

HEAT-TIMER®

INSTALLATION/OPERATING INSTRUCTIONS

HEAT-TROL Elite Series HWE-Motorized Valve

How Water Reset Control with Setback and Boost For Motorized Valve Operation

HOW THE HWE-MOTORIZED VALVE OPERATES...

The HWE-Motorized Valve (HWE-MOV) establishes ambient comfort by varying the temperature of the heating system's circulating hot water in response to changes in the outdoor temperature. In addition, it provides an outdoor temperature based start/stop, heating system pump control.

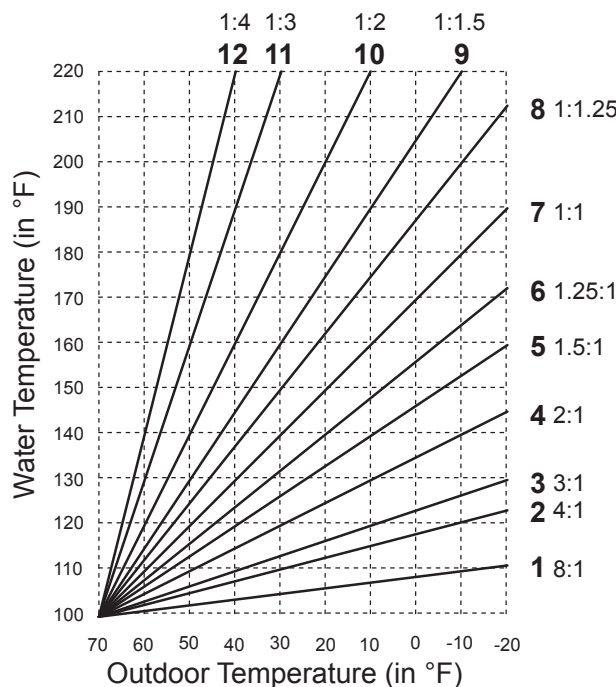
Two sensors are used, one to monitor the outdoor temperature, and one to monitor the circulating hot water temperature in the heating system. When the outdoor temperature falls to the outdoor cutoff setting C_{OFF} , the heating system is activated and the hot water temperature is increased proportionally to meet the need for more heat. Should it get warmer outdoors, the hot water temperature is automatically lowered by the control. If the outdoor temperature continues to rise $2^{\circ}F$ above the Outdoor Cutoff setting then the heating system is turned off.

Because of many physical characteristics, and the type of radiation, ie. baseboard or radiant, heat loss varies. In one building, a 1-degree temperature change outdoors may require a change of 1 degree in heating water temperature; for another it may require a change of 2, 3, or even 4 degrees in order to gain the desired comfort level. This is known as the Reset Ratio RSE . The middle chart shows the wide range of Reset Ratios available for the HWE-MOV.

The installer fine tunes the HWE-MOV to a specific building by adjusting the Reset Ratio curve.

With a curve of 4 (2:1 reset ratio) a 2-degree change in outdoor temperature will change the circulating hot water temperature by 1 degree; at an 11 curve (1:3 reset ratio) an outdoor change of 1 degree will change the water temperature by 3 degrees. Most buildings with baseboard radiation require a curve of 6, 7, or 8. Radiant heat applications usually require a lower curve.

An optional external thermostat EE or Setback SB control input can be connected to the HWE-MOV. This input can be connected to a new or existing thermostat or switch to shut the heating system down when the thermostat is satisfied. When set to Setback SB mode this input will switch the heating system to a lower setting determined by the Setback SB_C setting.



Reset Ratio Curves

An optional Boiler Return water sensor is provided to avoid thermal shock to the boiler and, therefore, to help prolong boiler life. If the sensor registers that the boiler return water is colder than $120^{\circ}F$, the HWE-MOV immediately lowers the temperature of the circulating heating water to reduce the load on the boiler, allowing the return water temperature to rise. The amount of time it takes the return water temperature to recover will depend upon the piping configuration and any additional heating or other loads on the boiler.

Digital display of the sensor temperatures and all control settings allow rapid verification of operating status and precise adjustment of the HWE-MOV.

INSTALLATION

MOUNTING THE CONTROLLER

- The HWE-MOV is designed to mount on a standard 1900 (4"x4") electrical box (not supplied).
- If panel mounting, or if additional room is needed for wiring, an extension skirt is available (HT#908520-00).♦
- Locate the HWE-MOV in a convenient location near the boiler to be controlled.
- Mount the HWE-MOV away from excessive heat or cold. Ambient operating temperature is from 20 to 120°F.
- After completing all the wiring connections (see below) use the two screws provided to mount the HWE-MOV to the 1900 box.

INSTALL THE HEATING SYSTEM SENSOR

- The HWE-MOV Heating System Sensor is designed to be installed in a 3/8" ID well.
- If sensor is installed as a Strap-On, good contact is required for proper operation. Also, insulating the sensor with the pipe will ensure sensor will have a more accurate reading.
- Locate the sensor in the common header, where it will register the output of the motorized valve and before any takeoffs.
- The sensor wires can be extended up to 500' by splicing with 18 gauge shielded wire.
- Do not run sensor wire in conduit with line voltage.
- The sensor has no polarity. Connect either sensor wire to the front terminal marked *SYS*.
- Connect the other sensor wire **and its shield** to the front terminal marked *COM*.

INSTALL THE OUTDOOR SENSOR

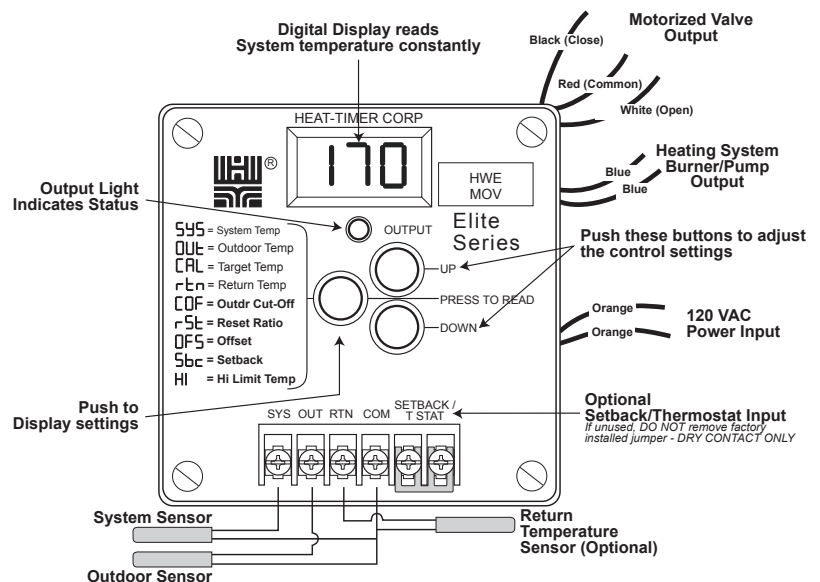
- Locate the Outdoor Sensor in the shade on the north side of the building.
- Be sure the location is away from doors, windows, exhaust fans, vents, or other possible heat sources.
- The sensor should be mounted at least 4 inches away from the building wall and approximately 10 feet above ground level.
- The sensor wires can be extended up to 500' by splicing with 18 gauge shielded wire.
- Do not run sensor wire in conduit with line voltage.
- The sensor has no polarity. Connect either sensor wire to the front terminal marked *OUT*.
- Connect the other sensor wire and its shield to the front terminal marked *COM*.

OPTIONAL - INSTALL THE BOILER RETURN SENSOR

- Read the Boiler Return Operation section on page 7 to determine if the sensor is required.
- The Boiler Return Sensor is designed to be installed in a 3/8" ID well.
- If sensor is installed as a Strap-On, good contact is required for proper operation. Also, insulating the sensor with the pipe will ensure sensor will have a more accurate reading.
- Locate the sensor in the boiler return piping. The sensor should be located where it will register the average temperature from all boiler returns, not just the return from the loop controlled by the HWE-MOV.
- The sensor wires can be extended up to 500' by splicing with 18 gauge shielded wire.
- The sensor has no polarity. Connect either sensor wire to the front terminal marked *RTN*.
- Connect the other sensor wire **and the shield** to the front terminal marked *COM*.

WARNING

The HWE-MOV is shipped with a jumper across the SETBACK / T-STAT terminals. DO NOT remove this jumper unless you replace it with dry contact switch which closes when heat is required in the building. This type of contact is usually provided by thermostat or a timer.



- ♦ The optional Mounting Kit includes the Extension Skirt, the Rear Wire Connector, and an Input terminal Cover. Order separately as HT#908520-00.

WIRING THE SETBACK / T-STAT INPUT

- If the SETBACK / T-STAT input terminals are open, the HWE-MOV will not energize the valve or the Heating System Pump outputs when it is set to LL in the Initial Startup. When it is set to $5b$, it will energize Heating System Pump and activate or deactivate the motorized valve to reach a lower (calculated less the Setback setting $5bc$) water temperature.
- **The HWE-MOV is shipped with a jumper across the SETBACK / T-STAT terminals. DO NOT remove this jumper unless you replace it with a dry contact switch which closes when heat is required in the building. This type of contact is usually provided by a thermostat or a timer.**
- When the SETBACK / T-STAT terminals are opened, the Heating System Pump output will immediately turn off, and the motorized valve will begin to drive shut.
- The SETBACK / T-STAT signal must be a dry contact only. No voltage can be placed across the SETBACK / T-STAT terminals.
- Bring the two wires from the dry contact to the front terminals marked T-STAT.

WIRING TO THE BACK OF THE CONTROL

WIRING THE POWER INPUT

- Attach 120VAC line voltage to the two orange wires extending from the back of the HWE-MOV.
- If possible, provide a dedicated circuit breaker for the HWE-MOV. Never connect the HWE-MOV on a circuit breaker connected to high inductance devices such as relays, contractors, pumps, fans, or motors.
- Use wire nuts to ensure proper connection.
- Class 1 voltages must enter the enclosure through a different opening from any Class 2 wiring.
- Heat-Timer recommends connecting power to its controls through a surge suppressor.
- **To ease maintenance, connect power to the HWE-MOV through a power switch mounted near the control to ease maintenance.**

CAUTION

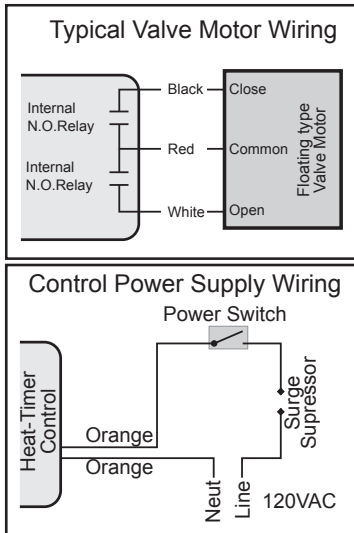
When connecting power to the HWE-MOV control, Heat-Timer recommends a surge suppressor to protect the control.

WIRING THE HEATING SYSTEM PUMP OUTPUT

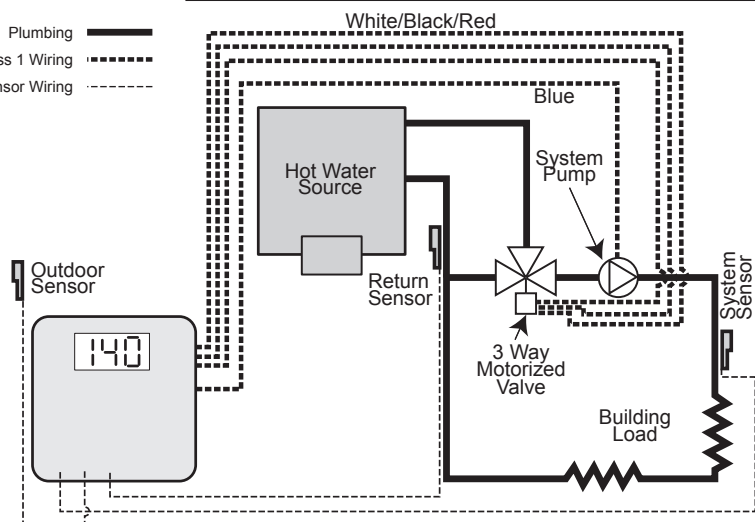
- The Blue output wires provide a dry contact closure only. They do not source any power.
- The pair of Blue wires are connected internally to a N.O. relay which is rated at 8 Amp max (see diagram at page bottom).
- The total of all outputs must not exceed 15A.
- Class 1 voltages must enter the enclosure through a different opening from any Class 2 wiring.
- Connect the Blue pair of wires to the Heating System Pump starter as shown at the bottom of the page.

CAUTION

The Heat-Timer control DOES NOT source power. It only operates as a dry contact switch. A separate power source for motorized valve and pump must be supplied.



Plumbing ———
 Class 1 Wiring - - - - -
 Class 2 Sensor Wiring ·····



- Heat-Timer is aware that each installation is unique. Thus, Heat-Timer is not responsible for any installation related to any electrical or plumbing diagram generated by Heat-Timer. The provided illustrations are to demonstrate Heat-Timer's control operating concept only.

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. After Heat-Timer control is installed, installer is responsible to change control settings according to manufacturers of boiler, piping, tubing and heating fixtures.

WIRING THE MOTORIZED VALVE OUTPUT

- The valve motor must be of the floating type.
- The Red to Black and Red to White connections are dry contacts only. They do not source any power.
- The two valve relays are N.O. and each is rated at 8 Amp max.
- Connect the Red wire to the valve motor Common.
- Connect the Black wire to the valve motor Close.
- Connect the White wire to the valve motor Open.

INITIAL CONTROL START-UP

- Whenever the HWE-MOV is powered up, it will display the software version number and then the current operating modes. Each display will remain on the screen approximately 5 seconds. If the operating modes are correct, there is no need to make any adjustments.
- Once the operating modes have been set for a particular application, they will be retained in memory.
- Note that if you do change an operating mode, you will need to reset all the settings (shown in Display Chart).
- An operating mode can only be changed when it is being displayed in the start-up sequence. To restart the sequence it is necessary to remove power to the HWE-MOV and then power it again.
- Set the operating parameters as described in sequence below:

F or *°C* - Fahrenheit or Celsius Temperature Operation

Default is *F*

- If the display shows *F* then the HWE-MOV will operate in Fahrenheit degrees.
- If the display shows *°C* then the HWE-MOV will operate in Celsius degrees.
- To change the temperature operation, hold down the center button *PRESS TO READ* while pushing either the *UP* or *DOWN* button to toggle between the displays of *F* and *°C*.
- When the correct temperature operation is selected, release the buttons and wait approximately 5 seconds.

nrS or *rS* - Boiler Return Sensor Disabled/Enabled

Default is *nrS*

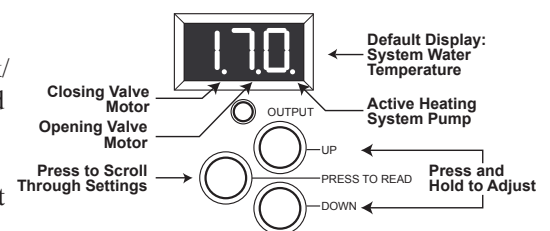
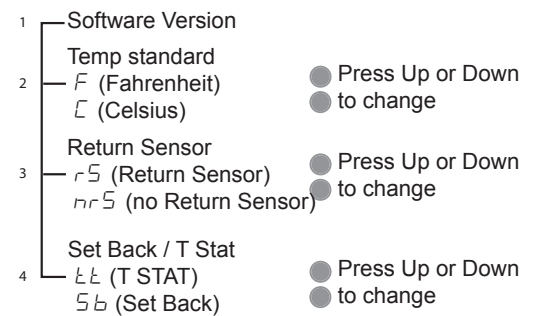
- If the display shows *nrS* then the HWE-MOV will not check the status of the Boiler Return Sensor or display its value.
- If the display shows *rS* then the HWE-MOV will display the temperature of the Boiler Return Sensor and lower the calculated water temperature when the return water temperature is below 120°F.
- If *nrS* item is selected from the reset menu (See Startup Settings) or if the return sensor fails when *rS* is selected from reset menu, the control will disable the return temperature function and resume operation based on System Sensor and Outdoor Sensor data.

LL or *Sb* - Thermostat or Setback/Boost

Default is *LL*

- If the display shows *LL* (Thermostat) the HWE-MOV will check the Setback/T-STAT terminals for continuity before initiating system pump and motorized valve.
- If the display shows *Sb* (Setback/Boost) the HWE-MOV will check the Setback/T-STAT terminals for continuity. If continuity exist system will boost calculated water temperature by the Setback setting *Sbc* for one hour then revert to normal water temperature. When continuity breaks, the HWE-MOV will lower the calculated water temperature by the Setback setting *Sbc*.

STARTUP SETTINGS



DEFAULT SETTINGS

Default settings shown in instructions will provide proper operation for many installations.

- The HWE-MOV comes equipped with default settings which are a good starting point for most installations. You can reset the control back to default manufacturing setting by pressing both buttons the *PRESS TO READ* with either the *UP* or *DOWN* during Power-Up. The display will show *dEF* to indicate this change.
- After the start-up routine has completed, the display will show the system water temperature.
- To display the other settings (see chart on opposite page), repeatedly press the center *PRESS TO READ* button.
- A setting can only be adjusted when it is being displayed.
- Use the *UP* and *DOWN* buttons to adjust the setting.
- The display will always revert back to the actual system water temperature after 30 seconds.

OPERATION

DISPLAY SETTINGS

- The HWE-MOV will display the System Water Temperature *SYS* when no buttons were pushed for 5 seconds.
- The HWE-MOV will control the motorized valve to regulate the Calculated Water Temperature *CAL*. It is based on Outdoor Temperature *OUT*, Offset *OFF*, Reset Ratio *rSt*, and Setback *Sbc* values. The actual system water temperature will fluctuate around this value depending on the valve, boiler and heating system load.
- The Calculated Water Temperature *CAL* can not be greater than the Hi Limit Temp *HI* setting.
- If the Outdoor Temperature *OUT* is above the Outdoor Cutoff setting *COF*, the HWE-MOV will not activate the heating system pump. The display will show *OFF* to indicate this condition.
- If the Outdoor sensor is reading a fault condition (*OPn* or *SHt*), the Heating System Pump output will be activated and the HWE-MOV will control the motorized valve to maintain the heating water at the Hi Limit Temp setting *HI*.
- If the Heating Sensor has a fault condition (*OPn* or *SHt*), the Heating System Pump will be off if the Outdoor Temperature *OUT* is above the Outdoor Cutoff. *COF* If the Outdoor Temperature *OUT* is below the Outdoor Cutoff *COF* the Heating System Pump will be activated and the valve will be fully opened. The display will show *On* to indicate this condition.
- If Setback (*Sb*) is activated on Initial Control Startup and an external control, ie time clock, energized the SETBACK / T-STAT terminals, the Calculated Water Temperature *CAL* is changed to reflect the reduction in Calculated water temperature by the Setback setting *Sbc*. When terminals are de energized control will boost water temperature by the Setback setting *Sbc* for one hour. Afterwards, it will revert to normal Calculated Water Temperature *CAL*.

DISPLAY CHART AND ADJUSTMENTS

Press Center Button	Display	Press and hold either UP or DOWN button to adjust or read setting
Once ♦	OUT Outdoor	The temperature value measured by the Outdoor Sensor. If the sensor is not connected, the display will show <i>OPn</i> . If shorted, it will show <i>SHt</i> .
Twice ♦	CAL Calculated Water	This is the calculated water temperature the HWE-MOV will control motorized valve to hold. It is based on the Outdoor Temperature, Reset Ratio, Offset, and the Setback values. If <i>OFF</i> is shown, there is no call for heat.
3 Times ♦	rStn Return	The temperature value measured by the Boiler Return Sensor. If the sensor is not connected, the display will show <i>OPn</i> . If shorted it will show <i>SHt</i> . This feature is activated when Boiler return Sensor reads 120°F or below. and Initial Startup setting was set to <i>rS</i> . • <i>This setting is only available when rS is selected in the Initial Control Startup.</i>
3 Times (4 in rS mode)	COF Outdoor Cut-Off	When the Outdoor Temperature falls below the Outdoor Cutoff setting, the HWE-MOV will give heat. When the outdoor temperature rises 2°F above the Outdoor Cutoff, the Calculated value will be <i>OFF</i> and no stage will be activated. The Outdoor Cutoff is adjustable from 40 to 100°F with an <i>On</i> setting for continuous operation. Manufacturing default is 65°F.
4 Times (5 in rS mode)	rSt Reset Ratio	The Reset Ratio controls the amount of heat which enters the heating system based on the Outdoor Temperature. A higher numbered Reset Ratio will result in a higher Calculated Water Temperature <i>CAL</i> . See the chart on the first page for the reset curves. If the application has radiant heat, a lower numbered Reset Ratio curve should be selected. The Reset Ratio is adjustable from 1 to 12. Manufacturing default is 7.
5 Times (6 in rS mode)	OFF Offset	The Offset moves the Reset Ratio curves vertically up or down. For example, changing the offset from 0 to -10 will decrease the Calculated Water Temperature <i>CAL</i> 10° regardless of Outdoor Temperature <i>OUT</i> or the Reset Ratio curve selected. The Offset is adjustable from -40 to 40°F. Manufacturing default is 0°F.
6 Times (7 in rS mode)	Sbc Setback/Boost	The Setback function only works when <i>Sb</i> is selected in Startup Settings. It allows an external control or time clock wired to terminals marked SETBACK/T-STAT to lower Calculated Water Temperature <i>CAL</i> down by the Setback setting when terminals are closed. And increase Calculated Water Temperature <i>CAL</i> by the Setback setting for 1 hour when terminals are opened. The Setback is adjustable from 0°F to 30°F. Default is 10°F.
7 Times (8 in rS mode)	HI Hi Limit Temp.	This is the highest temperature heating water the HWE-MOV will circulate through the heating system. It should be set according to the tubing or floor manufacturer's specification. The Hi-Limit Water Temperature is adjustable from 100°F to 200°F. Default is 160°F.
8 Times (9 in rS mode)♦	SYS Default	The HWE-MOV returns to the default display of system water temperature as measured by the System Sensor. If the sensor is not connected, the display will show <i>OPn</i> . If shorted, it will show <i>SHt</i> .

- ♦ The actual values are displayed and can not be adjusted with the *UP* and *DOWN* buttons.

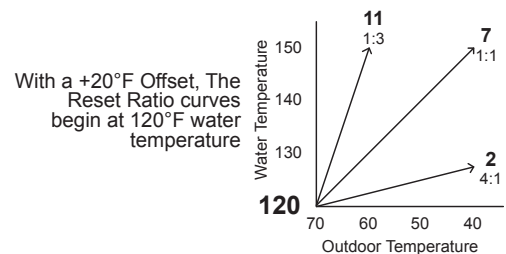
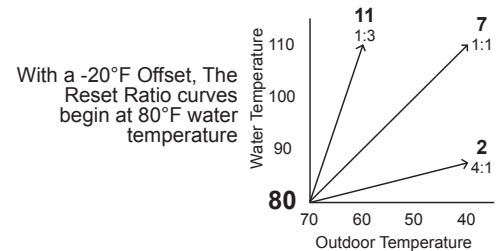
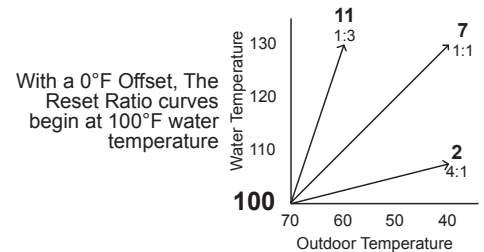
Outdoor Cutoff ΔOF **Default is 65°F**

- The Outdoor Cutoff sets at what Outdoor Temperature ΔUT the HWE-MOV will activate the heating system.
- When the Outdoor Temperature is above the Outdoor Cutoff setting plus 2°F, the HWE-MOV will not give heat. The Calculated Water Temperature ΔRL will read ΔFF .
- The Outdoor Cutoff has a built in 2°F differential. When the Outdoor Temperature drops below the Outdoor Cutoff setting, the HWE-MOV will compute the water temperature ΔRL and control the boiler to hold that temperature.
- If the building is too cold before the heating system is activated, raise the Outdoor Cutoff temperature.

Reset Ratio rSL **Default is 7**

♦ *This is a good starting point for baseboard radiation. Radiant installation should start lower.*

- The Reset Ratio controls how much heat will be input to the system based on Outdoor Temperature ΔUT .
- A 1:1 Reset Ratio signifies for each degree it gets colder outside, the Calculated Water Temperature ΔRL will rise 1 degree. (See first page.)
- The Reset Ratio curves start at 70°F. At 70°F the HWE-MOV will require 100°F water. Note that 70°F is not the Outdoor Temperature where the HWE-MOV will begin giving heat. That point is determined by the Outdoor Cutoff ΔOF . Also note the 100°F starting point can be changed by adjusting the Offset ΔFS as described below.
- For new baseboard heating installations, begin with a Reset Ratio curve of 7.
- For new radiant heat installations, begin with a Reset Ratio curve of 2 or 3. (Refer to *Tube Design* for desired curve.)
- Adjust the Reset Ratio curves in cold weather. If the ambient indoor temperatures are cold in the cold weather, pick the next higher Reset Ratio (that is, go from 7 to 8). If the ambient building temperatures are warm in the cold weather, pick the next lower Reset Ratio.
- After adjusting the Reset Ratio curve, wait at least 24 hours before making another adjustment.



Offset ΔFS **Default is 0°F**

- The Offset value moves the starting point of the Reset Ratio curves.
- Therefore, any change made to the Offset will immediately change the value of the Calculated water temperature by the same amount (unless the new value is above Hi Limit Temp). For example, if the Calculated Water Temperature ΔRL were 150°F based on the specific Outdoor Temperature ΔUT and Reset Ratio rSL , then increasing the Offset ΔFS from 0°F to 10°F would increase the Calculated Water Temperature ΔRL to 160°F.
- In a new installation, start with an Offset ΔFS value of 0°.
- Adjust the Offset value ΔFS in mild weather. If the ambient indoor temperatures are warm in the warm weather, decrease the Offset ΔFS . If the ambient building temperatures are cold in the mild weather, increase the Offset ΔFS .
- The rule of thumb for baseboard radiation is to change the Offset ΔFS by 4° for every 1° change to the ambient temperature. For radiant heat applications, change the Offset ΔFS by 1° or 2° for every 1° change to the ambient temperature.

Setback / Boost SBc **Default is 10°F**

- When the Setback SB mode is chosen in the Initial Startup and contact terminals between SETBACK/T-STAT are closed, by using a timer or other timing controls, the Calculated Water Temperature ΔRL is lowered by an amount set by the Setback SBc . When contact terminals are opened, the newly Calculated Water Temperature ΔRL will be boosted higher by the amount set by the Setback SBc for 1 hour. The normal Calculated Water Temperature will resume after the boost hour.

Hi Limit Temp HI **Default is 160°F**

- The Hi Limit Temp value is the maximum water temperature the HWE-MOV will calculate.
- When there is a call for heat, the HWE-MOV will compute the temperature of the water to circulate based on the outdoor temperature, Reset Ratio, Offset and Setback.
- Then, the HWE-MOV will compare the newly computed water temperature to the Hi Limit Temp. The HWE-MOV will use either the computed value or the Hi Limit Temp value, whichever is LOWER.

WARNING

Excessive heat can cause substantial property damage in certain installations. It is the responsibility of the installer to determine the correct maximum water temperature which can be safely circulated through a specific installation. In addition, the Heat-Timer control can not be used as a limit control. Separate high limit controls must be installed to prevent property damage.

MAIN DISPLAY AND STATUS LIGHTS

- The main display will show $\square F F$ when there is no call for heat, either because the outdoor temperature is above the Outdoor Cutoff or because the SETBACK/T-STAT input is open. NOTE: To read the temperature of the Heating System Sensor when the display shows $\square F F$, repeatedly press the center button until the display shows $5 4 5$. The system temperature will be displayed for approximately 5 seconds before the display reverts to $\square F F$.
- The decimal points in the Main Display digits indicate the status of the Heating System Pump and the motorized valve. see pg.4:
 - Right hand decimal on - Active Heating System Pump
 - Center decimal on - Opening Valve Motor
 - Left hand decimal on - Closing Valve Motor
- The red LED marked OUTPUT will be off when there is no call for heat and on when the Heating System Pump is active.

SETBACK & BOOST / T-STAT INPUT

- When the SETBACK/T-STAT terminals are closed and the initial Startup mode was $\ell \ell$ (Thermostat) the control will energize the Heating System Pump and the motorized valve, if they were not already on, until Calculated Water Temperature is reached, then it will shut off the Heating System Pump and the motorized valve. Close Relay will energize for 10 minutes.
- When the SETBACK/T-STAT terminals are closed and the initial operating mode was set to $5 b$ (Setback / Boost) the control will energize the Heating System Pump and the motorized valve, if it was not already on, until Calculated Water Temperature plus the Setback $5 b c$ setting is reached. When terminal are open the HWE-MOV will energize the Heating System Pump and the motorized valve when System Water Temperature is less than the Calculated Temperature less the Setback $5 b c$.
- The HWE-MOV comes equipped with a factory installed jumper across the SETBACK/T-STAT terminals. DO NOT remove this jumper unless it is being replaced by a dry contact switch.
- The SETBACK/T-STAT input would typically be provided by a thermostat or a timer. When the thermostat is satisfied, no heat is required. When the thermostat calls for heat, the HWE-MOV will activate the Heating System Pump and the motorized valve to bring the System Water temperature to the Calculated Temperature.
- This input can also be used as a remote stop/start for the HWE-MOV.
- When the SETBACK/T-STAT terminals are first opened, the Heating System Pump output will immediately open and the motorized valve outputs will drive the valve motor shut.

HEATING SYSTEM PUMP OPERATION

- The Heating System Pump output is design to continuously circulate the heating water whenever heat is required.
- The Heating System Pump relay will energize whenever the outdoor temperature is below the Outdoor Cutoff temperature and the SETBACK/T-STAT input is closed when control is operating in Thermostat $t t$ mode, or when input is open or closed when control is operating in Setback / Boost $5 b$ mode.

MOTORIZED VALVE OPERATION

- When there is no heat demand, the motorized valve Close Relay is energized for 10 minutes to guarantee a fully closed valve.
- If during a heat demand the System Sensor or the Outdoor Sensor fails, the motorized valve Open Relay will energize for 10 minutes to guarantee a fully open valve.

BOILER RETURN OPERATION

- The Boiler Return Sensor should only be installed and activated when required by the boiler manufacturer's specification. Activating the Boiler Return Sensor feature can help prevent cold water returning to the boiler, thereby, reducing the likelihood of thermal shock and potentially increasing the life of some boilers.
- When the water temperature measured by the Boiler Return Sensor $r \ell n$ is above 120°F, the HWE-MOV will operate normally.
- When the Boiler Return temperature $r \ell n$ falls below 120°F, the HWE-MOV will recompute the Calculated Water Temperature $\ell A L$ not to exceed 20°F above the Return Water temperature $r \ell n$. That will remain till Return Water Temperature $r \ell n$ rises above 123°F, then the Calculated Water Temperature $\ell A L$ will change to match Reset Ratio $R 5 \ell$ curves. This will enable the Boiler Return Temperature $r \ell n$ to recover more quickly.
- The Calculated water temperature $\ell A L$ display will flash to indicate when it has been lowered due to the Boiler Return Sensor.

WARNING

In most applications, the MOV will control only one of several zones. If demand in other zones lowers the boiler return temperature, the Boiler Return Sensor feature may not provide enough energy to enable the return temperature to recover, but will cause the ambient temperatures in the MOV zone to drop. It is the responsibility of the installer to pipe the entire system in a manner that will prevent this.

TROUBLESHOOTING

No Display

Check the power to the HWE-MOV. The HWE-MOV requires 120VAC power to the orange wires. Turn the power off and back on to restore the display.

Display shows *BBB*

Consult factory.

System, Outdoor, or Boiler Return Display shows *OPn*

Check that the wires from the sensor are continuous to the HWE-MOV. Then follow the procedure for Incorrect Temperature Display.

System or Outdoor Display shows *SHL*

The HWE-MOV sees a short across the input terminals. Remove the wires from the input terminals. The display should change to read *OPn*. If it doesn't, the HWE-MOV may be damaged.

Incorrect Temperature Display

Remove the wires from the input terminals. The display should change to read *OPn*. If it doesn't, the HWE-MOV may be damaged. Take an Ohm reading across the detached sensor wires. The Ohm reading should correspond to the chart at right. If it doesn't, the sensor or its wires may be damaged.

Calculated Temperature Flashing

The Boiler Return Sensor temperature is below 120°F. The display is flashing to indicate the Calculated water temperature has been recalculated to assist the boiler return temperature in recovering rapidly.

No Heat - No Outputs - Output Light *OFF*

Check the outdoor temperature and Outdoor Cutoff readings. If the outdoor temperature is above the Outdoor Cutoff, the HWE-MOV will not give heat. Then check the SETBACK/T-STAT terminals. If the SETBACK/T-STAT terminals are not jumped together, the HWE-MOV will not give heat.

No Heat - Output Light ON - Heating System Pump Not Running

Remove any connections to the Blue wires for the Heating System Pump. Test for continuity across the pair of Blue wires. If the wires are continuous, the HWE-MOV is calling for the Heating System Pump to run. Check the pump to determine why it is not circulating.

No Heat - Output Light ON - Heating System Pump Running

Check that the boiler (or other hot water source) is providing hot water to the inlet of the motorized valve. If hot water is available, remove the wire attached to terminal marked OUT and all wiring to the motorized valve. Then check for continuity across the MOV's Red and White wires. If the continuity exist, the HWE-MOV is working properly, check the valve and motor.

Too Little Heat

Check if the displayed System temperature is close to that of the Calculated temperature. If it is not, follow the procedure for No Heat- Heating System Pump Running. Next check if the Calculated temperature is the same as the Hi Limit Temp. If so, check the Hi Limit Temp has not been set too low for the system (DO NOT increase the Hi Limit Temp without consulting the installer or tubing/flooring manufacturer). Finally, adjust the Reset Ratio or Offset to increase the temperature of the circulating hot water. Note that, depending on the type of radiation, it may take several hours before the ambient temperature increases.

Too Much Heat

Check if the displayed System temperature is close to that of the Calculated temperature. If it is, adjust the Reset Ratio or Offset to decrease the temperature of the circulating hot water. If it is not, remove the wire attached to terminal marked OUT and all the motorized valve wiring. Check for continuity across the MOV's Red and White wires and for a lack of continuity across the MOV's Red and Black wires. If the continuity is correct, the MOV is working properly. Check the valve and motor.

TEMPERATURE (in degrees °F)	Value (in Ohms)
0	42683
10	31215
20	23089
25	19939
30	17264
35	14985
40	13040
45	11374
50	9944
55	8714
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
190	489
200	412