



INSTALLATION & OPERATION MANUAL

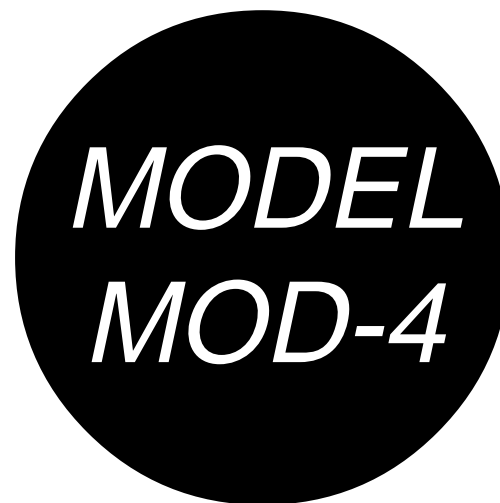
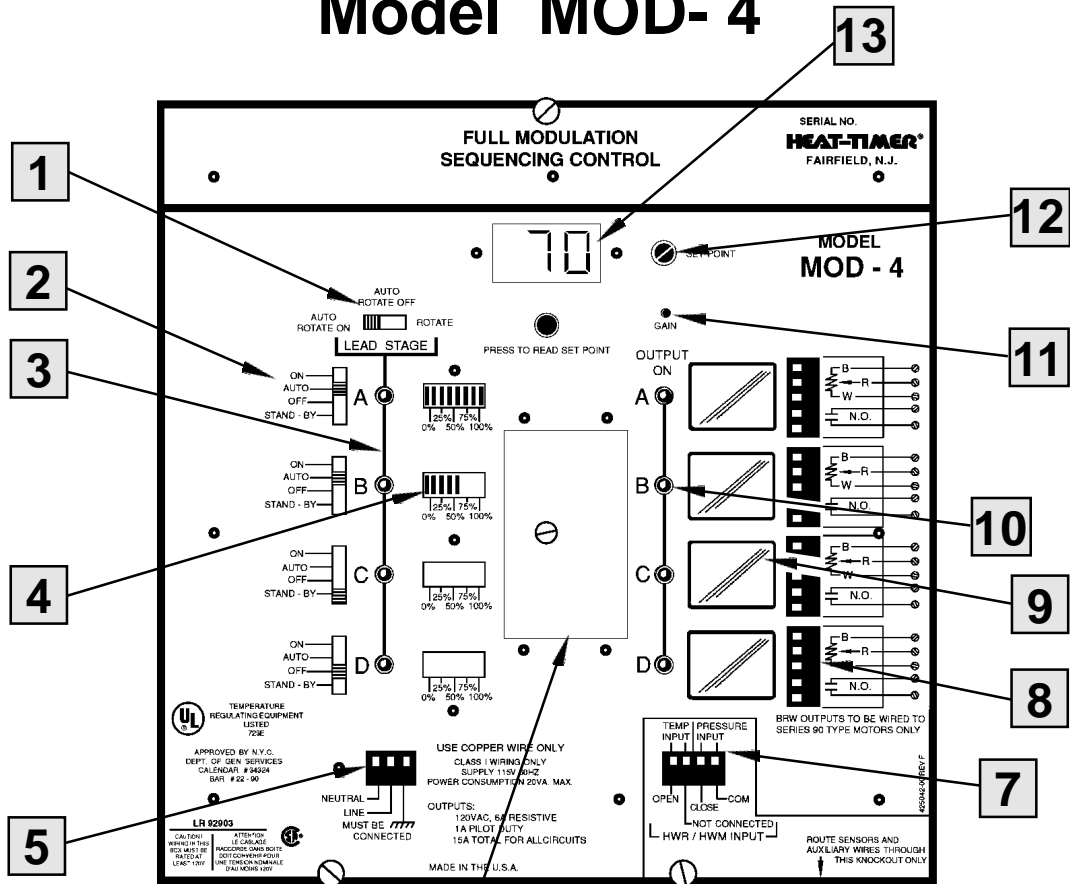


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THIS HEAT-TIMER MODEL MOD-4 HAS BEEN APPROVED BY THE UNDERWRITERS LABORATORIES FILE-60760(M) AND THE CANADIAN STANDARDS ASSOCIATION FILE LR92903. THIS MODEL HAS ALSO BEEN OFFICIALLY APPROVED FOR INSTALLATION AND OPERATION IN THE CITY OF NEW YORK BY THE DIVISION OF PUBLIC STRUCTURES, NYC CALENDAR #34324 AND BAR #22-90

Model MOD-4



1 Switch for NORMAL or SETUP mode.
2 Turn back to NORMAL after setting trimmers.

3 E. Low fire hold time delay.

4 F. Lag stage delay

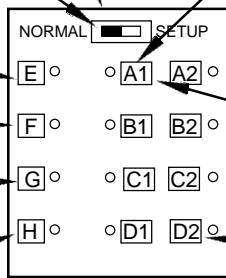
5 G. Setback provision

6 H. Adjusts standby time (in minutes)

7 A, B, C, & D identify each stage. when LED goes ON next to each letter, it means that stage's trimmer can be adjusted. Press set point button (under display) to advance from trimmer to trimmer.

8 Left row (all 1's) of trimmers are for adjusting ignition start points (minimum modulation) at 0% to 50%

9 Right row (all 2's) are for adjusting modulation start points (50% to 100%).



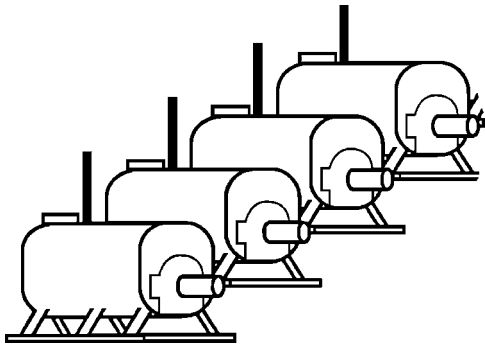
Functions

To help simplify these instructions, sections of the control panel are keyed and referred to in the text by the above numbers

- 1** **AUTO ROTATE ON / AUTO ROTATE OFF / ROTATE SWITCH**
Switch to select automatic rotation or manual selection of lead stages.
- 2** **ON / AUTO / OFF / STANDBY STAGE SWITCH**
4-way manual override switch for each stage
- 3** **LED INDICATOR / LEAD STAGE**
One LED on this line goes on to indicate which is the lead stage at any given time
- 4** **BAR GRAPHS**
Continually shows percentage of modulation for each stage.
- 5** **POWER TERMINAL**
- 6** **TRIMMER PANEL**
Contains 12 adjustment trimmers which are located at the center and just behind the control panel
- 7** **INPUT TERMINALS**
Either temperature or pressure; or for interface to a reset or cycle control
- 8** **OUTPUT TERMINALS**
For each stage
- 9** **RELAYS**
Four relays available for up to 4 stages
- 10** **LEDS**
LEDS go ON when stages are activated; OFF when inactive
- 11** **GAIN SCREW**
Sets gain factor
- 12** **SET POINT KNOB**
Adjusts the set point
- 13** **DIGITAL DISPLAY**
Shows sensor temperature or pressure constantly. Other values also appear here when set point button is pressed

Understanding the MOD - 4: An Overview

Until now, lead/lag controls for multiple full modulation boilers have been mazes of individual controls, each doing its own thing. The limitations of these controls, and their interactions with each other, have often compromised the entire systems performance. Operation was often erratic, making it difficult to hold the system temperature or pressure with any accuracy. And, as accuracy suffered, fuel usage increased, system problems developed, and maintenance costs soared.



MOD-4 BRINGS COMPUTER INTELLIGENCE TO THE TASK

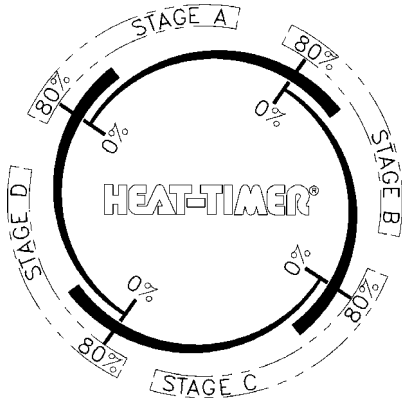
The MOD-4 smoothly integrates the staging and modulation of multiple boilers to hold the system set point. The MOD-4 uses PID type logic and a powerful proprietary computer program to monitor the system, anticipate the system needs, and adjust the outputs in 100s of tiny steps. This allows the MOD-4 to hold the system set point with unprecedented accuracy, whether controlling 2, 3, 4, or even more boilers. And, once the initial set up has been completed, the MOD-4 will work completely automatically, so maintenance costs will be lowered as well.

CONFIGURABLE FOR VIRTUALLY ANY SYSTEM

Any MOD-4 can be set up to hold either temperature or pressure set points. The temperature range is from -30°F to 250°F. There are three pressure ranges available, 0-30psi, 0-100psi, and 0-200psi (other ranges may be available upon request). The MOD-4 program adjusts itself to virtually any type or size of boiler, and can even handle different size or type boilers in the same installation.

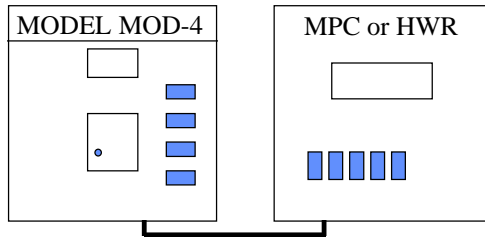
OVERLAPPING STAGES A UNIQUE FEATURE

The MOD-4 is unique in that it can start a new boiler stage up before the previous stage has reached high fire. This controlled overlap contributes to smooth-flowing operation and helps eliminate short cycling. Boilers can also be selected to rotate the lead stage every 24 hours. This allows even wear on all stages and increases boiler life.



INTERFACES WITH CYCLE OR RESET CONTROLS

The MOD-4 may be used by itself to provide hot water or steam at a fixed set point. The control can also be interfaced with Heat-Timer's Model HWR (Part #926580) hot water reset control, or its Model MPC (Part #926560) steam cycle control to provide weather-activated temperature control for heating a building - with features that include automatic setback, early shutdown, and optimum start.



COMMUNICATIONS OPTIONS

With the optional RI Plus (part #900147) the MOD-4 can be monitored and adjusted from a remote location, such as an office or a home. This allows the operator full access to the control without even going to the boiler room. With this option, the MOD-4 also interfaces with microprocessor-based flame safeguard communication systems and energy management systems. Heat-Timer is an approved Connectivity Partner with the Johnson Metasys system.

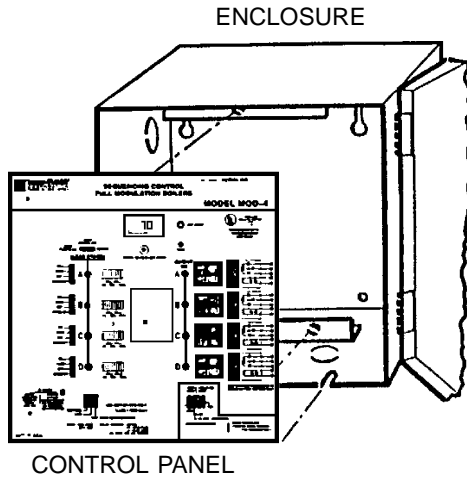
Getting the installation started

Prior to beginning the installation of the MOD-4, carefully evaluate your entire system. The installation varies depending on the type of system. The MOD-4 can stand alone as a single set point temperature or pressure controller. The MOD-4 can be interfaced to an HWR control for hot water reset. The MOD-4 can also be interfaced to a MPC for outdoor reset of steam systems. Two MOD-4s can be attached together to form a MOD-8.

Once you have determined exactly how your MOD-4 will be used, follow the step-by-step instructions in the following pages.

WARNING: *The Heat-Timer Model MOD-4 is strictly an operating control; under no circumstances should it be used as a primary limit or safety control. Each boiler must have its own certified limit and safety controls required by local codes. These are the responsibility of the installing contractor who must verify proper operation and correct any safety problems prior to starting the MOD-4 installation.*

First step: mount the control(s)



Locate an appropriate site

- Near the equipment to be controlled
- Away from excessively high or low temperatures
- At eye level, or where the display is easily visible
- The surface must be strong enough to hold the weight of the control and the metal box

If you have multiple controls (such as a 2 MOD-4s, an HWR with MOD-4, or an MPC with MOD-4)

- Select a location wide enough to mount as many enclosures as required side by side, 5" or 6" apart

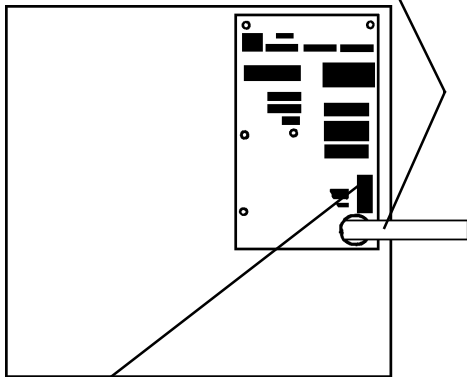
Remove the MOD-4 from the yellow metal enclosure

- Remove the top center screw holding the panel to the enclosure
- Loosen the two screws at the bottom of the enclosure
- Lift the panel from the box

Screw the enclosure to the mounting surface through the holes provided

Set the back of panel:

Remove insulating strip from battery located on the piggyback circuit board on the back of control panel



Set installation options on dip switches located just above the battery

Activate the battery

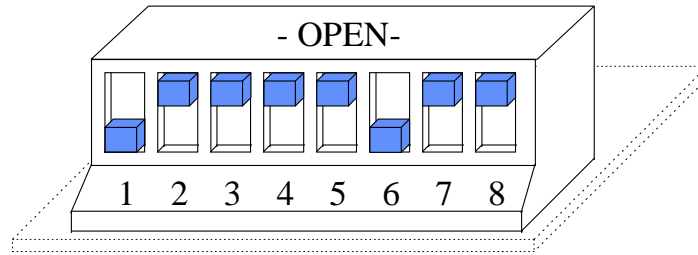
- Turn the MOD-4 panel over to reveal the piggyback circuit board
- Remove the insulating strip from the coin-type battery

CAUTION: Do not activate the battery unless you plan to power the control at once. If the control is not powered, the battery will lose its charge in 100 days.

Set the dip switches

- Refer to next page for detailed descriptions of the dip switch settings
- Determine the correct settings for your installation
- Locate the dip switch panel on the rear of the MOD-4 next to the battery
- Set the switches. The OPEN position is up away from the circuit board, and the CLOSE position is down toward the circuit board.

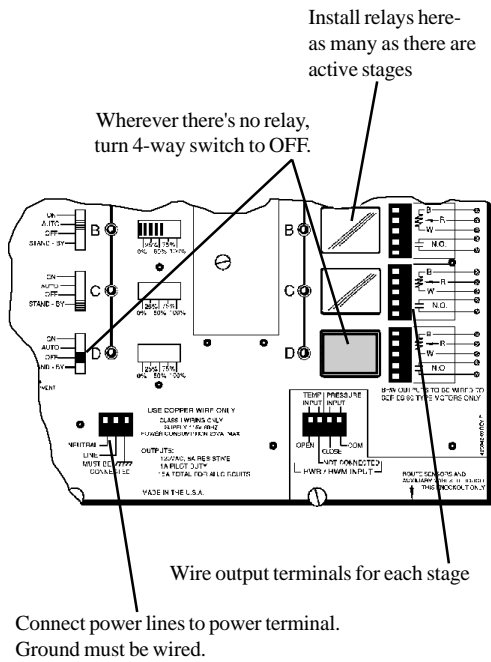
DIP SWITCH FUNCTION CHART



DIP SWITCH	OPEN	CLOSE
1	TEMPERATURE Temperature applications -30 to 250F	PRESSURE Pressure applications - 0-30psi range unless switch 6 or 7 is closed
2	NORMAL OPERATION	HWR INTERFACE Used only when MOD-4 is attached to Heat-Timer HWR for outdoor reset
3	MASTER (MOD-8) For stand-alone applications or for the master of a MOD-8	SLAVE (MOD-8) Unit is a slave in a MOD-8
4	NORMAL OPERATION Lead stages remain in high fire when lag stages are turned on	PARALLEL LOADING All stages that are on modulate at the same percentage
5	NORMAL OPERATION	EXTERNAL SETBACK Must be set when attached to Heat-Timer MPC - When unused terminals are shorted, unit holds a different set point
6	TEMPERATURE OR OTHER PSI Reads temperature, 0 to 30 or 0 to 100 psi	200 PSI Reads pressure range of 0-200 psi (with switch 1 is closed, switch 7 is open)
7	TEMPERATURE OR OTHER PSI Reads temperature, 0 to 30 or 0 to 200 psi	100 PSI Reads pressure range of 0 to 100 psi (with switch 1 closed, switch 6 open)
8	HEATING Increases modulation as system falls below set point	COOLING Decreases modulation as system falls below set point

WARNING: If the dip switch is not set properly, the MOD-4 will not operate correctly. Carefully check the details of the installation and determine the correct settings before continuing.

Second step: wire the output and power terminals



Install the relays

- There should be a relay (HT #500031-00) for each active boiler stage
- Push the relays into the stage sockets in alphabetical order
- Any stage without a relay (and a boiler) should be switched to OFF

CAUTION: If stages without relays are not switched to OFF, the MOD-4 will not lead lag or modulate properly.

Wire the boiler stages

- Bring the boiler wires through the bottom right KO holes.
- Wire the NO contacts for each stage in series with the boiler limit circuits.
- Wire the RWB contacts for each stage to the boiler terminals for an 135W motor input.

WARNING: The MOD4 is an operating control only. The boiler 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 the MOD-4 is installed.

Wire the power terminals

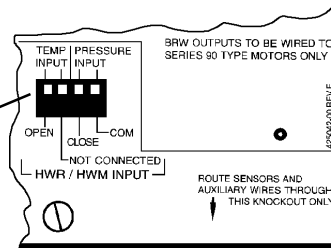
- Bring the wires through the bottom left KO holes.
 - Class 1 copper wire is required by UL.
- The GROUND wire must be connected.

Third step: wire the input terminal

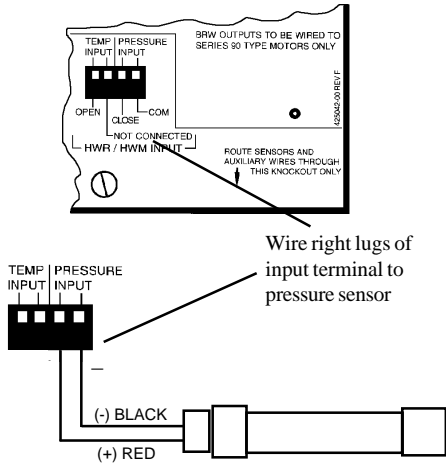
Single MOD-4 for temperature

- Bring the temperature sensor wires to the two left-hand terminals marked TEMP INPUT.
- Dip switch 1 must be to TEMPERATURE (see chart pg. 8, diagram pg. 26).

Wire left lugs of input terminal to temperature sensor

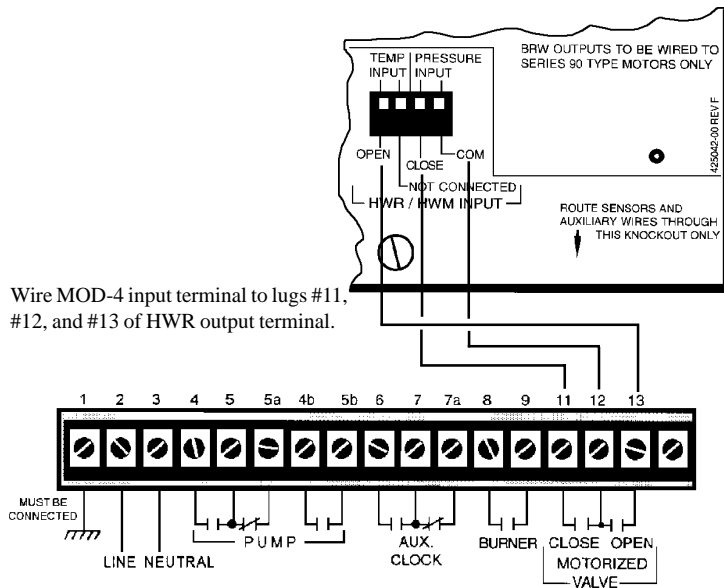


Single MOD-4 for Pressure



- The black pressure sensor wire goes to the outside (right) PRESSURE INPUT terminal.
- The red pressure sensor wire goes to the inside (left) PRESSURE INPUT terminal.
- Do not connect the ground or the atmospheric tube
- If installing a 30 psi transducer, dip switch 1 must be to PRESSURE, dip switch 6 and 7 must be open (see chart pg. 26).
- If installing a 100 psi transducer, dip switch 1 must be closed for PRESSURE, and dip switch 7 must be closed for 100 psi (see chart pg. 8, diagram pg. 27).
- If installing a 200 psi transducer, dip switch 1 must be closed for PRESSURE, and dip switch 6 must be closed for 200 psi (see chart pg. 8, diagram pg. 27).

MOD-4 to an HWR Reset Control

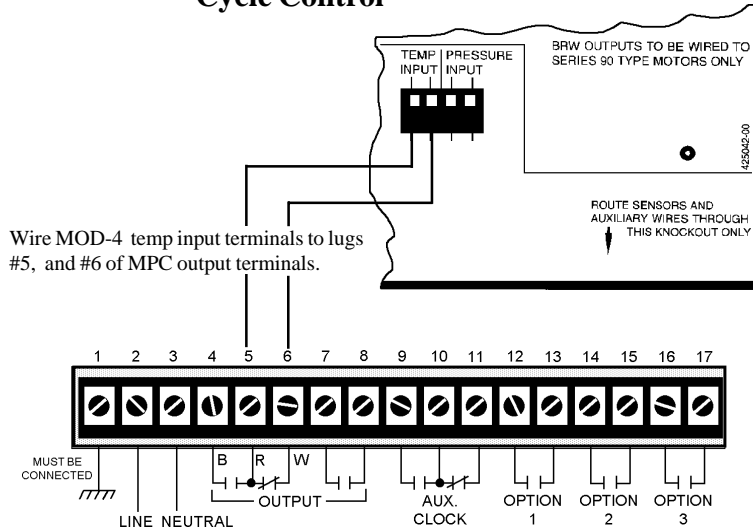


See wiring schematic on pg. 36

- No sensor is used.
- Wire terminals #11, #12, and #13 of the HWR to the CLOSE, COM, OPEN respectively on the MOD-4.
- Dip switch 2 must be to HWR INTERFACE see chart pg. 8, diagram pg. 27).

HWR Output Terminal Strip

**MOD-4 to a MPC
Cycle Control**

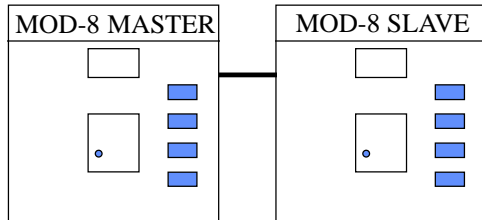


MPC Output Terminal Strip

See wiring schematic pg. 34

- Install a pressure sensor as described on opposite page.
- Wire the temperature input terminals to terminals #5 and #6 of the MPC.
- Dip switch 5 must be to EXTERNAL SHUTDOWN/SETBACK (see chart pg. 8, diagram pg. 28).
- Set SETBACK trimmer G fully clockwise so it displays OFF (see pg. 21).

**Two MOD-4s
Create a MOD-8**

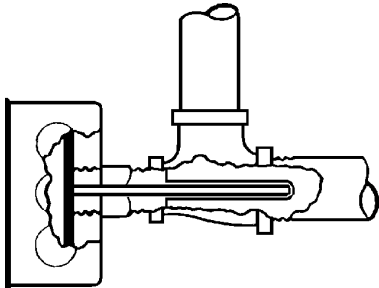


Two MOD-4s are joined by a data cable to create a MOD-8

CAUTION: To create a MOD-8, each MOD-4 must come equipped with an RI plus package (with or without modem) and must be ordered as follows:
 For MOD-8 WITH modem specify HT#926550-10.
 For MOD-8 WITHOUT modem specify HT#926550-20.

- Select one MOD-4 to be the master (dip switch 3 open chart pg. 8, diagram pg. 28) and one to be the slave (dip switch 3 closed). If one of the units has a modem (identifiable by the rear circuit board being fully populated), that one should be the master.
- Connect the data cable between the back of the two MOD-4s
- Attach either a pressure sensor, temperature sensor, or interface to the master's input terminals. The slave's input terminals are not connected.
- Set trimmer pots A1 through D2 on each MOD-4 (see pg. 18).
- Set trimmer pots E, F, G, and H on the master only (see pg. 20-22).
- Connect power to both MOD-4s
- Install as many relays as needed. For example, with 6 boilers, the master would have 4 relays, the slave would have two relays, and the other two slave stages would be turned OFF.
- Connect the N.O. and RWB of all stages with relays (see pg. 9).

**Fourth step:
Install the sensor**



Immersible type temperature sensor should be inserted into a well on a common supply line.

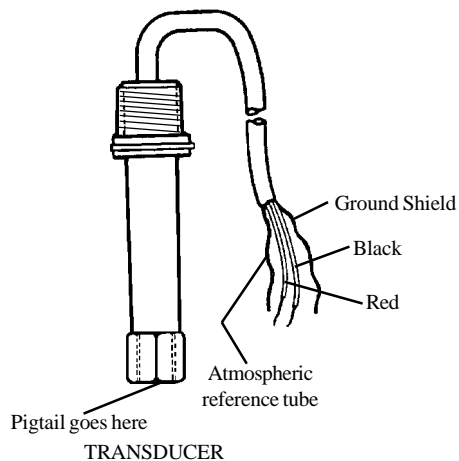
Skip this step if connecting the MOD-4 to an HWR Reset Control

Installing a temperature sensor

- Select a location in the common supply pipe, approximately 10 feet past any boiler inputs, but before any takeoffs
- Insert the sensor into a standard 3/8" ID well (Available separately as HT #904011 or use an existing or equivalent well)
- The sensor wire can be extended up to 500' without loss of accuracy, but do not run wires in conduit containing other wires with line voltage
- Extend the wires with shielded 2-conductor cable, Belden #8760 or equivalent. Ground the shield only at the panel side to the inside (right) temperature terminal.

Installing a pressure sensor

- Select a location in the main common supply header
- Attach a 1/4" brass isolation tube (pigtail)
- Screw the pressure sensor to the pigtail. The sensor has 1/4"NPT tapered threads.
- The sensor wire can be extended up to 500' without loss of accuracy, but do not run wires in conduit containing other wires with line voltage



CAUTION: The location of the sensor is very important. It must be placed where it measures the output of all the boilers. If boiler output bypasses the sensor, the MOD-4 will not operate properly.

**Final Step:
Make these
initial settings**

Once the control is mounted, wired, and the dip switch is correctly configured, the next step is to get an initial program set. The following settings are recommended for initial start-up. Some of these settings will remain just as you set them, while others will need to be adjusted later, based on experience with the system.

The list numbers below correspond to the detailed description of each setting in the following section THE CONTROL SETTINGS. The box numbers refer to the diagram on page 2 to aid in locating each knob or switch.

1. Select the temperature or pressure SET POINT (box 12) at which you want the system to run. Press and hold the button PRESS TO READ SET POINT and turn the SET POINT knob until the desired setting is reached. (If interfacing to an HWR, skip this step.)
2. Set the AUTO ROTATE ON/AUTO ROTATE OFF/ ROTATE switch (box 1) to AUTO. This will rotate the lead stage every 24 hours for even boiler wear.
3. Set the ON/AUTO/OFF/STANDBY switches (box 2). Any stages which are to be active and have relays should be set to AUTO. Any stages without relays should be set to OFF. (See Step 10 for stages in STANDBY.)
4. Set the GAIN (box 11) to Zero. To display the gain, press the PRESS TO READ SET POINT button, briefly release it, and then press and hold. With a small screwdriver turn the screw until 0 is displayed.

OPEN PANEL ACCESS DOOR (box 6) to expose the trimmer panel. Flip the NORMAL/SETUP switch to SETUP. The light next to A1 will light, and the display will show the value of A1. To move to other trimmers, simply push the button PRESS TO READ SET POINT and the light will move to the next trimmer being displayed.

5. Set ignition starts (A1, B1, C1, D1). These are the minimum firing rates for each stage. They should be set to the boiler manufacturers specifications. In general, if the boilers are not of the atmospheric type, A1 to D1 should be set to Zero.
6. Set modulation start points (A2, B2, C2, D2). These should be set at 80 to 90%.
7. Set the low fire hold timer (E) as recommended by the manufacturer. If there is no recommendation then it should be approximately as long as the pre-purge cycles on the boilers. 2 minutes is often a good starting point.
8. Set the lag stage delay (F) to Zero minutes.
9. If the optional setback provision is being used (dip switch 5 must first be to the EXTERNAL SHUTDOWN/SETBACK position) then dial in the setback trimmer (G) the number of degrees or pounds pressure to reduce the set point. (If connecting to an MPC, turn this all the way clockwise to OFF.)
10. Set the standby time to 30 minutes. Any stages with the ON/AUTO/OFF/STANDBY switches in the STANDBY position will not come on until all the stages in AUTO have been at 100% modulation for 30 minutes.

CAUTION: While the NORMAL SET-UP switch is in the SET-UP position, the bar graphs will not display properly. Be sure to return the switch to the NORMAL operation before closing the access door.

As you start up the control, learn each setting and how it operates

The initial start-up settings in the previous section should get the MOD-4 up and running. But to adjust the MOD-4 to run optimally in your system, additional adjustments will probably have to be made.

In the following pages are complete descriptions of the MOD-4 functions. All the settings are keyed by number to the chart of Initial Settings for easy reference.

To quickly find the location to adjust each setting, refer to the Box numbers on the MOD-4 panel diagram on page 2.

1. Establishing a set point

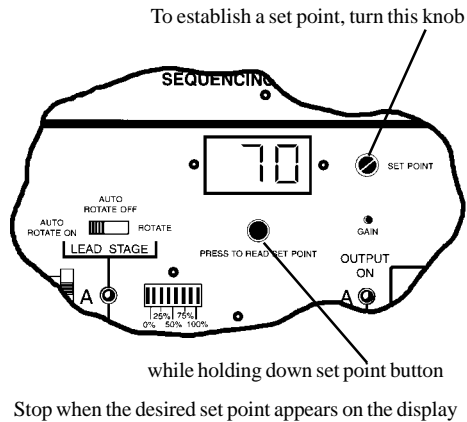
To adjust the set point, press and hold down the button marked PRESS TO READ SET POINT. The digital display will now show the value of the set point. Then turn the SET POINT knob (Box 12) until the desired temperature or pressure appears on the display.

NOTE: Turning the set point knob without displaying the value will not change the set point. Only when you see the set point value changing will the computer recognize a new value.

The temperature set point range is from -30°F to 250°F. The pressure ranges are either from 0psi to 30psi (displayed in tenths of pounds), 0 to 100psi, or 0 to 200psi. If you do not get the correct range on the set point, check the dip switches (see chart pg. 8, diagrams pg. 26-28) to be sure they are properly set up.

If interfacing to an HWR: The set point can not be set. The MOD-4 will hold the water temperature the HWR calculates.

If interfacing to an Energy Management System: A 4 to 20mA signal can be used to reset the set point on the MOD-4. For more information, consult the factory.



2. Choosing a lead stage

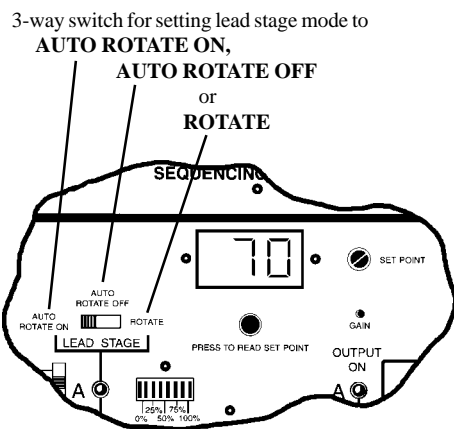
To promote even wear on all stages, it is desirable to rotate the lead stage among all the active stages. This means no single stage will always be the first one brought on, and the last one turned off. The lead stage will only rotate among stages switched to the AUTO position. The MOD-4 allows you two methods to accomplish this, an automatic rotation every 24 hours and a manual rotation which can be done at any time. The lead stage is easily recognizable as the green light next to the stage switch will be on.

The LEAD STAGE switch (Box 1) can be set to any of the following three positions:

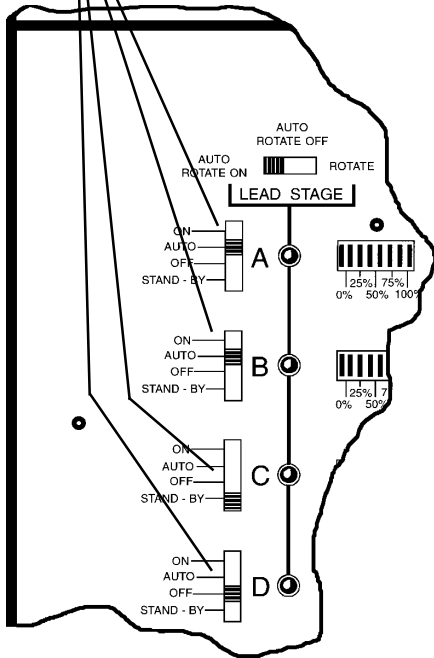
AUTO ROTATE ON position: The lead stage will automatically rotate every 24 hours among the active stages.

AUTO ROTATE OFF position: The automatic rotation is disabled. The present lead stage will remain the lead stage until the switch is changed.

ROTATE position: Every time the switch is pushed to the rotate position the lead stage will increment. Keep pushing the switch until the green lead stage LED next to the desired stage lights up.



4-Way stage switches
one for each stage
offer individual control
of each stage



3. Setting the ON/AUTO/OFF/STANDBY switches

Any active stages should be switched to AUTO. This means they will be part of the automatic modulation and participate in holding the system set point. Any stage without a relay must be switched OFF. Turning a stage to ON can be used for setting up and testing the boilers. A stage in STANDBY will only be used when all of the stages in AUTO can not carry the load.

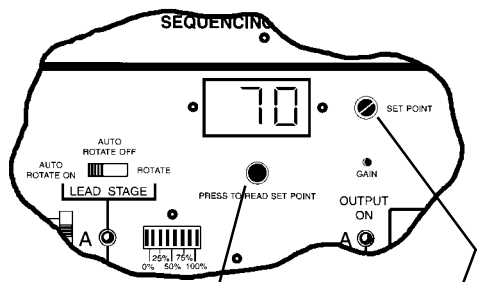
A complete description of each mode switch (Box 2) position follows:

ON: Any stage switched to the ON position will run at high fire as soon as it is released to modulation. The N.O. contacts will be closed, and the bar graph will show 100% modulation. This setting can be used for testing the stages, and can also act as a manual override.

AUTO: The stage will be part of the automatic sequencing. The stage will be turned on and off, and modulated as necessary to hold the set point. Only stages in AUTO will be part of the lead stage rotation.

OFF: When a stage is switched to OFF, it will not run. The N.O. contacts will be open, and the bar graph will show 0% modulation. When stage position is not attached to a unit it should be turned OFF. OFF can also be used for maintenance, or as a manual shutdown. If a unit is not functioning properly and has been switched off manually, be sure to switch the MOD-4 stage to OFF for proper rotation and modulation.

STANDBY: A stage in STANDBY will come on only when all the stages in AUTO can not hold the load for an adjustable period of time (see pg. 22, *Setting the STANDBY time*). A STANDBY stage will never be chosen as the lead stage.



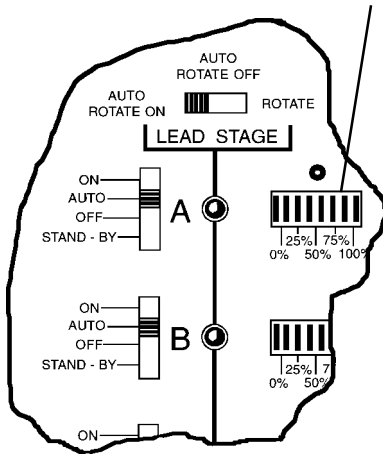
To set gain factor,
press set point button
Twice and hold it down. then turn this screw
clockwise for plus, counterclockwise for minus.

4. Setting the gain factor

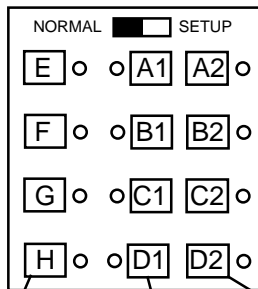
The GAIN (Box 11) adjusts how quickly the MOD-4 responds to changes in the system. The GAIN is adjustable from -10 (or the least aggressive) to 10 (the most aggressive). The GAIN factor adjusts the response rate of the boilers for your specific installation. A gain of zero is a good start point.

The gain factor can be seen by pushing the button PRESS TO READ SET POINT twice and holding the button down. At this point, a small screwdriver can be inserted through the hole marked GAIN, and the GAIN can be adjusted.

Bar graphs, one for each of the four stages, continuously show approximate percentage of modulation for each stage on a scale of 0 to 100% (in 8 modules of 12.5% each)



When adjusting trimmers, the master switch must be set at **SETUP**, and then back to **NORMAL** for regular operation of the control.



This A1 to D1 row is for setting ignition starts (min. firing rates)

Trimmers **E, F, G & H** are used for key functions

This A2 to D2 row is for modulation start points

NOTE: Unlike the set point knob, the GAIN can be changed whether or not it is presently being displayed. Therefore, when adjusting the GAIN screw be careful not to rotate it after the button has been released.

In general, if your system is over and undershooting the set point, the gain should be lowered. If the system never quite seems able to get to set point, the gain should be increased.

NOTES ON BAR GRAPHS AND TRIMMERS

The remaining instructions deal with the operation of the bar graphs and the setting of the trimmers so a short discussion of these two features follow:

Reading the bar graphs: Each stage has a bar graph (Box 4) which shows the percent modulation of that stage. If none of the bar graphs are lit, the stage is at 0% modulation. If all of the bar graphs are lit, the stage is at 100% modulation. If half (four) of the bar graphs are lit, the stage is at 50% modulation. Therefore, it is possible to tell the approximate position of a 135w motor by simply glancing at the MOD-4.

Adjusting the trimmers: Behind the access door (Box 6) are 12 trimmers, each with a specific function. To read the value of the trimmers on the digital display (Box 13), first move the NORMAL/SETUP switch to the SETUP position. The small red LED next to trimmer A1 will light up. This indicates the display is now showing the value of A1.

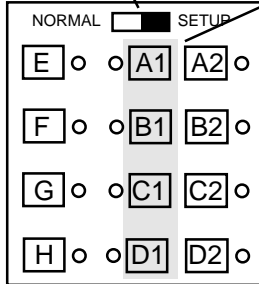
Each time the PRESS TO READ SET POINT button is pressed, the small red LED will increment to the next trimmer, and the display will show the new trimmer value. The trimmers advance A1, A2, B1, B2, C1, C2, D1, D2, E, F, G, and finally H, before starting again at A1.

NOTE: Unlike the set point knob, the trimmers can be changed whether or not they are presently being displayed. Therefore, when adjusting the trimmers be careful not to rotate them after the button has been released.

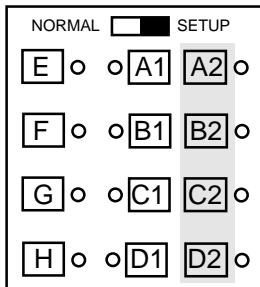
CAUTION: While the NORMAL SET-UP switch is in the SETUP position, the bar graphs will not display properly. Be sure to return the switch to the NORMAL operation before closing the access door.

Master switch must be turned to SETUP

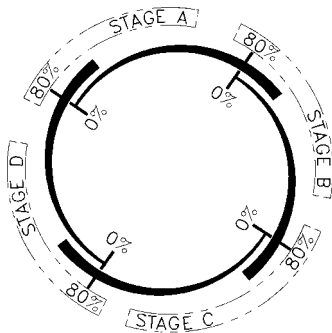
Then as LED goes ON at A1 stage, turn trimmer screw until desired percentage of modulation shows on the control's display



Press set point button to move LED (thru A2) to B1 and repeat the procedure with B1. Then (thru B2) to C1. Set "1" trimmers of all active stages.



Row A2 to D2 trimmers establish modulation start points.



Setting the Stage A trimmer to 80% directs Stage A to become active at 0% modulation when the previous Stage D reaches 80% modulation. Setting Stage C trimmer to 80% directs Stage C to become active at 0% modulation when the previous Stage B reaches 80% modulation.

5. Setting the ignition start points (Trimmers A1 through D1)

The ignition start point is the minimum firing rate, or the percentage of modulation, recommended for ignition and/or proper operation. If, for example, the ignition start point were set at 20%, the 135w motor would have to modulate up to 20% before the N.O. contacts would close and the boiler would fire.

Each stage has its own ignition start points set by the trimmers A1 through D1. Stage A has the point set on A1, Stage B has the point set on B1, etc. This way different types of burners can be used in the same installation. The ignition start point is adjustable from 0% to 50%.

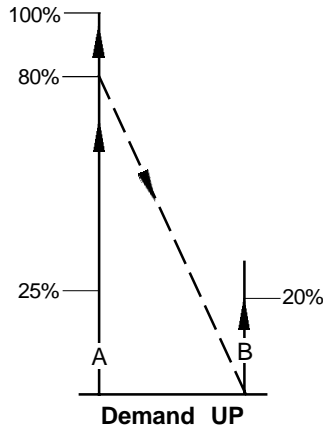
NOTE: If using modern power burners, this setting typically is 0%.

6. Setting the modulation start points (Trimmers A2 through D2)

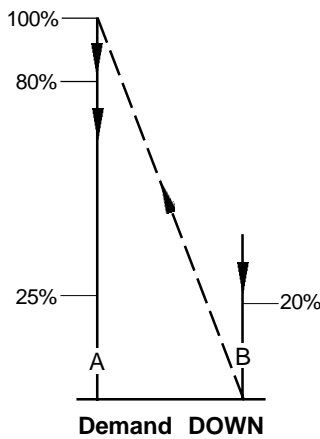
The modulation start points allow for a smooth transition as stages are brought on or off. The modulation start points can be set between 50% and 100% modulation for each stage. What this means is a lag stage will begin modulating whenever the previous stage reaches between 50% and 100%. Perhaps more importantly, the lag stage will remain in low fire until the previous stage has modulated down from high fire to the modulation start point. Therefore, short cycling of lag stages is greatly minimized as the lead stage can be brought down from high fire before the lag stage is turned off.

Each stage has its own modulation start point set by the trimmers A2 through D2. The modulation start point is based on the previous stage reaching that percent of modulation. For example, say Stage A is the lead stage and the modulation start point of Stage B is 80%. When Stage A reaches 80% modulation of its burner, Stage B will begin modulating.

Note: It does not matter where the modulation point of Stage A is set in this example. When it would matter is when another stage was the lead stage. Then when Stage D had modulated up to Stage A's modulation start point, Stage A would begin modulating.



1. Stage **A** modulates upward to meet set point demand...
2. When stage **A** reaches 80% (modulation start point), stage **B** begins its start-up process.
3. After start-up, **stage B** modulates upward and **stage A** moves up from 80%.....
4. By the time stage **A** reaches 100%. stage **B** has, perhaps, reached 20% of modulation..



1. Demand for heat drops and stage **B** starts modulating downward...
2. When stage **B** modulation reaches low fire level, the **MOD-4** holds it there... at low fire.
3. Control now turns to stage **A**, modulating it down from 100%. When stage **A** reaches below the modulation start point (80%), only then does stage **B** shut down...leaving **A** free to go up or down.

A typical setting for the modulation start point is 80%. The following two examples show when you might use a higher or lower value.

- 50% Modulation Start Point - Might be used in an application which has wide load swings such as an industrial plant or a hospital. This allows an additional boiler to be brought on line when the previous stage is at 50%. The next boiler will now be available for fast, high demands.
- 100% Modulation Start Point - Might be used in an apartment building where the load is fairly constant, the load changes slowly with the outside temperature, and additional boilers are mainly for backup.

Short Cycling is Minimized

The low fire output of many full modulation boilers is 20% (a 5 to 1 turndown ratio) or more of the total capacity. Consider an example where the load is such that to hold the set point, the first boiler must be at 100%, and the second stage must be at 10% of their total capacity. With previous controls for multiple full modulation boilers, this could not be realized. The first stage at high fire could not hold the load. So the second stage was brought on in low fire. However, this was now too much capacity, and the second stage was quickly turned off as the system overshoot the set point. But, the first stage at high fire was not enough, so the second stage was brought on again, and turned off again, and so on.

The MOD-4, on the other hand, can hold 110% with the two boilers. The second stage can fire (with a 0% ignition start point) when the first stage reaches 80% (if that is the modulation start point). The MOD-4 will now see the second boiler's output. The first stage will continue modulating up to catch the load. The first boiler will finish at 90%, and the second stage will remain in low fire.

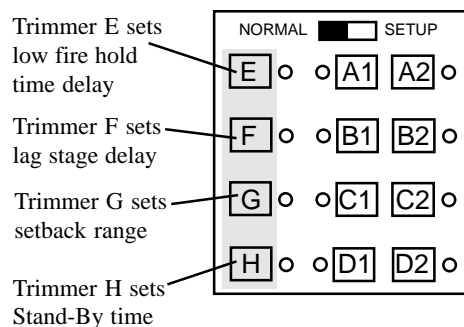
Now say the load begins to drop. Instead of dropping out the second stage, the first stage decreases its modulation (usually to 80%, but it will decrease the modulation even more if the ignition start point of Stage B is 0% as in this example). Finally, the second stage is turned off, as its output is no longer necessary. The MOD-4 now has room to maneuver the first stage up or down before again bringing on the second stage.

7. Setting the low fire hold time delay (Trimmer E)

This is a time adjustment that keeps a burner from modulating until the burner management control has released it to modulation. The low fire hold gives the burner time to go through its entire pre-purge sequence. Then when the burner ignites and is ready to operate, the MOD-4 begins modulation.

The low fire hold adjustment is set by trimmer E and is adjustable from 1 to 10 minutes. The setting should be slightly longer than the actual purge cycle, typically 2 minutes.

NOTE: During the time delay set by trimmer E, all stages, not just the stage being purged, are prevented from modulation. This keeps the MOD-4 from adding unnecessary capacity to the system before the other stage is released to modulation.



8. Setting the lag stage delay (Trimmer F)

This is a time adjustment that delays firing a lag stage for up to 60 minutes. The lag stage delay holds the previous stage in high fire for a given amount of time before the lag stage is fired. It is important to note that the lag stage delay works only when the system load exceeds the present boiler capacity, that is when modulation needs to be added. When the modulation of stages is being reduced, the lag stage delay has no effect. So, even when the lag stage delay is being used, it is still important to set the modulation start points to prevent short cycling of the second stage.

The lag stage delay should be used in two applications:

- Where the boilers, or at least the lead boiler, is enough to hold the load except under extreme conditions. In this case, bringing on the lag boiler is undesirable, since the lead stage will almost certainly catch up to the load given a few minutes. Meanwhile, low fire of the second stage will almost certainly cause the system to overshoot the set point.
- Where the boilers are usually fired cold. That is, when the load is not constant, so the boilers are given time to cool down between firing. When the first stage is fired, it may take a considerable period of time for it to warm up sufficiently to start affecting the system (especially in a steam application). Instead of heating up several boilers, where only the lead may be necessary, setting the lag stage delay gives the first boiler time to heat up and catch the load if it can.

The lag stage delay time is set by trimmer F. It is adjustable from 0 to 60 minutes. The lag stage delay works on multiple lag stages. If the trimmer is set to 10 minutes, the lead stage will be held at 100% for 10 minutes. If that is not sufficient to meet the load, then the next stage will be fired. If more output is needed, the second stage will be held at high fire for 10 minutes, and then the third stage will fire, and so on.

9. Setting the setback (Trimmer G)

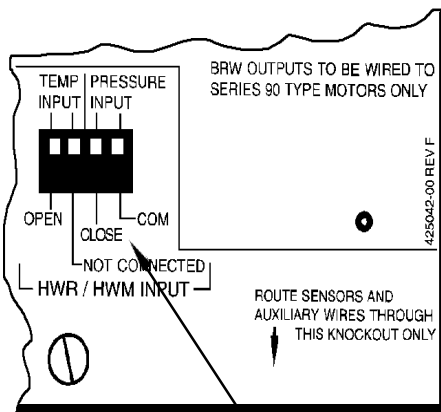
The MOD-4 can be configured to go into a setback mode. When the setback is activated, the set point will be lowered (or raised in for a cooling application). The display of the set point will flash to show that it is not the normal set point. If the setback trimmer G is turned fully clockwise, the main display will flash OFF, signifying the MOD-4 has been shutdown by the setback.

To get into the setback mode dip switch 5 must be to the setback position (see chart pg 8). Then, to be activated, the unused set of input terminals must be shorted together. For example, if using the temperature sensor, a short across the pressure terminals would cause setback. Once the unused terminals are opened, the MOD-4 returns back to the normal set point.

The MOD-4 can be put into setback through an external set of normally open contacts. A common application for setback is with a time clock. When a commercial building is occupied, the clock outputs are open, and the MOD-4 controls the building to a comfortable temperature. Then, after everyone goes home, the clock outputs close, and the MOD-4 lowers the temperature of the building.

Trimmer G sets the number of setback degrees or pounds. For temperature, the setback range is from 0 to 75° F. For a 0 to 30 psi unit, the setback range is from 0 to 7.5psi. For a 0 to 100, and a 0 to 200 psi unit, the setback range is from 0 to 75 psi. When trimmer G is turned fully clockwise, the display will flash OFF. In this position, the MOD-4 will turn the whole system off whenever the external contact are shorted (as long as dip switch 5 is set).

For MPC Interface: Trimmer G must be set to the OFF position. The MPC will wire to the temperature inputs of the MOD-4 (see pg. 11). When the MPC does not need steam, the MOD-4 will shut the boilers down.



Connect external clock to the two unused lugs on the output terminal (dip switch #5 must have been activated see page 8)

10. Setting the standby time (Trimmer H)

The standby applies only to MOD-4 stages where the ON/AUTO/OFF/STANDBY switches have been set to STANDBY. It will not apply to stages in AUTO, or bypassed ON or OFF. Standby holds a stage in reserve until all the other stages at 100% modulation can not hold the load.

NOTE: This is different than the lag stage delay time in that only stages switched to standby are affected. Also, a standby stage can never be the lead stage. In fact, a stage in standby will always be the last stage brought on, and the first stage turned off.

The standby function is used in installations where there is extra capacity, and it is desirable to hold a stage in reserve. This might be used where there is an older or inefficient boiler in the installation, which should not be fired unless absolutely necessary. However, if there is an unusual load condition that all the other stages can not handle, then the standby stage will be activated.

Trimmer H sets the standby time. It can be set from 0 to 60 minutes.

Appendix

This section contains detailed technical information on the MOD-4. All of the following are included:

- Specifications
- Displaying Information
- Dip Switch Settings
- Wiring Diagrams
- Troubleshooting Guide

The specific pages for your application have been referred to in other parts of the manual. It is important to first determine exactly what type of system is needed (see pg. 6, *Getting the Installation Started*) before following any one wiring diagram.

The Troubleshooting section is included for owner diagnosis of any apparent problems. Often a simple adjustment or change may be all that is necessary.

MOD-4 General Specifications

Voltage Input: 120VAC 60Hz

Power Consumption: 30VA Max

Output Ratings:

Relays: 1 Amp inductive, 6 Amp resistive at 115V 60 Hz (Up to four per panel)

0 to 135 ohm: RWB output

Temperature Ranges: -30°F to 250°F

Accuracy - plus or minus 1°F

Pressure ranges: 0-30psi, 0-100psi, 0-200psi

Other ranges may be available

Accuracy - 1% FS

Standby Battery: Operates for 100 days minimum with overall average life of 5 years

Max Ambient Temp: 120°F

Adjustment Trimmers:

Ignition Start Points - adjustable from 0% to 50%

Modulation start points - adjustable from 50% to 100%

Low fire hold Time - adjustable from 1 to 10 minutes

Lag stage delay Time - adjustable from 0 to 59 minutes

Setback - Temperature range from 0 to 75°F and OFF

Pressure range 0 to 7.5 psi (0 - 30 psi), 0 to 75 psi (0-100 or 0-200) and OFF

Standby - adjustable from 0 to 59 minutes

Lead stage Switch: 3-way switch for automatic or manual rotation

Mode Switches: 4-way switches to set each stage to ON, AUTO, OFF, or STANDBY

LED Indicators: to show lead stage and activated stages at all times

Bar Graph Displays: show approximate percent modulation of each stage

Enclosure: General purpose surface mounted 16 gauge steel NEMA-1 cabinet

Dimensions: 4-5/8" x 12-1/4" x 12-3/8"

Displaying Information

The MOD-4s digital display, bar graphs, and lights constantly allow you to monitor the status of the MOD-4 and its operation. In addition, the values set by the trimmers under the front access door can be displayed. To get the specific information you require, follow these procedures.

Sensor reading: The temperature or pressure is constantly displayed. *

Set point: Press the set point button once and hold to display set point. *

Gain setting: Press the gain button twice and hold to display the gain. *

Modulation percentage: The bar graphs show the percent modulation of each stage in 12.5% increments. To see the percent in 1% increments, press and hold the set point button: **3** times for Stage A, **4** for Stage B, **5** for Stage C, and **6** for Stage D. *

Lead stage: The lead stage is the one with the lit LEAD STAGE green light next to it.

Active stages: Any stages which are energized will have the red OUTPUT ON light next to them lit up.

* When the MOD-4 is attached to an **HWR**, pressing the set point button will have no affect. The display constantly shows the total percent modulation of all active stages. For instance, if four stages are in AUTO, and two are fully on, the MOD-4 would display 50 since 50% of the total stages are on.

Ignition start points: Open the panel access door and set the master switch to SETUP. The red light next to **A1** will go on, and the main display will now show the ignition start point of Stage A. Press the set point button to **B1** for Stage B, **C1** for Stage C, and **D1** for Stage D.

Modulation start points: Follow the above, pressing until the red light by **A2** comes on. The main display now shows the modulation start point of Stage A. Press the set point button to **B2** for Stage B, **C2** for Stage C, and **D2** for Stage D.

Low fire hold: Follow the above, pressing until the red light by **E** comes on. The main display now shows the delay time in tenths of minutes.

Lag stage delay time: Follow the above, pressing until the red light by **F** comes on. The main display now shows the delay time in minutes.

Setback: Follow the above, pressing until the red light by **G** comes on. The main display now shows the setback in either temperature or pressure, or may be OFF.

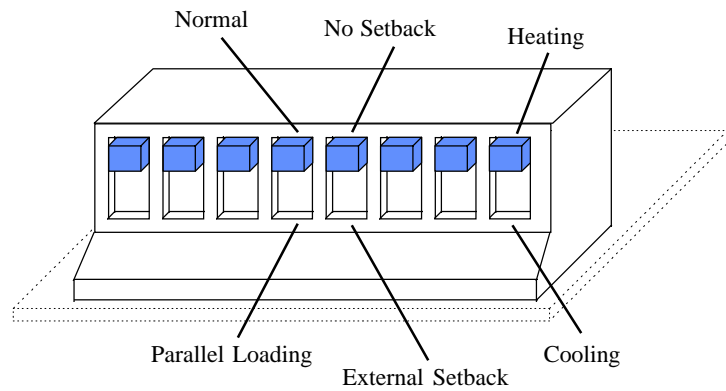
Standby: Follow the above, pressing until the red light by **H** comes on. The main display now shows the standby setting in minutes.

Dip switch configurations: option settings

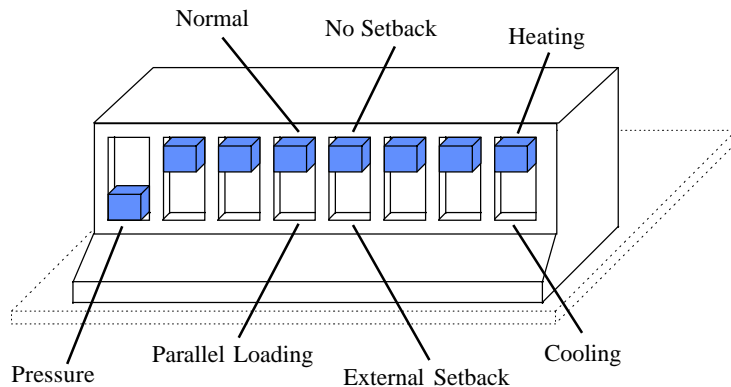
If the dip switch is not set properly, the MOD-4 will not operate correctly. To access the dip switch, it is necessary to remove the panel from the enclosure as described on pg. 7.

Set any switches without options as shown. The chart on pg. 8 describes the function of each switch position. **Normal Loading** is fully described on pg. 19, under *Short Cycling is Minimized*. In some cases it may be preferable to operate with **Parallel Loading**, that is to modulate any stages that are turned on together. For instance, if three stages were on, all would be at 45%. If more modulation were needed, all three would increase to 46%. The **Setback** function is described on pg. 21. The **Heating** mode increases modulation as the system falls below the set point. The **Cooling** mode decreases modulation as the system falls below set point.

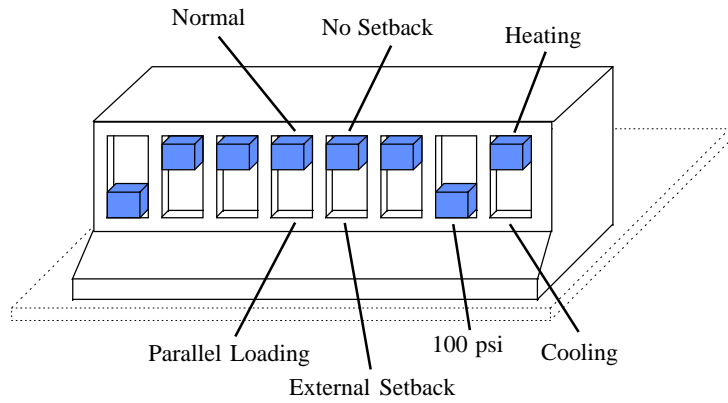
MOD-4 for Single Set Point Temperature Application:



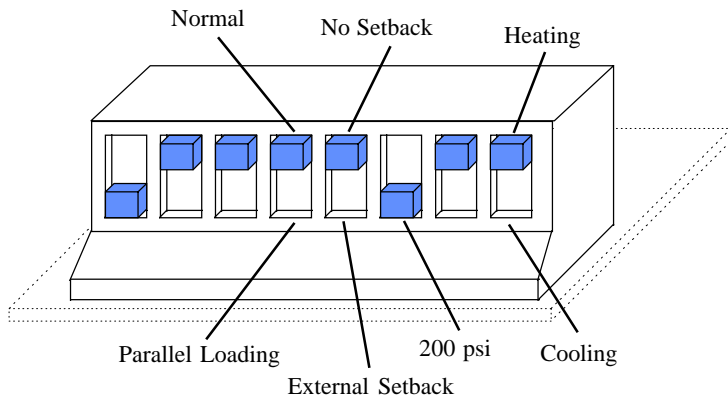
MOD-4 for Single Set Point 0 - 30psi Application:



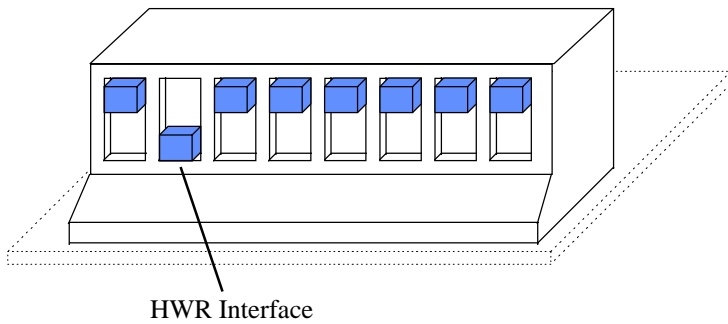
**MOD-4 for Single Set Point
0 - 100psi Application:**



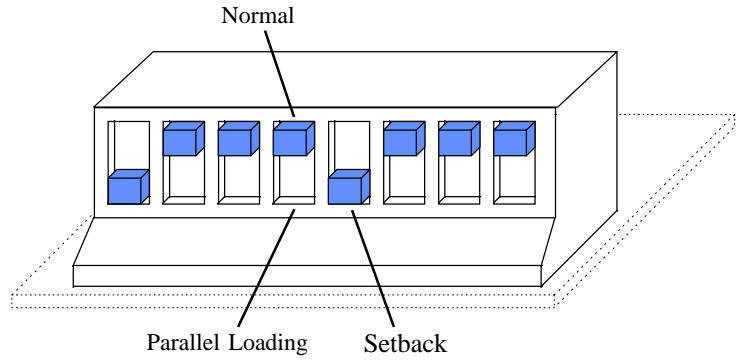
**MOD-4 for Single Set Point
0-200 psi Application:**



MOD-4 with HWR Reset Control:

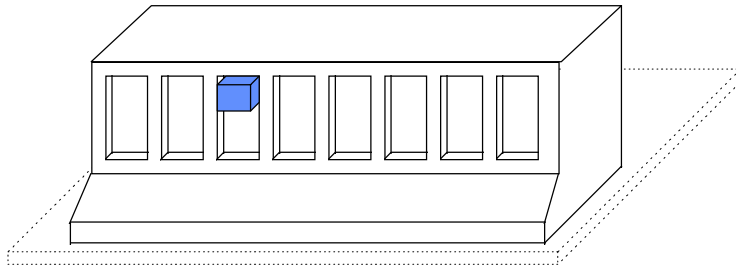


MOD-4 with MPC Reset Control:



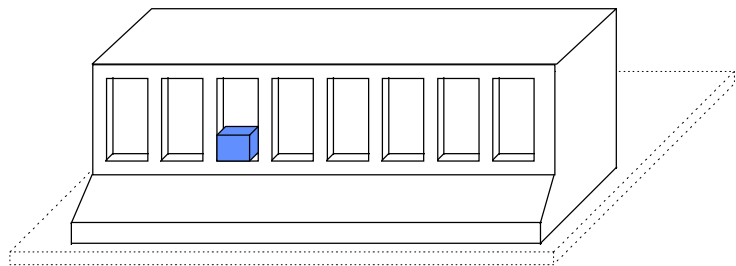
MOD-8 Master Unit:

Set all Switches except 3 as shown in the previous examples. The Master unit of the MOD-8 must have Switch 3 OPEN.



MOD-8 Slave Unit:

Set all Switches except 3 as shown in the previous examples. The Slave unit of the MOD-8 must have Switch 3 CLOSED.



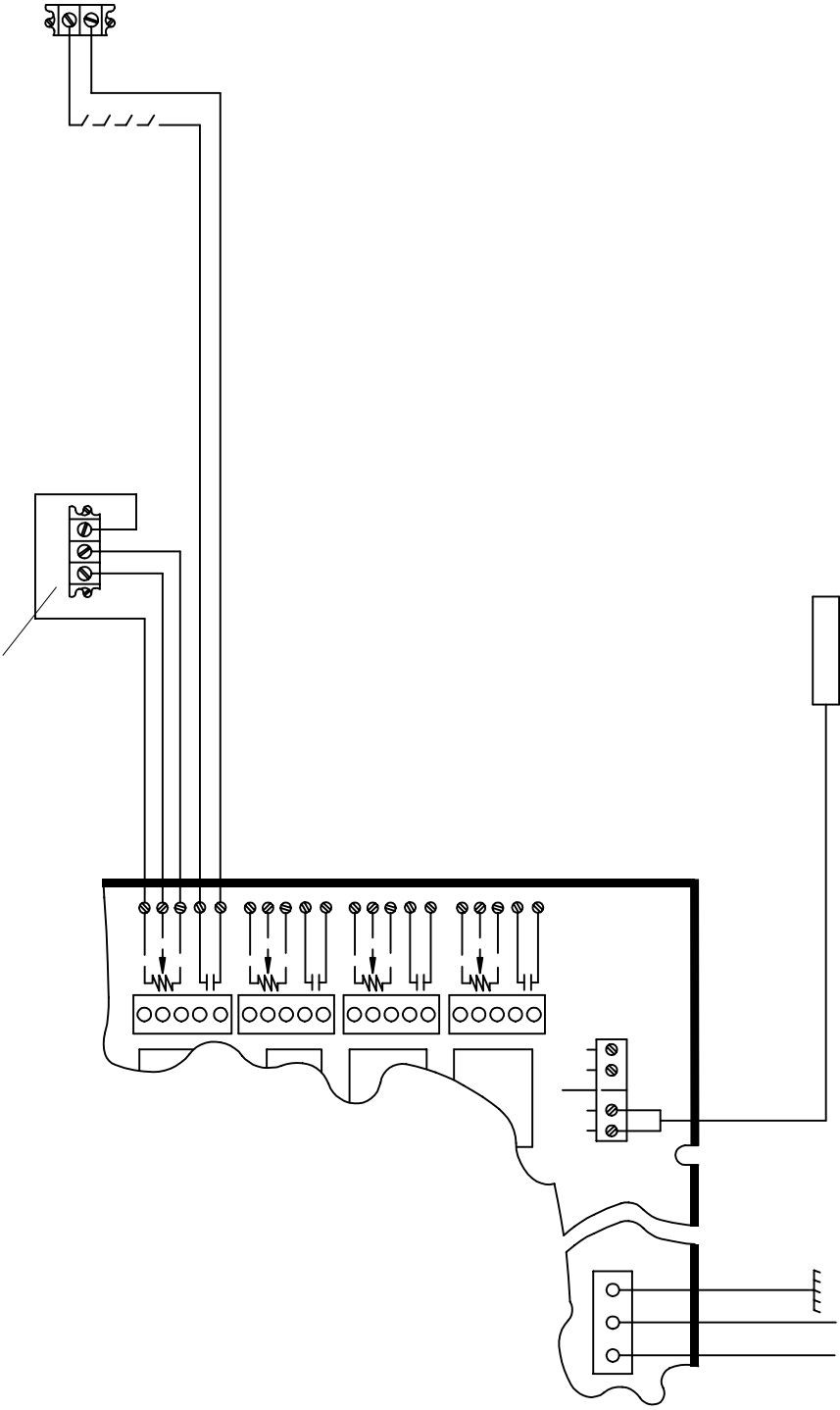
Wiring Diagrams:

The following wiring diagrams show the details for each type of installation. Pick the diagram from the list below which fits your application. For more details on the placement of sensors, refer to page 12.

	Page
MOD-4 to Full Modulation Burners (Temperature).....	30
MOD-4 to Full Modulation Burners (Pressure).....	31
MOD-8 to Full Modulation Burners (Temperature).....	32
MOD-8 to Full Modulation Burners (Pressure).....	33
MOD-4 to MPC Gold Series Steam Reset.....	34
MOD-8 to MPC Gold Series Steam Reset.....	35
MOD-4 to HWR Gold Series Hot Water Reset.....	36
MOD-8 to HWR Gold Series Hot Water Reset.....	37

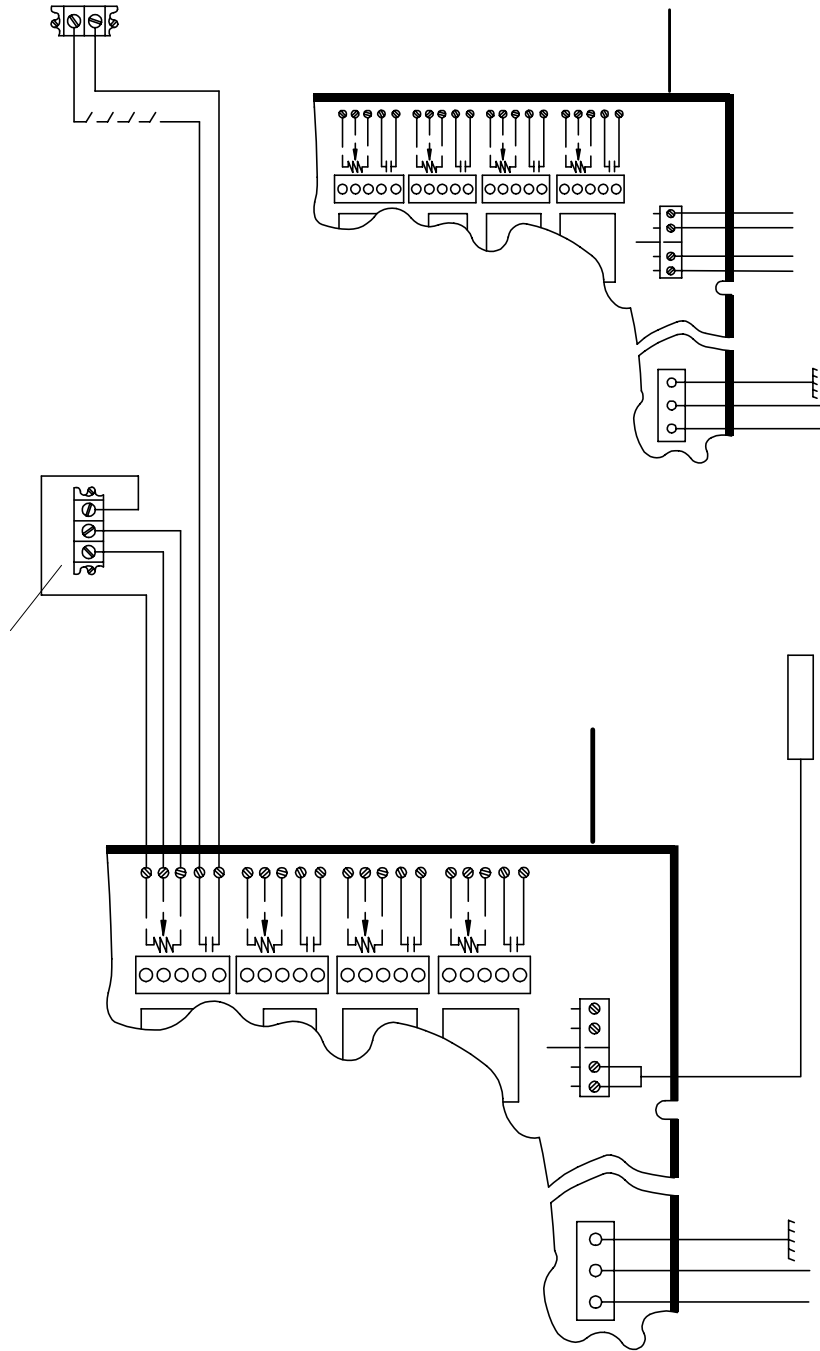
Typical Wiring Diagram #1

MOD - 4 to FULL MODULATION BURNERS (Temperature)



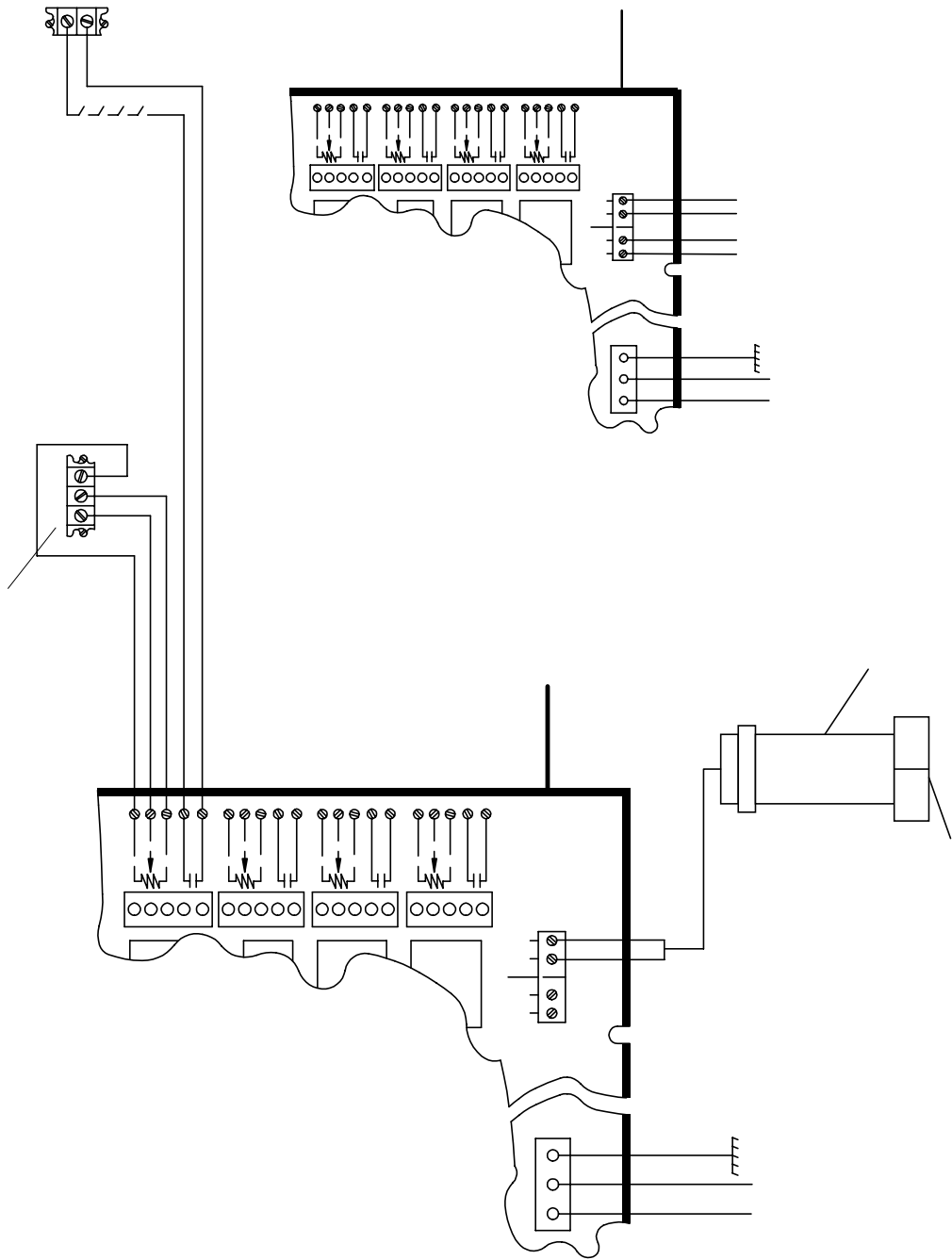
Typical Wiring Diagram #3

MOD - 8 to FULL MODULATION BURNERS (Temperature)

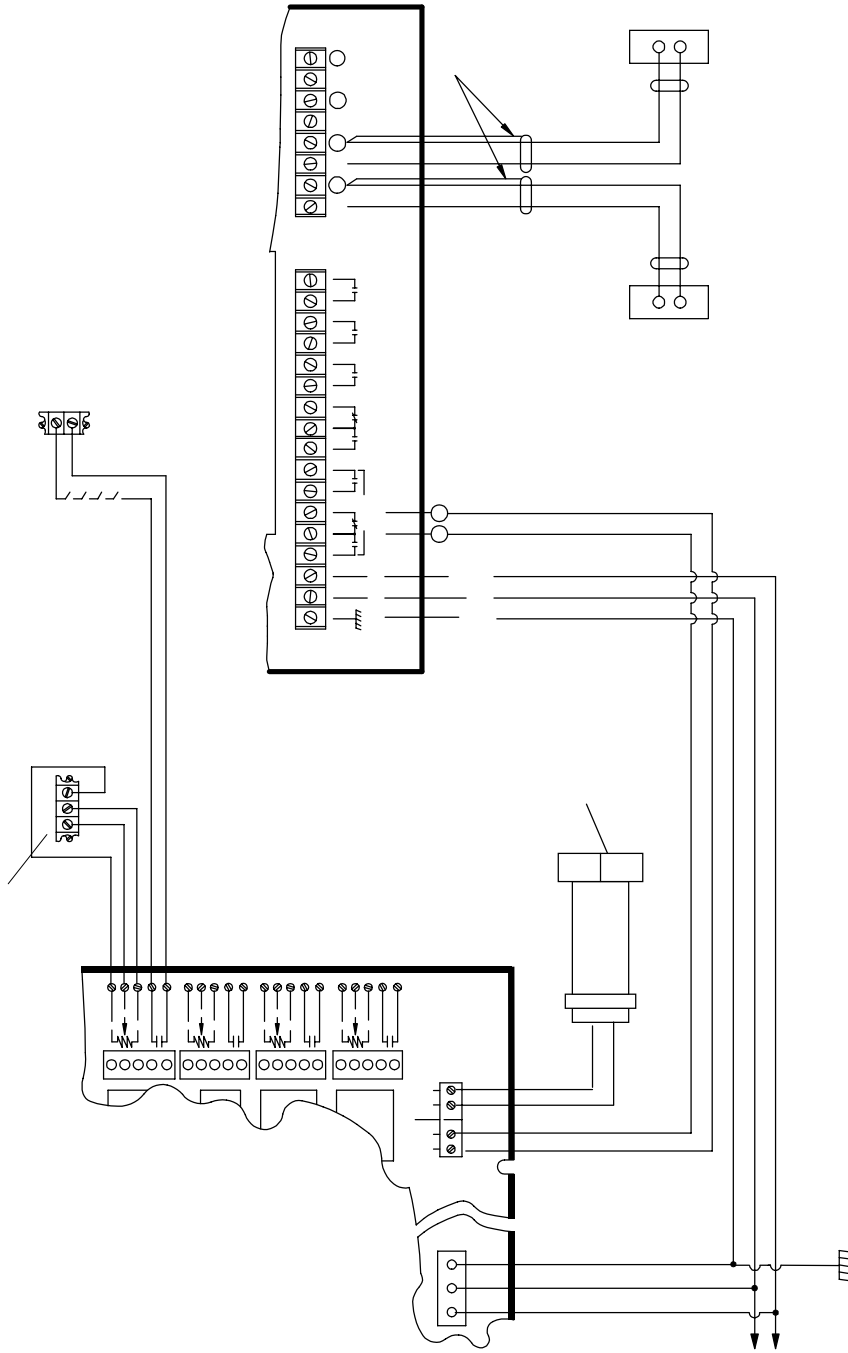


Typical Wiring Diagram #4

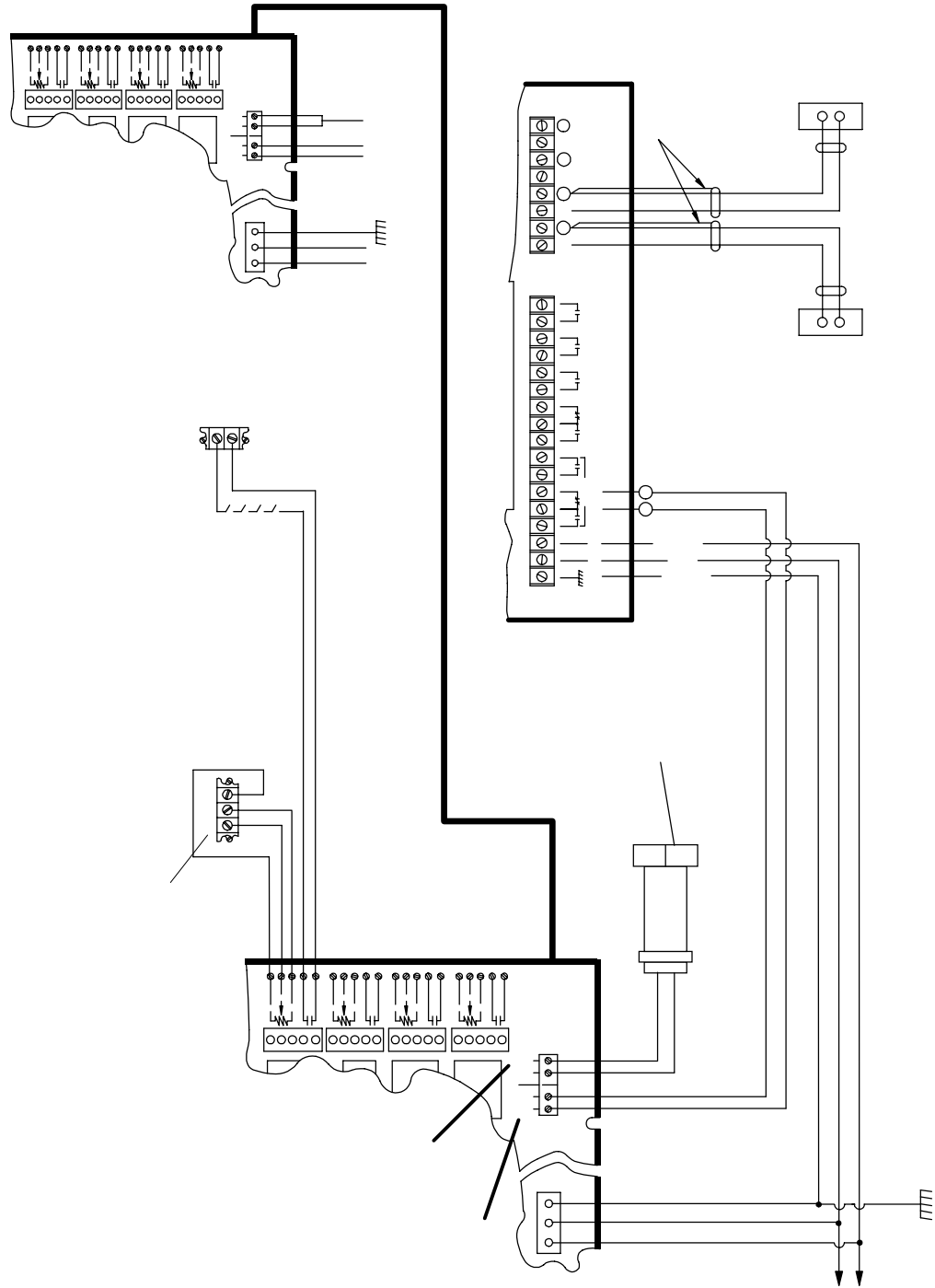
MOD - 8 to FULL MODULATION BURNERS (Pressure)



Typical Wiring Diagram #5
MOD - 4 to MPC GOLD SERIES STEAM RESET CONTROL

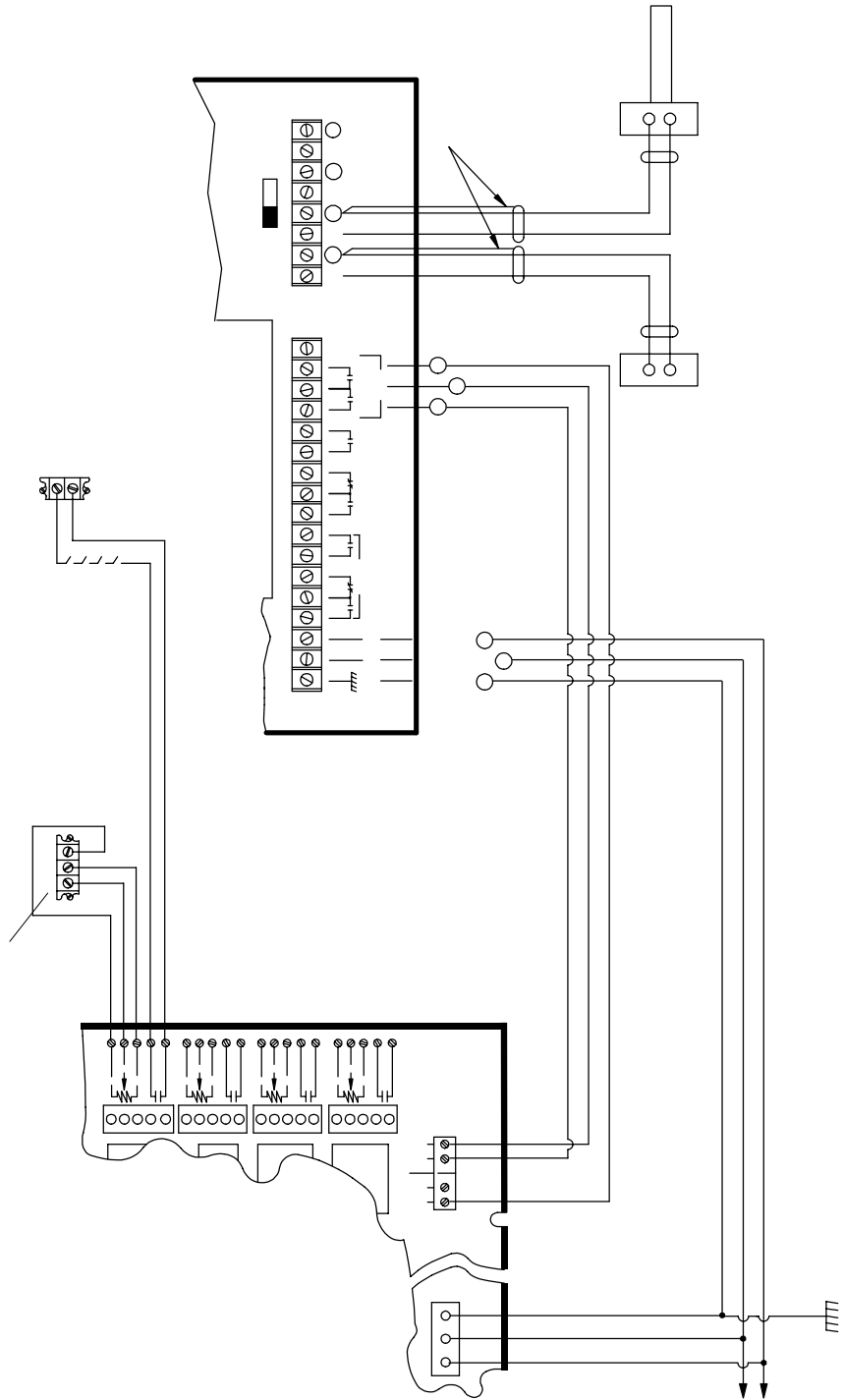


Typical Wiring Diagram #6
MOD - 8 to MPC GOLD SERIES STEAM RESET CONTROL



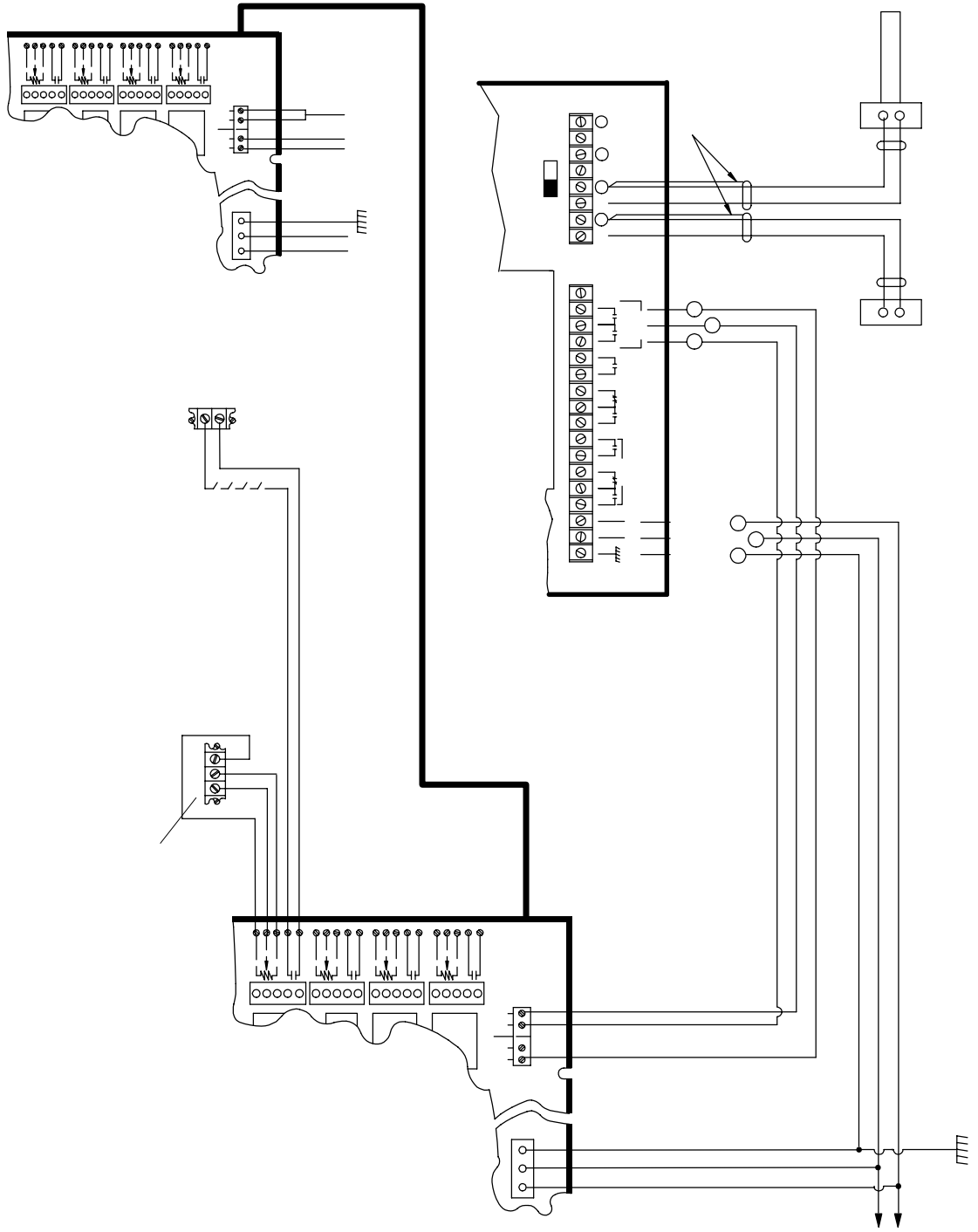
Typical Wiring Diagram #7

MOD - 4 TO HWR GOLD SERIES HOT WATER RESET



Typical Wiring Diagram #8

MOD - 8 TO HWR GOLD SERIES HOT WATER RESET



Troubleshooting Guide

The MOD-4 is just a part of the entire system. When the system is no longer producing heat, or steam, or cooling (depending on your application) the problem may be with the MOD-4. Or, it may be with some other component. Or the problem may be due to improper adjustment of some MOD-4 parameters. It is important to isolate the problem. Look through the following highlighted sections to find your problem. Then follow the steps to solve the problem

No Display, No Lights, No Bar graphs:

Check that 110V are present from the NEUTRAL to the LINE terminals. Make sure the GND terminal has been properly connected. If the power connections are all properly made, turn the power to the panel off, and then turn it back on. If this does not cause the MOD-4 to light up, continue with the steps in the following section.

Random Display Segments and Lights are On:

Remove the MOD-4 panel from the yellow box. Turn the panel over and look at the piggybacked circuit board called the CPU Board (see pg. 7). It should be firmly attached to the main board. If the connector is loose, push the CPU board on firmly and then lock it in place by giving the four black screws a quarter turn clockwise.

If the CPU Board is firmly connected to the main board, look for a chip with a typed label in a socket on the CPU Board. The heading written above the chip on the circuit board will read EPROM. Check the chip is firmly in the socket and has not come loose due to shipping or handling.

Return power to the MOD-4 and see if the display returns to normal. If it does not, the MOD-4 may well have been damaged.

Main Display Flashes Three Letter Codes:

These three letter codes are self diagnostic messages the MOD-4 runs on itself. The only time these messages can occur is when the MOD-4 is initially powered up, or has subsequently lost power and then power was restored. In rare cases, such as might be caused by a power brown out, the MOD-4 may come up with error messages that are not valid. Simply remove power to the control and power it back up. If the MOD-4 then operates properly the message can be ignored. Otherwise, check the following chart to determine what to do.

Display Flashes OPN or SHT but Sensor and Wiring Test OK:

The piggyback CPU Board (see pg. 7) can easily be removed by loosening the four black screws holding it to the main board. A new CPU Board can be ordered separately HT #900135. Be sure to specify the CPU Board is for a MOD-4.

First check the sensor wires are going to the correct pair of input terminals. If you have a temperature sensor, it must be connected to the left hand pair of input terminals. If you have a pressure sensor, it must be connected to the right hand pair of terminals and the polarity must be correct (see pg. 10). If you are connecting to an HWR, and have no sensor, see the following paragraph. Also check the metal wire strands are making good contact with the screw terminals. If the terminal is touching the outside insulation of the wire, or if the wire strands have been broken, there may be no connection. Finally, make sure the terminal block is tightly connected to the board.

Next check the dip switch options (see chart pg. 8). If the MOD-4 has not been set up for your type of installation, it will not recognize the sensor (or HWR connections). For example, if the MOD-4 has been set up as a temperature control, and a working pressure sensor is properly attached to the pressure inputs, the MOD-4 will not recognize it.

Finally, perform the following tests:

Display flashing OPN: Remove the sensor and any other wires to the input terminals. Short the temperature input by screwing a short piece of wire across the TEMP INPUT pair. Then short the pressure input in the same manner. If the display does not change, the MOD-4 may have been damaged.

Display flashing SHT: Remove the black input connector from the input terminals, removing any wiring to the two pairs of input

terminals. If the display does not change, the MOD-4 may have been damaged.

If the display changes, go back and recheck the sensors (pg. 43 and 44) and all of the above.

Display Shows a Value Which Does Not Correspond to the Sensor:

First check the NORMAL/SETUP switch under the door panel is in the NORMAL position. If it is not, the display is showing the value of the trimmer which has a light on next to it. Then check the dip switch settings (see chart pg. 8). If the MOD-4 is set up for another application, it may not be reading the sensor you think it is. Finally, check the sensors and wiring (see pg. 43 and 44) to determine if the fault is with the sensor.

Lead stage Does Not Rotate:

The lead stage will only rotate among stages which are switched to AUTO. If none or only one stage is switch to AUTO, the lead stage will not rotate. If several stages are in AUTO, then push the LEAD STAGE switch to the right ROTATE position and release it. The green light indicating the lead stage should increment to the next stage in AUTO.

For automatic rotation every 24 hours, check that you can manually rotate as described above. Once again, the lead will only rotate among stages in AUTO. If the manual rotation works, move the LEAD STAGE switch to the AUTO ROTATE ON position and wait 24 hours to see if the lead stage changes.

Moving the Mode Switch to ON Does Not Turn a Stage ON:

Remove the black connector from the stage which has been switched on. Check if there is continuity across the N.O. contacts for that stage. If there is continuity, the MOD-4 is working properly. Check the limits and safety controls for the stage. Remember the MOD-4 only provides dry contacts, it does not output power to a stage.

If there is no continuity, check the red light marked OUTPUT ON next to the stage. If it is not lit up, the MOD-4 has probably been damaged. Otherwise, remove the relay from the stage in question. Replace the relay with one from another stage which does work. If the contacts are now continuous, the relay has been damaged and should be replaced (HT # 500031).

Moving the Mode Switch to OFF Does Not Turn a Stage off:

Remove the black connector from the stage that has been turned off. If the stage does not turn off, the MOD-4 is not connected to the stage and is not the problem.

If removing the connector turns the stage off, check the bar graphs and the red OUTPUT ON light. The light should be off, and none of the bar graph segments for the stage should be on. If this is not true, the MOD-4 may be damaged.

Finally, replace the black connector and pull the relay out of the socket. If the stage now turns off, the relay has been damaged and should be replaced (HT #500031).

Stages Turn Off When They are Not in Low Fire:

Check the red OUTPUT ON light next to the stage in question. If the light is on, the stage is most likely off due to its own limit circuits or safeties. Make sure the limits are far enough above the MOD-4 set point so they will not trigger accidentally. If this is not the problem, follow the tests on the opposite page *Moving the Mode Switch to On Does Not Turn a Stage On*.

Bar graphs Do Not Show the Percent Modulation:

Make sure the NORMAL/SETUP switch under the center door is in the NORMAL position. It must be for the bar graphs to display properly.

135W motors Do Not Follow the Bar graphs:

Many burners have maximum firing rate potentiometers mounted on the side of the burner panel. Check to see that the maximum firing rate is set to 100% so that the MOD-4 has full authority to set the firing rate at any percentage. Also, during pre-purge cycles, the burner management module has control over the motor, and does not release control to the MOD-4 until the cycle is over.

If only one motor is giving you the problem, swap that black connector with the connector from a working stage. For example, if Motor1 attached to STAGE A follows the bar graph, but Motor2 attached to STAGE B does not, switch the black connectors so Motor1 is attached to STAGE B and Motor2 is attached to STAGE A. If Motor1 continues to work, and Motor2 still does not, the problem is either with Motor2 or the wires running to it. Otherwise, go to the section CHECKING THE 135W OUTPUT CARDS (pg. 45).

MOD-4 Will Not Turn on Stages:

Look at the display. If the display is flashing OFF, this means the control is in setback and all stages should be off. If the MOD-4 is attached to an MPC control, this is a standard mode of operation. Adjust the MPC if more heat is necessary. Otherwise, determine what has shorted out the unused input terminals.

(Continued on next page)

If the display shows the sensor pressure or temperature, push the button marked PRESS TO READ SET POINT. If the control is in the heat mode (Dip Switch 8 is OPEN), the control will not bring on any stages until the system falls below the set point. For example, if the set point is 70°F and the system is at 78°F, no stages will be brought on. Similarly, in a cooling mode (Dip switch 8 is CLOSED) if the set point is 70°F and the system is at 62°F, no stages will be brought on.

Make sure all the stages which should be active have the ON/AUTO/OFF/STANDBY switches to AUTO. If stages are not in AUTO, the MOD-4 can not turn them on based on the set point.

NOTE: If only one stage comes on, check the lag stage delay trimmer (pg. 20). The MOD-4 can not bring on another stage until the lead stage has been at high fire for the time set by the trimmer. If stages should come on without a delay, simply move the trimmer fully counterclockwise.

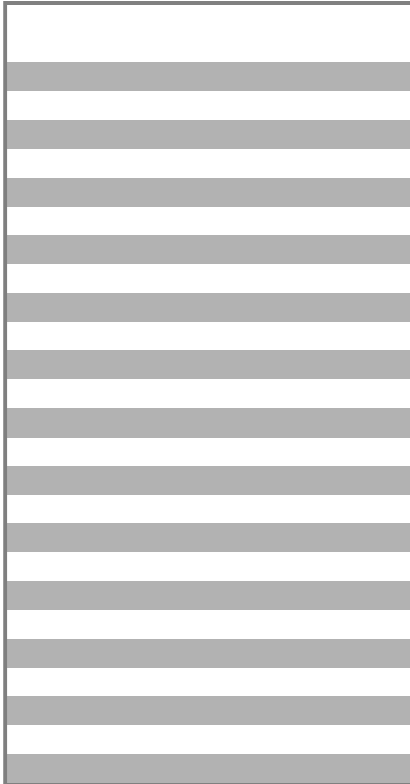
MOD-4 Does Not Hold the Set Point:

Make sure all the stages which should be active are switched to AUTO. If stages are not in AUTO, the MOD-4 can not control them to hold the set point. Then check the set point is what you think it is. The set point may be externally setback. Press the button PRESS TO READ SET POINT. If the set point is flashing, the control will be holding this lower set point, not the standard set point.

Next, check the trimmer values (see pg. 13 for appropriate initial settings). If the trimmers are not set properly, the MOD-4 may appear to be acting erratically. Also make sure the dip switches are set correctly.

Finally, if the control tends to quickly overshoot then undershoot the set point, lower the gain several numbers. If the control tends to turn off modulation too soon, and has a hard time reaching the set point, raise the gain. Remember, the set point is the center of the range the MOD-4 will hold, not a high limit. All stages should not turn off when set point is reached.

Checking the Sensors



The MOD-4 sensors record the temperature or pressure where they are located. Before assuming a sensor is incorrect, it is important to get an accurate reading at the sensor location. For instance, a MOD-4 temperature sensor which is located 10 feet down a supply line will very probably not read the same temperature as a gauge mounted on the boiler. When a pressure sensor is involved, it is important to check that the pigtail is clear, and has not become blocked.

To perform these tests, you will need a digital multimeter capable of reading resistances for temperature sensors, and for pressure sensors capable of reading current in mAs and DC voltage.

TESTING TEMPERATURE SENSORS

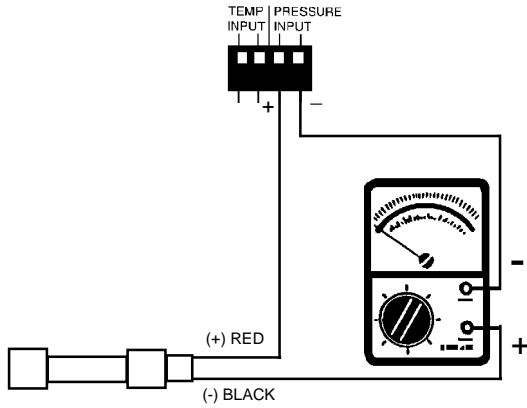
Remove the sensor wires from the TEMP INPUT terminals. Take a resistance reading across the detached wires going to the sensor. If the reading shows:

OPEN or a resistance in the WMs - Check the wires going to the sensor. They may have been broken or become disconnected.

If the wires are fine, check the resistance at the sensor itself. If the resistance is still open, the sensor has been damaged and needs to be replaced.

SHORT or a resistance less than 100W s - Check the wires going to the sensor. They may have become shorted together in the run of the wire. If not, check the resistance at the sensor itself. If there still is no resistance, the sensor has been damaged and needs to be replaced.

Resistances from 200W s to 100,000W s - Find the temperature that corresponds to the resistance value on the chart. If the sensor appears to be outputting correctly, check that the wires were properly connected to the MOD-4 inputs. If they were, the MOD-4 may have been damaged. If the sensor is not outputting correctly, take another reading at the sensor itself. If this is correct, the problem is in the wiring between the sensor and the MOD-4. Otherwise, the sensor has been damaged, and should be replaced.



TESTING PRESSURE SENSORS

First check the wires to the PRESSURE INPUT have not been switched. The black wire must go to the right-most outside terminal, and the red wire must go to the inside terminal (see pg. 10). If the wires were reversed, simply switch them and the sensor should begin working.

Remove the black connector from the INPUT terminals. Take a DC voltage reading across the two PRESSURE INPUT terminals. The + side of the meter should go to the inside terminal, and the GND side should go to the right-most terminal. The voltage reading should be between 25VDC and 36VDC. If the MOD-4 is not outputting this voltage, it has been damaged. Otherwise, continue with the following:

- Adjust the meter to read mAs.
- Replace the red wire from the transducer into the middle PRESSURE INPUT terminal.
- Attach the + side of the meter to the black wire from the transducer.
- Attach the GND side of the meter to the right-most PRESSURE INPUT terminal.

If the reading shows:

No current - The wires to the transducer may have been damaged or broken. If the wires appear OK, then the transducer may have been damaged.

4mA - The transducer is probably working. However, it is not registering any pressure where it is located. Make sure there is pressure at the sensor location. Also check the pigtail has not become blocked.

Between 4mAs and 20mAs - Check the chart at side and find the pressure corresponding to the mA reading. If the mA reading appears correct for the system, the MOD-4 may be damaged. If the mA reading varies significantly from the actual system pressure check the pigtail is clear and the wires running to the transducer have not been damaged. If neither of these are at fault, the transducer may have been damaged.

More than 20mAs - There may be a short between the wires going to the transducer. Check the wires are not making contact. If they are not, the transducer may have been damaged.

Checking the 135W Output Cards

For these tests you will need a digital multimeter capable of reading from 0 to 135W s.

First pull the black connector going to RWB and the N.O. contacts of the stage in question. Then perform the following two tests: Switch the mode switch for the stage to the ON position. Then take two resistance readings, one from the red to the black terminals, and one from the red to the white. The values should correspond to

RED to BLACK - Less than 25W s

RED to WHITE - More than 130W s

Now switch the mode switch for the stage of the OFF position and repeat the two readings. The values should now correspond to

RED to BLACK - More than 130W s

RED to WHITE - Less than 25W s

If both pairs of readings are correct, the MOD-4 is outputting properly. Check the wires to the motors. Make sure they have not been broken or damaged. Then check the motor itself. It may no longer be operating properly.

If the readings are not correct, but other stages of the MOD-4 are working properly, the output card itself may be damaged. They can be ordered separately HT #900079. Otherwise, the MOD-4 may have been damaged.

For further technical assistance, call our staff at:

Heat Timer Corporation
20 New Dutch Lane
Fairfield, NJ 07004

Phone (973) 575-4004

Fax (973) 575-4052

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