

# HEAT-TIMER

## INSTALLATION/OPERATING INSTRUCTIONS

# SYSTEM CONTROL PANEL

### A Multiple Stage Output Panel

Provides Adjustable Boiler (Secondary) Pump Run-on Delay, Combustion Air Interlocks, Primary Pump Lead-Lag, and Primary Pump Failure Alarm

#### DESCRIPTION

The System Control Panel (SCP) is designed to be used with multiple hot water boiler systems. The SCP provides boiler pump run-on delay relays. In addition, the SCP can provide an interlock to combustion air, and/or a lead-lag function for two primary circulator pumps. The SCP control is designed to be used as an interface between a boiler sequencing control such as a Heat-Timer HWR-Q and the boilers and pumps. The SCP panel will control up to four boilers or two lo/hi boilers, four boiler (secondary) pumps, two system (primary) circulator pumps in lead-lag mode, a combustion air damper/fan, a combustion air damper/fan interlock, and a system pump alarm output.

When the heating system is activated, the SCP will bring on one of two system (primary) circulator pump relays. The system pump lead-lag function can be performed every time the system pump is activated, every 24 hours, every 7 days, or either system pump can be specified to be lead. If there is no proof of flow in 30 seconds, the SCP will activate the lag system pump relay and activate an alarm relay to signal the user that one of the system pumps has failed. If neither system pump can provide proof of flow, the SCP will not bring on any boiler stages.

Once system flow has been proved, the SCP will wait until the sequencing control calls for one or more of the boiler stages. The SCP will then activate the combustion air fan relay. Until combustion air has been proved, the SCP will not activate any boiler stage relays.

Once combustion air flow has been proved, the SCP will then activate the appropriate boiler stage relays and their (secondary) pump relays. As the sequencing control continues to add boiler stages, the SCP will activate additional boiler stages and their pumps. When the sequencing control removes a boiler from the system, the SCP will turn the boiler stage relay off. However, the boiler pump relay for that stage will remain activated for an adjustable time delay period. If at any point the system flow or the combustion air flow should fail, all the boiler stages will be turned off. But, the boiler pumps for any boilers that were active will remain on until the time delay period has elapsed.

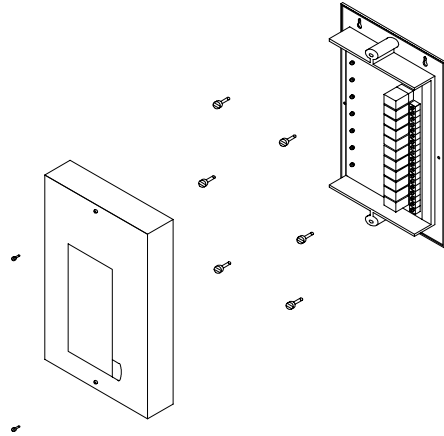
#### FEATURES

- Selectable system (primary) circulator pump lead/lag function: Alternate every time activated, every 24 hours, every 7 days, or either pump can be specified to always be lead
- Alarm contacts for system (primary) circulator pump failure with LED indicator
- Manual reset needed to clear system (primary) circulator pump failure alarm
- TEST/AUTO/SILENCE switch for system (primary) circulator pump failure alarm
- System flow interlock to disable all boiler stages and combustion fan if system flow is not proved
- ON/AUTO/OFF switches for both system (primary) circulator pump outputs with LED indicators
- ON/AUTO/OFF switch for combustion fan with LED indicator
- Combustion air interlock to disable all boiler stages if combustion air is interrupted or can not be proved
- ON/AUTO/OFF switch for each boiler stage and its associated boiler (secondary) pump with LED indicators
- Adjustable delay on break for boiler (secondary) pumps: 1 to 15 minutes of additional pump run time
- Multiple SCPs can be cascaded together for additional boiler stages.

# INSTALLATION

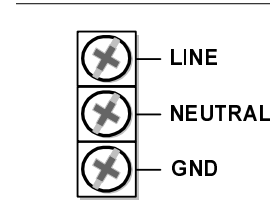
## MOUNT THE PANEL

- Remove the plastic panel cover from the SCP by loosening the two screws to reveal the six mounting holes.
- Locate the SCP near the sequencing panel and the equipment to be controlled but away from excessively high or low temperatures.
- The surface must be flat, smooth, and strong enough to hold the weight of the control and the enclosure.
- Leave the panel cover off until the installation is complete.



## POWER INPUTS

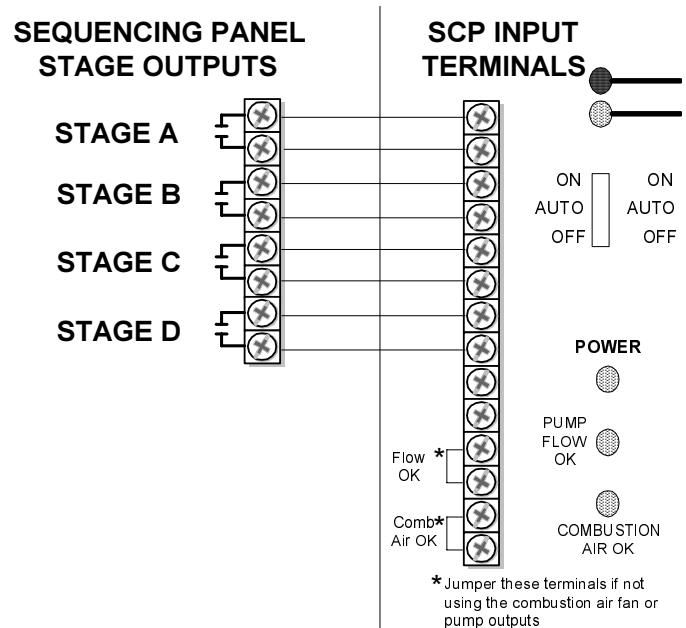
- Bring the power wires through the upper KO of the enclosure.
- Attach 120V 60 Hz to terminals LINE, and NEUTRAL.
- The GND terminal must be connected.



## BOILER STAGES

### Wiring the Inputs

- The sequencing panel outputs for each stage must be dry contacts only. If voltage is placed across the SCP input terminals, the SCP may be damaged.
- Wire each sequencing stage output into the corresponding input terminals of the SCP. A single SCP can accept up to four stages. If more stages are needed, see *Cascading SCP Panels* pg. 6.
- **IMPORTANT:** If **not** using the combustion air fan outputs, place a jumper across the Combustion Air OK terminals, otherwise see *Combustion Air Fan* pg. 3.
- **IMPORTANT:** If **not** using the system (primary) pump outputs, place a jumper across the Flow OK terminals, otherwise see *System (Primary) Pumps* pg. 4.



## 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 date of installation. The foregoing is in lieu of all other warranties, express or implied, and Heat-Timer Corporation specifically disclaims any and all warranties of merchantability or fitness for a particular purpose.

Under no circumstances shall Heat-Timer Corporation, its authorized representatives, affiliated or subsidiary companies be liable for special, consequential or incidental damages. Except as specially stated in these terms and conditions of sale, the sole remedy with respect to any product or part sold or manufactured by Heat-Timer Corporation shall be limited to the right to replacement, or at Heat-Timer Corporations option, repair F.O.B, Fairfield, New Jersey.

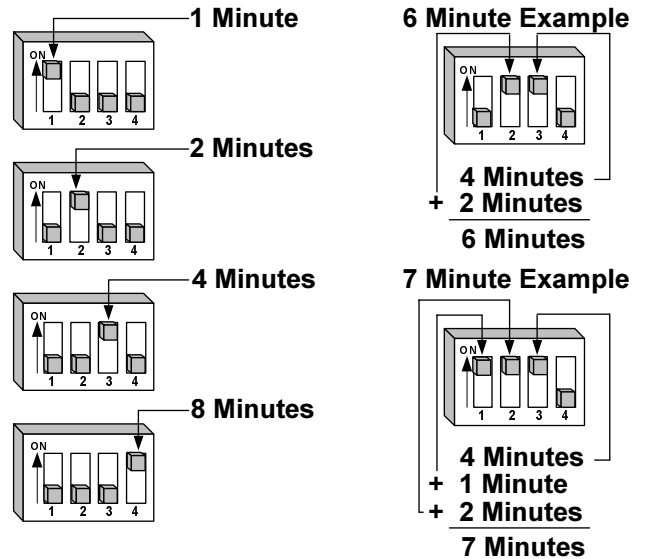
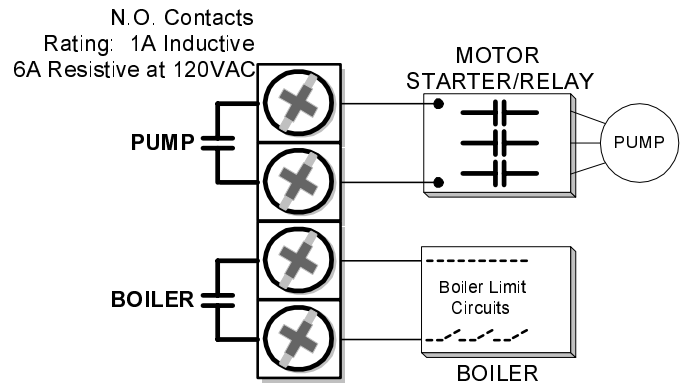
## Wiring the Outputs

- Each stage output has two sets of Normally Open (N.O.) dry contacts.
- These N.O. contacts do not output any power.
- Connect the SCP BOILER outputs in series with the limit circuits of the boiler
- Connect the SCP boiler PUMP outputs to the pump motor starter or relay.
- Each set of contacts is capable of switching 1A Inductive, 6A Resistive at 120VAC.

**WARNING: The SCP is an operating control only. The boilers must have all safety and limit controls required by code. It is the responsibility of the installer to verify that all the safety and limits are working properly before and after the SCP is installed.**

## Setting the Boiler (Secondary) Pump Delays

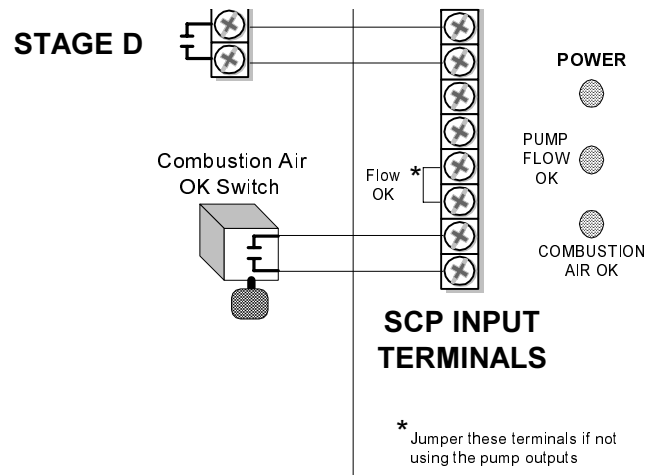
- The boiler pumps can run on for up to 15 additional minutes after the boiler stage has been turned off.
- To select the desired time delay, locate the four position dip switch below the input terminals.
- Add up the necessary dip switch values to reach the desired time delay as shown at right.



## COMBUSTION AIR FAN

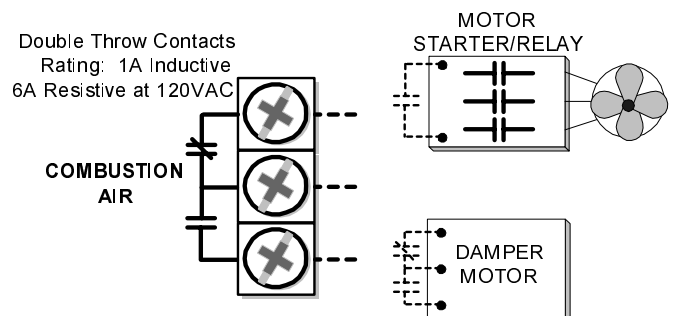
### Wiring the Input

- No stage outputs will be activated unless the COMBUSTION AIR OK input is closed by an air flow switch. (If not using the Combustion Air capability, these terminals must be jumped together.)
- The COMBUSTION AIR OK input must be dry contacts only. If voltage is placed across the SCP input terminals, the SCP may be damaged.
- The combustion air input may come from a sail type switch or a pressure differential switch in the air flow from a combustion fan.
- If using a damper for combustion air, an end switch on the damper motor should be used to signal that air flow is OK.



### Wiring the Output

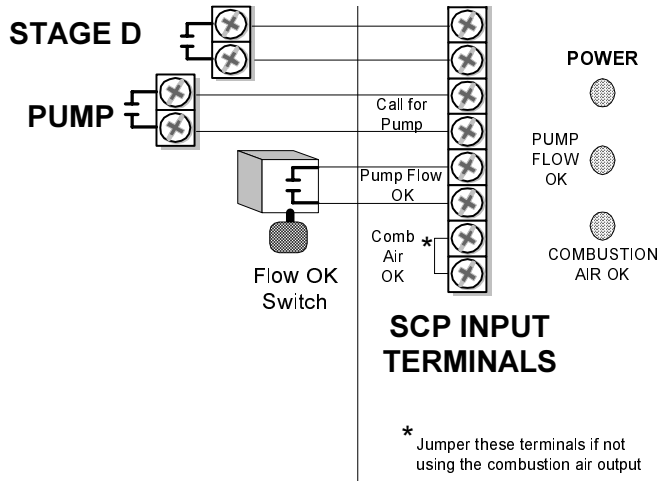
- The combustion air output is single pole, double throw relay output with COMMON, Normally Open (N.O.), and Normally Closed (N.C.) contacts.
- These relay contacts do not output any power.
- Connect COMBUSTION AIR output to the combustion air fan or the damper.
- The contacts are capable of switching 1A Inductive, 6A Resistive at 120VAC.



## SYSTEM (PRIMARY) PUMPS

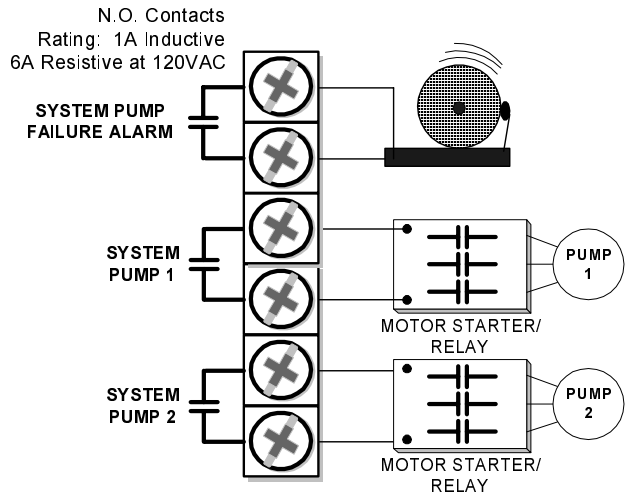
### Wiring the Input

- Neither the combustion air nor the stage outputs will be activated unless there is a CALL FOR PUMP and the PUMP FLOW OK input is closed by a flow switch. (If not using the system pump capability, the PUMP FLOW OK terminals must be jumped together.)
- The CALL FOR PUMP and PUMP FLOW OK inputs must be dry contacts only. If voltage is placed across the SCP input terminals, the SCP may be damaged.
- The pump flow input may be a sail type switch or a pressure differential switch.



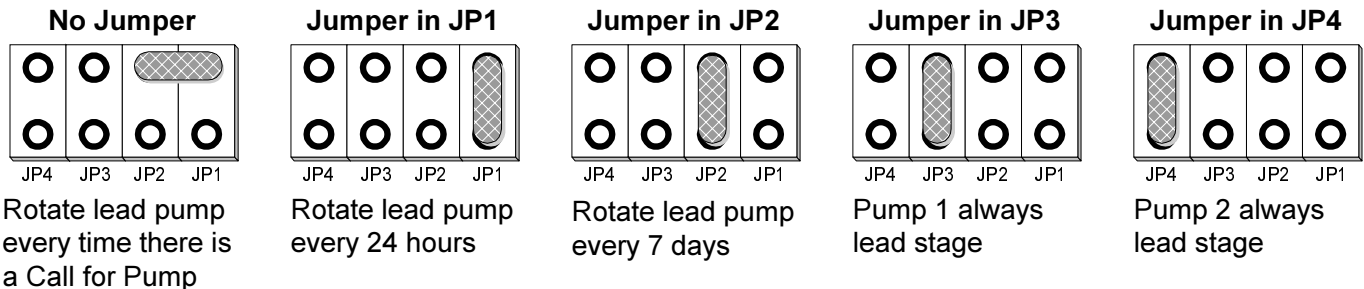
### Wiring the Output

- Each SYSTEM PUMP, and the SYSTEM PUMP FAILURE ALARM, has one set of Normally Open (N.O.) dry contacts.
- These N.O. contacts do not output any power.
- Connect the pump outputs to the pump motor starter or relay.
- Connect the SYSTEM PUMP FAILURE ALARM relay outputs to an alarm.
- The Heat-Timer Vis-U-Larm (HT #925011) with both a red light and a buzzer may be used for the alarm.
- Each set of contacts is capable of switching 1A Inductive, 6A Resistive at 120VAC.



### Setting Up the System Pump Lead-Lag Function

- The SCP can be set up to rotate the system (primary) pump lead stage.
- To select the desired lead-lag function, locate the black jumper block marked JP1 through JP4 below the input terminals.
- Select the desired lead stage function as shown below.

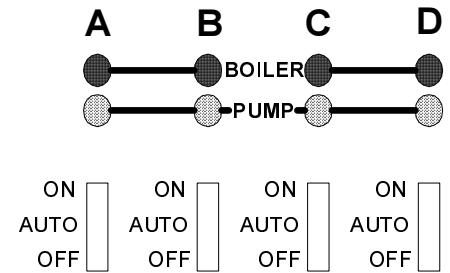


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# OPERATION

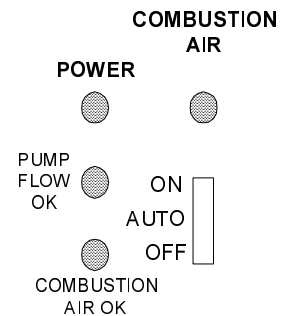
## BOILER STAGES

- Each stage has an ON-AUTO-OFF switch.
- In the ON position, both the stage boiler and pump relay will be activated.  
**NOTE:** When switched out of the ON position, there will be no pump run on delay. If the sequencing panel is not calling for that stage, both the boiler and the pump will be turned off immediately.
- In the AUTO position, the stage boiler and pump relays will be made whenever the sequencing panel calls for the stage to be activated (and the combustion air and system flow have been proved). When the sequencing panel removes the stage (or it is turned off due to loss of combustion air or system flow inputs), the pump relay will remain on for the number of minutes set by the dip switch (pg. 3).
- In the OFF position, the stage boiler and pump relays will be off and will not be activated if the stage input is made.
- The row of lights marked **BOILER** indicate which boiler stage relays have been activated. When the numbered stage light is on, the matching boiler stage relay is energized.
- The row of lights marked **PUMP** indicate which stage pump relays have been activated. When the numbered stage light is on, the matching stage pump relay is energized.



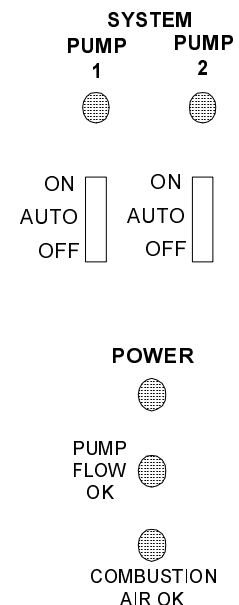
## COMBUSTION AIR

- If the switch is set to ON, the combustion air relay will be activated.
- In the AUTO position, the combustion air relay will be activated whenever the system flow has been proved and the sequencing panel is calling for any one of the boiler stages to fire.
- In the OFF position, the combustion air relay will be off. If using the combustion air interlock, the resulting loss of air flow will cause all the boiler stages to be turned off.
- The light marked **COMBUSTION AIR** indicates when the combustion air relay is activated. When the light is on, the combustion air relay is energized.
- The light marked **COMBUSTION AIR OK** indicates when combustion air has been proved (the **COMBUSTION AIR OK** inputs are shorted together).



## SYSTEM (PRIMARY) PUMPS

- If a **SYSTEM PUMP** switch is set to ON, that pump relay will be activated.
- In the AUTO position, one of the pump relays will be activated whenever the sequencing panel **CALLS FOR PUMP**. Which pump relay is activated will be determined by the position of the jumper (pg. 4). If the lead pump does not prove **PUMP FLOW OK** in 30 seconds, then both the lag pump relay and the **SYSTEM PUMP FAILURE ALARM** relay will be activated.
- In the OFF position, that pump relay will be off. If the lead pump is switched OFF and system flow is lost, the SCP will automatically activate the lag pump relay and try to prove system flow. However, the **SYSTEM PUMP FAILURE ALARM** relay will be activated. If both pumps are turned OFF, or the system flow can not be proved, the boiler stage relays and the combustion air relay will be off.
- The lights marked **PUMP1** and **PUMP2** indicate when the pump relay is activated. When the light is on, the pump relay is energized.
- The light marked **PUMP FLOW OK** indicates when system flow has been proved (the **PUMP FLOW OK** inputs are shorted together).

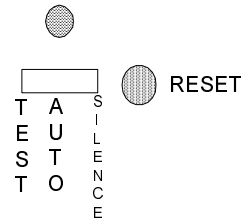


## SYSTEM (PRIMARY) PUMP FAILURE ALARM

- The SYSTEM PUMP FAILURE ALARM relay will be activated whenever the lead pump does not prove system flow (in other words, the lead pump running does not cause the PUMP FLOW OK contacts to be shorted). The alarm requires a manual reset.
- The alarm output can be tested by moving the switch into the TEST position. While the switch is in the TEST position, the alarm relay will be activated.
- With the switch in the AUTO position, the SYSTEM PUMP FAILURE ALARM relay will be activated whenever the lead pump fails to prove system flow in 30 seconds. The alarm can only be cleared by pressing the manual RESET button next to the switch.
- To turn the alarm off while the pump is being worked on, switch to the SILENCE position. This will turn off the alarm relay. The red light marked SYSTEM PUMP FAILURE ALARM will remain on to indicate that the alarm had been set, and has not yet been cleared.
- The light marked SYSTEM PUMP FAILURE ALARM indicates when the lead pump has either not been able to establish system flow, or when the system flow signal has been interrupted when the lead pump relay was activated.

**NOTE:** Switching to SILENCE will not turn off this red light. The light will only be cleared when flow is proven and the manual RESET button is pushed.

### SYSTEM PUMP FAILURE ALARM



## CASCADING MULTIPLE SCP PANELS

### WIRING THE CALL FOR PUMP

- Only one panel will provide the System (Primary) Pump outputs (see diagram on right).
- Wire the CALL FOR PUMP from the sequencing panel into the SCP which will control the system pump. See page 4 on wiring the CALL FOR PUMP.
- Do not wire the CALL FOR PUMP input on the second or any additional SCPs.

### WIRING THE PUMP FLOW OK

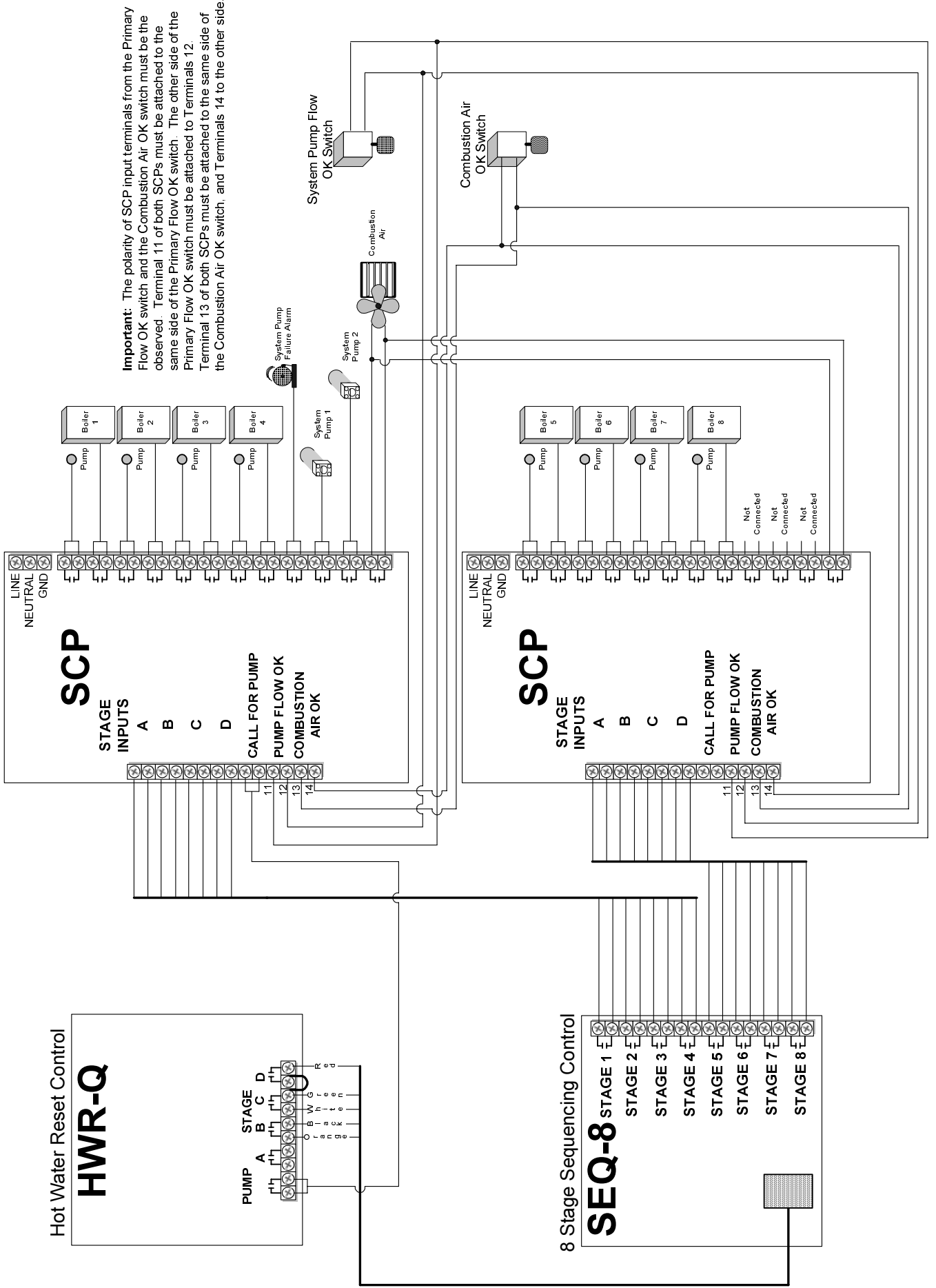
- Each SCP must receive an input (dry contacts only) from the Primary Flow OK switch (see diagram on right).
- The output of the Primary Flow switch must be connected in parallel to all the SCPs.
- The switch output must be wired with the same polarity on all the SCPs. In other words, if one side of the switch is connected to the PUMP FLOW OK terminal 11 on one of the SCPs, then the same side of the switch must be attached to the terminal 11 on other SCPs.
- If the switch is wired with different polarity, the SCP will not work correctly and may be damaged.

### WIRING THE COMBUSTION AIR FAN

- Each SCP must receive an input (dry contacts only) from the Combustion Air OK switch (see diagram on right).
- The output of the Combustion Air OK switch must be wired with the same polarity on all the SCPs. In other words, if one side of the switch is connected to terminal 14, then the same side of the switch must be attached to the terminal 14 on other SCPs.
- If the switch is wired with different polarity, the SCP will not work properly and may be damaged.
- Each SCPs relay outputs for the combustion air fan must be wired in parallel to activate the combustion air fan or damper. See page 3 on wiring the combustion air fan.
- This means if any SCP panel activates the combustion air fan relay, the fan should be energized.

**ALL THE OTHER TERMINALS SHOULD BE WIRED AS DESCRIBED ON PAGES 2-5**

# TYPICAL CASCADE WIRING DIAGRAM



**Important:** The polarity of SCP input terminals from the Primary Flow OK switch and the Combustion Air OK switch must be the same. Terminal 11 of both SCPs must be attached to the same side of the Primary Flow OK switch. The other side of the Primary Flow OK switch must be attached to Terminal 12. Terminal 13 of both SCPs must be attached to the same side of the Combustion Air OK switch, and Terminal 14 to the other side.

# TROUBLESHOOTING

**No lights are on, no outputs are activated** - If the POWER light is not on, the SCP may not be receiving power. Check the 120VAC power supply into the SCP. If the power input is correct, the SCP may be damaged. Call the factory for further assistance.

**The sequencer is calling for boiler stages, but neither the boiler stages nor the combustion air fan are activated** - Check if the PUMP FLOW OK light is on. If the PUMP FLOW OK light is on, test the stage input (see TESTING THE INPUTS below). If the light is not on, place a jumper across the PUMP FLOW OK input terminals. If the PUMP FLOW OK light still does not come on, the SCP may be damaged. Otherwise, the System Flow OK switch may not be working properly, the system pumps may not be working, the wires to the panel may be broken, or the system may be wired incorrectly (see pg. 4).  
**IMPORTANT:** Remove the jumper on the PUMP FLOW OK as soon as the test is completed unless you are **NOT** using the SCP to control system pumps.

**The sequencer is calling for boiler stages, the combustion air output relay is energized, but no boiler stages are activated** - Check if the COMBUSTION AIR OK light is on. If it is, then make sure the boiler stage's ON-AUTO-OFF switch is in AUTO. If a boiler stage has been switched OFF, the stage will not run. If the COMBUSTION AIR OK light is not on, place a jumper across the COMBUSTION AIR OK input terminals. If the light still does not come on, the SCP may be damaged. Otherwise, the Combustion Air OK switch may not be working properly, the combustion air fan may not be working, the wires to the panel may be broken, or the system may be wired incorrectly (see pg. 3).  
**IMPORTANT:** Remove the jumper on the COMBUSTION AIR OK as soon as the test is completed unless you are **NOT** using the SCP to control a combustion air fan or damper.

**System Pump Failure Alarm is activated** - This alarm will come on whenever the lead pump can not establish system flow, or loses system flow for more than 30 seconds. Test the pumps (see TESTING THE OUTPUTS below). If both pumps run properly, the System Pump Flow OK switch may not be working properly.

**Boiler Pumps do not run the specified amount of time after the Boiler Stage turns off** - The time periods set by the dip switch are slightly longer than the actual setting. For example, if the switch is set to 5 minutes, the Boiler Pumps will turn off between 5 and 6 minutes later. If the time periods are more than one minute off, carefully check how the dip switch has been set (see pg. 3).

**The sequencer is not calling, but outputs are active** - Check that the ON-AUTO-OFF switches are in the AUTO position. Any pump relay, boiler stage relay, the alarm relay, or the combustion air fan relay will continuously be energized when switched to the ON position.

## TESTING THE INPUTS

*The SCP inputs must be dry contact closures only. No voltage should be put across the input terminals. To test if an input is working properly:*

1. Remove the wires attached to the appropriate SCP input terminals.
2. Test the detached pair of wires coming from the sequencing panel or flow switch for continuity.
3. If the wires are continuous, the SCP should respond to the signal. Return the wires to the SCP terminals, and continue with the TROUBLESHOOTING procedure.
4. If the wires are not continuous then check the signal at the sequencing panel or flow switch. If the signal is continuous there, the wires between the two units may be broken.

## TESTING THE OUTPUTS

*The SCP outputs are dry contacts only. They do not output any power. This is true for all the outputs, including the system pumps, alarm, combustion air, boiler stages, and boiler pumps. To test if an output is working properly:*

1. Remove any wires attached to that those specific SCP output terminals.
2. Switch the ON-AUTO-OFF switch for the appropriate output to the ON position.
3. Test for continuity across the two N.O. output terminals.
4. If the outputs are not continuous, the relay may be damaged. Try replacing the relay for that output with another output relay which does work properly. If the N.O. terminals are still open, the SCP may be damaged.
5. If the N.O. output is continuous, turn the switch OFF and return the output wires to the appropriate terminals.
6. Turn the switch back to ON, and the output should come on. If it does not, the problem is not with the SCP, but rather with the output unit itself or the wiring to the output unit.