

HEAT-TIMER®

INSTALLATION/OPERATING INSTRUCTIONS

SEQUENCING PANELS

SEQ-6, SEQ-6P and SEQ-12

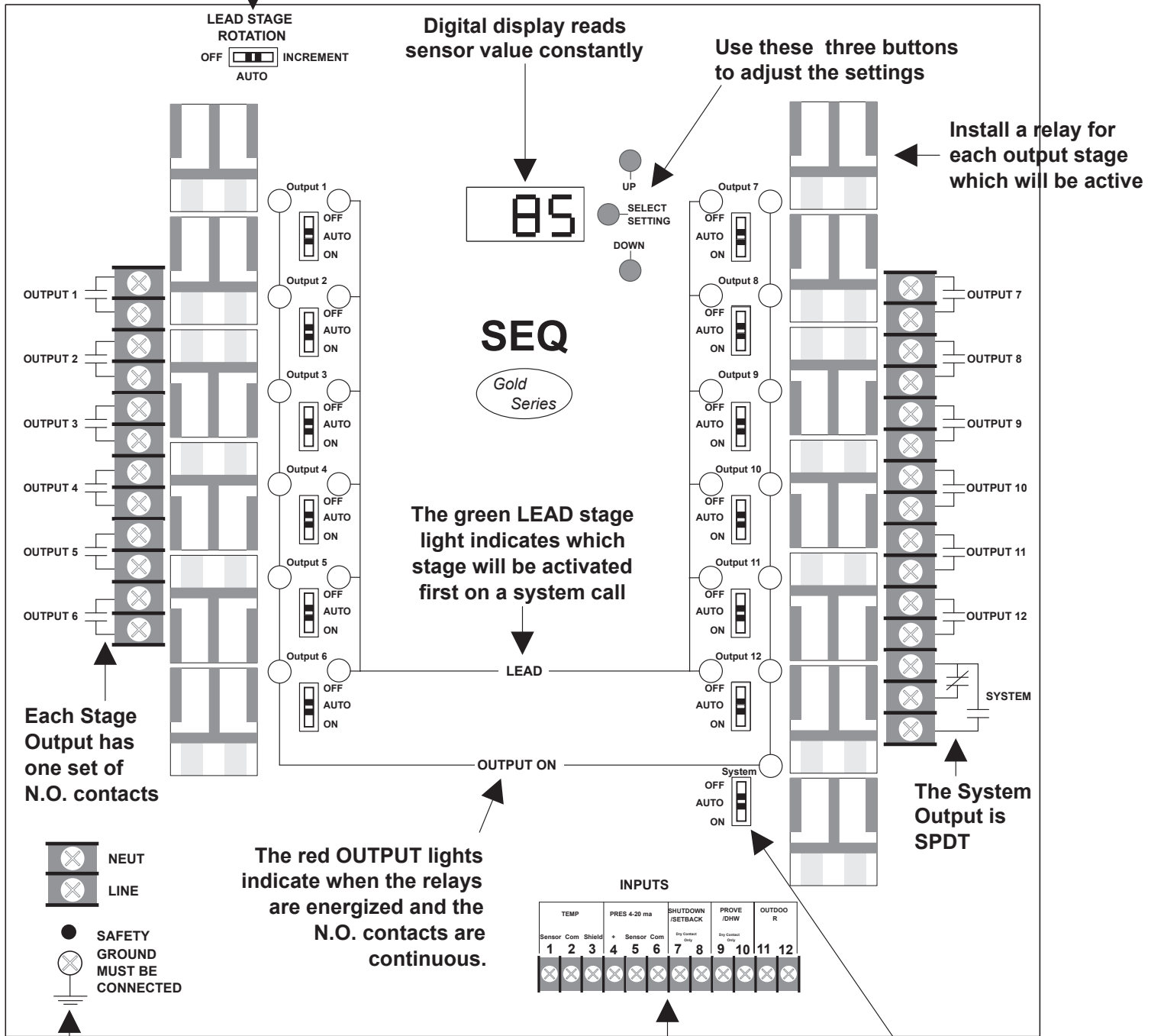
Output Panels to Sequence up to 12 Individual Stages
with Lead-Lag and Manual Override Capabilities

CONTENTS

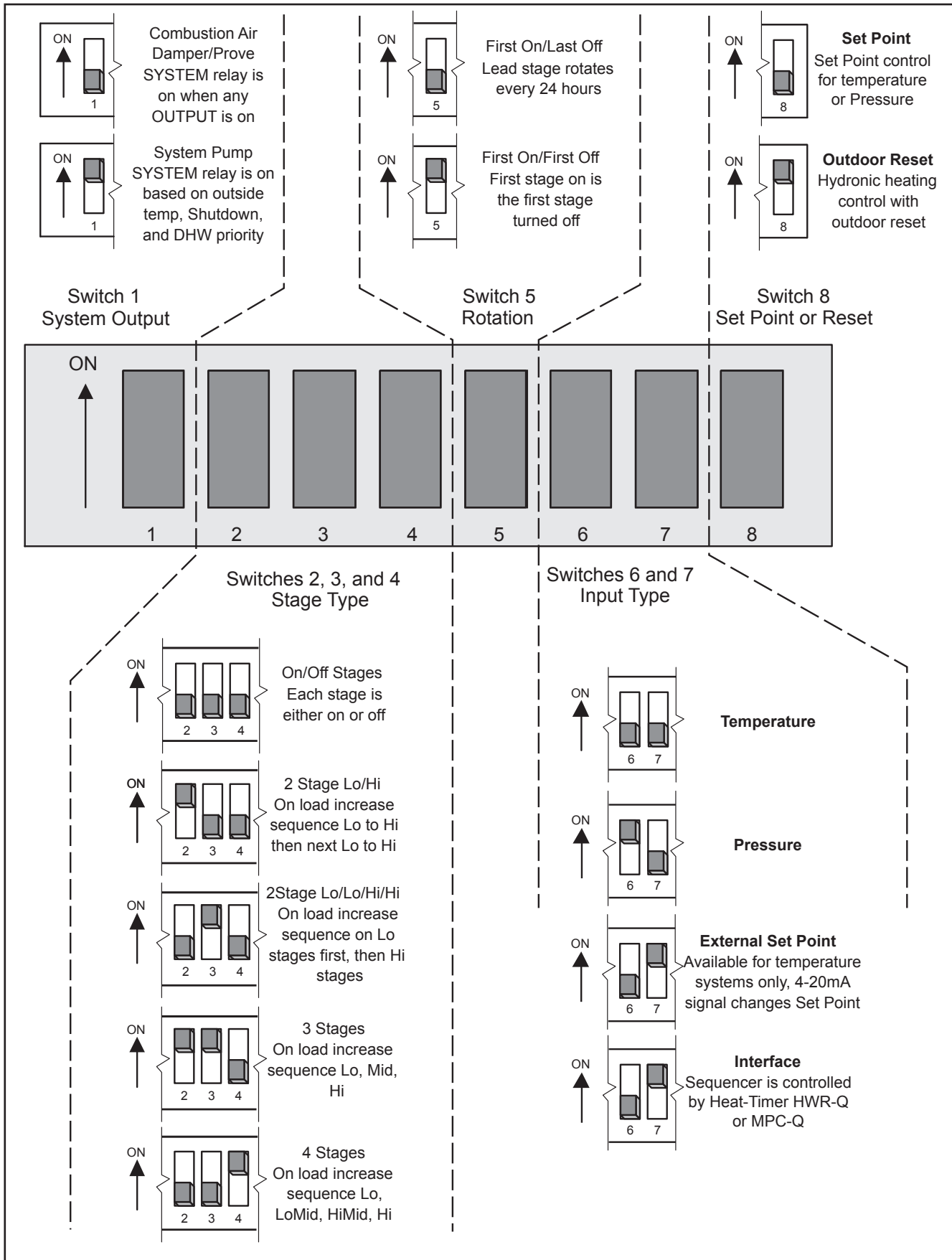
SEQ FUNCTION CHART	2
DIP SWITCH CHART	3
INSTALLATION	4
MOUNTING THE SEQ	4
SET THE DIP SWITCHES	4
WIRING THE POWER INPUT	4
WIRING THE INPUT TERMINALS	4
INTERFACING TO A HWR-Q OR MPC-Q	6
WIRING THE STAGE OUTPUTS	7
WIRING THE SYSTEM OUTOUT	7
POWER UP SEQUENCES	8
SET POINT CONTROL - TEMPERATURE AND EXTERNAL SET POINT	8
SET POINT CONTROL - PRESSURE	9
OUTDOOR RESET CONTROL	9
ADJUSTING THE CONTROL SETTING	10
SET POINT CONTROL WITH NORMAL SEQUENCING	11
SET POINT CONTROL WITH OSS SEQUENCING	12
INTERFACE	12
OUTDOOR RESET CONTROL WITH NORMAL SEQUENCING	13
OUTDOOR RESET CONTROL WITH OSS SEQUENCING	14
SEQ-6 AND SEQ-12 OUTPUT WIRING	15
SEQ-6P OUTPUT WIRING	16
SAMPLE WIRING AND PLUMBING DIAGRAMS	17
OUTPUT RELAY CHARTS	18
OPERATION	19
SET POINT CONTROL SETTINGS	19
OUTDOOR RESET SETTINGS	20
NORMAL SEQUENCING SETTINGS	21
OVERSIZE SYSTEM SEQUENCING SETTINGS	22
SYSTEM OUTPUT SETTINGS	23
LEAD STAGE	23
OUTPUT CONTROLS	24
EXTERNAL SET POINT	25
INTERFACE MODE	25
TROUBLESHOOT	27
WARRANTY	32

SEQ FUNCTION CHART

In AUTO, the lead stage will automatically rotate among the active outputs. Press to INCREMENT for manual rotation.



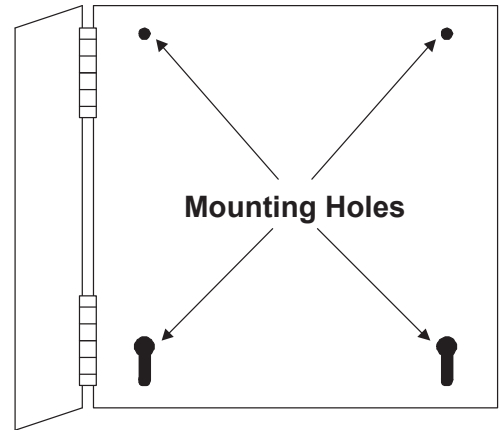
DIP SWITCH CHART



INSTALLATION

MOUNTING THE SEQ

- Select a location near the equipment to be controlled.
- The surface should be flat, and be sufficiently wide and strong to hold the SEQ.
- Keep the control away from extreme heat or cold. Ambient operating temperature is from 20 to 120°F.
- Remove the panel from the metal enclosure by removing the top center screw and loosening the two screws at the bottom of the panel. Lift the panel out.
- Screw the enclosure to the surface through the mounting holes in the back of the enclosure.
- Be sure to set the dip switches (below) before returning the panel to the enclosure.



SET THE DIP SWITCHES

- The dip switch chart is shown on page 3.
- The dip switch is located on the back on the SEQ board (the side of the board without the metal front panel).
- The dip switch sets all of the following:
 - System relay output type - Combustion Air Damper, or System Pump operation
 - Stage type - On/Off, Lo/Hi, 3 Stage or 4 Stage
 - Rotation sequence - First On/Last Off or First On/First Off
 - Input type - Temperature, Pressure, External Set Point, or Interface
 - Operation - Set Point or Outdoor Reset

⚠WARNING

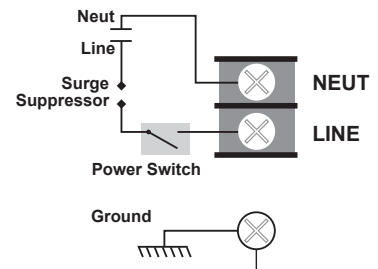
If the dip switch is changed during operation, the SEQ will be completely reset. Wait until the SEQ restarts and then reprogram all settings.

IMPORTANT

The dip switch must be set correctly. Carefully, check the details of the installation and determine the appropriate dip switch settings before continuing on to the next steps.

WIRING THE POWER INPUTS

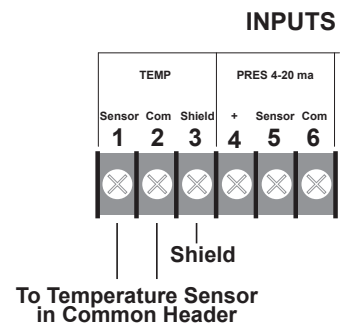
- Bring the 120VAC 60Hz power wires through a bottom knockout of the enclosure. Class 1 voltages must enter the enclosure through a different opening from any Class 2 voltage wiring.
- Connect the hot line to terminal marked *LINE*.
- Connect the neutral line to the terminal marked *NEUT*.
- The green ground screw must be connected to earth ground.
- *Wiring a surge suppressor and a power switch is recommended before wiring to the SEQ Control.*



WIRING THE INPUT TERMINALS

System Temperature Sensor - Terminals 1, 2, and 3

- The System Temperature Sensor must be installed unless the SEQ will be used for regulating pressure or if it is connected to an MPC-Q or HWR-Q in the Interface mode (see chart on pg 3).
- The SEQ is designed to be connected to HT#904015 standard brass tube sensor, or HT#904024 for immersion in a 3/8" ID well (HT#904011 or equivalent). Contact the factory for additional temperature sensor options.
- Locate the sensor where it will register the water temperature output of all the stages. Sensor should *not* be installed between boiler connections to primary header. If the sensor does not register the output of all the stages, it will not be able to sequence properly.
- Temperature sensor wires can be extended up to 500' by splicing with 18 gauge shielded wire.
- Do not run wire in conduit with line voltage.
- Temperature sensors have no polarity. Connect either wire from the sensor to terminal 1 *SENSOR*.
- Connect the other sensor wire to terminal 2 *COM*.
- Connect the shield to terminal 3 *SHIELD*.

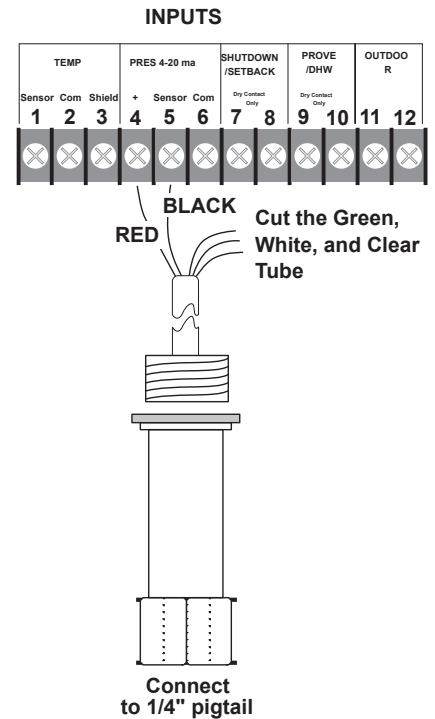


System Pressure Sensor - Terminals 4, 5, and 6

- For controlling pressure systems, dip switch 6 must be *ON* and dip switches 7 and 8 must be *OFF* (see chart on pg. 3).
- The SEQ is designed to be connected to any of the following pressure transducers:

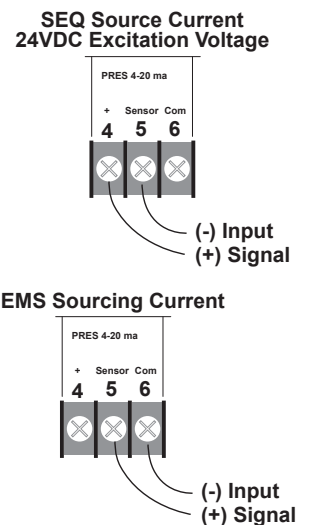
0-30 psi	HT #904310
0-100 psi	HT #904312
0-200 psi	HT #904311
0-300psi	HT #904313

 Contact the factory for additional pressure ranges.
- Locate the sensor on the main supply header where it will register the output of all the stages. If the sensor does not register the output of all the stages, it will not be able to sequence properly.
- Attach a 1/4" isolation tube (pigtail) to the header.
- Screw the pressure sensor to the pigtail. The sensor has 1/4" NPT threads.
- Pressure sensor wires can be extended up to 500' by splicing with 18 gauge shielded wire.
- Do not run wire in conduit with line voltage.
- Pressure sensors have polarity. If the Heat-Timer sensor has a green wire, a white wire, or a clear tube, none of them should be connected. Simply cut them off. Only the red and black wire should be connected.
- Connect the red wire from the pressure transducer to terminal (4 +).
- Connect the black wire from the pressure transducer to terminal 5 *SENSOR*.



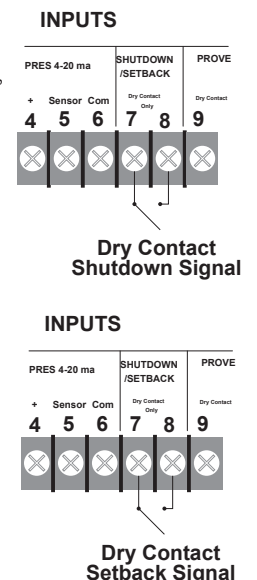
External Set Point - Terminals 4, 5, and 6

- The External Set Point option can only be used when the SEQ is controlling stages to regulate a water temperature Set Point. The SEQ can then accept a 4-20mA signal from an Energy Management System (EMS) or other signal source to change the Set Point remotely (see pg. 25 for additional details).
- Dip switch 6 and 8 must be *OFF* and dip switch 7 must be *ON*. These settings will allow the SEQ to read and monitor the system water temperature using the System temperature sensor and monitor the 4-20mA input to change the Set Point remotely (see pg. 25).
- The signal must be a two-wire 4-20mA.
- Connect the System Temperature Sensor as described on pg. 4.
- The SEQ can source the current for the 4-20mA input. It provides an excitation voltage of 24VDC. If using the SEQ to source the power, attach the (+) side of the 4-20mA input to the *PRESSURE* input terminal marked 4 +. Attach the (-) side of the 4-20mA signal to the *PRESSURE* input terminal marked 5 *SENSOR*.
- If the EMS or other signal sources the current (provides the excitation voltage), attach the (+) side of the 4-20mA input to the *PRESSURE* input terminal marked 5 *SENSOR*. Attach the (-) side of the 4-20mA input to the *PRESSURE* input terminal marked 6 *COM*.



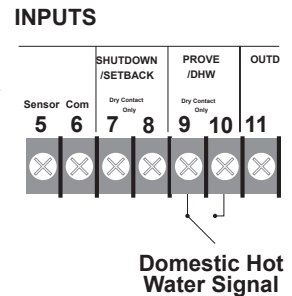
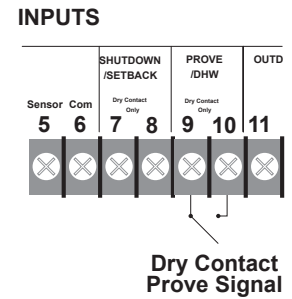
Shutdown or Setback - Terminals 7 and 8

- When adjusting control *SETBACK* \leq 0 the *SHUTDOWN* feature is enabled by closing a dry contact, all active stages are turned off. Any pumps that were controlled by the SEQ that were on will remain on until the *System Delay* \leq is over, then they will also turn off.
- The Shutdown feature can be used whenever it is desirable to turn off the SEQ from a remote location or another controller (for more details see pg. 26).
- The Shutdown/Setback signal must be a dry contact only. No voltage can be placed across the *SHUTDOWN* terminals.
- Bring the two wires from the dry contact to the terminals marked 7 and 8.
- The *SETBACK* \leq option is not available if the SEQ is regulating pressure or if it is connected to an MPC-Q or HWR-Q in the Interface mode.
- When *SETBACK* \leq is enabled by closing a dry contact, the SEQ will immediately reduce the temperature of the circulating hot water by the desired amount (see pg. 20 to adjust the amount of Setback). Any pumps controlled by the SEQ that were on will remain on until the System Delay is over, then they will also turn off.



Prove or Domestic Hot Water (DHW) Input - Terminals 9 and 10

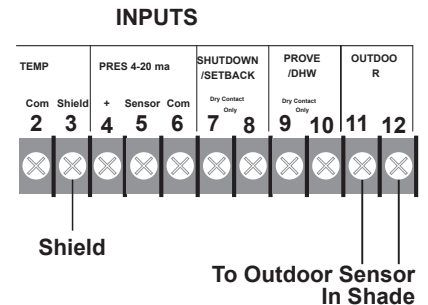
- The Prove or Domestic Hot Water features are set by the External Input Mode in the Power Up Sequence. It can be switched between Prove (*Pr*) and Domestic Hot Water (*d/h*).
- To use Prove or Domestic Hot Water (DHW), bring the two wires from the dry contact to the terminals marked 9 and 10.
- The *PROVE* feature is used to check system components' operation before activating any stages. See pg. 26 for typical applications.
- If the *PROVE* input terminals are open, the SEQ will enable only the System Output relay. All Stage Outputs will be off when the *PROVE* input is open.
- The Domestic Hot Water (DHW) feature is only available when the SEQ is controlling stages to regulate hot water (Outdoor Reset mode or water temperature Set Point mode for heating, as opposed to cooling, applications). To set terminals 9 and 10 for DHW, see pgs. 9 and 11.
- When the Domestic Hot Water (*DHW*) input is enabled by closing a dry contact, the Calculated water temperature or the Set Point will change to 200°F and the decimal point on the left-most digit on the display will flash.
- The *DHW* input will take priority over the outdoor reset function or the Outdoor Cutoff temperature. Regardless of outdoor temperature, when the *DHW* input is closed, the SEQ will Sequence stages to hold 200°F.
- If **NO** external conditions must be met before Stage Output is activated and terminals 9 and 10 are not used for Domestic Hot Water (see pg. 26), **DO NOT** remove the factory installed jumper across the *PROVE/DHW* terminals.
- The *PROVE/DHW* signal must be a dry contact only to terminals 9 and 10. No voltage can be placed across the terminals.



IMPORTANT FACTORY INSTALLED PROVE JUMPER: The *PROVE* input terminals must be shorted for Stage Outputs to be activated. DO NOT remove the factory installed PROVE jumper unless replacing it with a Prove or Domestic Hot Water signal.

Outdoor Sensor- Terminals 11 and 12

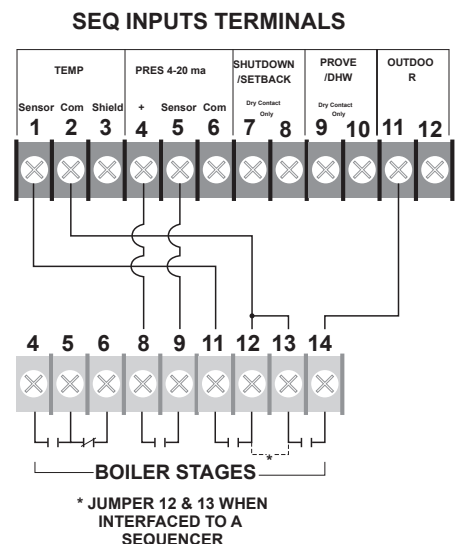
- The Outdoor Sensor must be installed if the Outdoor Reset operational mode is required (dip switch 8 *ON*).
- Installing the Outdoor Sensor is optional in the Set Point mode (dip switch 8 *OFF*). If it is installed, it will act as an Outdoor Cutoff (see pg. 20). In a heating mode, no stages will be activated when the outdoor temperature is above the Outdoor Cutoff. In cooling, no stages will be activated when the outdoor temperature is below the Outdoor Cutoff.
- 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.
- Temperature 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.
- Temperature sensors have no polarity. Connect either wire from the sensor to terminal 11 AND 12.
- Connect the shield to terminal 3 *SHIELD*. Note that both sensor shields will be connected to terminal 3.



INTERFACING TO A HEAT-TIMER CONTROL (HWR-Q, MPC-Q)

The HWR-Q is an outdoor reset control for hot water heat. The MPC-Q is an outdoor reset control for steam heat. Either can directly control up to four output stages. The SEQ can be used to expand the number of output stages of either control. Check the I/O manual for the HWR-Q or MPC-Q to be sure they are set up correctly.

- When being used in the Interface mode, the SEQ does not require any sensor. It receives its staging information from the outdoor reset control (see pg. 25).
- Dip switches 6 and 7 must be ON for the SEQ to recognize the information from the reset control.
- Terminal 8 of the reset control must be wired to SEQ input terminal 4.
- Terminal 9 of the reset control must be wired to SEQ input terminal 5.
- Terminal 11 of the reset control must be wired to SEQ input terminal 1.
- Terminal 12 of the reset control must be wired to SEQ input terminal 2.
- Terminal 14 of the reset control must be wired to SEQ input terminal 11.



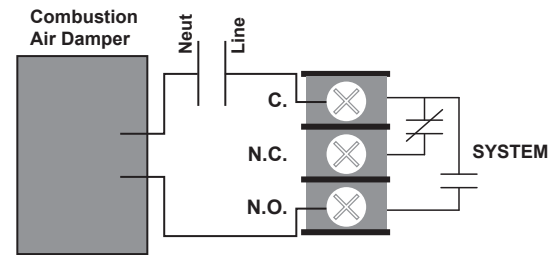
WIRING THE STAGE OUTPUTS

- For SEQ-6 and SEQ-12 see pg. 15.
- For SEQ-6P see pg. 16.

WIRING THE SYSTEM OUTPUT

Combustion Air Damper

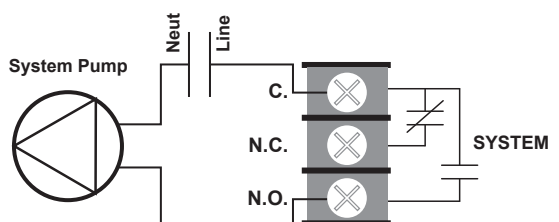
- To select the Combustion Air Damper mode of operation, Dip Switch 1 must be *OFF*.
- If the SEQ is set for Pressure Set Point control or Interface, then the System Output will be overridden by the Combustion Air Damper mode, regardless of the state of dip switch 1.
- The Combustion Air Damper option causes the System relay to act as follows:
 - If there is no call for stage output, the System relay is off
 - On a call for stage output, the System relay is energized
 - When the PROVE input is made, the lead stage is energized
 - The System relay remains energized as long as any stage is active
 - When the last stage turns off, the System relay remains energized for the period of time set by the System Delay S_d .
 - Then the System relay is turned off
- To give the damper time to open, wire the damper motor end switch into the PROVE inputs. The PROVE input can be used in a similar fashion to provide a delay for any equipment being energized by the System relay.
- The Combustion Air Damper operation can also be used to activate any piece of equipment that should be on whenever any stage is active or can provide a signal to other equipment that one or more stages of the SEQ has been activated.
- The SPDT output is capable of switching 6A resistive.
- Check the wiring information provided by the damper motor or other equipment manufacturer for the appropriate method to activate the equipment with a SPDT output.



⚠ WARNING
The SEQ is NOT a safety control.
Make sure damper is wired back into boiler for safety.

System Pump

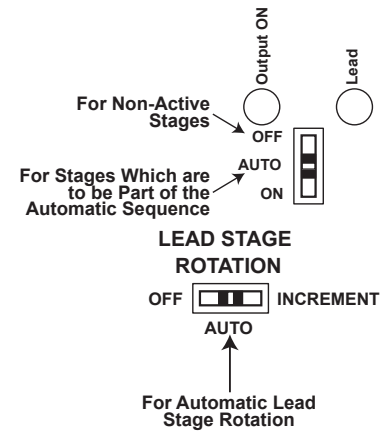
- To select the System Pump mode of operation, dip switch 1 must be *ON*.
- The System Pump mode of operation is not available if the SEQ is in Pressure Set Point mode or in Interface mode.
- When there is no call for DHW, the System relay will be energized whenever the Outdoor temperature is below the Outdoor Cutoff $CDF + 2^\circ F$ and the Shutdown is not active. The System relay will remain energized even if all Output Stages are off.
- If an outdoor sensor is not connected or registers a fault condition:
 - The System relay will be energized when any stage is active
 - After the last stage is turned off, the System relay will remain energized for the period of time set by the System Delay S_d (see pg. 22) and then turn off.
- When the control is set for “no DHW priority” dh (see pgs. 8 and 10) and there is a call for DHW:
 - When the outdoor temperature is at or below the Outdoor Cutoff + $2^\circ F$ ($CDF + 2^\circ F$), the System relay output will be active.
 - Otherwise, the System relay will be off above (after the System Delay S_d time has expired).
- When the control is set for “DHW priority” (see pgs. 8 and 10):
 - The System relay will be off for an adjustable period of time set by the DHW Priority Time dhP .
 - After the Priority Time has elapsed, when the outdoor temperature is below the Outdoor Cutoff + $2^\circ F$ ($CDF + 2^\circ F$), the System relay will be energized.
 - When the outdoor temperature is $2^\circ F$ above the Outdoor Cutoff ($CDF + 2^\circ F$), the System relay will be off at all times.
- The System Output relay is capable of switching 6A resistive.



⚠ REMEMBER
The SEQ DOES NOT source power.
A separate power source must be supplied for equipment being controlled.

BEFORE POWER UP

- The dip switches must be set correctly for the application. Check the dip switch chart on pg. 3 to make sure the SEQ is set properly before power up.
- Each Stage Output which is to be active (and has a relay installed) should have its *OFF/AUTO/ON* switch in the *AUTO* position.
- Any Stage Output which is not to be active (or any output without a relay) should have its *OFF/AUTO/ON* switch in the *OFF* position.
- Set the *LEAD STAGE* switch in the *AUTO* position for automatic rotation.



POWER UP SEQUENCES

- Whenever the SEQ is powered up, it displays the software version number and then the operating parameters. Each display will remain on the screen approximately 5 seconds. If the parameters are correct, there is no need to make any adjustments.
- There are no adjustable parameters when using the SEQ in the Interface mode, where it is connected to a HWR-Q or MPC-Q.
- Once the parameters have been set for a particular application, they will be retained in memory and will not need to be reset.
- Note that if you do change any parameter, or make any changes to the dip switch positions, all settings will revert to their default values and must be reset.
- A parameter can only be changed in the start-up sequence. To restart, it is necessary to remove and reapply power.
- Set the parameters to find the appropriate sequence for your application, Set Point Control - Temperature and External Set Point (pg. 8), Set Point Control - Pressure (pg. 9), or Outdoor Reset (pg. 9)

Set Point Control - Temperature and External Set Point

Temperature Display Mode

Default: Fahrenheit F

- The SEQ can be field adjusted to read temperature sensors and display the Set Point either in $^{\circ}F$ or $^{\circ}C$.
- The sensor input range is from -35 to $250^{\circ}F$ or from -30 to $120^{\circ}C$.
- If the display shows F the SEQ will operate in Fahrenheit. If the display shows C then the SEQ will operate in Celsius.
- To change the temperature display mode, hold down the center button while pushing either the *UP* button to increase the value, or the *DOWN* button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Heating or Cooling

Default: Heating HL

- The SEQ can be field adjusted to bring on stages for heating, where stages are added when the system temperature is below the Set Point SP , or for cooling, where stages are added when the system temperature is above the Set Point SP .
- If the display shows HL the SEQ will operate in a heating mode. If the display shows CL then the SEQ will operate a cooling mode.
- To change the heating or cooling mode, hold down the center button while pushing either the *UP* button to increase the value, or the *DOWN* button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Set Input Terminals 9 and 10 to PROVE or DHW

Default: Prove Pr

- This option is not available in the cooling mode. The control will automatically default to Prove Pr .
- If the system is designed to provide heat and DHW, the SEQ can be programmed to Domestic Hot Water dH hold a $200^{\circ}F$ when a call for DHW is installed on Input terminals 9 and 10 (see pg. 27).
- All other applications should use the default Prove Pr setting (see pg. 26).
- If the display shows Pr the Input terminals 9 and 10 will function in the Prove mode. If the display shows dH then the same terminals will function in the DHW mode.
- To change the Input terminal functions, hold down the center button while pushing either the *UP* button to increase the value, or the *DOWN* button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Set the Sequencing Mode

Default: Normal nr

- For most applications, the Normal nr or PID type sequencing mode provides the most stable operation. Stages are brought on or off based on the rate of change of the system temperature and the impact a stage has on that rate.
- For applications where the stages are oversized for most load conditions, the SEQ has an Oversize System (oss) sequencing mode that brings on stages proportionally, based on how high above or far below the Set Point the current system temperature is. For more details, see pg. 22.

- If the display shows $n\bar{0}r$ then the SEQ will sequence in the PID type mode. If the display shows $\bar{0}\bar{5}\bar{5}$ then SEQ will sequence stages based on a throttling range around the Set Point.
- To change the sequence function, hold down the center button while pushing either the *UP* button to increase the value, or the *DOWN* button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Set Point Control - Pressure

Temperature Display Mode

Default: Fahrenheit F

- The SEQ can be field adjusted to read temperature sensors and display the Set Point either in °F or °C.
- The sensor input range is from -35 to 250°F or from -30 to 120°C.
- If the display shows F the SEQ will operate in Fahrenheit. If the display shows C then the SEQ will operate in Celsius.
- To change the temperature display mode, hold down the center button while pushing either the *UP* button to increase the value, or the *DOWN* button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Pressure Display Mode

Default: $\bar{0}$

- The SEQ can be field adjusted to read four pressure ranges: 0-30 psi, 0-100 psi, 0-200 psi, and 0-300 psi.
- If the display shows $\bar{0}\bar{0}$ the SEQ will operate with a pressure range of 0-30 psi. Similarly, if the display shows $1\bar{0}\bar{0}$, the operating pressure range will be 0-100 psi, $2\bar{0}\bar{0}$ will be 0-200 psi, and $3\bar{0}\bar{0}$ will be 0-300 psi.
- To change the pressure range mode, hold down the center button while pushing either the *UP* button to increase the value, or the *DOWN* button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Heating or Cooling

Default: Heating $H\bar{L}$

- The SEQ can be field adjusted to bring on stages for heating, where stages are added when the system temperature is below the Set Point $\bar{5}P$, or for cooling, where stages are added when the system temperature is above the Set Point $\bar{5}P$.
- If the display shows $H\bar{L}$ the SEQ will operate in a heating mode. If the display shows $C\bar{0}$ then the SEQ will operate a cooling mode.
- To change the heating or cooling mode, hold down the center button while pushing either the *UP* button to increase the value, or the *DOWN* button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Set the Sequencing Mode

Default: Normal $n\bar{0}r$

- For most applications, the Normal $n\bar{0}r$ or PID type sequencing mode provides the most stable operation. Stages are brought on or off based on the rate of change of the system pressure and the impact a stage has on that rate.
- For applications where the stages are oversized for most load conditions, the SEQ has an Oversize System ($\bar{0}\bar{5}\bar{5}$) sequencing mode that brings on stages proportionally, based on how high above or far below the Set Point the current system pressure is. For more details, see pg. 22.
- If the display shows $n\bar{0}r$ then the SEQ will sequence in the PID type mode. If the display shows $\bar{0}\bar{5}\bar{5}$ then SEQ will sequence stages based on a throttling range around the Set Point.
- To change the sequence function, hold down the center button while pushing either the *UP* button to increase the value, or the *DOWN* button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Outdoor Reset Control

Temperature Display Mode

Default: Fahrenheit F

- The SEQ can be field adjusted to read temperature sensors and display the Set Point either in °F or °C.
- The sensor input range is from -35 to 250°F or from -30 to 120°C.
- If the display shows F the SEQ will operate in Fahrenheit. If the display shows C then the SEQ will operate in Celsius.
- To change the temperature display mode, hold down the center button while pushing either the *UP* button to increase the value, or the *DOWN* button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Minimum Water Temperature

Default: 140°F

- The SEQ will not compute a temperature for the circulating hot water below this setting. Check with the boiler manufacturer for the appropriate setting for your specific boiler(s).
- The Minimum Water Temperature can be adjusted from 110°F to 180°F with a factory default of 140°F.
- To change the minimum water temperature, hold down the center button while pushing either the *UP* button to increase the value, or the *DOWN* button to decrease the value.

- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Set Input Terminals 9 and 10 to PROVE or DHW

Default: Prove P_r

- This option is not available in the cooling mode. The control will automatically default to Prove P_r .
- If the system is designed to provide heat and DHW, the SEQ can be programmed to Domestic Hot Water d_h hold a 200°F when a call for DHW is installed on Input terminals 9 and 10 (see pg. 27).
- All other applications should use the default Prove P_r setting (see pg. 26).
- If the display shows P_r the Input terminals 9 and 10 will function in the Prove mode. If the display shows d_h then the same terminals will function in the DHW mode.
- To change the Input terminal functions, hold down the center button while pushing either the UP button to increase the value, or the DOWN button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

Set the Sequencing Mode

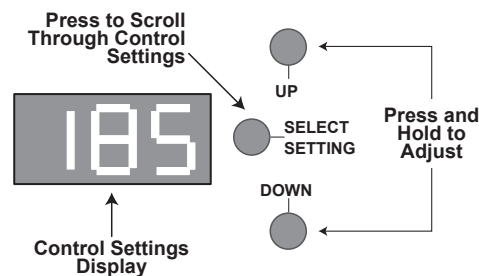
Default: Normal $n\bar{r}$

- For most applications, the Normal $n\bar{r}$ or PID type sequencing mode provides the most stable operation. Stages are brought on or off based on the rate of change of the system temperature and the impact a stage has on that rate.
- For applications where the stages are oversized for most load conditions, the SEQ has an Oversize System ($\bar{r}\bar{r}\bar{r}$) sequencing mode that brings on stages proportionally, based on how high above or far below the Set Point the current system temperature is. For more details, see pg. 22.
- If the display shows $n\bar{r}$ then the SEQ will sequence in the PID type mode. If the display shows $\bar{r}\bar{r}\bar{r}$ then SEQ will sequence stages based on a throttling range around the temperature Set Point.
- To change the sequence function, hold down the center button while pushing either the UP button to increase the value, or the DOWN button to decrease the value.
- When the correct mode is shown, release the button and wait 5 seconds. The display will flash if changes were made.

ADJUSTING THE CONTROL SETTING

- After the power up routine is complete, the display will show the system water temperature or steam pressure, except in the Interface mode, where the display will show $i_n F$.
- To display the other control settings, repeatedly press the center *SELECT SETTING* 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 temperature or pressure after 30 seconds.
- Select the appropriate page from the list below for the available control settings for your application:

Set Point Control with Normal Sequencing, Heating or Cooling Temperature, Pressure, or External Set Point	pg. 11
Set Point Control with Oversize System Sequencing, Heating or Cooling Temperature, Pressure, or External Set Point	pg. 12
Interface Mode Connected to HWR-Q or MPC-Q	pg. 12
Outdoor Reset Control with Normal Sequencing	pg. 13
Outdoor Reset Control with Oversize System Sequencing	pg. 14



SET POINT CONTROL WITH NORMAL SEQUENCING

Dip Switch 8 - OFF

Press SELECT Button	DISPLAY	Press and hold either the UP or DOWN button to adjust
Once	SP Set Point	The Set Point is the temperature or pressure which the SEQ will sequence stages to hold. Note that if you are using the External Set Point, you will not be able to change the Set Point unless you adjust the 4-20mA input. The temperature Set Point is adjustable between -30°F to 250°F. Default is 70°F. Pressure Set Point is adjustable between 60 PSI to 220 PSI. Default is 15 PSI.
Twice◆	OUT Outdoor Temp	This is the outdoor sensor temperature value.
3 Times◆◆	COF Outdoor Cutoff	Available only when the outdoor sensor is installed. When the outdoor temperature falls below the Outdoor Cutoff value, the SEQ will activate stages for heat. The Outdoor Cutoff can be set ON or OFF and from 40 to 100°F. Default is 60°F.
3 or 4 Times	rt Reaction Time	The Reaction Time controls the minimum run time for a stage (1/2 the Reaction Time). Also, it controls how long should a stage run before it activates/subtracts another stage. It is adjustable from half a minute (0.5) to 8.0 minutes. Default is 2 minutes.
4 or 5 Times	Sd System Delay	The System Delay controls how long the System Output relay will remain energized after the last Output has been turned off or the outdoor temperature rises 2°F above the Outdoor Cutoff COF . On the SEQ-6P, the System Delay also controls how long each individual pump will remain energized after its boiler stages have been turned off. The System Delay is adjustable from 0 to 30 minutes. Default is 0.
5 or 6 Times	Pt Purge Time	The Purge Time should be set to the length of the unit's purge cycle. The Purge Time will apply when any ON/OFF unit is activated. On multiple stage units, the Purge Time will only apply to the Lo stages. The Purge Time is adjustable from 0.0 to 10.0 minutes. Default is 0.
6 or 7 Times	brt Boiler runtime	This is the minimum amount of time any boiler will run after the Purge cycle has been completed. This timer does not apply when only one stage is running, the Last Stage Hold applies in that case. The Boiler Runtime is adjustable between 0 to 60 minutes. Default is 0.
7 or 8 Times◆◆	PO Program Offset	The Programmed Offset fine tunes the External Set Point. With a known 4mA input, the offset can be set to make the External Temperature Set Point read 110°F or the External Pressure Set Point read 0.0PSI. The Program Offset is adjustable between -10°F to +10°F for temperature. For pressure the Program Offset is adjustable ±5PSI (30), ±10PSI (100), ±20PSI (200), or ±30PSI (300).
7 or more Times	LSH Last Stage Hold	To prevent short cycling of the last stage in low load conditions, the system temperature or pressure can exceed the Set Point by the amount selected by the Last Stage Hold before the last stage is turned off. The Last Stage Hold is adjustable between 0°F to 20°F in temperature. Default is 10°F. The last Stage Hold is adjustable ± 5PSI (30), ±10PSI (100), ±20PSI (200), or ±30PSI (300) in pressure. Default is 0PSI
8 or more Times◆◆	Stb Setback	Setback is not available for pressure. The Setback adjusts the number of degrees the Set Point water temperature will be reduced when Input terminals 7 and 8 are closed. If the Setback is set to 0, then the system will Shutdown on a closure. The Setback is adjustable from 0°F to 40°F. Default is 0°F.
8 or more Times◆◆	dHP DHW Priority Time	Only available when the System Output is set to System Pump (dip switch 1 is ON and dip switch 6 is OFF) This setting adjusts the amount of time the System relay output will remain off during a DHW call. If the DHW call is not satisfied before the DHW priority time has elapsed, the System relay will energize to provide heat. The DHW Priority is adjustable from 0 to 4 hours in half hour increments. Default is 0.
8 or more Times◆	SYS Default	The SEQ returns to the default display of system water temperature.

- ◆ Actual temperature values are not adjustable
- ◆◆ May not be available, depending on status of the outdoor sensor and dip switches.

SET POINT CONTROL WITH OSS SEQUENCING

Dip Switch 8 - OFF

Press SELECT Button	DISPLAY	Press and hold either the UP or DOWN button to adjust
Once	SP Set Point	The Set Point is the temperature or pressure which the SEQ will sequence stages to hold. Note that if you are using the External Set Point, you will not be able to change the Set Point unless you adjust the 4-20mA input. The temperature Set Point is adjustable between -30°F to 250°F. Default is 70°F. Pressure Set Point is adjustable between 60 PSI to 220 PSI. Default is 15 PSI.
Twice♦	OUT Outdoor Temp	This is the outdoor sensor temperature value.
3 Times♦♦	COF Outdoor Cutoff	Available only when the outdoor sensor is installed. When the outdoor temperature falls below the Outdoor Cutoff value, the SEQ will activate stages for heat. The Outdoor Cutoff can be set ON or OFF and from 40 to 100°F. Default is 60°F.
3 or 4 Time	Sd System Delay	The System Delay controls how long the System Output relay will remain energized after the last Output has been turned off or the outdoor temperature rises 2°F above the Outdoor Cutoff <i>COF</i> . On the SEQ-6P, the System Delay also controls how long each individual pump will remain energized after its boiler stages have been turned off. The System Delay is adjustable from 0 to 30 minutes. Default is 0.
4 or 5 Times♦♦	PO Program Offset	The Programmed Offset fine tunes the External Set Point. With a known 4mA input, the offset can be set to make the External Temperature Set Point read 110°F or the External Pressure Set Point read 0.0PSI. The Program Offset is adjustable between -10°F to +10°F for temperature. For pressure the Program Offset is adjustable with ±5PSI (<i>30</i>), ±10PSI (<i>100</i>), ±20PSI (<i>200</i>), or ±30PSI (<i>300</i>).
4 or more Times	thr Throttling Range	The throttling range sets the number of degrees or psi above and below the Set Point where stages will be turned on or off. The Throttle Range is adjustable from 1°F to 20°F. Default is 5°F. See pg. 22 for details.
5 or more Times♦♦	Stb Setback	The Setback adjusts the number of degrees the Set Point water temperature will be reduced when Input terminals 7 and 8 are closed. If the Setback is set to 0, then the system will Shutdown on a closure. The Setback is adjustable from 0°F to 40°F. Default is 0°F.
5 or more Times♦♦	dHP DHW Priority Time	Only available when the System Output is set to System Pump (dip switch 1 is ON and dip switch 6 is OFF) This setting adjusts the amount of time the System relay output will remain off during a DHW call. If the DHW call is not satisfied before the DHW priority time has elapsed, the System relay will energize to provide heat. The DHW Priority is adjustable from 0 to 4 hours in half hour increments. Default is 0.
5 or more Times♦	SYS Default	The SEQ returns to the default display of system water temperature.

- ♦ Actual temperature values are not adjustable
- ♦♦ May not be available, depending on status of the outdoor sensor and dip switches.

INTERFACE

Dip Switch 6 and 7 - ON

Press SELECT Button	DISPLAY	Press and hold either the UP or DOWN button to adjust
Once	Sd System Delay	The System Delay controls how long the System Output relay will remain energized after the last Output has been turned off or the outdoor temperature rises 2°F above the Outdoor Cutoff <i>COF</i> . On the SEQ-6P, the System Delay also controls how long each individual pump will remain energized after its boiler stages have been turned off. The System Delay is adjustable from 0 to 30 minutes. Default is 0.
Twice♦	INF Default	The SEQ returns to the default display of <i>INF</i> .

- ♦ Actual temperature values are not adjustable

OUTDOOR RESET WITH NORMAL SEQUENCING

Dip Switch 6 and 7 - OFF and 8 - ON

Press SELECT Button	DISPLAY	Press and hold either the UP or DOWN button to adjust
Once◆	CAL Calculated	This is the water temperature the SEQ will stage outputs to hold. It is based on outdoor temperature, Reset Ratio, and the Offset value. If OFF is shown, there is no call for heat. If <i>P r F</i> is shown, the SEQ is waiting for a Prove signal before activating stages.
Twice◆	OUT Outdoor Temp	This is the outdoor sensor temperature value.
3 Times	COF Outdoor Cutoff	When the outdoor temperature falls below the Outdoor Cutoff value, the SEQ will give heat. When the outdoor temperature is above the Outdoor Cutoff, the Calculated value will be OFF and no stages will be activated except on a DHW call. The Outdoor Cutoff can be set ON or OFF and from 40 to 100°F. Default is 60°F.
4 Times	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. See the chart on pg. 20 for the reset curves. The Reset Ratio is adjustable from 1 to 12. Default is 7.
5 Times	OFF Offset	The Offset moves the reset curves vertically up or down. For example, changing the offset from 0 to -10 will decrease the water temperature 10°F regardless of outdoor temperature or the reset curve selected. The Offset is adjustable from -40°F to 40°F. Default is 0°F.
6 Times	rT Reaction Time	The Reaction Time controls the minimum run time for a stage (1/2 the Reaction Time). Also, it controls how long should a stage run before it activates/subtracts another stage. It is adjustable from half a minute (0.5) to 8.0 minutes. Default is 2 minutes.
7 Times	Sd System Delay	The System Delay controls how long the System Output relay will remain energized after the last Output has been turned off or the outdoor temperature rises 2°F above the Outdoor Cutoff <i>COF</i> . On the SEQ-6P, the System Delay also controls how long each individual pump will remain energized after its boiler stages have been turned off. The System Delay is adjustable from 0 to 30 minutes. Default is 0.
8 Times	Pt Purge Time	The Purge Time should be set to the length of the unit's purge cycle. The Purge Time will apply when any ON/OFF unit is activated. On multiple stage units, the Purge Time will only apply to the Lo stages. The Purge Time is adjustable from 0.0 to 10.0 minutes. Default is 0.
9 Times	brt Boiler runtime	This is the minimum amount of time any boiler will run after the Purge cycle has been completed. This timer does not apply when only one stage is running, the Last Stage Hold applies in that case. The Boiler Runtime is adjustable between 0 to 60 minutes. Default is 0.
10 Times	LSH Last Stage Hold	To prevent short cycling of the last stage in low load conditions, the system temperature can exceed the Calculated water Temperature by the amount selected by the Last Stage Hold before the last stage is turned off. The Last Stage Hold is adjustable between 0°F to 20°F. Default is 10°F.
11 Times	Stb Setback	The Setback adjusts the number of degrees the Set Point water temperature will be reduced when Input terminals 7 and 8 are closed. If the Setback is set to 0, then the system will Shutdown on a closure. The Setback is adjustable from 0°F to 40°F. Default is 0°F.
12 Times◆◆	dHP DHW Priority Time	Only available when the System Output is set to System Pump (dip switch 1 is ON and dip switch 6 is OFF) This setting adjusts the amount of time the System relay output will remain off during a DHW call. If the DHW call is not satisfied before the DHW priority time has elapsed, the System relay will energize to provide heat. The DHW Priority is adjustable from 0 to 4 hours in half hour increments. Default is 0.
12 to 13 Times◆	SYS Default	The SEQ returns to the default display of system water temperature.

- ◆ Actual temperature values are not adjustable
- ◆◆ May not be available, depending on status of the outdoor sensor and dip switches.

OUTDOOR RESET WITH OSS SEQUENCING

Dip Switch 6 and 7 - OFF and 8 - ON

Press SELECT Button	DISPLAY	Press and hold either the UP or DOWN button to adjust
Once♦	CAL Calculated	This is the water temperature the SEQ will stage outputs to hold. It is based on outdoor temperature, Reset Ratio, and the Offset value. If OFF is shown, there is no call for heat. If $P r F$ is shown, the SEQ is waiting for a Prove signal before activating stages.
Twice♦	OUT Outdoor Temp	This is the outdoor sensor temperature value.
3 Times	COF Outdoor Cutoff	When the outdoor temperature falls below the Outdoor Cutoff value, the SEQ will give heat. When the outdoor temperature is above the Outdoor Cutoff, the Calculated value will be OFF and no stages will be activated except on a DHW call. The Outdoor Cutoff can be set ON or OFF and from 40 to 100°F. Default is 60°F.
4 Times	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. See the chart on pg. 20 for the reset curves. The Reset Ratio is adjustable from 1 to 12. Default is 7.
5 Times	OFF Offset	The Offset moves the reset curves vertically up or down. For example, changing the offset from 0 to -10 will decrease the water temperature 10°F regardless of outdoor temperature or the reset curve selected. The Offset is adjustable from -40°F to 40°F. Default is 0°F.
6 Times	Sd System Delay	The System Delay controls how long the System Output relay will remain energized after the last Output has been turned off or the outdoor temperature rises 2°F above the Outdoor Cutoff COF . On the SEQ-6P, the System Delay also controls how long each individual pump will remain energized after its boiler stages have been turned off. The System Delay is adjustable from 0 to 30 minutes. Default is 0.
7 Times	thr Throttling Range	The throttling range sets the number of degrees or psi above and below the Set Point where stages will be turned on or off. The Throttle Range is adjustable from 1°F to 20°F. Default is 5°F. See pg. 22 for details.
8 Times	Stb Setback	The Setback adjusts the number of degrees the Set Point water temperature will be reduced when Input terminals 7 and 8 are closed. If the Setback is set to 0, then the system will Shutdown on a closure. The Setback is adjustable from 0°F to 40°F. Default is 0°F.
9 Times♦♦	dHP DHW Priority Time	Only available when the System Output is set to System Pump (dip switch 1 is ON and dip switch 6 is OFF). This setting adjusts the amount of time the System relay output will remain off during a DHW call. If the DHW call is not satisfied before the DHW priority time has elapsed, the System relay will energize to provide heat. The DHW Priority is adjustable from 0 to 4 hours in half hour increments. Default is 0.
9 to 10 Times♦	SYS Default	The SEQ returns to the default display of system water temperature.

♦ Actual temperature values are not adjustable

♦♦ May not be available, depending on status of the outdoor sensor and dip switches.

SEQ-6 and SEQ-12 OUTPUT WIRING

INSTALLING THE OUTPUT RELAYS ♦

- Each output (*OUTPUT 1* through *OUTPUT 12*) which is to be used must have a relay installed in the socket.
- Check the charts on pg. 17 to locate where the relays should be installed for each particular type of installation.
- To install a relay, orient the pins and then press it gently into the appropriate socket.
- Any Stage Output which does not have a relay must have its stage switch to the OFF position (see pg. 23).

♦Output relays must be ordered separately (HT #500054). Each active Stage Output must have a relay.

Wiring the Stage Outputs

- Each Stage Output has one Normally Open (N.O.) relay contact.
- The N.O. contacts are dry contacts only. They do not source any voltage.
- Each N.O. contact is capable of switching 6A resistive.
- Total output of all stages, including the *SYSTEM*, must not exceed 15A.

ON/OFF Units

- Each unit has one relay and one set of Stage *OUTPUT* contacts associated with it.
- Wire the N.O. relay contacts in series with the unit's limit circuit.

2 Stage (Lo/Hi) Units

- Each unit has two *OUTPUT* relays associated with it.
- Check the chart (pg. 17) for the Lo and Hi Stage Output positions.
- Connect the Lo N.O. relay contacts in series with the unit's limit circuit.
- Connect the Hi N.O. relay contacts to the Hi control circuit.

3 Stage (Lo/Mid/Hi) Units

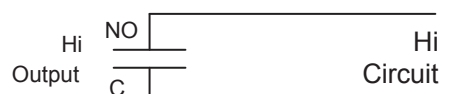
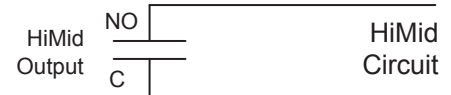
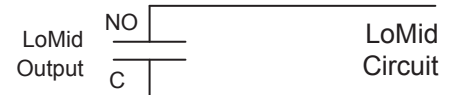
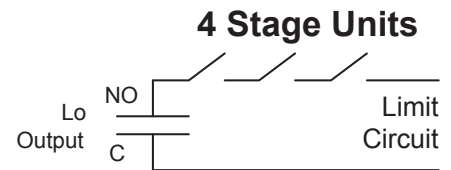
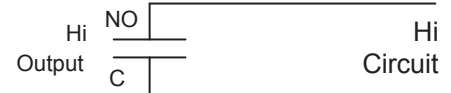
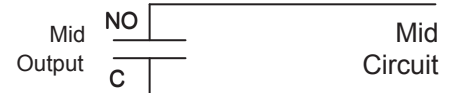
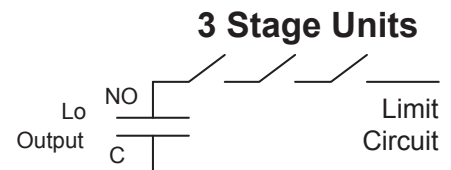
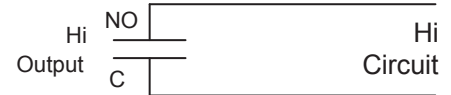
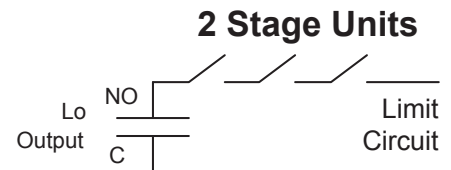
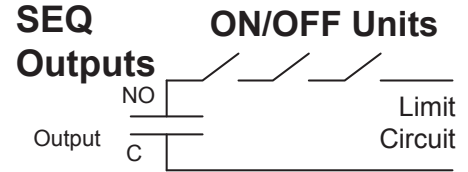
- Each unit has three *OUTPUT* relays associated with it.
- Check the chart (pg. 17) for the Lo, Mid and Hi Stage Output positions.
- Connect the Lo N.O. relay contacts in series with the unit's limit circuit.
- Connect the Mid N.O. relay contacts to the Mid control circuit.
- Connect the Hi N.O. relay contacts to the Hi control circuit.

4 Stage (Lo/LoMid/HiMid/Hi) Units

- The unit has four *OUTPUT* relays associated with it.
- Check the chart (pg. 17) for the Lo, LoMid, HiMid and Hi Stage Output positions.
- Connect the Lo N.O. relay contacts in series with the unit's limit circuit.
- Connect the LoMid N.O. relay contacts to the LoMid control circuit.
- Connect the HiMid N.O. relay contacts to the HiMid control circuit.
- Connect the Hi N.O. relay contacts to the Hi control circuit.

⚠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.



SEQ-6P OUTPUT WIRING

◆Output relays must be ordered separately (HT #500054). Each active Stage Output must have a relay.

INSTALLING THE OUTPUT RELAYS ◆

- Each *OUTPUT* which is to be used must have a relay installed in the socket.
- Each Boiler has an individual Pump associated with it.
- The SEQ-6P also has a *SYSTEM* relay which can be used for main or system pumps, or any other application where an output is needed when any stage has been activated.
- Check the charts on the pg. 17 to locate where the relays should be installed for each particular type of installation.
- To install a relay, orient the pins and then press it gently into the appropriate socket.
- Any *OUTPUT* which does not have a relay must have its stage switch to the OFF position (see pg. 23).

Wiring the Stage Outputs

- Each output has one Normally Open (N.O.) relay contact
- The N.O. contacts are dry contacts only. They do not source any voltage.
- Each N.O. contact is capable of switching 6A resistive.
- Total output of all relays, including the *SYSTEM* must not exceed 15A.

ON/OFF Units

- Each unit has one Pump relay and one Stage relay associated with it.
- Connect the N.O. pump relay contacts in series with the unit's pump starter.
- Connect the N.O. boiler relay contacts in series with the unit's limit circuit.

2 Stage (Lo/Hi) Units

- Each unit has one Pump relay and two Stage relays associated with it.
- Check the chart for the Pump, Lo and Hi *OUTPUT* positions.
- Connect the N.O. pump relay contacts in series with the unit's pump starter.
- Connect the Lo N.O. relay contacts in series with the unit's limit circuit.
- Connect the Hi N.O. relay contacts to the Hi control circuit.

3 Stage (Lo/Mid/Hi) Units

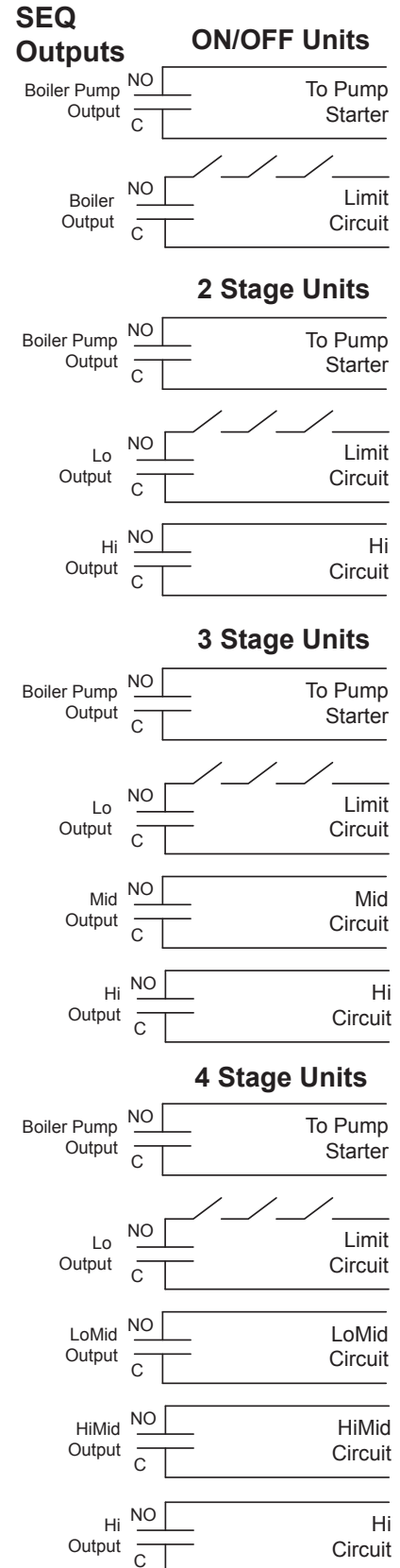
- Each unit has one pump relay and three stage relays associated with it.
- Check the chart for the Pump, Lo, Mid and Hi *OUTPUT* positions.
- Connect the N.O. pump relay contacts in series with the unit's pump starter.
- Connect the Lo N.O. relay contacts in series with the unit's limit circuit.
- Connect the Mid N.O. relay contacts to the Mid control circuit.
- Connect the Hi N.O. relay contacts to the Hi control circuit.

4 Stage (Lo/Mid/Hi) Units

- The unit has one pump relay and four stage relays associated with it.
- Check the chart for the Pump, Lo, LoMid, HiMid and Hi *OUTPUT* positions.
- Connect the N.O. pump relay contacts in series with the unit's pump starter.
- Connect the Lo N.O. relay contacts in series with the unit's limit circuit.
- Connect the LoMid N.O. relay contacts to the LoMid control circuit.
- Connect the HiMid N.O. relay contacts to the HiMid control circuit.
- Connect the Hi N.O. relay contacts to the Hi control circuit.

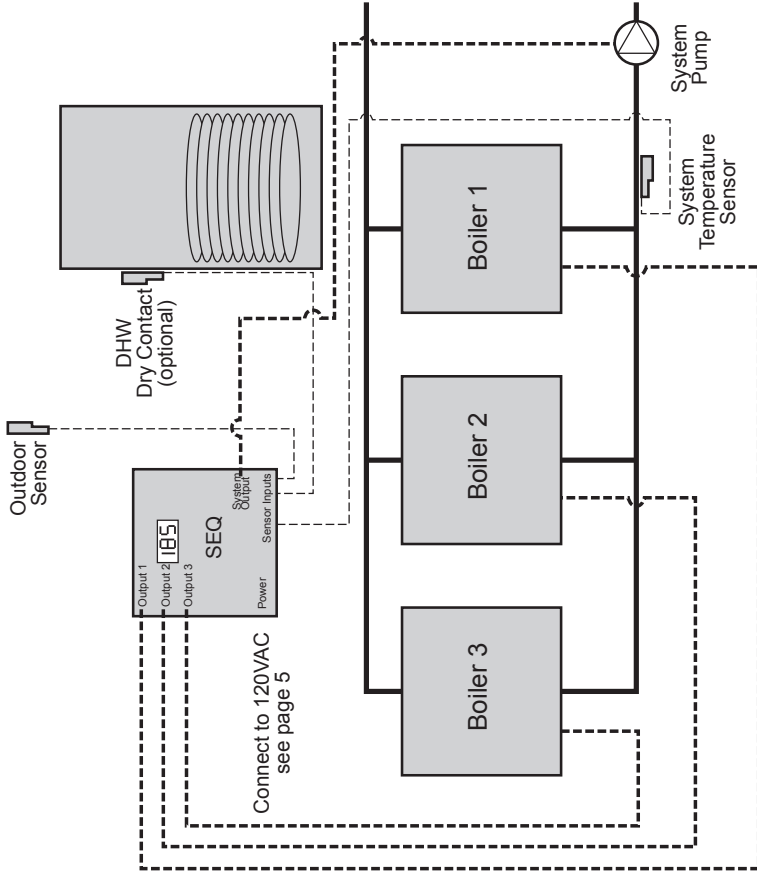
⚠WARNING

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.

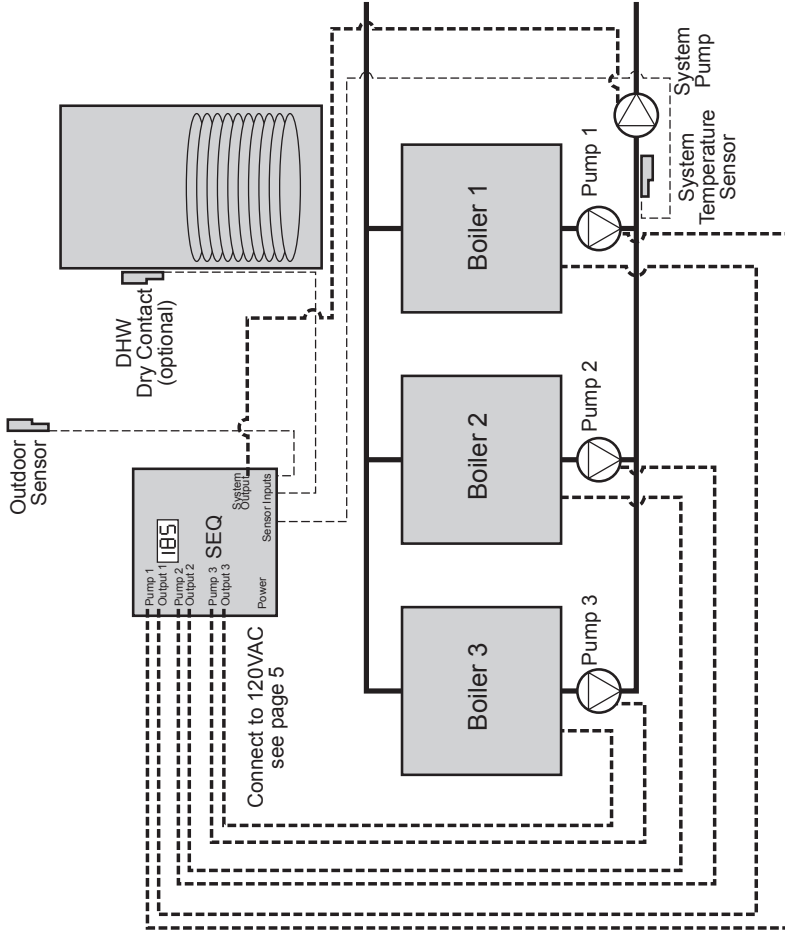


Sample Wiring and Plumbing Diagrams

Connecting the SEQ Control to 3 Boilers and Domestic Hot Water using Outdoor reset Setting



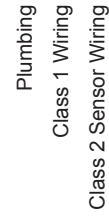
Connecting the SEQ6P Control to 3 Boilers with Pumps and Domestic Hot Water using Outdoor reset Setting



- The Heat-Timer's SEQ Sequencing control DOES NOT source power for boiler stages or pumps, it operates as dry contact switch.

- A separate power source for the burners and pumps must be supplied.

- 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.



OUTPUT RELAY CHARTS

6 Stage Sequencer - SEQ 6

	2 On/Off	3 On/Off	4 On/Off	5 On/Off	6 On/Off	1 Lo/Hi	2 Lo/Hi	3 Lo/Hi	1 3 Stages	2 3 Stages	1 4 Stages
Output 1	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit
Output 2	Limit	Limit	Limit	Limit	Limit	HiFire	HiFire	HiFire	MidFire	MidFire	LoMid
Output 3		Limit	Limit	Limit	Limit		Limit	Limit	HiFire	HiFire	HiMid
Output 4			Limit	Limit	Limit		HiFire	HiFire		Limit	HiFire
Output 5				Limit	Limit			Limit		MidFire	
Output 6					Limit			HiFire		HiFire	
System	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

12 Stage Sequencer - SEQ 12

	7 On/Off	8 On/Off	9 On/Off	10 On/Off	11 On/Off	12 Lo/Hi	4 Lo/Hi	5 Lo/Hi	6 Lo/Hi	3 3 Stages	4 3 Stages	2 4 Stages	3 4 Stages
Output 1	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit
Output 2	Limit	Limit	Limit	Limit	Limit	Limit	HiFire	HiFire	HiFire	MidFire	MidFire	LoMid	LoMid
Output 3	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	HiFire	HiFire	HiMid	HiMid
Output 4	Limit	Limit	Limit	Limit	Limit	Limit	HiFire	HiFire	HiFire	Limit	Limit	HiFire	HiFire
Output 5	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	MidFire	MidFire	Limit	Limit
Output 6	Limit	Limit	Limit	Limit	Limit	Limit	HiFire	HiFire	HiFire	HiFire	HiFire	LoMid	LoMid
Output 7	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	HiMid	HiMid
Output 8		Limit	Limit	Limit	Limit	Limit	HiFire	HiFire	HiFire	MidFire	MidFire	HiFire	HiFire
Output 9			Limit	Limit	Limit	Limit		Limit	Limit	HiFire	HiFire		Limit
Output 10				Limit	Limit	Limit		HiFire	HiFire		Limit		LoMid
Output 11					Limit	Limit			Limit		MidFire		HiMid
Output 12						Limit			HiFire		HiFire		HiFire
System	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

6 Stage Sequencer with Pumps - SEQ 6P

	2 On/Off	3 On/Off	4 On/Off	5 On/Off	6 On/Off	2 Lo/Hi	3 Lo/Hi	4 Lo/Hi	2 3 Stages	3 3 Stages	2 4 Stages
Output 1	Pump	Pump	Pump	Pump	Pump	Pump	Limit	Pump	Pump	Pump	Pump
Output 2	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit	Limit
Output 3	Pump	Pump	Pump	Pump	Pump	HiFire	HiFire	HiFire	MidFire	MidFire	LoMid
Output 4	Limit	Limit	Limit	Limit	Limit	Pump	Pump	Pump	HiFire	HiFire	HiMid
Output 5		Pump	Pump	Pump	Pump	Limit	Limit	Limit	Pump	Pump	HiFire
Output 6		Limit	Limit	Limit	Limit	HiFire	HiFire	HiFire	Limit	Limit	Pump
Output 7			Pump	Pump	Pump		Pump	Pump	MidFire	MidFire	Limit
Output 8			Limit	Limit	Limit		Limit	Limit	HiFire	HiFire	LoMid
Output 9				Pump	Pump		HiFire	HiFire		Pump	HiMid
Output 10				Limit	Limit			Pump		Limit	HiFire
Output 11					Pump			Limit		MidFire	
Output 12					Limit			HiFire		HiFire	
System	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

♦ The *SYSTEM* relay will be energized when any Stage Output relay is energized.

OPERATION

SET POINT CONTROL SETTINGS

SET POINT (SP)

Default: 70°F

- The Set Point is the temperature or pressure value the SEQ will use to control the system.
- The SEQ will either add Stage Outputs, subtract Stage Outputs, or maintain the same number of Stage Outputs to hold the system temperature or pressure around the Set Point.
- The Set Point is the average temperature or pressure the SEQ will maintain. The system can be expected to fluctuate above and below the Set Point. The size of the fluctuation depends on the number of stages, the size of each stage, the system load, and the Sequencing mode.
- When controlling temperature or pressure, the Set Point can be adjusted to any value in the temperature or pressure range.
- If the Set Point value is flashing, this indicates that the selected Set Point has been automatically changed. This may occur because of the Setback *SEB* setting (see pg. 26) or the DHW mode (see pg. 27).
- If the Set Point displays *FFF* then the Outdoor Cutoff *COF* or the Shutdown *SHL* is active (see below and pg. 26).
- If it is a temperature system and the External Set Point is being used, the Set Point will vary with the 4-20mA input (see pg. 25). Pushing the *UP* or *DOWN* buttons while the Set Point is being displayed will not change the value of the Set Point.

OUTDOOR TEMPERATURE (OUT)

No Adjustment - Display Only

- Use of the Outdoor Sensor is optional in the Set Point operation mode.
- If an Outdoor sensor is installed, it can be used to provide an Outdoor Cutoff (see below).
- If a sensor is not installed, the display will show *OPN*, indicating that the *OUTDOOR* terminals are open. In this case, the SEQ will control the system to maintain the Set Point temperature or pressure.

OUTDOOR CUTOFF (COF)

Default: 60°F

- The Outdoor Cutoff sets at what outdoor temperature the SEQ will begin heating or cooling. This setting will only be available if the SEQ does not register a fault from the Outdoor sensor (*OPN* Open or *SHL* short).
- For heating, when the Outdoor temperature drops below the Outdoor Cutoff temperature, the SEQ will begin to Sequence stages for heat. It will continue to Sequence until the Outdoor temperature rises 2°F above the Outdoor Cutoff temperature.
- For cooling, when the Outdoor temperature rises above the Outdoor Cutoff temperature, the SEQ will begin to Sequence stages for cooling. It will continue to Sequence until the Outdoor temperature drops 2°F below the Outdoor Cutoff temperature.
- The Outdoor Cutoff temperature can be set from 40 to 100°F. In addition, an ON setting is provided to override the Outdoor Cutoff for continuous Sequencing, and an OFF setting can be used to temporarily prevent any Sequencing.
- The Outdoor Cutoff has a built in 2°F differential.
- In heating mode, if the Outdoor temperature rises 2°F above the Outdoor Cutoff setting, the SEQ will not activate any stages and the Set Point will read *FFF*, inless there is a DHW call.
- In cooling mode, if the Outdoor temperature drops 2°F below the Outdoor Cutoff setting, the SEQ will not provide cooling and the Set Point will read *FFF*.

PROGRAMMED OFFSET (PO)

Default: 0°F

External Set Point

- The Programmed Offset can be used to fine tune the External Set Point reading.
- A 4mA input signal should generate a Set Point display of 60°F (see pg. 25).
- If a 4mA input generates a display of 62°F, then by setting the Programmed Offset to -2, the display will show 60°F. Similarly, if a 4mA input generates a display of 59°F then by setting the Programmed Offset to 1, the display will show 60°F.
- The Programmed Offset should only be used to fine tune the Set Point display when inputting a 4mA signal. Do not use it to adjust the Set Point reading at any other mA input value.
- The Programmed Offset can be set from -15 to 15 degrees.

Pressure Input

- The Programmed Offset can be used to fine tune the pressure sensor reading.
- With no pressure in the system, the SEQ should read 0 pounds of pressure.
- If, with no pressure on the system, the SEQ reads 1 psi, then by setting the Programmed Offset to -1, the display will read 0psi. Similarly, if the SEQ reads -2 psi, then by setting the Programmed Offset to 2, the display will read 0 psi.
- The range of the Programmed Offset for a 0-30 psi unit is ± 2 .
- The range of the Programmed Offset for a 0-100 psi unit is ± 5 .
- The range of the Programmed Offset for a 0-200 psi unit is ± 10 .
- The range of the Programmed Offset for a 0-300 psi unit is ± 15 .

SETBACK/SHUTDOWN (S L B)

Default: 0°F

- The Setback function is not available for pressure applications. For pressure, a short across INPUT terminals 7 and 8 automatically causes Shutdown (see pg. 26).
- For temperature applications, the terminals 7 and 8 can be programmed to provide either a lower Set Point temperature in heating or Shutdown, a higher Set Point temperature in cooling, or Shutdown.
- The Setback feature is typically used to lower the temperature of circulating hot water when a building is empty or when tenants are sleeping.
- To program INPUT terminals 7 and 8 to Shutdown, set the Setback/Shutdown value to 0. When the SEQ is Shutdown, the Set Point display will show OFF.
- The Setback/Shutdown value can also be set from 1 to 40°F.
- For a nonzero value in heating, the Set Point will be reduced by the amount of the Setback. This will be indicated by the System Temperature display flashing and the Set Point display flashing the new value.
- For a nonzero value in cooling, the Set Point will be increased by the amount of the Setback. This will be indicated by the System Temperature display flashing and the Set Point display flashing the new value.

OUTDOOR RESET SETTINGS

CALCULATED (C A L)

- This is the water temperature the SEQ will stage units to hold. It is based on Outdoor temperature, the Reset Ratio $R \leq L$, the Offset $\Delta F S$, the Setback/Shutdown $S L B$ values (see pg. 26) and the DHW input (see pg. 27).
- The Calculated water temperature can not be less than the minimum water temperature setting (see pg. 9).
- If either the System or Outdoor sensor is reading a fault condition, all stages will immediately turn off. The Calculated water temperature display will show $\Delta F F$ to indicate this condition.
- If the outdoor temperature is above the Outdoor Cutoff, the SEQ will not activate stages. The Calculated display will show $\Delta F F$ to indicate this condition.
- A DHW call (see pg. 27) will override the Outdoor Cutoff $C \Delta F$. During a DHW call, the Calculated temperature will be 200°F.
- The SEQ will either add stages, subtract stages, or maintain the same number of stages to hold the system temperature around the Calculated temperature $C A L$.
- The Calculated temperature is the average temperature the SEQ will maintain. The system can be expected to fluctuate above and below the Calculated temperature. The size of the fluctuation depends on the number of stages, the size of each stage, the system load, and the Sequencing options.
- The Calculated temperature is based on all the parameters described above. The Calculated value can not be changed by pressing the UP or DOWN button while it is displayed.

OUTDOOR TEMPERATURE (O U T)

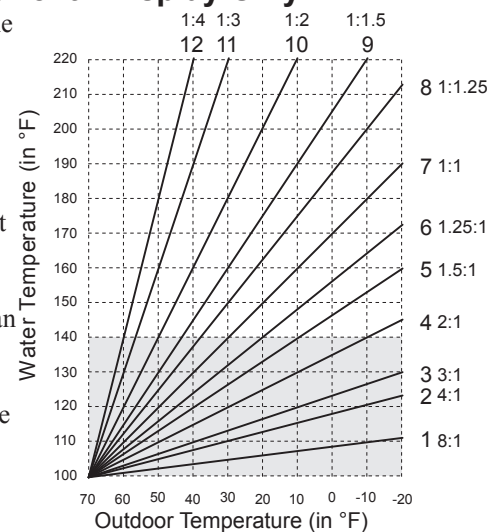
No Adjustment - Display Only

- The Outdoor Sensor must be installed for the Outdoor Reset function to work. If the sensor shows $\Delta P n$ for open or $S h L$ for short, no stages will be activated.

OUTDOOR CUTOFF (C \Delta F)

Default: 60°F

- The Outdoor Cutoff sets the temperature at which the SEQ will begin heating.
- When the outdoor temperature drops below the Outdoor Cutoff temperature, the SEQ will Sequence stages to hold that temperature as long as there is a call for heat or until the Outdoor temperature rises 2°F above the Outdoor Cutoff.
- The Outdoor Cutoff temperature can be set from 40 to 100°F. In addition, an ΔN setting is provided to override the Outdoor Cutoff for continuous Sequencing and an $\Delta F F$ setting can be used to temporarily prevent any Sequencing.
- The Outdoor Cutoff has a built in 2°F differential.
- When the Outdoor temperature rises 2°F above the Outdoor Cutoff temperature, the SEQ will not activate stages and the Calculated water temperature will read $\Delta F F$, unless there is a DHW call.
- If the building is too cold before the system starts, raise the Outdoor Cutoff.



RESET RATIO (R S L)

Default: 7

- The Reset Ratio controls how much heat will be added based on outdoor temperature. The Reset Ratios are shown as *Outdoor Temperature : Water Temperature*.
- A 1:1 Reset Ratio signifies for each degree it gets colder outside, the Calculated water temperature will raise 1 degree.

⚠WARNING
The SEQ will not compute a Calculated water temperature below the minimum water temperature setting.

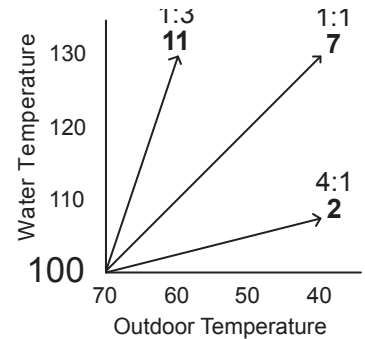
- The other Reset Ratios available are shown on the right.
- The Reset Ratio curves start at 70°F. At 70°F the SEQ will require 100°F water. Note that this is not the point where the SEQ will begin giving heat. That point is determined by the Outdoor Cutoff. Also note that this starting point can be changed by adjusting the Offset as shown below.
- For new installations with standard baseboard heating, begin with a Reset Ratio curve of 7.
- For new installations with radiant heat, begin with a Reset Ratio curve of 4 or 5.
- Adjust the Reset Ratio value 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.
- The Reset Ratio can be set from 1 to 12.

OFFSET (OF5)

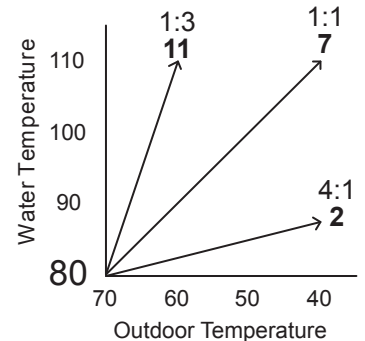
Default: 0°F

- The Offset value moves the starting point of the Reset Ratio curves (see charts on the right).
- Therefore, any change made to the Offset will immediately change the value of the Calculated water temperature by the same amount.
- For example, if the Calculated water temperature were 150°F based on the specific outdoor temperature and Reset Ratio, then increasing the Offset from 0°F to 10°F would increase the Calculated water temperature to 160°F.
- In a new installation, start with a Offset value of 0°.
- Adjust the Offset value in mild weather. If the ambient indoor temperatures are warm in the warm weather, decrease the Offset. If the ambient building temperatures are cold in the mild weather, increase the Offset.
- The rule of thumb for baseboard radiation is to change the Offset by 4° for every degree you wish to change the building temperatures. For radiant heat applications, change the Offset by 1° or 2° for every degree you wish to change the building temperature.
- The Offset can be set from -40 to 40°F.

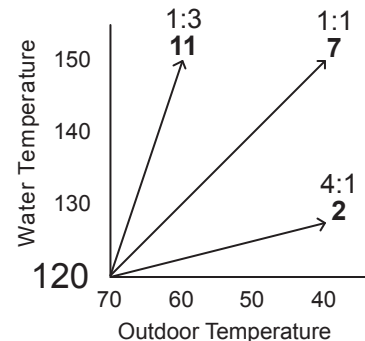
With a 0° Offset, the ratio curves begin at 100° Water Temperature.



With a -20° Offset, the ratio curves begin at 80° Water Temperature.



With a +20° Offset, the ratio curves begin at 120° Water Temperature.



SETBACK/SHUTDOWN (SLB)

Default: 0°F

- *INPUT* terminals 7 and 8 can be programmed to provide either a lower Calculated water temperature or Shutdown.
- The Setback feature is typically used to lower the temperature of circulating hot water when a building is empty or when tenants are sleeping.
- To program *INPUT* terminals 7 and 8 to Shutdown, set the Setback/Shutdown value to 0. When the SEQ is Shutdown, this will be indicated by the Calculated water temperature display showing *FFF*.
- The Setback/Shutdown value can also be set from 1 to 40°F.
- For a nonzero Setback value, the Calculated water temperature will be reduced by the amount of the Setback. This will be indicated by the System Temperature display flashing and the Calculated water temperature display flashing the new value.

NORMAL SEQUENCING SETTINGS

REACTION TIME (RL)

Default: 2 minutes

- The Reaction Time controls how Output Stages are Sequenced on and off based on PID type logic. Shorter Reaction Times allow Output Stages to be Sequenced more quickly and are appropriate for systems with many small stages, where any single stage does not significantly change the total output. Longer Reaction Times are appropriate for systems with relatively few stages, each of which significantly changes the total output.
- When a Stage Output has been added, it can not be turned off, nor can another Stage Output be activated, until at least half the Reaction Time has elapsed. The Purge Time, Minimum Boiler Run Time and Last Stage Hold also change the amount of time any single Output Stage will run.

- The Reaction Time must be at least as long as the time it takes for a newly activated Stage Output to start affecting the system. If the Reaction Time is shorter than this, the SEQ may activate additional Stage Outputs before it can see the impact of each Stage Output. (Note that it is not necessary to include the purge cycle time for a new stage, as that is set on the Purge Time see pg. 21).
- If the system tends to fluctuate rapidly above and below the Set Point, the Reaction Time may be set too short.
- If the system tends to remain always below the Set Point, the Reaction Time may be set too long.
- When making a change to the Reaction Time, wait at least 5 reaction times before making another change. The system will need time to settle out.
- The Reaction Time can be set from half a minute (0.5) to eight minutes (8.0).
- If the SEQ is in the Interface mode, the Reaction Time is set on the HWR-Q or MPC-Q. However, the function of the Reaction Time is the same as described above.

PURGE TIME (P_L)

Default: 0 minutes

- Many units must go through a purge cycle before they are brought on line and can begin generating heating or cooling.
- The Purge Time should be set to the length of time of the unit's purge cycle.
- The Purge Time applies to every Stage Output with ON/OFF units.
- The Purge Time applies only to the Lo stages of multiple stage units (see charts on pg. 18).
- When an ON/OFF stage, or a Lo stage, is turned on, the SEQ will begin counting down the Purge Time. When the Purge Time has elapsed, then the SEQ will begin counting down the Reaction Time. Therefore, if the Purge Time applies to a particular Stage Output, the minimum run time of that stage is the Purge Time plus half a Reaction Time.
- The Purge Time can be set from 0 minutes (0.0) to 10 minutes (10.0).

BOILER MINIMUM RUNTIME (B_RL)

Default: 0 minutes

- This is the minimum time any Output Stage can run. This timer begins after any Purge Time.
- The Boiler Minimum Runtime does NOT apply when only one stage holds the load or when all the stages but one have been turned off. In those cases, the Last Stage Hold (see below) applies.
- The Boiler Minimum Runtime setting prevents stages from being short cycled.
- The Boiler Minimum Runtime can be set from 0 minutes (0.0) to 6 minutes (6.0).
- The System temperature may rise above Set Point during this time.

LAST STAGE HOLD (L_SH)

Default: 10°F

- This setting helps to prevent short cycling of a single stage when load conditions are very light. If a single Output Stage provides significantly more output than is required to hold the load, the Output Stage will turn on, rapidly overshoot the Set Point, and then turn off as soon as the Purge Time and Reaction Time are satisfied.
- In these conditions, it may be desirable to override the Set Point or Calculated water temperature to allow the Output Stage to run longer and therefore also be off longer before restarting.
- The Last Stage Hold provides an adjustable temperature or pressure value which is added to the Set Point or Calculated water temperature in heating, or is subtracted from the Set Point in cooling.
- When heating, the SEQ will keep the last Output Stage running until the System temperature exceeds the Set Point or Calculated water temperature plus the Last Stage Hold value.
- In a cooling mode, the SEQ will keep the last Output Stage running until the System temperature or pressure drops below the Set Point minus the Last Stage Hold value.

OVERSIZE SYSTEM SEQUENCING SETTINGS

THROTTLING RANGE (T_HR)

Default: 5°F

- The Throttling Range sets a temperature or pressure band around the Set Point or Calculated water temperature that controls when stages will be turned on or off.
- For example, in the Set Point heating mode, no stages will be activated until the temperature or pressure falls one full Throttling Range below the Set Point. A second stage will be activated when the temperature or pressure falls two full Throttling Ranges below the Set Point, and so on, with one extra stage being turned on as the temperature or pressure falls additional stages below the Set Point.
- Stages will be turned off as the temperature or pressure rises toward the Set Point with one full throttling range as a differential.
- The last stage to be turned off will be allowed to exceed the Set Point by a full throttling range before it is turned off. This helps to prevent the last stage from short cycling when the load is low or when the stage is oversized.

Throttling Range Example

Heating Application Set Point = 180°F Throttling Range (ΔT_{hr}) = 5°F 4 Boiler Stages, A, B, C, and D

Temperature	Calculation	Falling Temperature		Rising Temperature	
		Stage Turned On	Stages On	Stage Turned Off	Stages On
185°F	180 + (1)THR	None	None	A	None
180°F	180 - (0)THR	None	None	None	A
175°F	180 - (1)THR	A	A	B	A
171 to 174°F	---	---	A	---	A,B
170°F	180 - (2)THR	B	A,B	C	A,B
166 to 169°F	---	---	A,B	---	A,B,C
165°F	180 - (3)THR	C	A,B,C	D	A,B,C
161 to 165°F	---	---	A,B,C	None	A,B,C,D
160°F	180 - (4)THR	D	A,B,C,D	None	A,B,C,D

SYSTEM OUTPUT SETTINGS

SYSTEM DELAY (S_d)

Default: 0 minutes

SEQ-6 or SEQ-12

- In Combustion Air Damper mode (Dip Switch 1 = OFF) when the last Stage Output relay is turned off, the System Output Relay will remain energized for a period set by the System Delay.
- In System Pump mode (Dip Switch 1 = ON) when the Outdoor Cutoff + 2°F is reached, the System Output Relay will remain energized for a period set by the System Delay.
- The System Delay can be set from 0 to 30 minutes. If the setting is 0, the System Output will turn off immediately when the last Stage Output turns off.

SEQ-6P

- The System Delay time applies to the System Output and the boiler Pump Outputs (see chart on pg. 17).
- Each individual boiler Pump will activate when the individual boiler is activated (the Lo Stage Output is activated). After the specific boiler (the Lo Stage Output) is turned off, that specific Pump will remain energized for the period of time set by the System Delay. That is, when any specific boiler is turned off, its Pump Output will continue to run on for the period of time set by the System Delay.
- When the last Pump Output turns off, the System Output will remain energized for the period of time set by the System Delay.

DOMESTIC HOT WATER PRIORITY TIME (dhp)

Default: 0 minutes

- This option is available in either Temperature Set Point or Outdoor Reset, when dip switch 1 is ON for System Pump operation.
- When there is a call for DHW, it may be desirable to turn off the System Pump that provides heating water to the building. This will allow the DHW call to be satisfied more quickly.
- However, if the DHW call is not satisfied after a certain period of time, the System Pump must be reactivated to once again provide heat to the building.
- The Domestic Hot Water Priority sets the amount of time the System Pump will be disabled for a DHW call. It is adjustable from 0 to 4 hours in half hour increments.

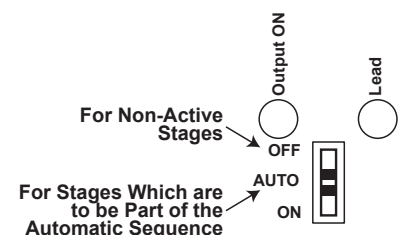
▲ REMEMBER

Only On/Off Boilers or Lo-Fire stages can be a lead stage.

LEAD STAGE

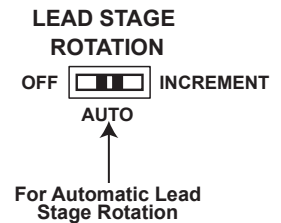
LEAD STAGE LIGHTS

- The row of green lights marked *LEAD* indicate which Stage Output is currently the Lead Stage.
- The Output with the green light on is currently the Lead Stage.
- Only one Stage Output can be the Lead Stage at any given time. The Lead Stage is always the first stage brought on when there is a call for output.



LEAD STAGE SWITCH

- The *LEAD STAGE* switch controls the rotation of the Stage Outputs.
- A unit can not be lead if any of its *OFF/AUTO/ON* switches is not set to *AUTO* (see pg. 24). Any unit which has a one or more of its stages switched *ON* or *OFF* is not considered as part of the rotation.
- Only the Lo stages of any multistage units can be selected to be lead (see chart on pg. 18).
- If the *LEAD STAGE* switch is in the *OFF* position, whichever stage is presently the Lead Stage will always remain the Lead Stage until there is a power failure. Then the SEQ will revert back to the first possible lead stage.
- To change the current lead stage, press the *LEAD STAGE* switch to the *INCREMENT* position and then release it. The green light indicating Lead Stage will increment to the next available stage.
- To automatically rotate the lead stage, switch the *LEAD STAGE* switch to the *AUTO* position (the different types of rotation are described below).



FIRST ON/LAST OFF ROTATION

- For this type of rotation, dip switch 5 must be in the *OFF* position.
- On power up, or any time the SEQ loses power, the Lead Stage will be the first possible lead stage (as described in the previous section).
- After the first 12 hours of power, the Lead Stage will change to the next possible stage.
- Subsequently, every 24 hours, the Lead Stage will change to the next possible stage.
- The Lead Stage will always be the first stage brought on when there is a call for output.
- As more output is needed, additional stages are added.
- When less output is needed, the additional stages are turned off in the reverse order of how they were added. For instance, if the stages were added in the sequence 1, 2, and 3, then they will be turned off in the sequence 3, 2, and finally 1.

FIRST ON/FIRST OFF ROTATION

- For this type of rotation, dip switch 5 must be in the *ON* position.
- On power up, or any time the SEQ loses power, the Lead Stage will be the first possible stage (as described above).
- The Lead Stage will always be the first stage brought on when there is a call for output.
- As more output is needed, additional stages are added.
- When less output is needed, the Lead Stage will be the first stage turned off. The green light indicating lead stage will then switch to the next available stage. For instance, if the stages were added in the sequence 1, 2, and 3, then they will be turned off in the sequence 1, 2, and finally 3. The lead stage would now be 4 when more output was needed.

OUTPUT CONTROLS

MANUAL OVERRIDES

- Each Stage Output, and the System Output, has an *OFF/AUTO/ON* switch.
- The SEQ only controls units which are switched to *AUTO*.
- In multistage applications, if any stage of the multistage unit is not switched to *AUTO*, then the whole unit will not be considered for automatic sequencing.
- If a Stage Output is switched *ON*, then its output relay will always be energized. The Stage Output will run constantly on its own internal limits. The System Output or any Pump Output on an SEQ-6P will also run constantly. This switch position can be used for testing individual outputs.
- If a Stage Output is switched *OFF*, then its output relay will not energize. Any Stage Output without an output relay must be switched to *OFF* (see chart on pg. 19). Also, if a Stage Output needs maintenance or is not working properly, it can be switched to the *OFF* position.

OUTPUT LIGHTS

- The row of red lights marked *OUTPUT ON* indicate which outputs are energized.
- If the red light next to a Stage Output is on, then its output relay should be energized and the output contacts should be continuous.
- If the red light next to a Stage Output is off, the output relay should not be energized and the output contacts should be open.

EXTERNAL SET POINT

- Can only be used if the SEQ is regulating temperature.
- The SEQ must have a temperature sensor located in the common header as described on pg. 4.
- A typical use for this option would be to allow an Energy Management System (EMS) to automatically change the Set Point of the SEQ to provide an outdoor air reset function for hot water heat.
- Dip switch 6 and 8 must be *OFF* and dip switch 7 must be *ON*. This setting will allow the SEQ to read and monitor the system temperature using the temperature sensor and also to monitor the 4-20mA External Set Point input to change the Set Point.
- The signal from the EMS must be a 2-wire 4-20mA input (for wiring see pg. 5).
- If the EMS provides a 4mA signal to the SEQ, the SEQ Set Point will be 60°F.
- If the EMS provides a 20mA signal to the SEQ, the SEQ Set Point will be 220°F.
- The Set Point range is linear between these two point as shown on the side chart.
- When using this option, the Set Point can only be changed by changing the 4-20mA input. The Set Point display will be shown but it can not be changed by rotating the knob.
- To disable the SEQ from the external source, send out a 0mA signal. The Set Point display will show *OFF*, and all active Stage Outputs will immediately be turned off. The System Output (and the individual Pump Outputs on the SEQ-6P) will remain activated for the period of time set by the System Delay.

NOTE: The Set Point will read *OFF* whenever the 4-20mA signal falls below 3.9mA or rises above 20.1mA.

Set Point reading at different mA Inputs

4-20mA Input	SEQ Set Point
4	60°F
6	80°F
8	100°F
10	120°F
12	140°F
14	160°F
16	180°F
18	200°F

INTERFACE MODE

- The SEQ can be connected to a Heat-Timer outdoor reset control, either the HWR-Q, or the MPC-Q.
- The HWR-Q provides an outdoor air reset function for hot water heat. When the outdoor temperature falls below the selected point, the HWR-Q will activate a system pump and circulate heating water. As it gets colder outside, the HWR-Q increases the temperature of the circulating hot water.
- The MPC-Q provides an outdoor air reset function for steam heat. When the outdoor temperature falls below the selected point, the MPC-Q will initiate heating cycles. The colder it gets outside, the more heat the MPC-Q will input into the heating system.
- Both reset controls can directly control up to 4 output stages.
- The SEQ can be used to expand the number of output stages of either control.
- When in the Interface mode, the reset control determines when heat is needed, how much heat is needed, and how often stages will be added or subtracted. Therefore, if the reset control is not set up properly, the SEQ will not output correctly. Check the I/O manual for the reset control to be sure it is set up properly to interface to the SEQ.
- The SEQ gets only four pieces of information from the reset control:
 - *Add* = Add the next available Stage Output
 - *Subtract* = Subtract a Stage Output
 - *Rotate* = If you have selected First On/Last Off rotation, the reset control will rotate the Lead Stage at 2am every day. If you have selected First On/First Off rotation, this signal will be ignored.
 - *Reset* = Turns off any active Stage Outputs
- When in the Interface mode, the display reads *17F*. The only parameter which can be set is the System Delay *5d* (see pg. 23).
- For wiring an Interface, see pg. 6.

SHUTDOWN

- This feature allows the user to shutdown all Stage Outputs on the SEQ from a remote location.
- This feature is not available if the SEQ is in the Interface mode (see pg. 25). However, a shutdown may be wired into the reset control directly.
- A typical use of this feature would be to turn off all boiler stages when the outdoor temperature rises above a certain point. The outdoor thermostat would close a dry contact and the SEQ would then turn all the Stage Outputs off until the outdoor temperature fell and heat was once again required. (In this example, the outdoor thermostat function could be provided by Heat-Timer Digi-Span SPC250.)
- On systems where the DHW input is used, a call for domestic hot water will override a Shutdown. During the DHW call, the water temperature will be maintained at 200°F. When the call for DHW is removed, the SEQ will then resume Shutdown.
- To enable the Shutdown, the Setback/Shutdown ($\overline{S L B}$) control setting must be set to zero. Zero is the default value. Any nonzero number will enable Setback $\overline{S L B}$ (see below).
- When the Shutdown is activated, all active Stage Outputs are immediately turned off. However, the System Output (and the individual Pump Outputs on the SEQ-6P) will remain activated for the period of time set by the System Delay $\overline{S d}$ (see pg. 23).
- For wiring a remote Shutdown, see pg. 5.

SETBACK

- This feature allows a user to temporarily reduce the Set Point or Calculated water temperature in heating, or increase the Set Point in cooling, to conserve energy.
- The Setback function is not available for pressure applications. For pressure, the Shutdown feature (see above) is automatically enabled.
- Setback is not available if the SEQ is in the Interface mode (see pg. 25). The HWR-Q and MPC-Q automatically provide integrated setback capabilities.
- A typical use of the Setback would be to lower the temperature of the heating water when the building is not occupied or tenants are sleeping. An external time clock could be programmed to close a dry contact to reduce the water temperature during these times. When the time clock contacts open, then the SEQ will resume circulating the higher temperature water.
- To enable the Setback, the Setback/Shutdown ($\overline{S L B}$) control setting must be set to the desired number of Setback degrees. If the default Setback/Shutdown value of 0 is not changed, the SEQ will shutdown all stages when Input terminals 7 and 8 are shorted.
- On systems where the DHW input is used, a call for domestic hot water will override the Setback. During the DHW call, the water temperature will be maintained at 200°F. When the call for DHW is removed, the SEQ will return to the Setback Set Point.
- For wiring a remote Setback, see pg. 5.

⚠WARNING

The SEQ *PROVE* input can not be used as a safety limit. All equipment must have its own certified limit and safety controls as required by local codes. Any combustion air damper signal or other interlock provided for safety MUST be wired back to the individual boilers and any other equipment required by code, in addition to being wired into the SEQ *PROVE* terminals.

PROVE

- This feature is provided to check if system components are running properly.
- The *PROVE* input terminals must be continuous for any Stage Output to be active. If the *PROVE* inputs are opened when Stage Outputs are active, then they will immediately de-energize (and the individual Pump Outputs on the SEQ-6P will de-energize after the System Delay time).
- The Prove function is the default value for Input terminals 9 and 10. However, the same input terminals can be programmed to provide a DHW input. To check or change the function of these terminals, see pg. 8 and 10.
- The Set Point or Calculated water temperature will display $\overline{P r F}$ to indicate when stages are not being energized because the Prove signal is not made.
- The *PROVE* input does not affect the status of the System Output.
- A typical use of this feature is to check for flow before firing any boiler stages. When there is a call for heat, the System Output activates the system pump starter. When the pump establishes flow, a flow switch shorts together the *PROVE* input terminals. The SEQ then adds Stage Outputs as required to hold the temperature Set Point.
- Another typical application is to check the combustion air damper. When there is a call for output, the System Output can be wired to open a combustion air damper. An end switch on the damper can then be wired back to the *PROVE* input terminals. The SEQ then activates Stage Outputs as required.
- The *PROVE* input must be shorted for Stage Outputs to be activated. When not using the Prove function, the *PROVE* input must be shorted. (The SEQ is shipped with a jumper to short out the *PROVE* terminals.)
- For wiring the *PROVE* input, see pg. 6.

DHW CALL

- This function is not available for pressure or Interface applications
- When the *DHW* terminals are closed, the SEQ Set Point immediately changes to 200°F. This will happen regardless of outdoor temperature, the status of the Setback/Shutdown inputs, or the External Set Point (if that function is being used).
- Typically the *DHW* input is wired to an aquastat which monitors the domestic hot water temperature. When the aquastat calls for heat, it will close the *DHW* input terminals.
- If the System Output is configured for Combustion Air Damper operation, the System relay output will be closed when any Stage Output is activated to hold the 200°F set point.
- If the System Output is configured for System Pump operation without DHW priority (see pg. 23) then the System relay will be closed whenever the outdoor temperature is below the Outdoor Cutoff, regardless of the DHW input status.
- If the System Output is configured for System Pump operation with DHW priority (see pg. 23) then:
 - The System relay output will be open for the time set by the DHW Priority time
 - After the DHW priority time has elapsed, the System relay output will revert to its normal mode of operation (that is either on or off depending on outdoor temperature.)
- For wiring the DHW input, see pg. 6.

TROUBLESHOOTING

No Display, or Display of *888*

Check the 120VAC power input to the SEQ. Turn power to the SEQ off and back on.

TEMPERATURE INPUTS

Display shows *□Pn*

First check the dip switch (see pg. 3) to be sure the SEQ is configured to read a temperature input. If the dip switch is correct, then the SEQ does not register that a sensor is connected. Check that the wires from the sensor are continuous to the SEQ. Then follow the procedure for Incorrect Temperature Display.

Display shows *ShL*

The SEQ sees a short across the input terminals. Remove the wires from the *TEMP (1 & 2)* inputs. The display should change to read *□Pn*. If it doesn't, the SEQ may be damaged.

Display shows an Incorrect Temperature Display

Remove the wires from the *TEMP (1 and 2)* inputs. The display should change to read *□Pn*. If it doesn't, the SEQ 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 may be damaged.

Outdoor Temperature Display shows *□Pn*

Check the wires from the outdoor sensor are continuous to the SEQ. Then follow the procedure for Incorrect Outdoor Temperature Display.

Outdoor Temperature Display shows *ShL*

The SEQ sees a short across the input terminals. Remove the wires from the *OUTDOOR (11 and 12)* inputs. The display should change to read *□Pn*. If it doesn't, the SEQ may be damaged.

Outdoor Temperature Display shows an Incorrect Reading

Remove the wires from the *OUTDOOR (11 and 12)* inputs. The outdoor temperature display should change to read *□Pn*. If it doesn't, the SEQ may be damaged. Take an ohm reading across the detached sensor wires. The ohm reading should correspond to the chart on the right. If it doesn't, the sensor may be damaged.

Temperature Sensor Chart

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

PRESSURE INPUTS

Display shows $\square P n$

First check the dip switch (see pg. 3) to be sure the SEQ is configured to read a pressure input. If the dip switch is correct, then the SEQ does not register a sensor is connected. Check the wires from the sensor are continuous to the SEQ. Then follow the procedure for Incorrect Pressure Display.

Display shows $S h t$

The SEQ sees a short across the input terminals. Remove the wires from the *PRESSURE* (4 and 5) inputs. The display should change to read $\square P n$. If it doesn't, the SEQ may be damaged.

Incorrect Pressure Display

Check the pressure range (pg. 9). If the reading is still not correct remove the wires from input terminals + and *SENSOR* (4 and 5). Check for 24VDC across the two terminals. If it is not present, the SEQ may be damaged. Otherwise replace the black sensor wire to terminal *SENSOR* (5). Put an ammeter in series by connecting the (-) side of the meter to the detached red wire from the sensor, and the (+) side of the meter to the + (4) input terminal. The mA reading should correspond to the side chart. If it doesn't, the sensor may be damaged.

Pressure Sensor Chart

Pressure Input (in mA)	0 - 30 PSI Range	0 - 100 PSI Range	0 - 200 PSI Range	0 - 300 PSI Range
4	0	0	0	0
4.08			1	
4.16		1	2	3
4.53	1			10
5.07	2			20
5.6	3	10	20	30
7.2	6	20	40	60
8.8	9	30	60	90
10.4	12	40	80	120
12	15	50	100	150
13.6	18	60	120	180
15.2	21	70	140	210
16.8	24	80	160	240
18.4	27	90	180	270
20	30	100	200	300

INTERFACE INPUT

Display does not show $I n F$

Check the dip switch (see pg. 3).

Stages do not sequence

Make sure that any Stage Outputs which should be sequenced have their *OFF/AUTO/ON* switch in the *AUTO* position. Check the wiring between the SEQ and the HWR-Q or MPC-Q as shown on pg. 6. Check for continuity on each wire. Make sure the metal jumper is between terminals 12 & 13 of the HWR-Q or MPC-Q. If the wiring is correct, check the manual for the HWR-Q or MPC-Q for further troubleshooting procedures.

EXTERNAL SET POINT INPUT

Set Point changes when the knob is rotated

Check the dip switch (pg. 3).

Set Point always reads $\square F F$

Check that the wiring is appropriate for the application (see pg. 25). Then use an ammeter to measure the 4-20mA input. If the input is below 3.9mA or above 20.1mA, the Set Point will always be $\square F F$.

LEAD STAGE

There is no green lead stage light on

Check the 120VAC power input to the SEQ. Turn power to the SEQ off and back on. If more than one lead stage LED lights, the unit may be damaged.

There are more than one green lead stage lights on

Check the 120VAC power input to the SEQ. Turn power to the SEQ off and back on. If only one lead stage LED does not light, the unit may be damaged.

Lead Stage does not rotate when switch to *INCREMENT*

Only units which have (all stages of) their *OFF/AUTO/ON* switches in the *AUTO* position and which are designated as Unit or Lo stages (see chart on pg. 18) can be lead. If there is more than one stage which meets this criteria, the SEQ may be damaged.

Lead Stage does not rotate every 24 hours (First On/Last Off Rotation)

Check the dip switch is set up for First On/Last Off rotation (see pg. 3). Check the lead stage can be rotated as described above. Finally, check if the *INCREMENT/OFF/AUTO* switch is in the *AUTO* position. In the *AUTO* position, the lead stage should rotate among the possible lead stages every 12 hours after the unit is first powered up, and then every 24 hours thereafter. If the panel loses power, the lead stage and the rotation counters will be reset.

Lead Stage does not rotate First On/First Off

Check the dip switch is set up for First On/First Off rotation (see pg. 3). Check the lead stage can be rotated as described above. Finally check if the *INCREMENT/OFF/AUTO* switch is in the *AUTO* position.

STAGE OUTPUTS

When switched to *ON*, the unit does not come on

Remove any wires attached to the SEQ output. Check for continuity across the SEQ N.O. contacts. If there is continuity, the SEQ output is working correctly. Check the wiring and the unit being energized to determine why it is not operating.

Red stage light is lit, but the unit is not on

The SEQ is calling for this unit to be on. Follow the procedure above.

Red stage light is not lit, but the unit is on

The SEQ is not calling for this unit to be active. Remove any wires attached to the SEQ output. Check for continuity across the SEQ N.O. contacts. If there is no continuity, the SEQ output is working correctly. Check the unit for any other operating controls which may be causing it to run.

Stage Outputs don't sequence

Make sure that the red output lights on the SEQ correspond to the stage's operation. If they don't, follow the steps above. Check the dip switches (pg. 3) to be sure they are set correctly for your application. Check the Set Point or Calculated water temperature is correct and the display does not read *FFF* or *P r F*. Finally, check the *OFF/AUTO/ON* stage switches. Only units which (have all stages) switched to *AUTO* will be part of the automatic sequencing.

SYSTEM OUTPUT

When switched to *ON*, the *SYSTEM* component does not come on

Remove any wires attached to the SEQ *SYSTEM* terminals. Check for continuity across the N.O. contacts. Then check the N.C. terminals are open. If both are true, the SEQ is working correctly. Check the wiring and the component being energized to determine why it is not operating.

Red stage light is lit, but the *SYSTEM* component is not on

The SEQ is calling for the unit. Follow the procedure above.

Red stage light is not lit, but the *SYSTEM* component is on

The SEQ is not calling for the unit to run. Remove any wires attached to the SEQ *SYSTEM* output terminals. Check the N.O. terminals are open. Then check the N.C. terminals are closed. If both conditions are true, the SEQ output is working correctly. Check the unit for any other operating controls which may be causing it to energize.

LIMITED WARRANTY

Heat-Timer Corporation warrants that it will replace, or at its option, repair any products or part thereof which is found defective in material or workmanship within one year from the date of installation.

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Heat-Timer Controls for the HVAC/R & Plumbing Industry

- Steam heating controls
- Hydronic heating controls
- Sequencing controls
- Radiant heat controls
- Digital Set Point controls
- Precision tempering valves
- VARIVALVE® air vents
- 2, 3, and 4 way motorized valves
- Snow melt controls