

## **CONTROL SYSTEM SPECIFICATION: Mini-MOD and Mini-Extension AS MANUFACTURED BY HEAT-TIMER CORPORATION**

### **Mini-MOD**

The contractor shall furnish and install a microprocessor based control system. The control shall be pre-engineered and programmed exclusively for the operation and sequence of hot water heating systems using a single or multiple modulating boilers. It shall incorporate the following integrated functions:

#### **General**

The control shall operate on 120 VAC, with a maximum power of 12 watts. The control shall operate between 20 and 130°F with an operating humidity of 20 to 80% RH (non condensing) with a storage temperature of no less than -4 to 180°F.

#### **Modulation Signal**

The control shall be capable of operating any combination of the following modulating burner motors: 0-5V, 1-5V, 0-10V, 2-10V, and 4-20mA.

#### **Outputs**

The control shall have the capability of providing five independent outputs. A LED will indicate which outputs are energized. The outputs include:

1. A system relay shall control the system circulator based on an outdoor temperature set point or boiler relay operation. The relay shall have a set of N.O. contacts that shall close when the Mini-MOD requires output. These contacts will remain closed for an adjustable period after the last stage is turned off.
2. The control shall have four normally open contacts that can be used to start/stop the burner. These outputs shall have a minimum current carrying capability of 5amps. The control shall have four modulating outputs.

#### **Boiler Mode**

The control shall have a separate setting for each boiler to set its mode of operation. Modes of operation should include the following:

- Auto: The control will modulate boilers based on PID logic.
- Standby: The boiler set to Standby will operate only after all boilers set to Auto fire to their 100% modulation and remain for an adjustable Standby period.
- Manual: The boiler shall fire to a manually adjusted modulation percent.
- Off: The boiler shall be always off regardless of the heating demand.
- On: The boiler shall be always on regardless of the heating demand.

#### **Additional Outputs**

The control shall be able to accept a maximum of two extension modules to increase the capacity by an additional 12 stages. All of the functions of the extension module shall be displayed on the Mini-MOD. The communication between the primary control and the extension modules shall be using RS485.

## Display

The control shall have a graphical display capable of displaying numbers, characters, and graphics. The display shall be visible with no ambient light. All control operation information shall be available for display.

## User Parameters

The control shall have the following user adjustable parameters:

- **Sensor Set Point:** The control shall provide an integral sensor set point adjustment. The set point shall be adjustable in 1 °F increments.
- **Ignition Start Point:** Adjustable from 1 to 50%. This setting shall determine the position of the firing rate (fully modulating) motor at the time the burner is energized or de-energized. There shall be an independent adjustment of this setting for each burner.
- **Modulation Start Point:** Adjustable from 0 to 100%. This setting shall determine the percent of modulation the previous stage must achieve before the next stage is activated. There shall be an independent adjustment of this setting for each burner.
- **Gain:** Adjustable from -10 to +10. This setting shall increase or decrease the amount of modulation based on the rate of change in system sensor reading and the set point.
- **Purge Timer:** Adjustable from 0- 10.0 minutes. This setting shall determine the delay time between a stage being energized and the beginning of modulation.
- **Lag Delay:** Adjustable from 0 to 60 minutes. The next stage in the rotation shall not be fired until the previous stage has remained in high fire for the period set by the Lag Delay.
- **Setback:** Setback shall be adjustable from 0 to 75°F. This setting shall determine the °F drop from the primary set point whenever the setback mode is activated. The setback mode shall be activated either by an external switch closure or based on a configured Day/Night Schedule.
- **Standby Timer:** Adjustable from 1 to 60 minutes. This setting shall determine the delay period that must elapse before any designated standby stages are activated. The timing sequence shall begin when all active stages reach 100% firing rate.
- **System Delay:** Adjustable from 0 to 60 minutes. This timer shall start after the last stage has turned off. The System contacts will remain energized until the time period has ended.
- **Rotation mode:** The control shall be capable of the following rotations:
  - Manual rotation.
  - Automatic rotation adjustable in one-hour increments from 1 hour to 60 days.
  - Last-On
- **Parallel modulation mode:** The control shall be capable of operating stages such that all active stages modulate at the same rate.

## Memory & Backup

The control shall store all configuration and settings on EE Prom. In case of power failure, the control should be able to retrieve all of its latest settings.

## Sensors

Standard sensor inputs shall be of the thermistor type. Operating temperature range shall be minus 30° to 250°F. The control shall come complete with system and outdoor temperature sensors.

## External Shutdown

The control shall accept a dry contact input to shut all boiler stages down. The control shall keep any boilers being shut down in low fire for an adjustable Soft-Off Delay period before opening the limit circuit relay. The Soft-Off Delay period is adjustable from 0 to 60 seconds through.

### **System Prove**

The control shall be capable of accepting a dry closure type system prove input. This shall prevent any stages from activating until the contact is closed.

### **Setback**

The control shall provide an integral setback adjustment. The range of settings shall be 0° to -75°F. The setting selected is the degree of water temperature drop, during the night schedule or a short on the setback terminals, from the computed day water temperature.

### **Hydronic Outdoor Reset**

When Outdoor Reset is selected, the control shall be capable of resetting the temperature of heating water based on the outside temperature. All the following shall be user adjustable:

- **Reset Ratio:** The control shall provide adjustable reset ratios from 4:1 (Outdoor Temperature: Water Temperature) to 1:4
- **Offset:** The control shall provide an integral offset adjustment to parallel shift the selected reset curve. The range of settings shall be -50°F to 50°F.
- **Outdoor Cutoff:** The control shall provide an adjustable outdoor temperature cutoff with a range of 20°F to 100°F, with two additional settings, ON and OFF.
- **Minimum Water Temperature:** The control shall provide a minimum water temperature set point to limit the computed water temperature. The range of settings shall be 70°F to 170°F.
- **Maximum Water Temperature:** The control shall provide a maximum water temperature set point to limit the computed water temperature. The range of settings shall be 90°F to 240°F.

### **Domestic Hot Water with or without Priority**

The control shall be capable of increasing the system water temperature when a domestic hot water call is initiated. In addition, it shall allow for optional priority of the domestic hot water over the heating hot water or running them both.

### **Security**

The control shall have a locking mechanism using a switch to provide security against manual tampering. The switch must be covered and inaccessible when control enclosure is protected with a lock.

### **Summer/Winter**

An integral summer/winter option shall be provided for summer shutdown. In the summer mode the control panel will not activate the heating system. However, domestic hot water operation should be available.

### **Time Clock**

A digital electronic time clock shall be incorporated to switch between the Normal (Day) and Save (Night) modes of operation. The Day/Night schedule shall be stored in EE Prom indefinitely.

### **Battery**

A lithium "coin" type battery shall be included to maintain all system parameters in the event of a power failure. Storage capacity shall be 100 days.

### **Boost (Optimum Start/Stop)**

The control shall incorporate a separate field selectable "boost" functions. During the "boost" period the hot water temperature will be elevated by the setback value above the "computed day" level.

### **Regulatory Approvals**

The control shall be UL Listed, Tested per standard 916, Temperature Indicating and Regulating Equipment. It shall also be approved for use in NYC by the City of New York, Department of Environmental Protection.

### **Mini-Extension**

The contractor shall furnish and install a microprocessor based control system. The control shall be pre-engineered and programmed exclusively for the addition of boilers to Mini-MOD control system. It shall incorporate the following integrated functions:

#### **General**

The control shall operate on 120 VAC, with a maximum power of 12 watts. The control shall operate between 20 and 130°F with an operating humidity of 20 to 80% RH (non condensing) with a storage temperature of no less than -4 to 180°F.

#### **Modulation Signal**

The control shall be capable of operating any combination of the following modulating burner motors: 0-5V, 1-5V, 0-10V, 2-10V, and 4-20mA.

#### **Outputs**

The control shall have the capability of providing six independent normally open relay outputs that can be used to start/stop the burner. These outputs shall have a minimum current carrying capability of 5amps. The control shall have six modulating outputs that correspond to the relay outputs.

#### **Extension Identification**

The control shall have a toggle switch to indicate the extension identification to the Mini-MOD modulating control.

#### **Communication**

The control must be able to accept communication from the Mini-MOD control using RS485. All of the functions of the extension module shall be displayed on the Mini-MOD display. A communication LED indicator shall blink when the communication between the controls is active.

### **Regulatory Approvals**

The control shall be UL Listed, Tested per standard 916, Temperature Indicating and Regulating Equipment. It shall also be approved for use in NYC by the City of New York, Department of Environmental Protection.