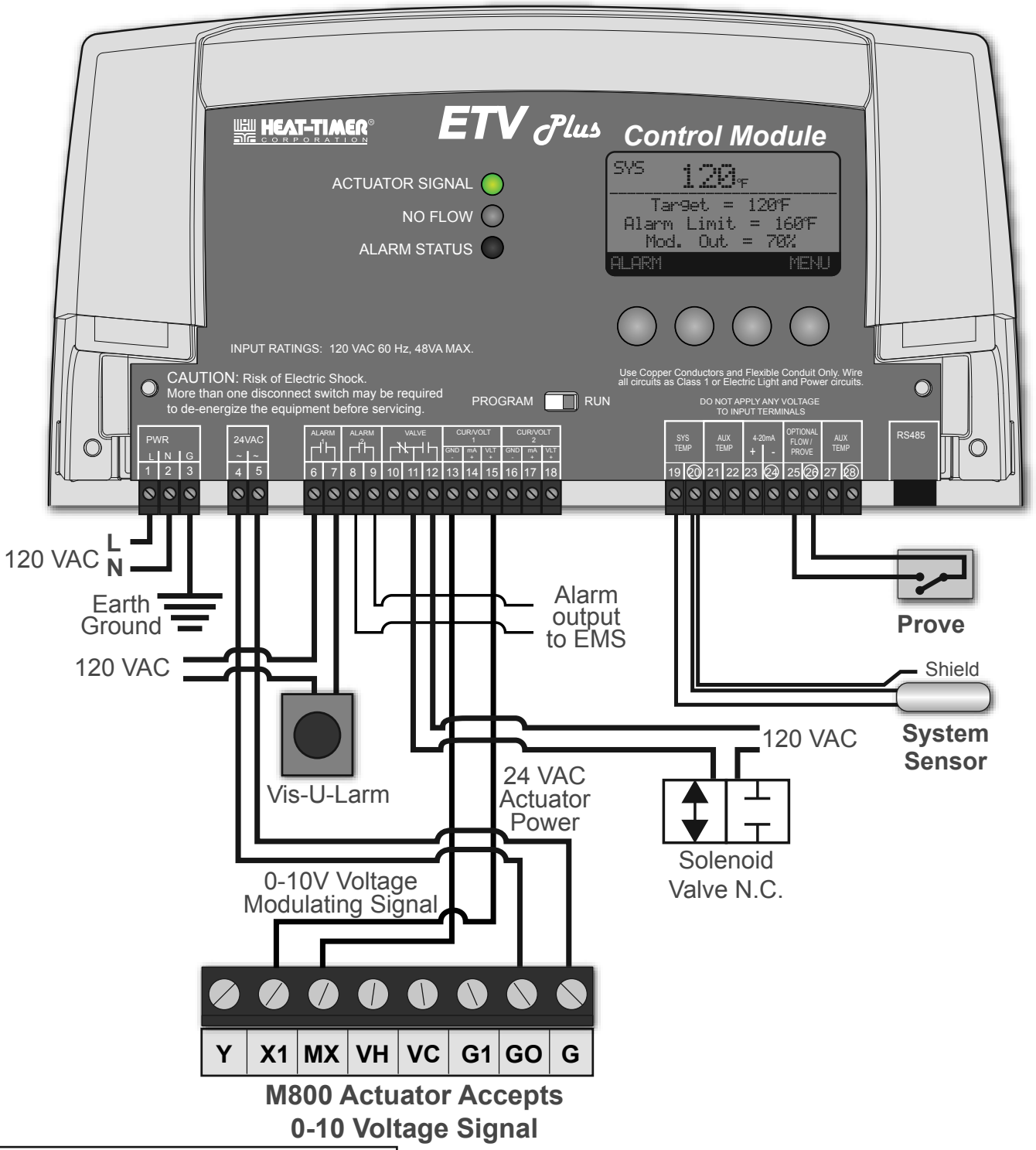
# WIRING ETV PLUS USING ONE M800 MIXING VALVE AND A SOLENOID VALVE




**M800 Actuator Accepts 0-10 Voltage Signal**

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***ETV Plus Startup Settings:***

- Control Type = ETV+TMC
- Flow Switch = Yes
- Control Input = Set Point
- Modulation Type = 0-10V

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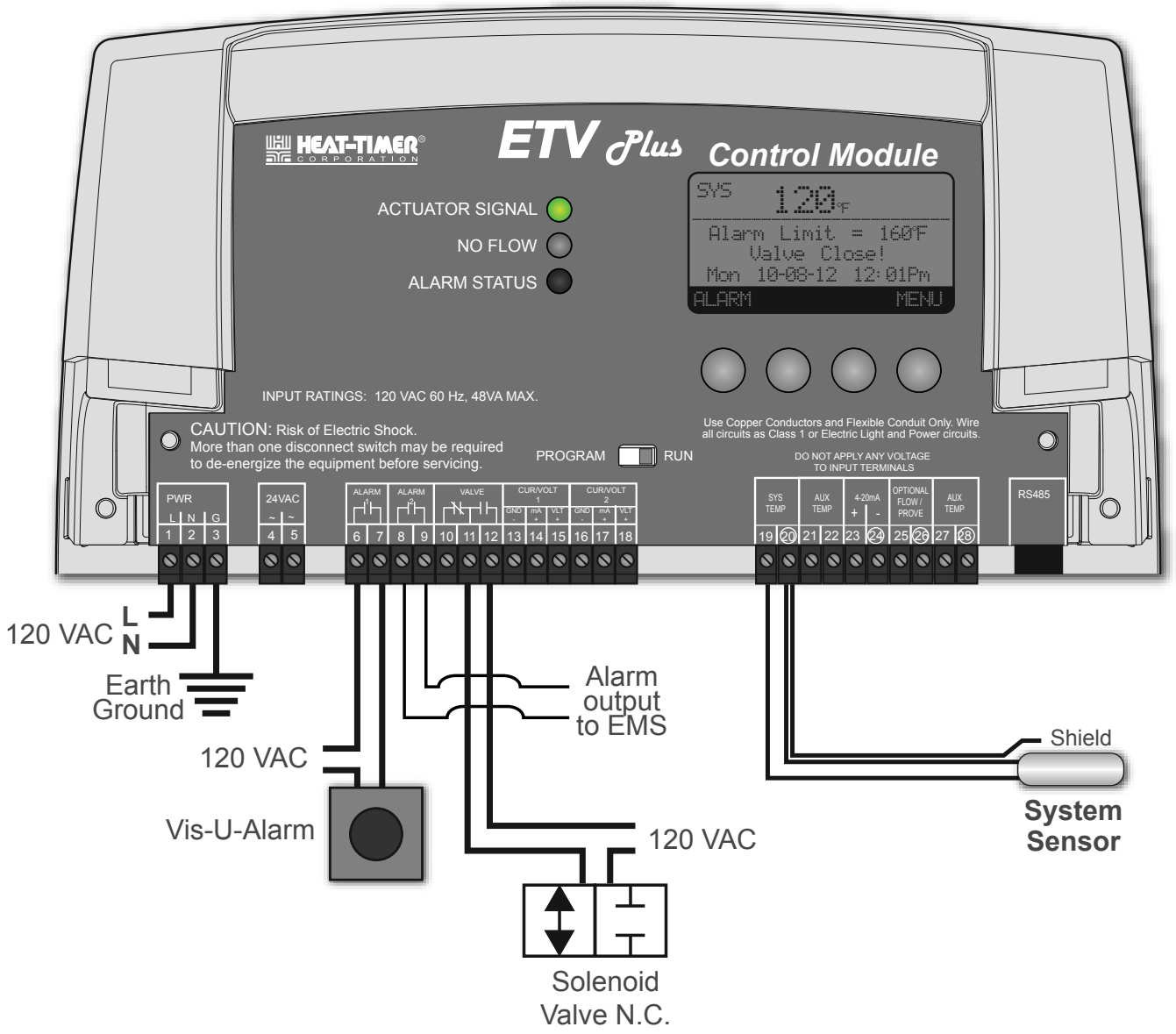
# WIRING ETV PLUS USING A SOLENOID VALVE

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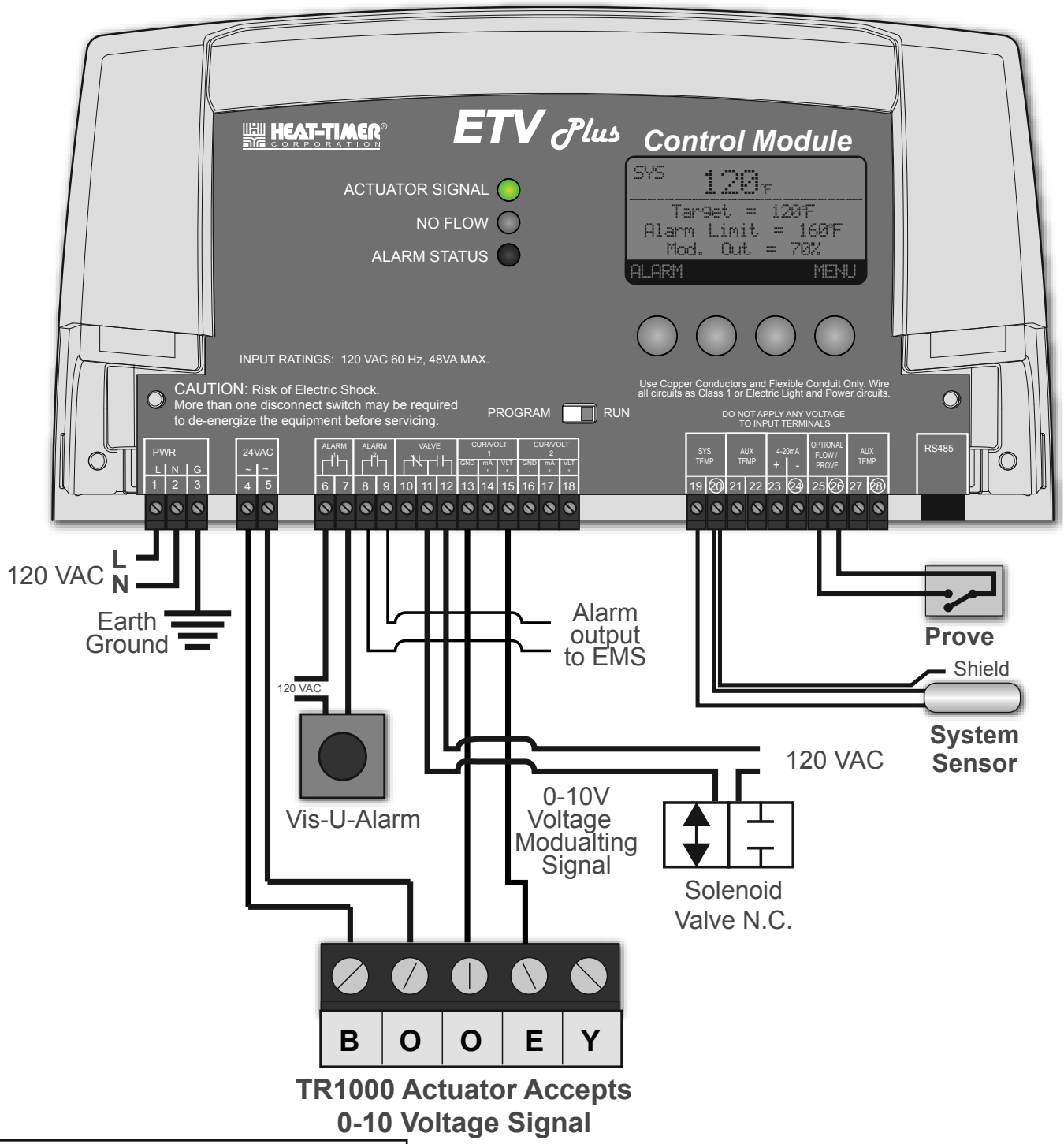
***ETV Plus Startup Settings:***

- Control Type = TMC
- Control Input = Set Point

HT# 059304-00 A

# WIRING ETV PLUS USING ONE TR1000 MIXING VALVE AND A SOLENOID VALVE

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***ETV Plus Startup Settings:***

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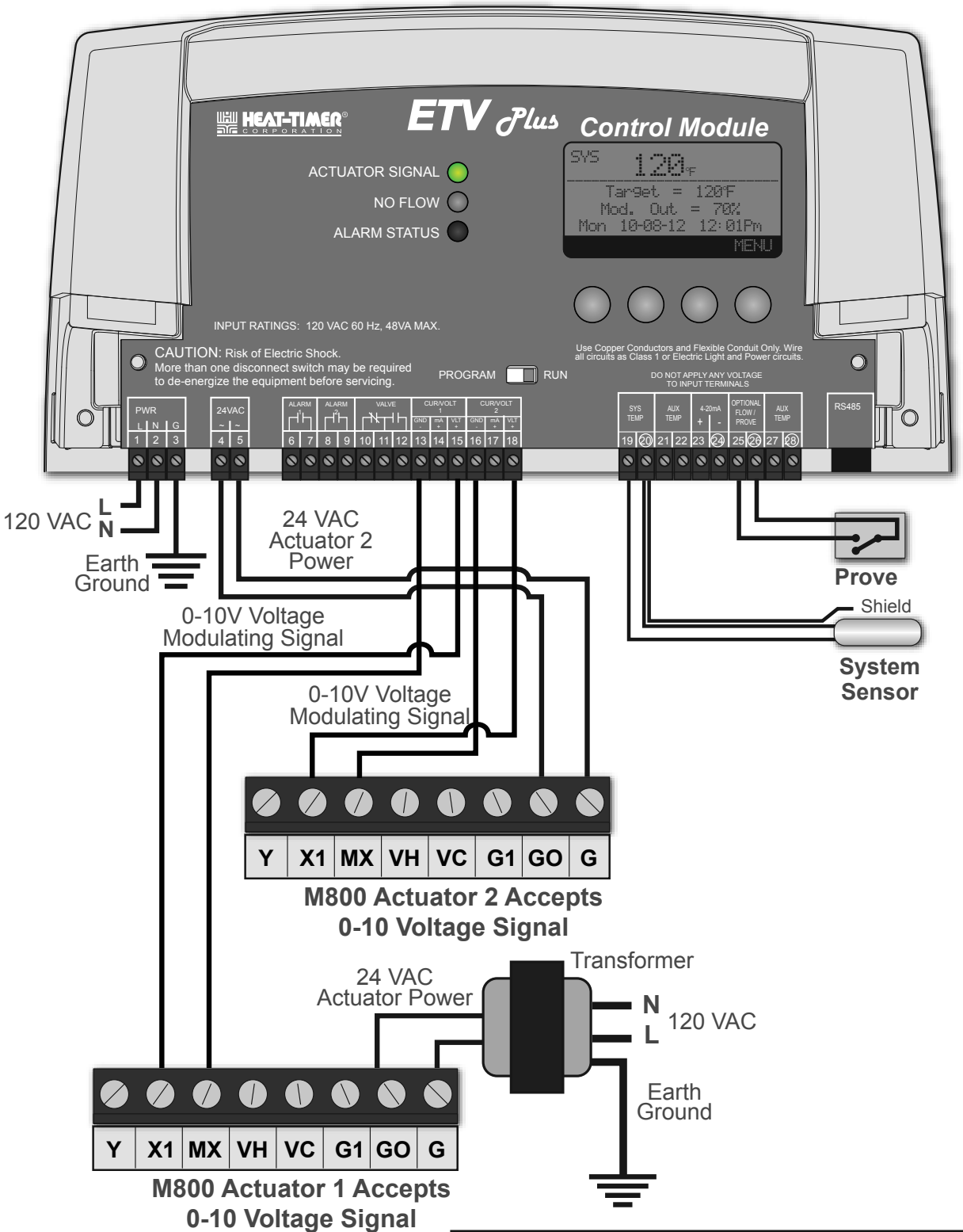
- Flow Switch = Yes
- Control Input = Set Point
- Modulation Type = 0-10V

HT# 059304-00 A

# WIRING ETV PLUS USING TWO M800 MIXING VALVE




***ETV Plus Startup Settings:***

- Control Type = ETV
- Flow Switch = Yes
- Control Input = Set Point
- Modulation Type = 0-10V

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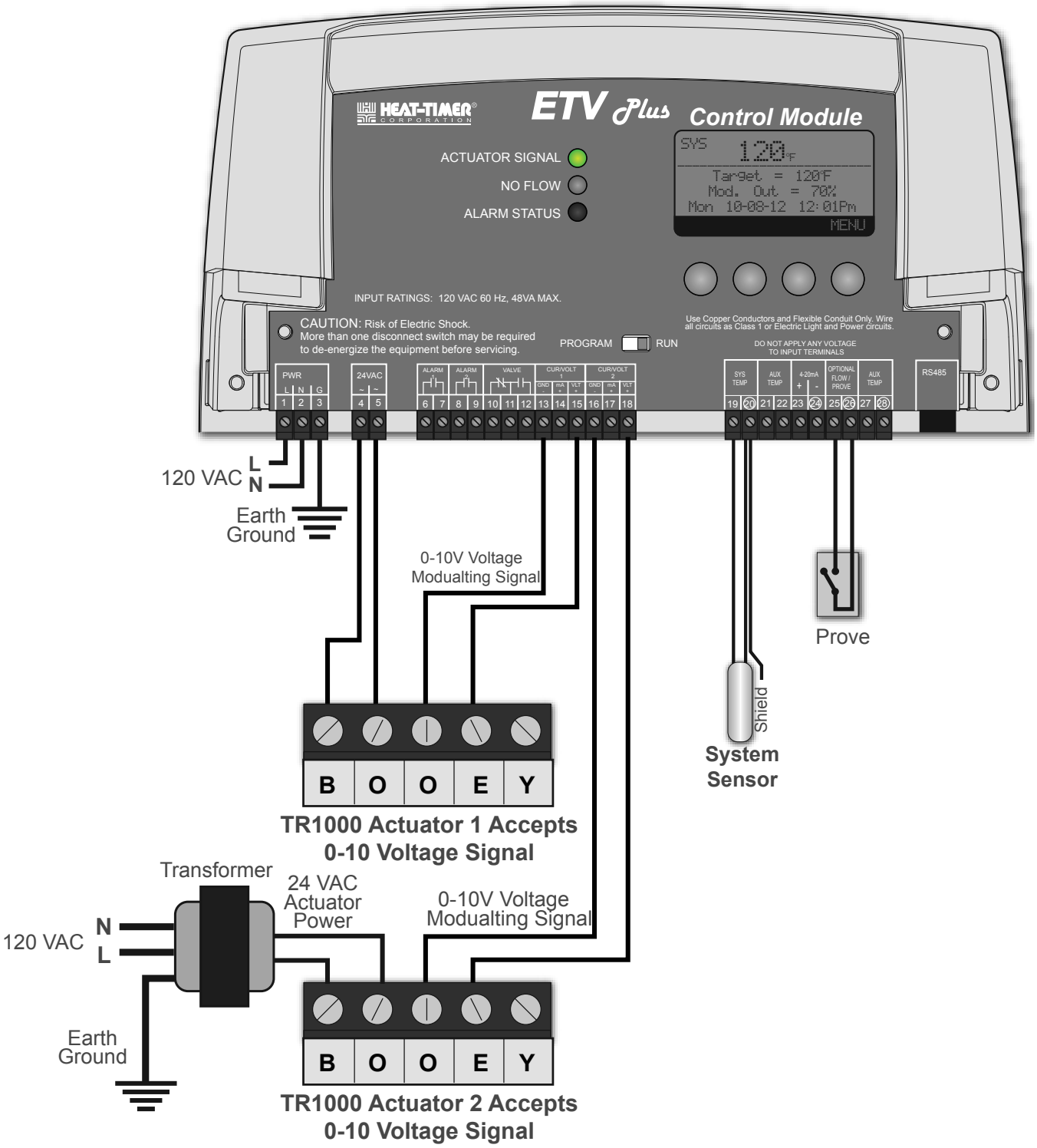


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- Flow Switch = Yes
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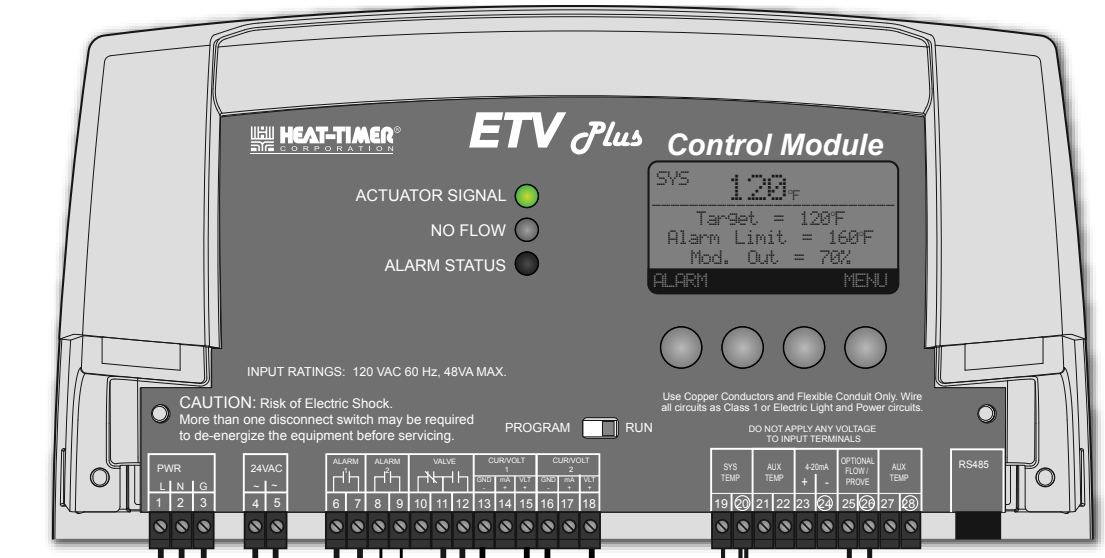
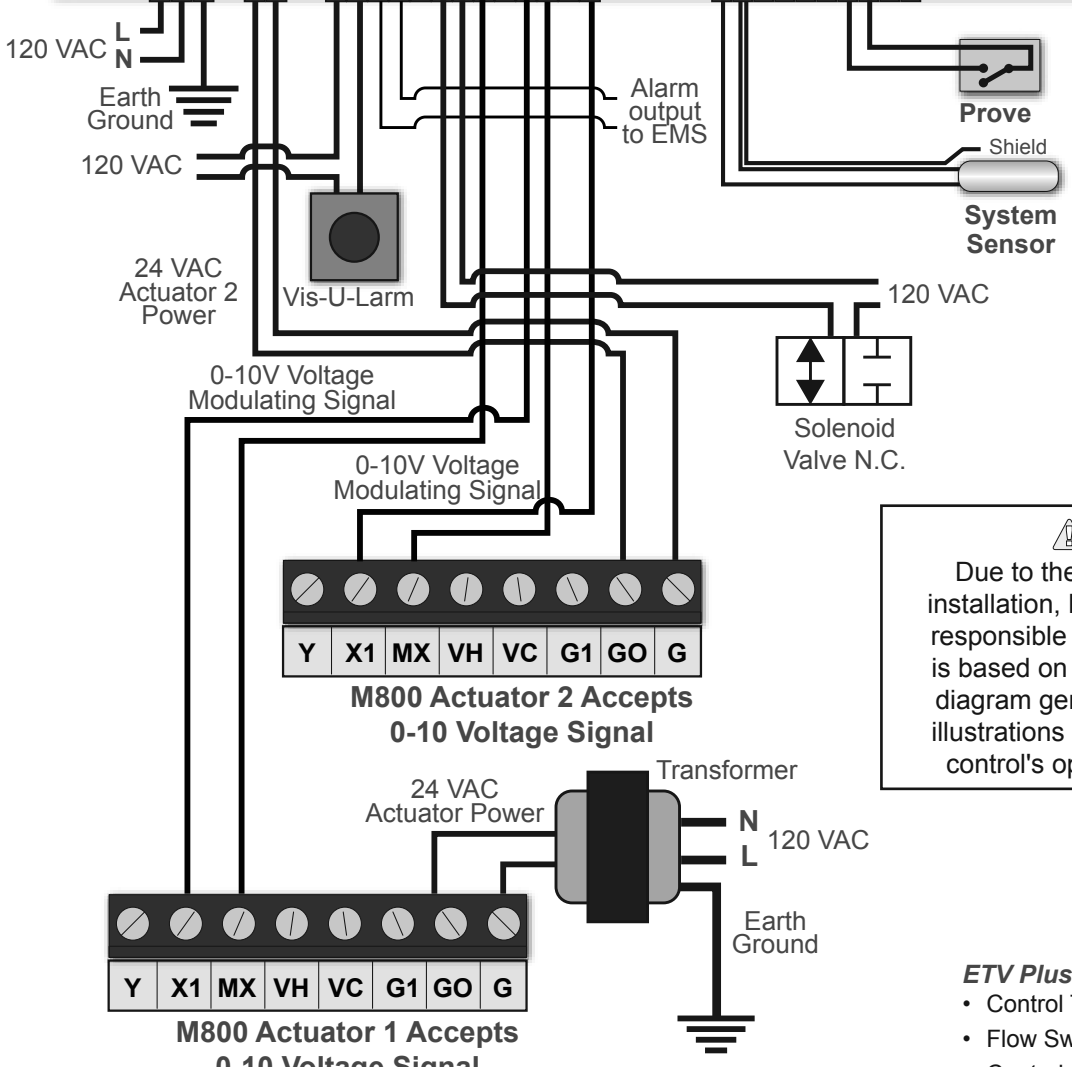
- Modulation Type = 0-10V

HT# 059304-00 A

# WIRING ETV PLUS USING TWO M800 MIXING VALVES AND A SOLENOID VALVE

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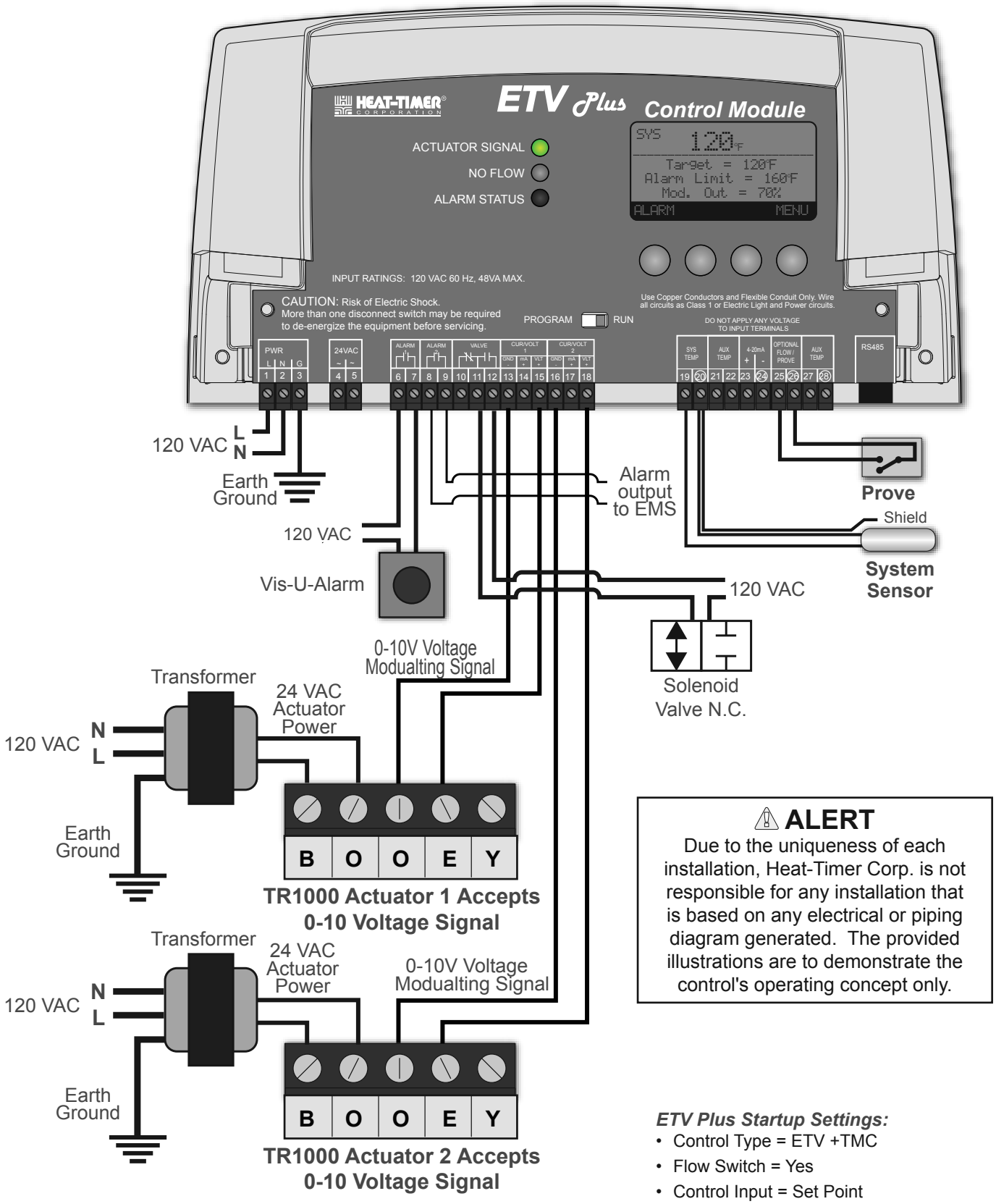
***ETV Plus Startup Settings:***

- Control Type = ETV +TMC
- Flow Switch = Yes
- Control Input = Set Point
- Modulation Type = 0-10V

HT# 059304-00 A

# WIRING ETV PLUS USING TWO TR1000 MIXING VALVES AND A SOLENOID VALVE

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- Control Input = Set Point
- Modulation Type = 0-10V

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# SPECIFICATIONS

## ETV-PLUS CONTROL SPECIFICATIONS

| | |
|---|---|
| **Voltage Input:** | **120 VAC 60 Hz** |
| **Maximum Input Rating:** | **48 VA Max** |
| **Display:** | **Graphical Display** |
| **Display Units:** | **Temperature (ºF and ºC)** |
| **Modes of Operation:** | **ETV+TMC, ETV, TMC** |
| **ETV Set Point:** | **60°F/16°C to 180°F/82°C** |
| **Alarm Set Point:** | **60°F/16°C to 200°F/93°C** |
| **Offset:** | **-50F°/-28C° to +50F°/+28C°** |
| **Modulation Gain:** | **from -10 to +10** |
| **Modulation Output Signal:** | **0-10V, 2-10V, 0-5V, 1-5V, 4-20mA** |
| **Output relays:** | **2 Alarms (SPST), 1 Valve (SPDT)** |
| **Output relay rating:** | **1 Amp inductive or 6 Amp resistive, at 120 VAC 60 Hz** |
| **LED:** | **3 (Actuator Signal, No Flow, Alarm Status)** |
| **Inputs:** | **System Temperature, Flow Prove, Remote Set pint (4-20mA)** |
| **Buttons:** | **4 (buttons' functions vary)** |
| **Dimensions:** | **11"W x 9"H x 3 ¾"** |
| **Weight:** | **2.5 pounds** |
| **BACnet Communication:** | **MSTP (RS485) requires BACnet Module Interface** |
| **BACnet Baud Rates:** | **9600, 19200, 38400** |