

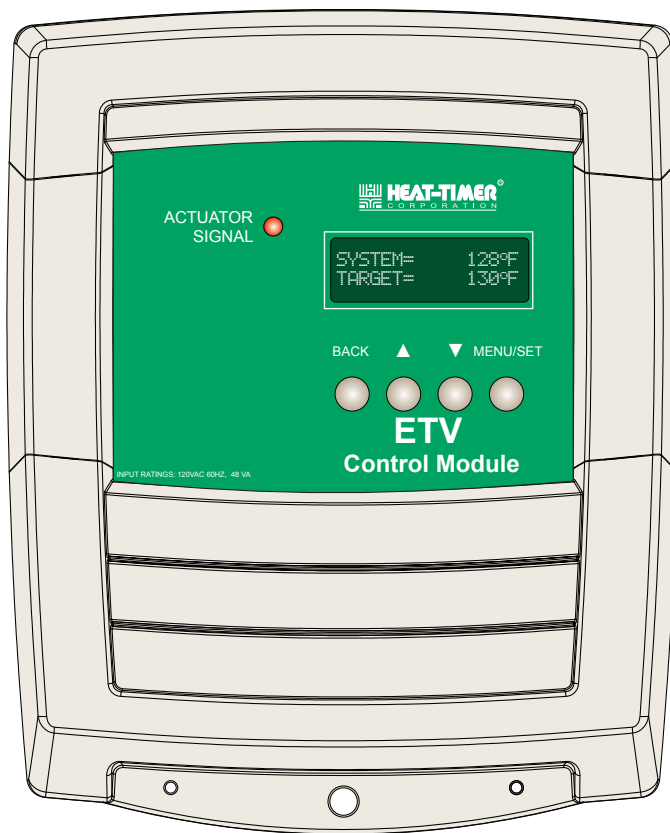
HEAT-TIMER®

INSTALLATION AND OPERATION INSTRUCTIONS

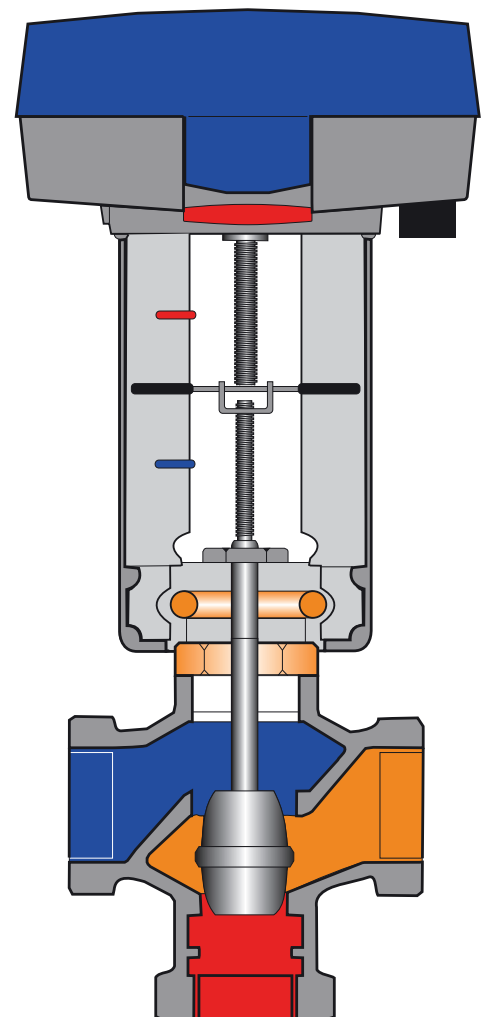
ETV

Electronic Tempering Valve Control

ETV Control



Actuator and Valve



⚠ 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 code. The installer must verify proper operation and correct any safety problems related to the installation of this Heat-Timer control.

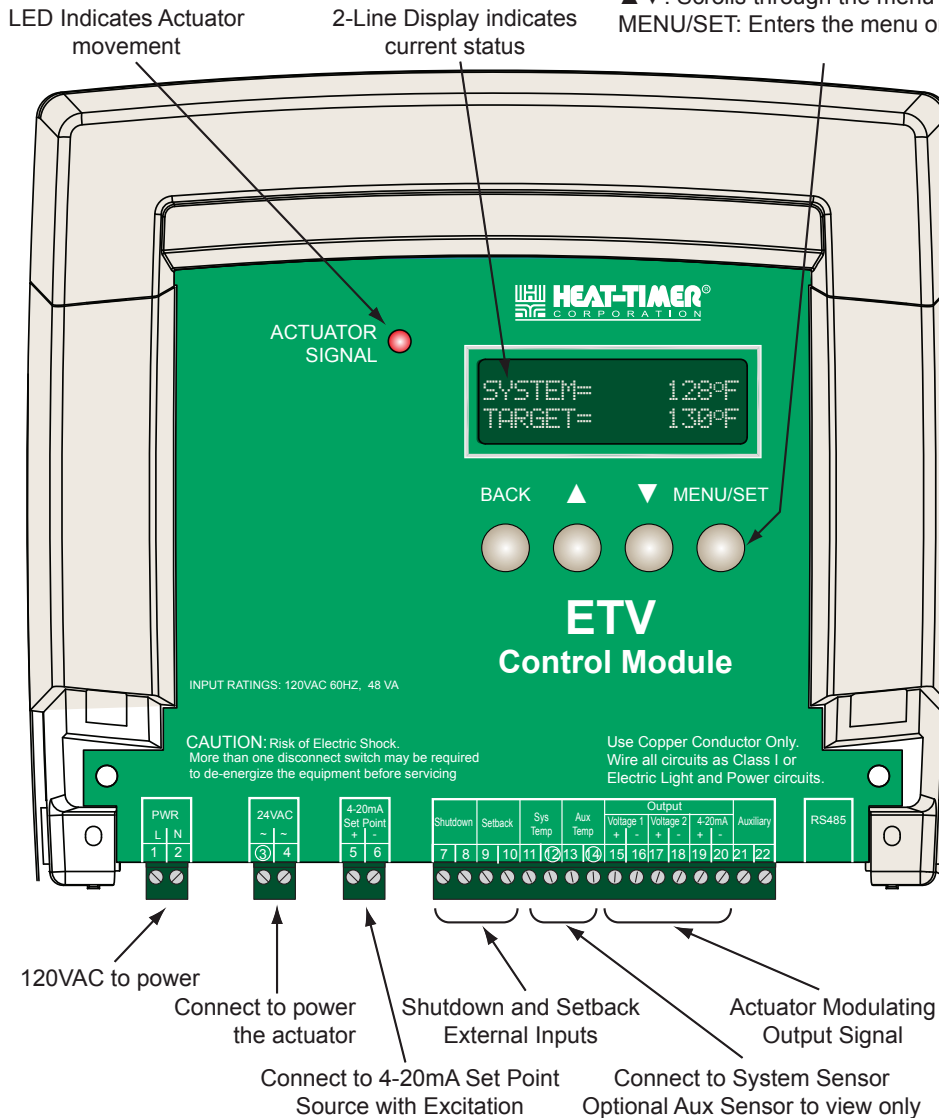
This control must be installed by a licensed electrician.

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ETV Control Layout

BACK: Goes back one menu level.
 ▲▼: Scrolls through the menu or changes values.
 MENU/SET: Enters the menu or accepts value.



CAUTION: Risk of Electric Shock.
 More than one disconnect switch may be required to de-energize the equipment before servicing.

Use Copper Conductor Only.
 Wire all circuits as Class I or Electric Light and Power circuits.

INPUT RATINGS: 120VAC 60HZ, 48 VA

ETV OPERATING CONCEPT

The ETV consist of four primary components; the ETV control, the ETV actuator, the 3-way mixing valve, and the sensor. The ETV control powers and operate the actuator to maintain a set point based on a the sensor temperature. The sensor is installed after the ETV valve.

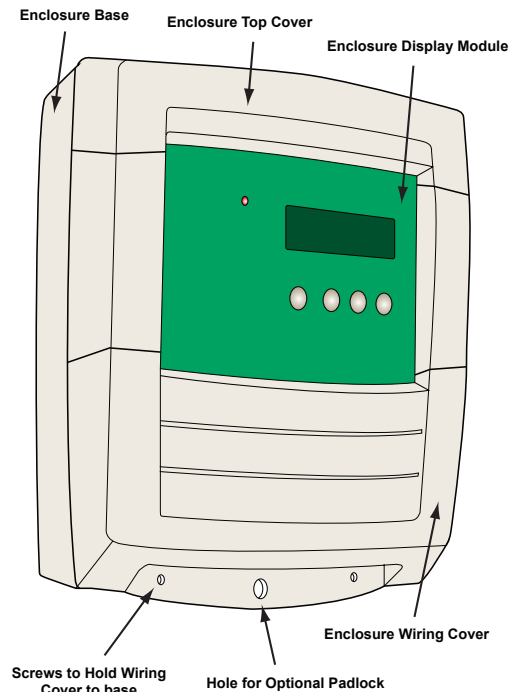
The actuator is of the direct drive type and is mounted vertically on the valve. The ETV control powers the actuator with 24 VAC. In addition, the ETV control modulates the ETV actuator with a 0-10V signal. See “ETV to Actuator Wiring” on page 4.

On a sensor fault (Short or Open), the ETV will send a Close signal to the actuator. The actuator will then close the hot port.

ETV CONTROL INSTALLATION

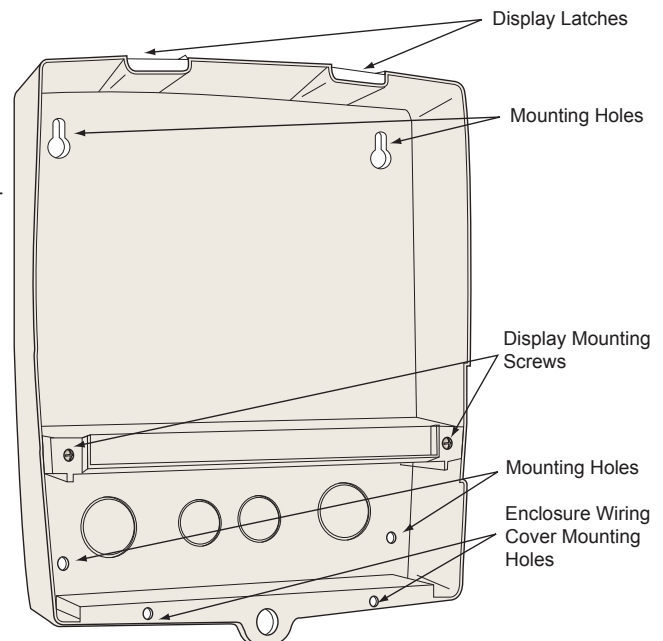
Each ETV control consists of four primary enclosure components.

- **The Enclosure Display Module:** contains the display, buttons, LEDs, and electric wiring terminals. It has two screws to hold it to the base. The wiring terminals are of the plug-in type to ease installation and removal.
- **The Enclosure Base:** contains the holes to mount and hold the control against the wall or any flat surface. All other enclosure components mount onto the base. The bottom section of the Enclosure Base contains the wiring chamber with bottom knockouts for all the inputs and outputs
- **The Enclosure Wiring Cover:** seals the wires from the external environment. It has two screws to hold it to the base. In addition, it has a hole that can be used with a padlock to secure the enclosure.
- **The Enclosure Top Cover:** seals the top of the Display Module. It is screwed to the Display Module from the inside.



MOUNTING THE ENCLOSURE

- Select a location near the equipment to be controlled.
- The surface should be flat, wide, and strong to hold the ETV Control.
- Keep the control away from extreme heat, cold, or humidity.
- Remove the Enclosure Wiring Cover by removing the two screws holding it to the base.
- Remove the Enclosure Display Module with the Enclosure Top Cover by removing the 2 middle screws.
- Screw the Enclosure Base to the surface through the upper and lower mounting holes on the back of the enclosure.
- Replace the Enclosure Display Module and replace the middle screws.
- Do not replace the enclosure wiring covers until all wiring is done.
- When purchasing a padlock for the Bottom Enclosure Wiring Cover, the maximum shank diameter should not exceed $\frac{1}{4}$ ".

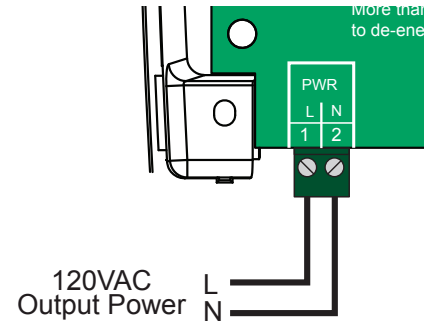


WIRING

WIRING THE ETV POWER

(Terminals 1, 2)

- Bring the 120VAC 60Hz power wires through the bottom Knockout of the enclosure.
- Connect the hot line to output terminal 1 marked L.
- Connect the neutral line to output terminal 2 marked N.
- Class 1 voltage wiring must use a different knockout and conduit from any Class 2 voltage wiring.
- Heat-Timer recommends the installation of a Power Switch and a surge-suppressor before the Power Line connection for safety and ease of service.



⚠ WARNING

Class 1 voltage wiring must use a different knockout and conduit from any Class 2 voltage wiring.

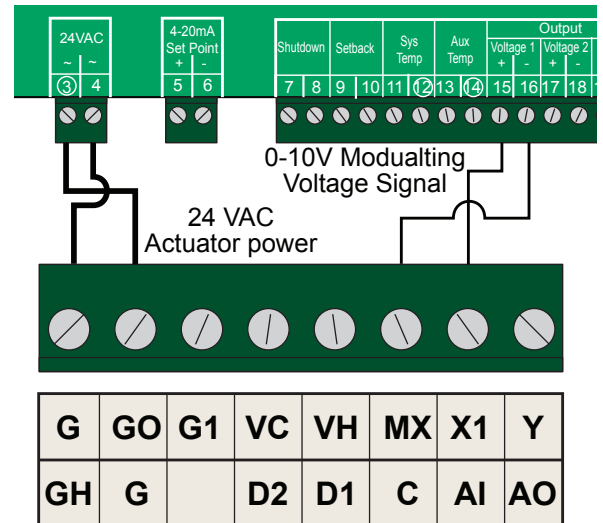
ETV TO ACTUATOR WIRING

(Power Terminals 3, 4)

(1st Actuator Voltage Signal Terminals 15, 16)

(2nd Actuator Voltage Signal Terminals 17, 18)

- The ETV control is designed to connect directly to the ETV actuator.
- Terminal ③ and 4 on the ETV control power the actuator using 24VAC. Connects the actuator terminals GO and G to the ETV terminals ③ and 4 respectively.
- If two actuators are used, the ETV can power both using terminals ③ and 4. See “Wiring ETV Control and Valve” on page 11
- Terminal 15 on the ETV control (Volt 1 +) connects to the 1st actuator terminal X1 (0 - 10VDC Signal).
- Terminal 16 on the ETV control (Volt 1 -) connects to the 1st actuator terminal MX (Input Common).
- If an additional actuator is to be used, then connect terminal 17 on the ETV control (Volt 2 +) to the 2nd actuator terminal X1 (0 - 10VDC Signal) and connect terminal 18 on the ETV control (Volt 2 -) to the 2nd actuator terminal MX (Input Common). See “Wiring ETV Control and Valve” on page 11
- Class 2 voltages must enter the enclosure through a different knockout from any Class 1 voltage wiring.



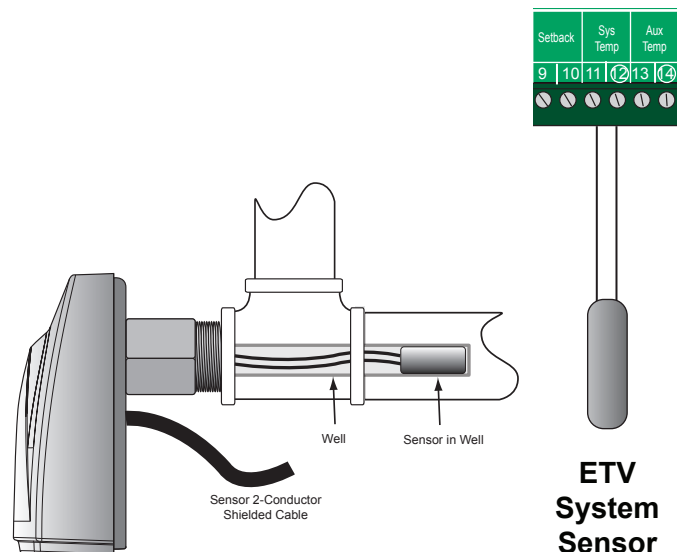
Actuator Accept 0-10 Voltage Signal

WIRING INPUT TERMINALS

SYSTEM SENSOR

(Terminals 11, 12)

- Install the system sensor well approximately 3' to 5' past the mixing valve but before any takeoffs where it will register the mixing valve output temperature. The sensor must be inserted into a 3/8" ID 1/2" NPT immersion well (HT #904011-00)
- Only use the sensors included with the control (HT# 904220-00).
- The sensor wires can be extended up to 500' using a shielded 2-conductor cable (Belden #8760 or equivalent (#18/2)). Connect the shield to ⑫ terminal.
- Do not run sensor wires in conduit with line voltage or in close proximity to line voltage wiring. Class 2 voltages must enter the enclosure through different knockout from any Class 1 voltage wiring.
- On a System sensor fault, the ETV control will send a CLOSE signal (0V) to the Actuator. The valve will close the hot port.



ETV System Sensor

SHUTDOWN

(Terminals 7, 8)

- The *Shutdown* terminals can be used to enable or disable the system by connecting it to a switch. This feature can be used whenever it is desirable to turn off the ETV from a remote location or another controller. It accepts dry contact input only. No voltage can be placed across the *Shutdown* terminals.
- The ETV will close the valve and will not operate the outputs if the *Shutdown* terminals are shorted.

SETBACK

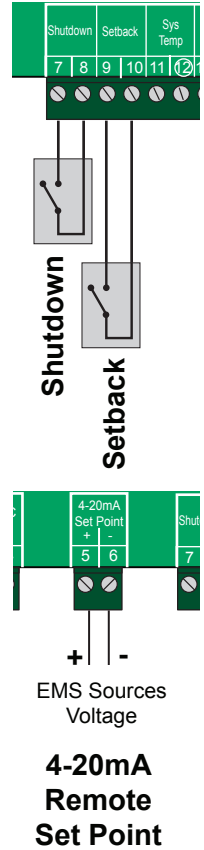
(Terminals 9, 10)

- This feature can be used whenever it is desirable to switch the ETV to lower the set point from a remote location during the night (i.e. EMS input or external time clock).
- When the Setback is enabled by closing a dry contact, the Target will be reduced by the Setback value. The display will indicate `SEC TGT= 100F`. See “Setback” on page 7
- The Setback signal must be a dry contact only. No voltage can be placed across the *Setback* terminals.

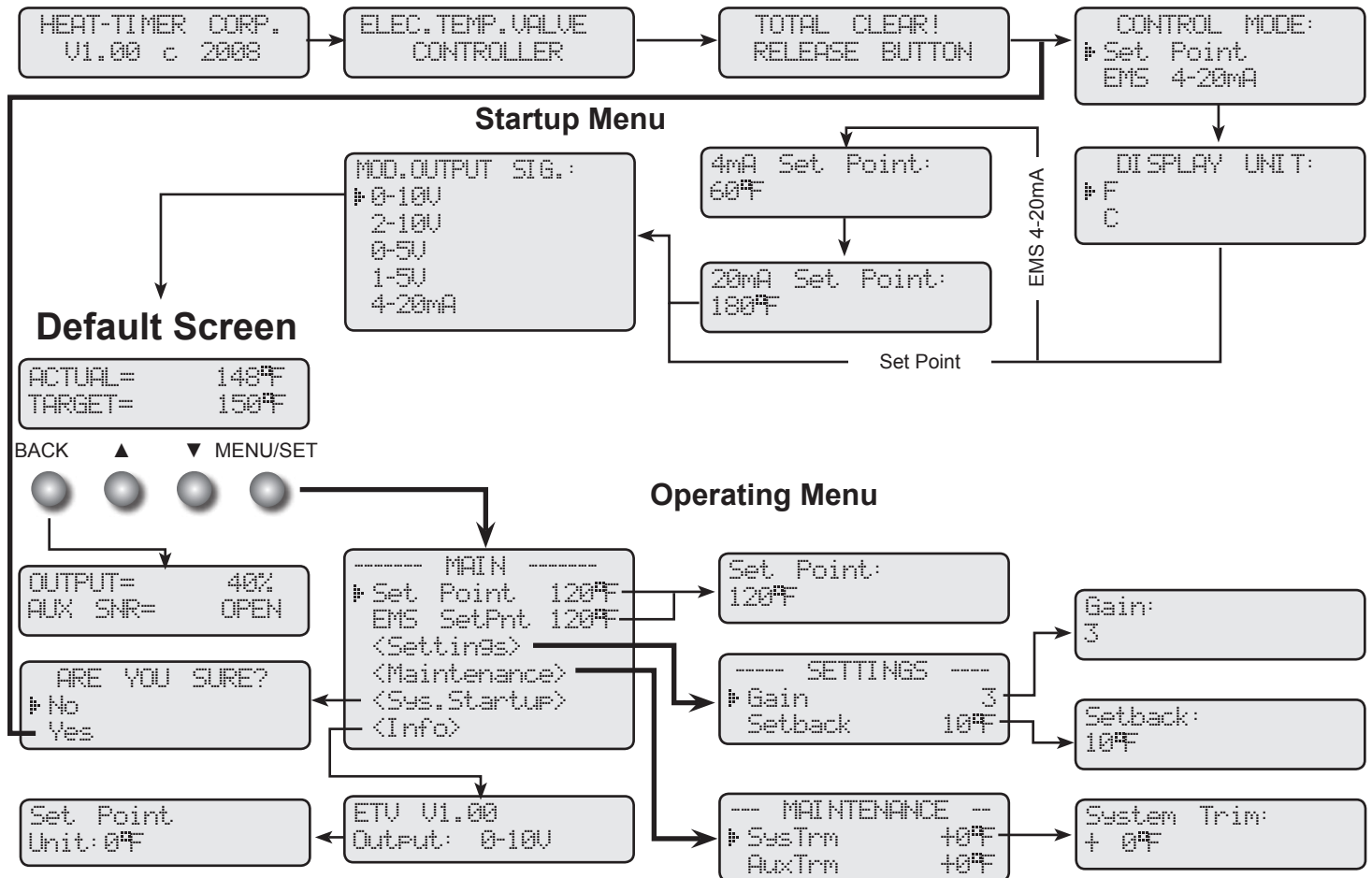
WIRING 4-20MA REMOTE SET POINT

(Terminals 5, 6)

- This feature can be used whenever it is desirable to send and adjust the ETV set point from a remote location.
- The Control Mode must be set to `EMS 4-20mA` to utilize this capability. See “Control Mode” on page 6
- The 4-20mA remote signal source must provide the excitation voltage.



MENUS



BUTTON AND NAVIGATING MENUS

THE ETV HAS FOUR BUTTONS.

- **MENU/SET:** The MENU/SET button function varies. When the Default Screen is displayed, pressing the **MENU/SET** Button views the MENU. When in the menus and settings, the Button accepts the selected entry or setting value.
- **▲ ▼:** When in the menus, pressing the **Up** and **Down** buttons will scroll through the menu options. They can be used to change the setting of a specific function. i.e., change the Set Point or System Trim.
- **BACK:** The BACK button allows the user to go back one menu level.

LED

The ETV has a single LED light that indicates the change in the valve opening. Hence, whenever the ETV changes the valve opening, the LED will turn on for a approximately one second. A Steady lit LED means the ETV is sending the Actuator a fully open signal.

STARTUP OPTIONS

When the control is initiated for the first time or after a manual reset, it will start its operation with the Startup Menu. Later, the Startup menu can be accessed as an option in the operation menu. An option must be accepted in each setting in the Startup Menu to move to the next setting.

CONTROL MODE

Options: Set Point, EMS 4-20mA

Default: Set Point

Menu Button: /<System Startup>/Control Mode

- The ETV can maintain a DHW set point temperature either by selecting the temperature or by remotely sending the temperature as a 4-20mA signal.
- If EMS 4-20mA option was selected, the user must set the temperature range based on the 4mA and 20mA setting that follows. See “Wiring 4-20mA Remote Set Point” on page 5

```
CONTROL MODE:
# Set Point
EMS 4-20mA
```

DISPLAY UNIT

Options: °F, °C

Default: °F

Menu Button: /<System Startup>/Control Mode/Display Unit

- The ETV will offer two different temperature displays. If °F is selected, all temperatures will display in Fahrenheit. If °C is selected, all temperatures will display in Celsius.

```
DISPLAY UNIT:
# F
C
```

4MA AND 20MA SET POINT

(Available only when EMS 4-20mA is the Control Mode)

4mA Set Point Adjustable from 60°F/16°C to 160°F/12°F

Default: 60°F/16°C

20mA Set Point Adjustable from 80°F/27°C to 180°F/82°F

Default: 180°F /82°C

Menu Button: /<System Startup>/Control Mode/Display Unit/4mA Set Point /20mA Set Point/

- If EMS 4-20mA option was selected, the user will need to set the temperature range parameters. First, set the 4mA temperature set point, then the 20mA temperature set point.
- To shutdown the control using the EMS signal, send a signal that is above or below the 2-22mA range. The display will show the message “Shutdown by EMS”. And the valve will close the hot port.

```
4mA Set Point:
60°F
```

```
20mA Set Point:
180°F
```

MODULATION OUTPUT SIGNAL

Options: 0-10V, 2-10V, 0-5V, 1-5V, 4-20mA

Default: 0-10V

Menu Button: /<System Startup>/Control Mode/Display Unit/Mod.Output Sig.

- The ETV is capable of operating a variety of actuators. The factory supplied actuator operates only using 0-10V signal. Make sure to use terminals 15 through 18 for voltage output. See “ETV to Actuator Wiring” on page 4

```
MOD. OUTPUT SIG.:
# 0-10V
2-10V
0-5V
1-5V
4-20mA
```

SETTING THE CONTROL TO FACTORY DEFAULT

To Reset the ETV control to its original factory defaults, power down the control. Hold down the MENU/SET and ▼ buttons while powering the control back up until the TOTAL CLEAR RELEASE BUTTONS screen appears. The display will direct you to the Startup menu after the defaults are loaded to program the control.

Hold Down Menu/Set and ▼

```
TOTAL CLEAR!
RELEASE BUTTON
```

NOTE: When resetting the control to original factory defaults, check all settings, as they will be over written.

DEFAULT DISPLAY

- The default display will show the Actual System temperature and the Target temperature.
- To view the Valve Opening % and the Aux Sensor value, click the BACK button while in the default screen.

```
ACTUAL= 148°F
TARGET= 150°F
```

Press the BACK

```
OUTPUT= 40%
AUX SNR= OPEN
```

```
Set Point:
120°F
```

SET POINT

Set Point is Adjustable from 60°F/16°C to 180°F/82°C

Default: 120°F/49°C

EMS Set Point is Read Only

Menu Button: /Set Point

- The Set Point is the temperature that 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 Mode 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 Mode” on page 6

GAIN

Adjustable from -10 to +10

Default: 3

Menu Button: /<Settings>/Gain

- The Gain setting provides PID type control of the ETV valve. The higher the Gain setting, the more aggressively the control adjusts the valve based on a change in water temperature. If the water temperature tends to oscillate quickly, reduce the Gain. If the water temperature tends to stay below the Set Point, increase the Gain. Start with a Gain setting of 3, and always wait at the least ten minutes after adjusting the gain to determine its affect on the system.

```
Gain:
3
```

SETBACK

Adjustable from 0F°/0C° to 80F°/44C°

Default: 10F°/6C°

Menu Button: /<Settings>/Setback

- The setback is the number of degrees the DHW temperature will be lowered when the Setback input is shorted. The Setback provides a lower DHW temperature when demand is low. It is used to save energy during nights and low load conditions.

```
Setback:
10°F
```

SENSOR TRIM

Adjustable from -20F°/-11C° to 20F°/11C°

Default: 0F°/0C°

Menu Button: /<Maintenance>/SysTrm or Aux 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.
- The Aux Trim will only be available when a Heat-Timer gold series sensor is connected to it.

```
-- MAINTENANCE --
# SysTrm  +0°F
AuxTrm    +0°F
```

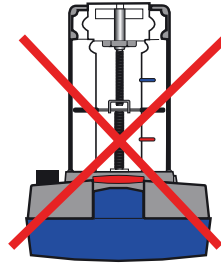
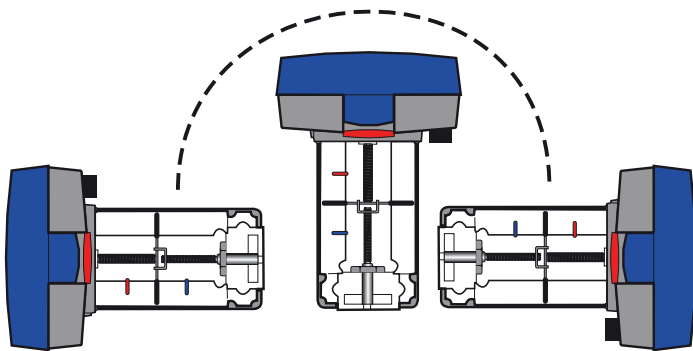
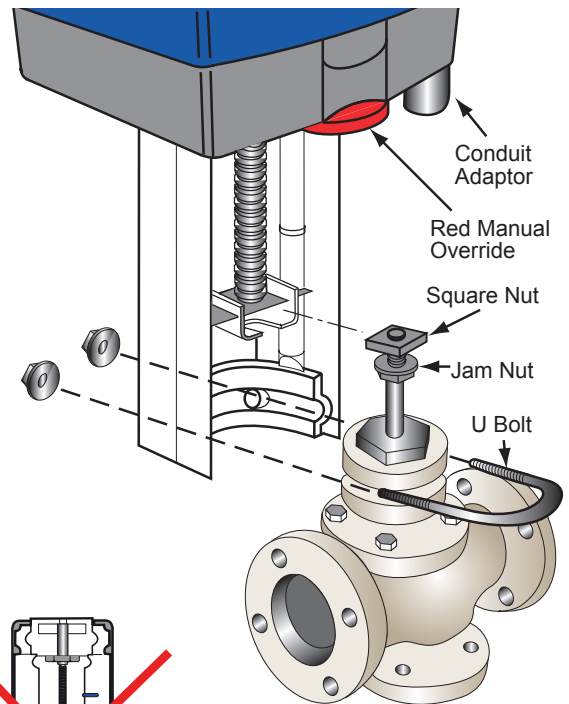
```
System Trim:
+ 0°F
```

```
Aux Trim:
+ 0°F
```


ACTUATOR AND VALVE INSTALLATION

Installing the Valve and Actuator

- The valve and actuator can be mounted vertical upright, sideways, or any angle in between. They must not be mounted upside down.
- Make sure the valve ports and piping are correct.
- Calculate a clearance of a minimum of 15" for mounting and servicing the actuator.
- Mount actuator to valve body using U bolt and nuts provided. Use the Red Manual Override to adjust actuator shaft open or closed in order to align square nut to actuator shaft bracket. Tighten jam nut. Install supplied conduit adaptor to actuator housing knockout.

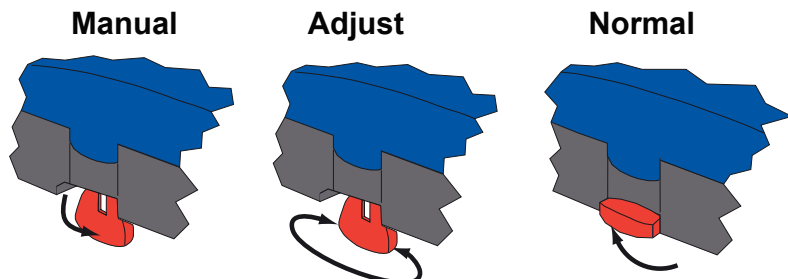


⚠ ALERT

When the manual operation handle is lowered, the actuator does not respond to control signals.

Actuator Manual / Override Operation

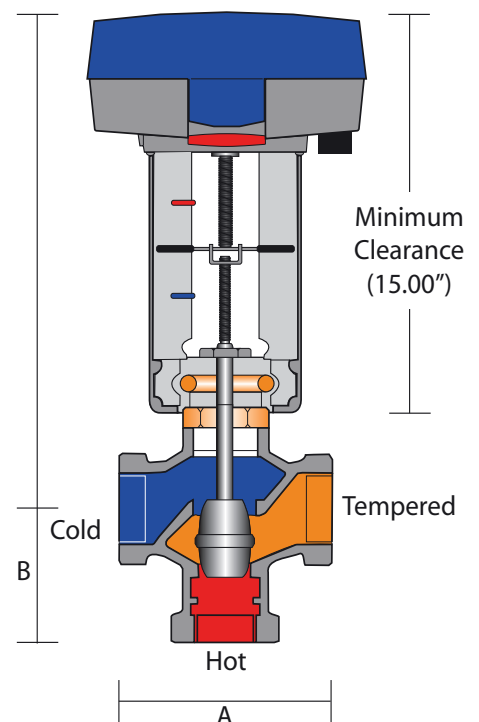
- Lower the manual Red Manual Override tab. The actuator stops.
- Operate the actuator manually by turning the Red Manual Override clockwise or counter clockwise.
- When the actuator has been manually operated, the handle must be raised completely in order for the actuator to work.

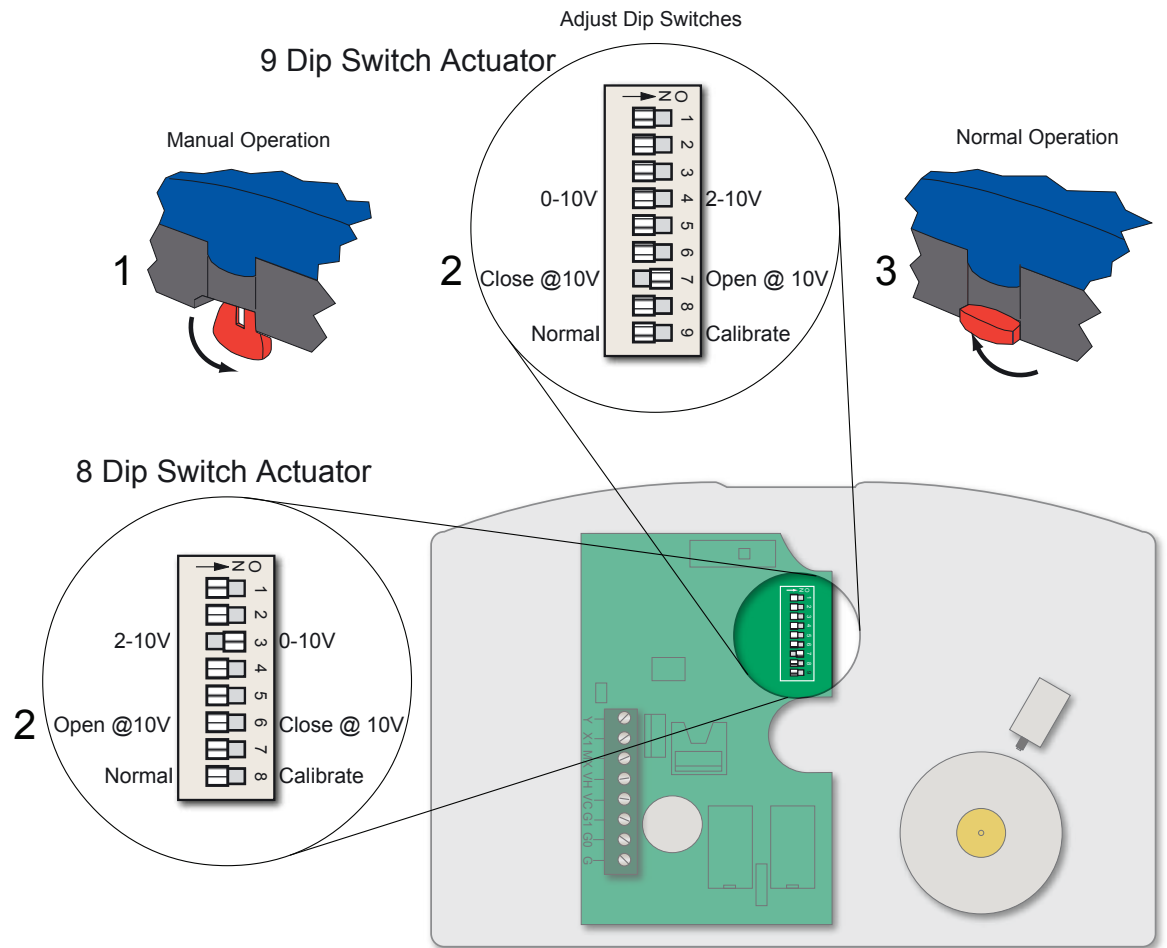


Flip The Red Manual Override Tab downward for manual operation

Turn Red Manual Override clockwise or counter clockwise to make adjustment to valve opening

Flip Red Manual Override upward for normal operation





Setting Actuator Dip Switches

- Step 1** Before changing any dip switch positions, power the ETV off and close the hot water supply to the valve or flip the Red Manual Override to the Manual position (Down) and close the hot water supply to the valve.
- Step 2** On the 9 Dip Switch Actuator, set Dip Switch 7 to ON. All other dip switches must be OFF.
On the 8 Dip Switch Actuator, set Dip Switch 3 to ON. All other dip switches must be OFF.
- Step 3** Return the Red Manual Override back to the normal operating position (Step 3). After the actuator stops moving, then open the hot water supply back to the valve hot port.

Calibrating Actuator End Positions

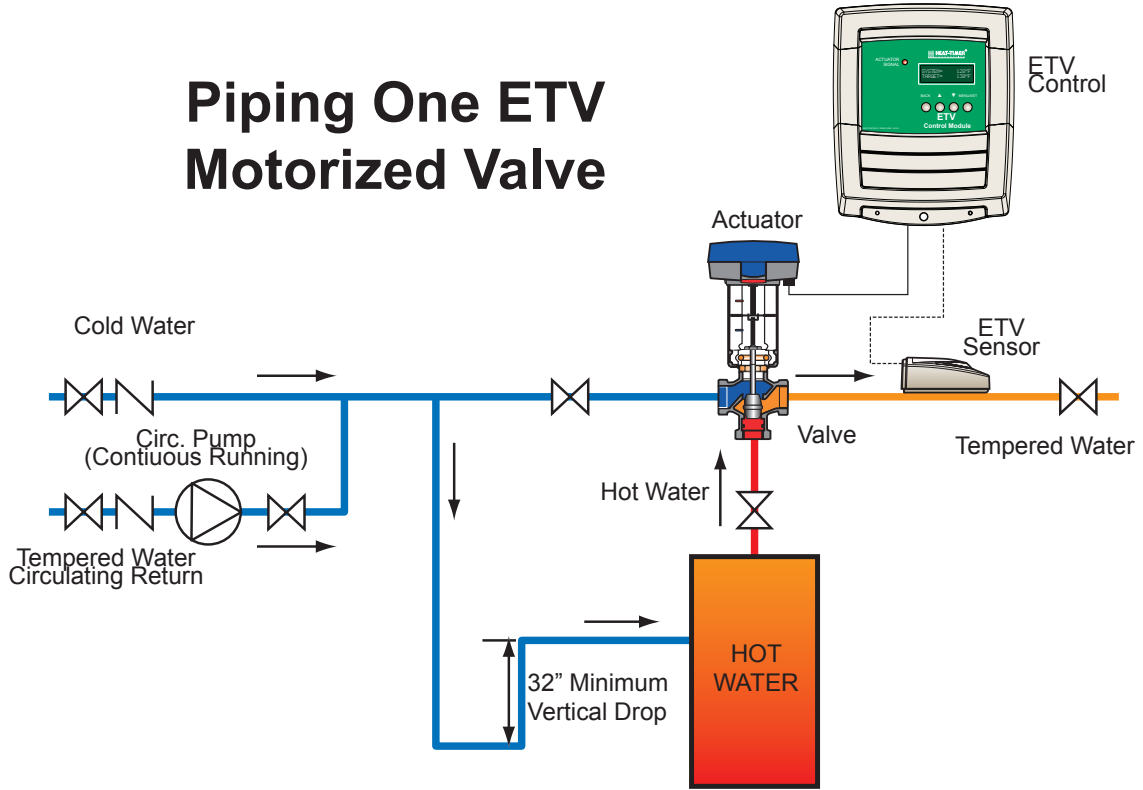
- The Actuator must be calibrated to each valve it is used with. This allows the actuator to find the valve end positions.
- Close the hot water supply to the valve.
- Start by moving the blue and red tabs on actuator path closer to each other.
- Flip Dip Switch 9 to ON then OFF (on 9 Dip Switch Actuators) or flip Dip Switch 8 to ON then OFF (on 8 Dip Switch Actuators). The Actuator will move up and down, then it will resume normal operation.
- After the actuator stops moving, then open the hot water supply back to the valve hot port.

⚠ WARNING

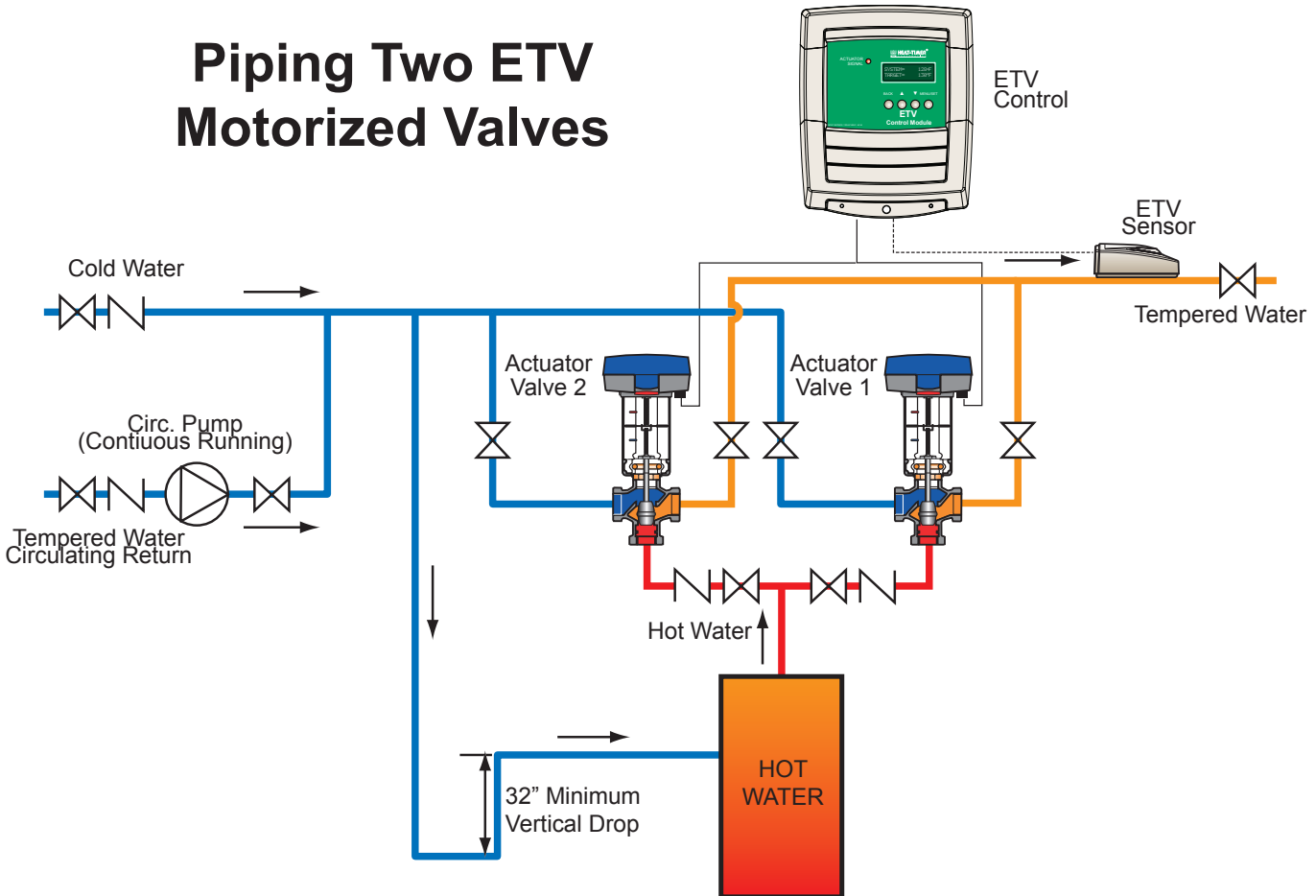
Before powering the ETV On or OFF or prior to calibrating the ETV Actuator, MAKE SURE THAT THE ETV VALVE HOT INPUT PORT IS CLOSED using an additional ball or shutoff valve or by installing the Heat-Timer TMC (Temperature Monitoring Control). The ETV Actuator will fully open to calibrate its highest and lowest points prior to following the ETV control signal and resuming normal operation. If the supply to the building is excessively hot, scalding or serious injury might occur.

Piping ETV Valve

Piping One ETV Motorized Valve

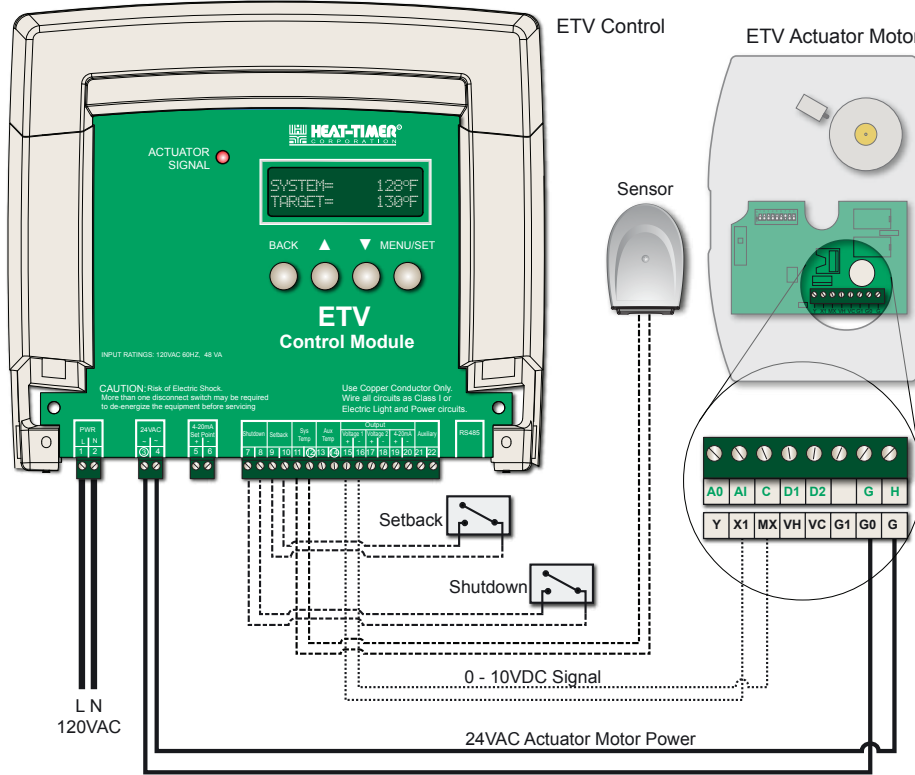


Piping Two ETV Motorized Valves

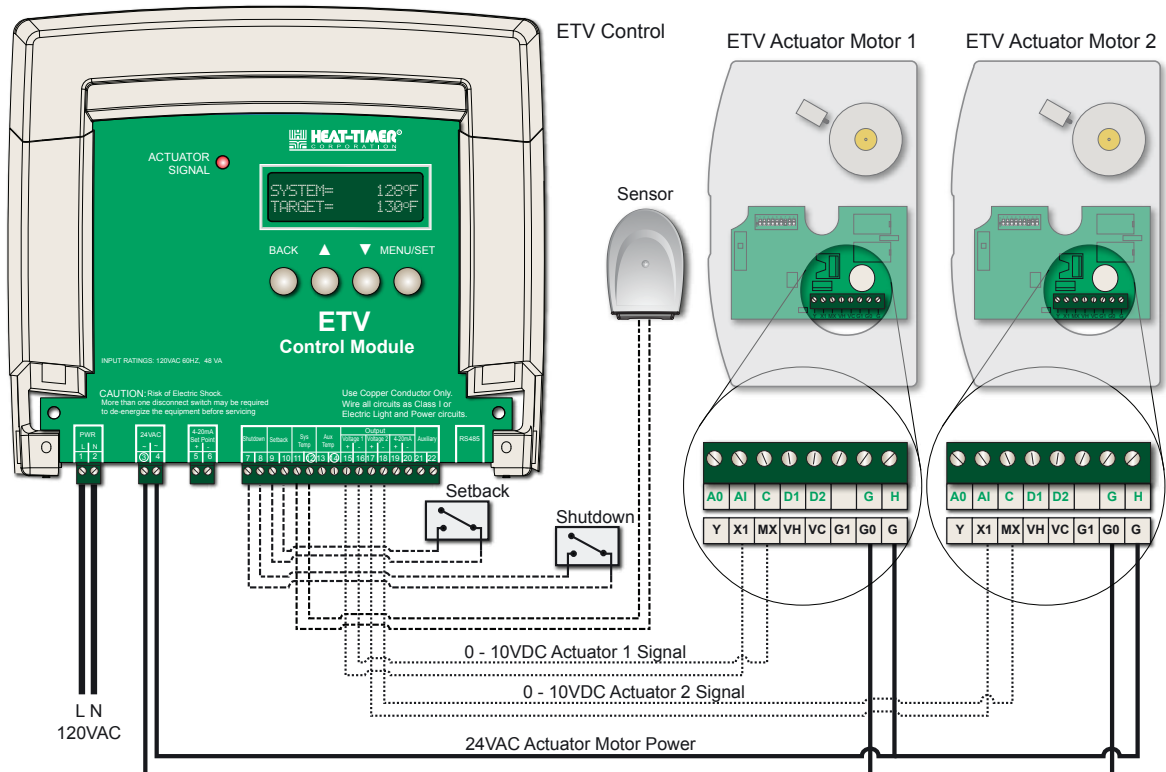


Wiring ETV Control and Valve

WIRING ETV CONTROL TO ONE ETV ACTUATOR MOTOR



WIRING ONE ETV CONTROL TO TWO ETV ACTUATOR MOTORS



TROUBLESHOOTING

TEMPERATURE SENSOR CHART

TEMPERATURE (in Degrees °F)	Value (in Ohms)
60	7653
70	5941
80	4649
90	3667
100	2914
110	2332
120	1879
130	1524
140	1243
150	1021
160	842
170	699
180	583

No Display or LED Lights

Check the power to the ETV. The ETV requires 120VAC power to terminal 1 and 2. Turn the power off and back on to restore the display.

Sensor Reads OPEN or SHORT and Valve is Fully Closed

The ETV will close the Valve Hot port when the System sensor reads **Short** or **Open**.
 If the System Sensor reads **Open**, short the sensor input terminals. The display should read **Short**. If it does, check the sensor wiring. If it doesn't, the ETV may be damaged.
 If the System Sensor reads **Short**, remove the wires from the input terminals. The display should read **Open**. If it does, check the sensor wiring. If it doesn't, the ETV may be damaged.

Sensor Reads Incorrect Temperature

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

No Hot Water

- **Shutdown Shorted** - If the display shows **Shutdown** then, check the *Shutdown* terminals. If the *Shutdown* terminals are shorted together, the ETV will close the valve.

ETV Does Not Move the Floating Motorized Valve

- **First check the valve wiring** - The ETV sources the power to the actuator. Make sure that the wiring to ETV terminals 3 and 4 is giving 24VAC.
- **Valve Modulating Signal** - Make sure that the ETV Modulating Signal is set to 0-10V to match the actuator's signal. Press the BACK button to read valve opening %. Your voltage signal reading must correspond to that value. If the valve opening % was at 40%, then the signal should read 4VDC. If it did not, the ETV control is damaged.

SPECIFICATIONS

ETV CONTROL

Voltage Input:	120 VAC 60 Hz
Power Consumption:	48 VA Max
Operating Temperature:	20°F to 120°F
Operating Humidity:	20% to 80%
Display:	Back Lite 2 Line Alphanumeric LCD Display
Display Units:	Fahrenheit (°F) and Celsius (°C)
Outputs:	1 S.P.S.T
Set Point Temperature:	from 60°F (16°C) to 180°F (82°C)
Setback:	from 0F° (0C°) to 80F° (44C°)
Gain:	from -10 to +10
Valve Output Signal:	0-10V, 2-10V, 0-5V, 1-5V, 4-20mA
LED:	1 Actuator Signal
Inputs:	1 Temperature Sensors, and Shutdown input, Setback Input, 4-20mA Set Point
Buttons:	4 (BACK, ▲, ▼, MENU/SET)
Dimensions:	8 5/8"W x 10"H x 3 1/2"
Weight:	2 pound

ACTUATOR AND VALVE

Maximum Pressure:	225 PSI
Maximum Temperature:	300°F
Connections:	NPT
Body and Trim:	Bronze
Stem:	Stainless Steel
Stem Packing:	EPDM Spring Loaded V-Cup

