

SERIES 59



Microprocessor Temperature Controller with Digital Display and RTD, Thermistor or Thermocouple Sensing

59.01.2

FEATURES

- Microprocessor-based
 - no cumbersome menus
- Large 3-digit LED display
 - permits easy viewing from a distance
- 4 sensor versions:
 - RTD, Thermistor, Thermocouple or Solid State
- Adjustable differential and setpoint offset values
 - more stable control and less frequent cycling
- LED status light
 - indicates when unit is heating or cooling
- Sensor failure detection
 - shuts down control
- Conformal coating protection
- Factory pre-set or field-adjustable units available
- Low cost alternative to DIN controllers
- UL and C UL Approved

APPLICATIONS

- Deep fat fryers
- Commercial ovens
- Laminating equipment
- Plastic machinery
- Packaging machines
- Industrial machinery
- Hot melt systems
- Commercial freezers and refrigerators
- Any 24/120/208/240VAC application requiring temperature control for heating or cooling

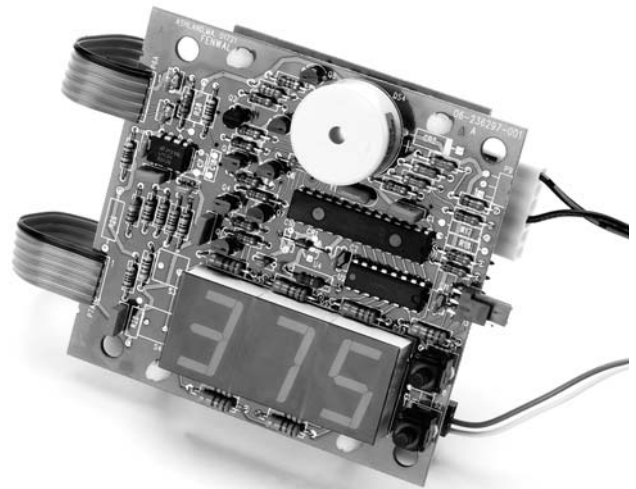
DESCRIPTION

The Series 59 is a microprocessor based temperature controller designed for easy installation and accurate operation. The unit is available as either a 24 VAC/VDC, or a 120/208/240 VAC field selectable On/Off controller with a large 3-digit LED display permitting easy viewing from a distance. Thermocouple, RTD, Solid-State or Thermistor sensors are supported. The controller is configured at manufacture for a specific sensor type and temperature range. A mechanical relay or an output for driving an external solid-state-relay (SSR Driver) is available. Adjustable differential and setpoint offset values allow for more stable control and less frequent cycling. Temperature offset values may be entered via pushbutton switches to calibrate the controller. A LED output status indicator will light whenever the unit is heating or cooling. The controller displays an error message when a failed temperature sensor is detected and de-energizes the output relay or SSR driver

AGENCY APPROVALS



The Series 59 is certified to UL Standard 873, Temperature Indicating and Regulating Equipment, as a temperature regulating device. UL has confirmed that the Series 59 meets the requirements of CSA Standard CAN C22.2 No. 24-93, Temperature Indicating and Regulating Equipment, as a temperature regulating device and of ANSI Z21.23 for Gas Appliance Approval.



SPECIFICATIONS

Input Type and Ratings

Thermocouple:	Type J standard
Thermistor:	10000 Ohm @ 25°C standard
RTD:	1000 Ohm platinum, 2 wire RTD standard

Displayed Temperature

For RTD, Thermistor or Solid-State Sensor Input Controller:

Display Resolution:	1°F or 1°C
Accuracy:	0.4% of span \pm 1°

For Thermocouple Input Controller:

Display Resolution:	1°F or 1°C
Accuracy:	0.6% of span \pm 1°

Output Ratings

Relay SPST:	30A Resistive @ 120VAC or 240VAC, 100,000 cycles
Relay SPDT:	15A Resistive @ 120VAC or 240VAC 100,000 cycles
Relay SPDT:	5A Resistive @ 120VAC or 240VAC 100,000 cycles 1A pilot duty @ 24/120/240 VAC
SSR Driver:	+12V, 100 Ohm source 20 \pm 4 milliamp current limit

Power Supply

Voltage:	120/208/240 VAC, +10%/-15% at 50/60 Hz 24 VAC Nominal (18 - 30 VAC) at 50/60 Hz 24 VDC Nominal (18 - 30 VDC)
Input power:	5.5 Watts maximum

ADDITIONAL SPECIFICATIONS

Environmental Specifications

Temperature: Operating: 0°F to +175°F
(-18°C to +80°C)

Storage: -40°F to +175°F
(-40°C to +80°C)

Humidity: Operating: 95% RH max.
(Non-condensing)

Other Options:

- On-board buzzer or alarm driver
- Remote switch inputs
- Default temperature scale (°F/°C)
- Custom thermistor compatibility
- Custom temperature ranges

OPERATIONAL SPECIFICATIONS

Pushbutton operation

Note: The standard Series 59 displays the process temperature (Pr°) by default. Other models may display the set point (SP°) by default. Consult part number configuration on back page to select model. On power up, the controller will display either °F or °C to indicate the temperature scale.

Standard Series 59 operation

- By simultaneously pressing the UP and DOWN buttons, the set point, set point offset, On/Off differential (hysteresis), temperature offset, temperature scale selection and default display selection are displayed and can then be altered
- Before displaying a value, the controller indicates the function it will display as follows:

Display	Description
SPF	Set point (°F standard, SPC for °C)
SPO	Set point offset
°Fd	On/Off differential (°F standard, °Cd for °C)
°FO	Temperature offset (°F standard, °CO for °C)
F-C	Select temperature scale (°F or °C)
dEF	Select default display (Pr° or SP°)

- When the UP and DOWN buttons are depressed simultaneously, the controller advances to the next function code after 2.5 seconds.

To Change the Set Point

- Depress the UP and DOWN buttons simultaneously. Once **SPF** (or **SPC**) is displayed, release the buttons. While the value is displayed, but within 5 seconds, press and release the UP or DOWN button to increase or decrease the set point value.
- To rapidly advance the adjustment of the set point, press and hold either the UP or the DOWN button and the value will increase or decrease 10 degrees per second.

- The display returns to normal operation automatically after 5 seconds.

To Change the Set Point Offset

The set point offset setting is used in conjunction with the on/off differential setting. If the differential setting is set to 4°F and the setpoint is set to 100°F the control output will turn off (heat control) at 100°F and turn back on at 96°F with the set point offset is set to 0°F. By setting the set point offset to 2°F, the control output will turn off at 102°F and turn back on at 98°F.

- Depress the UP and DOWN buttons simultaneously. Once SPO is displayed, release the buttons. While the offset value is displayed, but within 5 seconds, press and release the UP or DOWN button to increase or decrease the value.
- The display returns to normal operation automatically after 5 seconds.
- In order for the control to cycle around the set point, the set point offset should be one half the value of the differential

To Change the On/Off Differential (Hysteresis)

The on/off differential is the control deadband, a temperature range near the set point in which the control does not change the call-for-heat (or cool) output. The control will energize the output when the measured temperature drops below the differential value (or above for cooling applications). To adjust the On/Off differential:

- Depress the UP and DOWN buttons simultaneously. Once **°Fd** (or **°Cd**) is displayed, release the buttons. While the value is displayed, but within 5 seconds, press and release the UP or DOWN button to increase or decrease the differential value.
- The display returns to normal operation automatically after 5 seconds.

To Change the Temperature (Sensor) Offset

While the control will accurately sense the process temperature, there may be an occasion when it is desirable to calibrate the controller in its application. This can be accomplished by changing the temperature offset. The desired offset will adjust the displayed temperature scale to more closely match an external reference.

(Desired Offset = Desired Reading - Displayed Value)

- Depress the UP and DOWN buttons simultaneously. Once **°FO** (or **°CO**) is displayed, release the buttons. While the offset value is displayed, but within 5 seconds, press and release the UP or DOWN button to increase or decrease the value.
- The display returns to normal operation automatically after 5 seconds.

Temperature Scale Selection °F or °C

The control can display either °F or °C, the default setting is °F. To change the temperature scale:

1. Depress the UP and DOWN buttons simultaneously. Once **F-C** is displayed, release the buttons. While the value is displayed, but within 5 seconds, press and release the UP or DOWN button to change the value.
2. The display returns to normal operation automatically after 5 seconds.
3. All temperature parameters will be displayed in the temperature scale selected.

Default Display Option

The Series 59 can be programmed to display either process temperature (**Pr°**) or set point (**SP°**) during normal operation. To change this setting:

1. Depress the UP and DOWN buttons simultaneously. Once **dEF** is displayed, release the buttons. While the current default value is displayed, but within 5 seconds, press and release the UP or DOWN button to change to either process temperature (**Pr°**) or setpoint (**SP°**).
2. The display returns to normal operation automatically after 5 seconds.

NOTE: The Series 59 is also available from the factory with the set point displayed as default, rather than the process temperature. These models are identified by their part number. Consult part number configuration on back page to determine model. The functional operation is the same as the standard model, except for the following:

1. To temporarily display the process temperature, depress the UP and DOWN buttons simultaneously. Once °F (or °C) is displayed, release the buttons. The temperature value is displayed for thirty-seconds then the display reverts automatically to the set point value.

Program Retention Jumper

The Series 59 has a jumper JP10 (see Figure 4) that allows the user to make changes to the control settings. The control is shipped with the jumper on pins 1 and 2 to prevent unintended changes to the factory default settings. With the jumper in this position, the user can view either the setpoint or process temperature and can only change the setpoint. The jumper must be either removed or placed on pins 2 and 3 before other control parameters can be viewed or altered.

Function Value Retention and Factory Defaults

1. All settings are stored in memory and are retained indefinitely during power interruptions.
2. At power-up, the stored values are reinstated.
3. When an Operator changes a value, all values are reinstated.
4. The controller is shipped with the set point to OFF, the set point offset at 2°F (1°C), the on/off differential at 4°F (2°C) and the temperature offset at 0°F (0°C). Other values can be pre-loaded to meet specific customer requirements.
5. Operator must select a setpoint to enable control.

Sensor Failure (Lead Break Detection)

The controller de-energizes the output relay or SSR driver whenever it detects a failed sensor. The controller then displays **Prb** to indicate there is a probe or temperature sensor problem.

Mounting

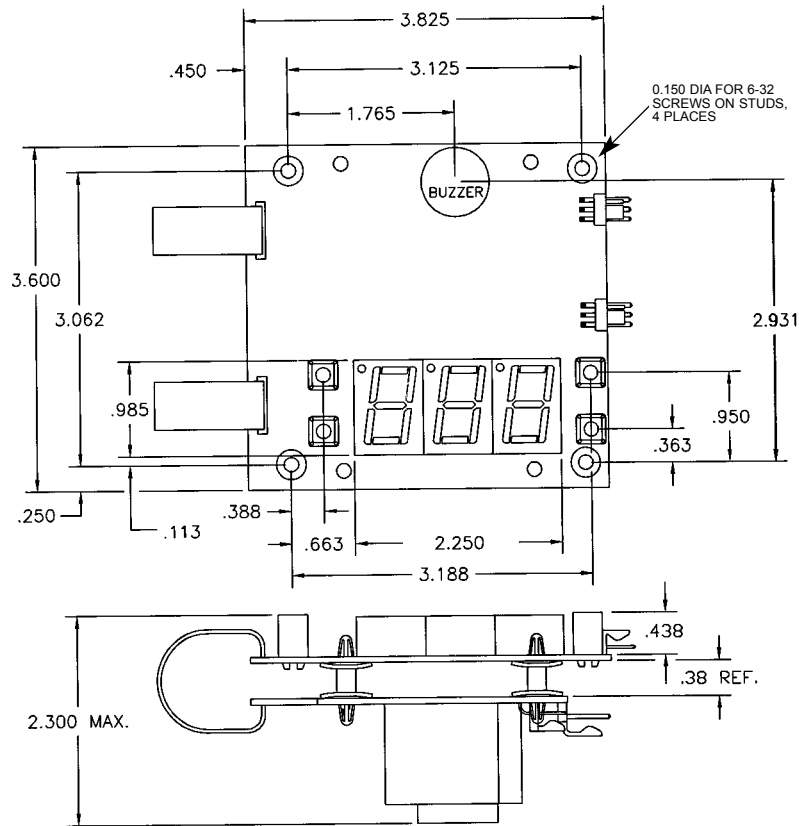
Four plastic standoffs with clearance holes for 6-32 screws or studs are provided for mounting the controller to the backside of a panel. Refer to Figure 1 for the mounting dimensions.



WARNING: ESD sensitive equipment. Severe damage to the controller may result from Electrostatic Discharge Voltage levels. Personnel must be properly grounded when handling controllers.

CONTROL DIMENSIONS

FIGURE 1

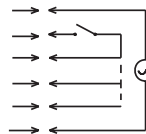


WIRING INFORMATION

FIGURE 2: Thermistor, Solid-State

P1 AC POWER

- PIN 1 = INPUT VOLTAGE
- PIN 2 = TO EXT. PWR. SW.
- PIN 3 = 240 (OR 24 VAC)
- PIN 4 = 208 VAC
- PIN 5 = 120 VAC
- PIN 6 = POWER GROUND



P2 RELAY 1 CONTACT

- PIN 1 = COMMON
- PIN 2 = NC CONTACT
- PIN 3 = NO CONTACT

P3 SOLID-STATE RELAY DRIVERS

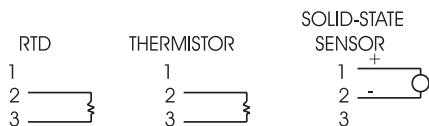
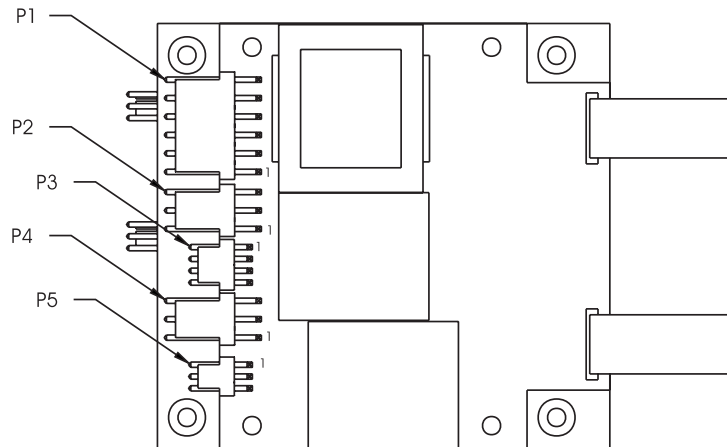
- PIN 1 = SSR-DRIVER 1
- PIN 2 = SSR-1 RTN
- PIN 3 = SSR-DRIVER 2
- PIN 4 = SSR-2 RTN

P4 RELAY 2 CONTACT

- PIN 1 = COMMON
- PIN 2 = NC CONTACT
- PIN 3 = NO CONTACT

P5 SENSOR INPUT

- PIN 1 = SSS+ INPUT
- PIN 2 = RTD+ INPUT OR SSS-
- PIN 3 = RTD+ INPUT (GND)



WIRING INFORMATION *continued*

FIGURE 3: Thermocouple

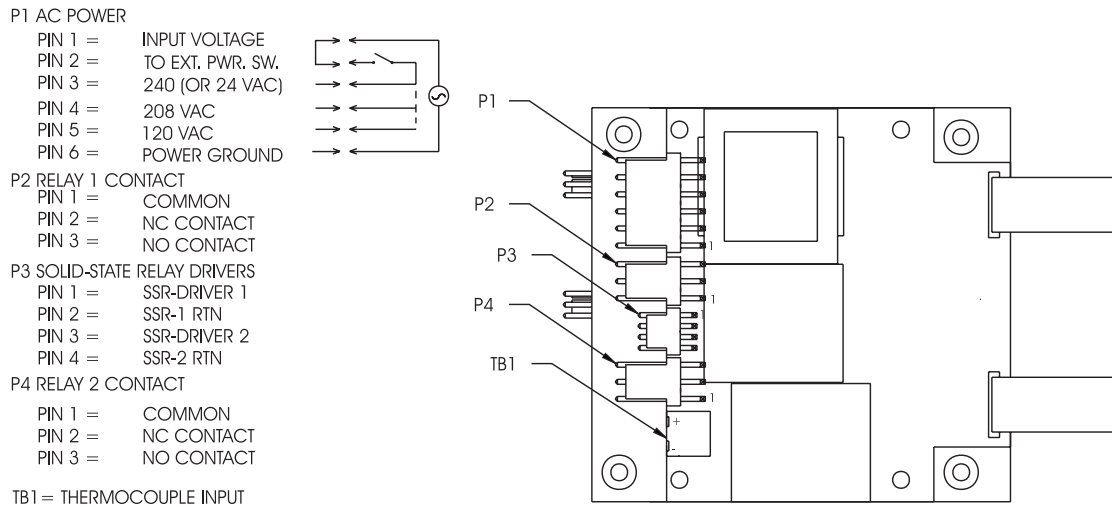


FIGURE 4: Parameter Lock Jumper and Optional Alarm Driver

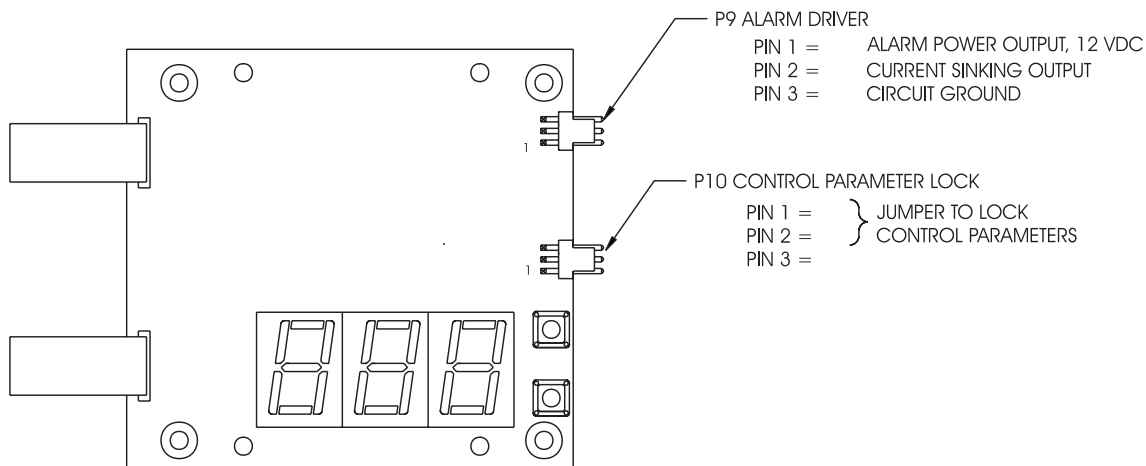
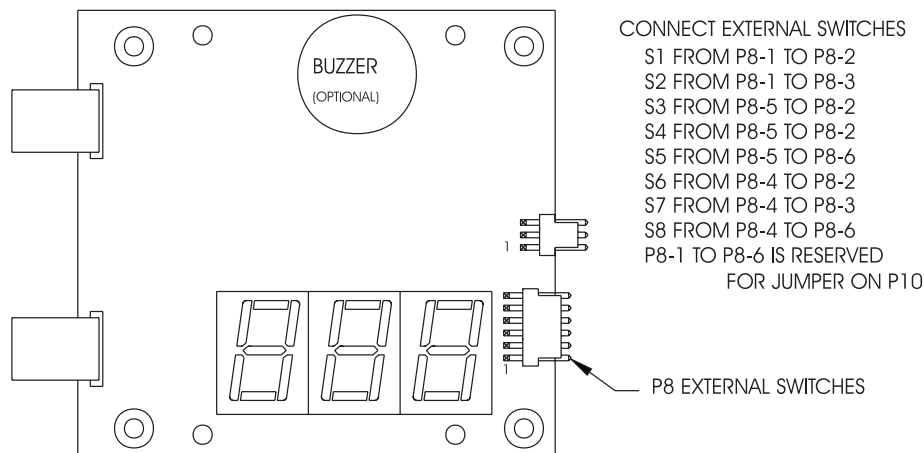


FIGURE 5: Optional External Switch



HOW TO ORDER

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SENSOR TYPE

- 1 - Thermistor
- 2 - RTD
- 3 - Thermocouple
- 4 - Solid State Sensor
- 9 - Custom Sensor

CONTROL MODE

- 1 - Heating Control
- 2 - Cooling Control
- 3 - Heating or Cooling Control (2 relays)

LINE VOLTAGE

- 1 - 120/208/240 VAC
- 3 - 24 VAC / 24 VDC

OUTPUT TYPE

- 1 - 30A Relay, SPST
- 2 - 15A Relay, SPDT
- 4 - 5A Relay, SPDT
- 5 - SSR Driver

DISPLAY OPTIONS

- 1 - Display process temperature as default
- 2 - Display set point as default

USER INTERFACE

- 1 - Integral pushbuttons
- 2 - Connector for inputs from external-switches

ALARM OPTIONS

- 0 - None
- 1 - ON BOARD BUZZER
- 2 - ALARM DRIVER OUTPUT

DEFAULT TEMPERATURE SCALE

- 1 - °F scale
- 2 - °C scale

TEMPERATURE RANGES

- 000 - 1000 OHM RTD OR TYPE J THERMOCOUPLE, 0°F to 400°F (-17°C to 205°C)
- 001 - 1000 OHM RTD OR TYPE J THERMOCOUPLE, 200°F to 600°F (93°C to 316°C)
- 002 - 1000 OHM RTD OR TYPE J THERMOCOUPLE, 400°F to 800°F (204°C to 427°C)
- 003 - 1000 OHM RTD OR TYPE J THERMOCOUPLE, 600°F to 999°F (315°C to 537°C)
- 004 - 1000 OHM RTD OR TYPE J THERMOCOUPLE, 150°F to 550°F (65°C to 288°C)
- 005 - 10K THERMISTOR, -67°F to 266°F (-55°C to 130°C)
- 006 - 100K THERMISTOR, 150°F to 400°F (65°C to 205°C)
- 007 - SOLID STATE SENSOR, -67°F to 266°F (-55°C to 130°C)
- 9XX - OEM SPECIAL, USED FOR CUSTOM CONFIGURATIONS



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These instructions do not purport to cover all the details or variations in the equipment described, nor do they provide for every possible contingency to be met in connection with installation, operation and maintenance. All specifications are subject to change without notice. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to FENWAL.

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