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INSTALLATION INSTRUCTIONS

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PEERLESS ATMOSPHERIC GAS BOILERS

INSTALLATION AND OPERATING INSTRUCTIONS

MOD–U–PAK SYSTEM

CONTROL SETS

No. 1 - PROPORTIONAL WATER TEMPERATURE CONTROL W/ SUPPLY OR RETURN WATER TEMPERATURE SENSOR

No. 2 - PROPORTIONAL WATER TEMPERATURE CONTROL W/ OUTDOOR RESET

No. 3 - PROPORTIONAL STEAM PRESSURE CONTROL W/ STEAM PRESSURE SENSOR

PB HEAT, LLC
NEW BERLINVILLE, PA 19545-0447

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MOD–U–PAK CONTROL SYSTEM

WATER BOILERS

PROPORTIONAL WATER TEMPERATURE CONTROL W/OUTDOOR RESET (CONTROL SET NO. 2)

1 – DESCRIPTION

This Mod-U-Pak System is a proportional system in which boiler water temperature and boiler gas input are modulated proportionately to changes in outside temperature.

For maximum comfort the boiler-water temperature varies inversely to the change in outside temperature; that is, as the outside temperature increases or decreases, the boiler water temperature decreases or increases correspondingly.

For maximum performance the input to the boiler is varied inversely to the change in outside temperature; that is, as the heating load requirement changes due to an increase or decrease in outside temperature the gas input to the boiler decreases or increases respectively.

Three controls are used to accomplish the modulating sequence: an indoor-outdoor reset control, and two dual-acting temperature controllers. The indoor-outdoor control maintains and modulates the boiler water temperature in accordance with a change in outside temperature; that is, as the outside temperature varies, the temperature setting of the control automatically changes, thus raising or lowering the boiler water temperature. The dual-acting temperature controllers vary the gas input to the boiler by sensing a change in outside temperature and thus opening or closing the three main automatic operating valves. The first gas valve flow circuit incorporates an orifice which provides 50% of the maximum flow rate, the second valve flow circuit incorporates an orifice which provides 75% of the maximum flow rate, and the third valve delivers 100% of the maximum flow rate.

2 – STANDARD CONTROLS

1–Honeywell T475A Outdoor Reset Control

2–Honeywell T675A Temperature Controllers

2–Element Guards for T675A Controllers

2–Split-Plugs for T675A Controllers

1–DP-ST Bypass Disconnect Switch

NOTE: Element guard and split-plug are provided with the T475A as part of the package.

3 – CONTROL INSTALLATION

When installing the T475A Outdoor Reset Control or the T675A Temperature Controllers, follow the manufacturer's installation instructions supplied with the appropriate control. These instructions cover the proper mounting of the control, sensing element and element guard.

4 – WIRING

All wiring must be done in accordance with the current National Electrical Code and local codes. Refer to wiring diagrams in rear of booklet for correct wiring of controls. Contact PB Heat, LLC for application of controls, ignition systems or codes not covered by these wiring diagrams.

5 – TEMPERATURE CHARTS

The following charts will enable you to set the controls under various design conditions. The charts are based on outside design temperatures of 0°F, -10°F, and -20°F with an indoor temperature of 70°F. The ratio setting of the T475A outdoor reset control is recommended as 1 to 1; that is, as the outdoor temperature varies 1°F the boiler water temperature will vary 1°F. Maximum boiler water temperature is assumed to be 180°F. If other maximum boiler water temperatures are desired, start at the outdoor design temperature, such as 0°F, and reduce the water temperature 5°F for each increment of 5°F rise in outdoor temperature.

a. 0°F OUTDOOR DESIGN TEMPERATURE:

OUTDOOR TEMP. °F	INPUT %	BOILER WATER TEMP. °F
70	50	110
65	50	115
60	50	120
55	50	125
50	50	130
45	50	135
40	50	140
35	75	145
30	75	150
25	75	155
20	100	160
15	100	165
10	100	170
5	100	175
0	100	180

Setting of #1 T675A Temperature Controller — 35°F
Setting of #2 T675A Temperature Controller — 20°F
Setting of T475A Outdoor Reset Control — 110°F

b. -10°F OUTDOOR DESIGN TEMPERATURE:

OUTDOOR TEMP. °F	INPUT %	BOILER WATER TEMP. °F
70	50	100
65	50	105
60	50	110
55	50	115
50	50	120
45	50	125
40	50	130
35	50	135
30	75	140
25	75	145
20	75	150
15	75	155
10	100	160
5	100	165
0	100	170
– 5	100	175
– 10	100	180

Setting of #1 T675A Temperature Controller — 30°F
Setting of #2 T675A Temperature Controller — 10°F
Setting of T475A Outdoor Reset Control — 100°F

c. -20°F OUTDOOR DESIGN TEMPERATURE:

OUTDOOR TEMP. °F	INPUT %	BOILER WATER TEMP. °F
70	50	90
65	50	95
60	50	100
55	50	105
50	50	110
45	50	115
40	50	120
35	50	125
30	50	130
25	75	135
20	75	140
15	75	145
10	75	150
5	100	155
0	100	160
– 5	100	165
– 10	100	170
– 15	100	175
– 20	100	180

Setting of #1 T675A Temperature Controller — 25°F
Setting of #2 T675A Temperature Controller — 5°F
Setting of T475A Outdoor Reset Control — 90°F

6 – OPERATING SEQUENCE

TO START

a. Refer to Lighting Instructions on boiler and ignite pilot(s), if necessary.

b. With pilot(s) proven, close main line power switch, set all safety interlocks with contacts closed and open main manual shut-off gas valve.

c. Set outdoor reset control and outdoor temperature controllers to desired settings.

d. Close bypass disconnect switch, adjust gas manifold pressure to required setting at 100% input rate (Natural Gas - 3.5" W.C./ LP Gas - 10" W.C.) and check main burner operation.

e. When all necessary adjustments are completed, open bypass disconnect switch for automatic operation.

OPERATION

a. **First Stage:**

Outdoor reset control activates the "A" valve(s) (50% Rate) through contacts "R" and "W" of the #1 temperature controller.

The main burners will continue to operate until the outdoor reset control is satisfied.

The 50% input rate will be maintained until the outdoor air temperature drops to 1°F below the setting of the #1 temperature controller.

b. **Second Stage:**

When the outdoor air temperature drops to 1°F below the setting of the #1 temperature controller contacts "R" and "B" make, closing the "A" valve(s).

The outdoor reset control activates the "B" valve(s) (75% Rate) through contacts "R" and "B" of the #1 temperature controller and "R" and "W" of the #2 temperature controller.

The main burners will continue to operate until the outdoor reset control is satisfied.

The second stage or 75% input rate will be maintained until the outdoor air temperature drops to 1°F below the setting of the #2 temperature controller.

c. **Third Stage:**

When the outdoor air temperature drops to 1°F below setting of the #2 temperature controller contacts "R" and "B" make, closing the "B" valve(s).

The outdoor reset control activates the "C" valve (100% Rate) through contacts "R" and "B" of both #1 and #2 temperature controllers. The main burners will continue to operate until the outdoor reset control is satisfied.

The sequence of operation is in reverse as the outside air temperature rises. The actuating points of the temperature controllers will be at the set-point.

TO SHUT DOWN

To shut down the boiler, open main disconnect switch and close main manual shut-off gas valve.

MOD–U–PAK CONTROL SYSTEM

WATER OR STEAM BOILERS

PROPORTIONAL WATER TEMPERATURE CONTROL
W/SUPPLY OR RETURN WATER TEMPERATURE SENSOR (CONTROL SET NO. 1)
or
PROPORTIONAL STEAM PRESSURE CONTROL
W/STEAM PRESSURE SENSOR (CONTROL SET NO. 3)

1 – DESCRIPTION

This Mod-U-Pak System is a proportional system in which boiler gas input is modulated proportionately to changes in load conditions.

For maximum performance, the input to the boiler is varied to the change in the heating load requirements within the range of 50% to 100% of input.

Three controls are used to accomplish the modulating sequence: an operating control and two dual-acting temperature controllers for water boilers or pressure controllers for steam boilers. The operating control maintains the designed boiler water temperature or steam pressure. The dual acting temperature or pressure controllers vary the gas input to the boiler by sensing a change in heating load requirements, thus opening or closing the three automatic modulating gas valves. The low rate gas valve flow circuit incorporates an orifice which provides 50% of the maximum flow rate, the medium rate gas valve flow circuit incorporates an orifice which provides 75% of the maximum flow rate, and the full rate gas valve provides 100% of the maximum flow rate.

2 – STANDARD CONTROLS

Water Boilers

1–Honeywell L4006A Operating Control

2–Honeywell L6006A Dual Acting Temperature Controllers

1–DP-ST Bypass Disconnect Switch

Steam Boilers

1–Honeywell L404F Operating Control

2–Honeywell L404F Dual Acting Pressure Controllers

1–DP-ST Bypass Disconnect Switch

3 – CONTROL INSTALLATION

When installing the operating control and dual acting controllers, they are generally located in the main supply header. The dual acting temperature controllers can be located in the return piping.

4 – WIRING

All wiring must be done in accordance with the current National Electrical Code and local codes. Refer to wiring diagrams in rear of booklet for correct wiring of controls. Contact PB Heat for application of controls, ignition systems or codes not covered by these wiring diagrams.

5 – TEMPERATURE PRESSURE CHART

The following chart will enable you to set the controls under various design conditions. The chart is based on water temperatures or steam pressure and can be varied depending on the requirements of each operating condition.

TEMPERATURE - PRESSURE CHART

WATER BOILERS
CONTROL SET NO. 1

Design Temp. °F	Operating Control °F	CONTROL NO. 1 R - B Breaks R - W Makes °F	CONTROL NO. 1 R - W Breaks R - B Makes °F	CONTROL NO. 2 R - B Breaks R - W Makes °F	CONTROL NO. 2 R - W Breaks R - B Makes °F
220	230	220	215	210	205
210	220	210	205	200	195
200	210	200	195	190	185
180	200	180	175	170	165

NOTES:

1—Set high limit control 10°F above the operating control setting.

2—Staging Controls - two (2) L6006A w/Bypass switch for 100% input rate.

STEAM BOILERS
CONTROL SET NO. 3

Design Pressure. psig	Operating Control psig	CONTROL NO. 1 R - B Breaks R - W Makes psig	CONTROL NO. 1 R - W Breaks R - B Makes psig	CONTROL NO. 2 R - B Breaks R - W Makes psig	CONTROL NO. 2 R - W Breaks R - B Makes psig
10	12	10	9	8	7
8	10	8	7	6	5
6	8	6	5	4	3
4	6	4	3	2	1

NOTES:

1—Set high limit control 2 psig above the operating control setting.

2—Staging Controls - two (2) H-L404F w/bypass switch for 100% input rate.

6 – OPERATING SEQUENCE

TO START

a. Refer to Lighting Instructions on boiler and ignite pilot(s), if necessary.

b With pilot(s) proven, close main line power switch, set all safety interlocks with contacts closed and open main manual shut-off gas valve.

c. Set operating control and dual acting temperature or pressure controls to desired settings.

d. Close bypass disconnect switch, adjust gas manifold pressure to required setting at 100% input rate (Natural Gas - 3.5" W.C./LP Gas -10" W.C.) and check main burner operation.

e. When all necessary adjustments are completed, open bypass disconnect switch for automatic operation.

OPERATION

a. **First Stage:**

On the initial start-up of a cold boiler, the operating control opens the "C" gas valve(s) (100% rate) through contacts "R" and "B" of both staging controls No. 1 and No. 2.

The 100% rate will be maintained until the boiler water temperature or steam pressure increases to the set point of staging control No. 2.

b. **Second Stage:**

When the boiler water temperature or steam pressure reaches the set point of staging control No. 2, contacts "R" and "B" break, closing the "C" gas valve(s).

Contacts "R" and "W" of staging control No. 2 make, opening the "B" gas valve(s) (75% rate).

The 75% rate will be maintained until the boiler water temperature or steam pressure increases to the set point of staging control No. 1.

c. **Third Stage:**

When the boiler water temperature or steam pressure reaches the set point of staging control No. 1, contacts "R" and "B" break, closing the "B" gas valve(s).

Contacts "R" and "W" of staging control No. 1 make, opening the "A" gas valve(s) (50% rate).

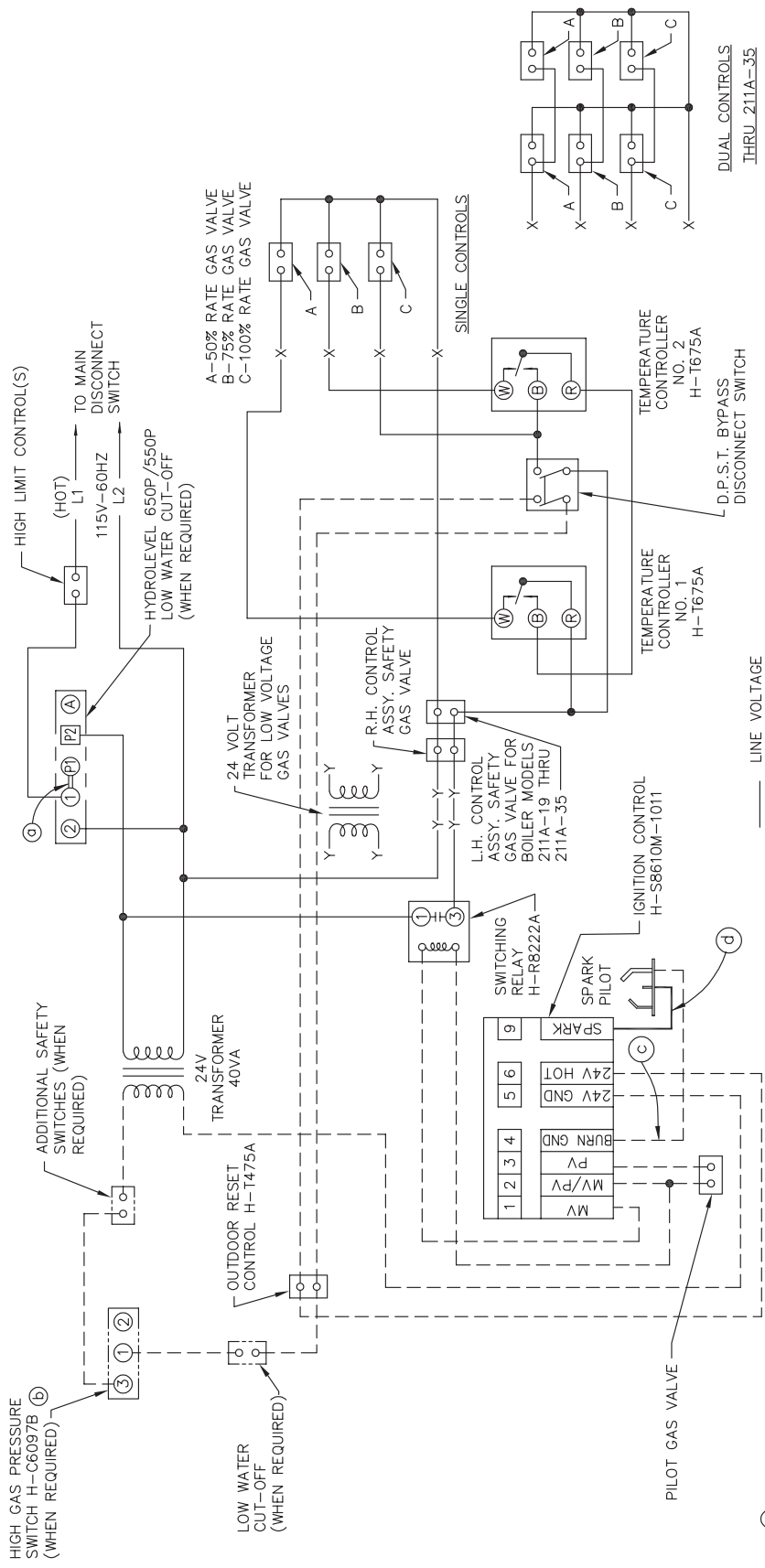
The 50% input rate will be maintained until the boiler water temperature or steam pressure increases to the set point of the operating control.

On boiler water temperature or steam pressure decrease, the staging controls and gas valves will operate in reverse of the above sequence, except that the staging controls will actuate at the set point minus the differential.

TO SHUT DOWN

To shut down the boiler, open main disconnect switch and close main manual shut-off gas valve.

211A SERIES CONTROL SET #2



ⓐ - PLACE JUMPER

ⓑ - HIGH GAS PRESSURE SWITCH H-C6097B REQUIRED ON BOILER MODELS 211A-13 THRU 211A-18. BOILER MODELS 211A-19 AND LARGER REQUIRE TWO H-C6097B HIGH GAS PRESSURE SWITCHES WIRED IN SERIES WITH SAFETY CONTROLS.

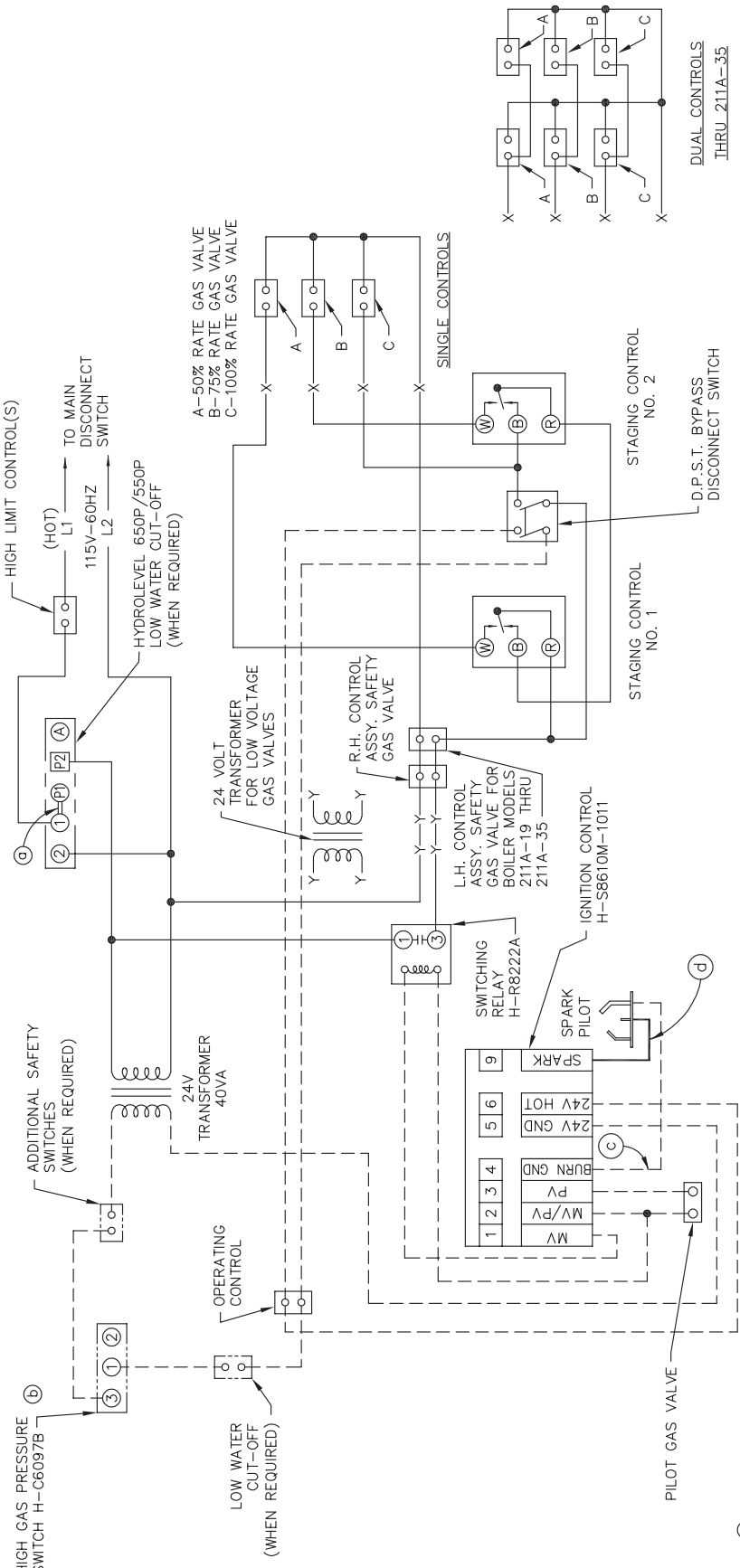
ⓒ - GROUND LEADWIRE 200°C THERMOPLASTIC, ALL OTHER WIRING 80°C THERMOPLASTIC.

ⓓ - IGNITION AND SENSING CABLE

NOTES:

ALL WIRING MUST COMPLY WITH APPLICABLE CODES, ORDINANCES AND REGULATIONS.
IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.

211A SERIES CONTROL SET #1 or #3



ⓐ – PLACE JUMPER

ⓑ – HIGH GAS PRESSURE SWITCH H–C6097B REQUIRED ON BOILER MODELS 211A–13 THRU 211A–18. BOILER MODELS 211A–19 AND LARGER REQUIRE TWO H–C6097B HIGH GAS PRESSURE SWITCHES WIRED IN SERIES WITH SAFETY CONTROLS.

ⓒ – GROUND LEADWIRE 200°C THERMOPLASTIC, ALL OTHER WIRING 80°C THERMOPLASTIC.

ⓓ – IGNITION AND SENSING CABLE

NOTES:

ALL WIRING MUST COMPLY WITH APPLICABLE CODES, ORDINANCES AND REGULATIONS.
IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.