TCA-9102 Series Surface Mount Temperature Controllers with High and Low Alarm

General Description & Applications

The TCA-9102 Series Temperature Controller with Alarm offers a versatile solution for a wide variety of applications that may require 20 amp relays, short cycle delays and independent dual stages in one convenient, easy to use controller.

The TCA-9102 controller can accommodate input voltages from 12VAC to 240VAC and offers sensor options ranging from -40F to 600°F (-40C to 316°C). The alarm function provides audible, visual flashing and a normally open dry contact for triggering an alarm system, telephone dialer or turning on a light or external siren. In addition the TCA-9102 will log the highest and lowest temperatures on record between resets.

Features

- Single or Dual stage models with independent relay control.
- High and Low temperature alarm set points with audible, flashing visual and relay output alarm capabilities.
- Programmable set point, differential, short cycle delay time, and temperature sensor calibration mode.
- Fahrenheit or Celsius Mode Selectable.
- NEMA 1, high-impact plastic enclosure.

- Tamper resistant features to lock out and limit set point adjustment and programming features.
- .56" high red LED display with three digit display in 1 degree increments.
- LED Relay status indicator.
- Displays current temperature.
- Durable touch-pad programming with LED display prompts.

Specifications

Power Requirements:
- Low Voltage (LV) models accept 12 to 24VAC & 24VDC.
- High Voltage (HV) models accept 120 to 240VAC.

Relay(s) Contact Rating:
1 relay on single stage models, 2 relays on dual stage models.
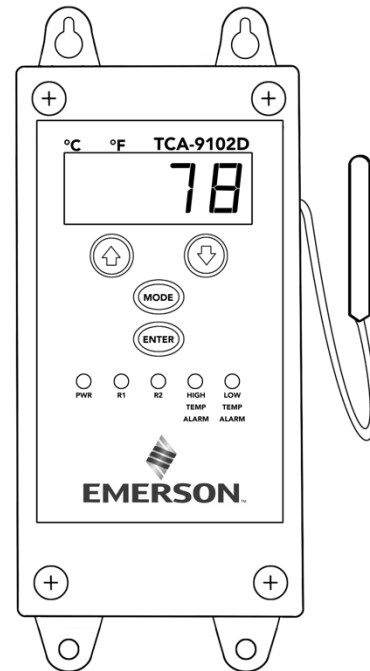- SPST, normally open – switch up to 20A at 277 VAC

Alarm Relay Rating:
SPST, normally open relay, 1 amp, 26 VAC resistive.

Ambient Operating Temp: 20 to 104°F (-6 to 40°C)

Ambient Operating Humidity: 90%RH at 95°F (35°C)

Alarm Notification Method:
60 dB audible alarm, flashing LED's & relay contact closure.

Temperature Sensor Range:
- PTC sensor included: -40 to 300°F (-40 to 148°C) with 36" (.91M) 24AWG, 2 conductor wire. Nickel plated copper sensor cap: 1.75"L (44mm) x .251" OD (6.38mm).
- Optional 1000 Ohm Platinum RTD sensor: 0 to 600°F (-17 to 316°C)

Accuracy: ± 2° F, ± 2°C
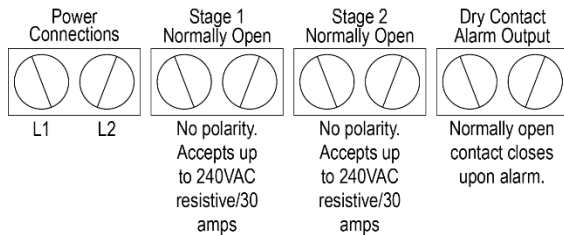
Relay Status Indicator: LED is on when relay is activated.

Dimensions: L 6.00" (15.24cm) x W 3.12" (7.92cm) x D 2.00" (5.08cm)

Agency Approvals: UL and CUL recognized

Material Certification: RoHS compliant. 100% lead free.

Wiring Connections

Power Connections	Stage 1 Normally Open	Stage 2 Normally Open	Dry Contact Alarm Output
L1 L2	No polarity. Accepts up to 240VAC resistive/30 amps	No polarity. Accepts up to 240VAC resistive/30 amps	Normally open contact closes upon alarm.

Low Voltage Power: On low voltage (LV) models, the input voltage can be 12 to 24 VAC or 24 VDC. LV models will only have a two position terminal block marked "240" and "COM". There is no polarity with any of the low voltage inputs, so both power leads can go into either of these terminal positions.

Sensor Type	Ground	Signal	+5 VDC
PTC or RTD sensor	Black	White	NA

WARNING:

To avoid the risk of electrical shock, disconnect all power sources to the controller and the equipment before wiring any connections. More than one disconnect may be required to completely de-energize the control and the equipment.

IMPORTANT:

All wiring must conform to local, national and regional regulations. Use copper conductors only for all wire connections. Do not exceed the electrical ratings for the TC-9102 series control or the equipment it is wired to.

Connect the proper power supply to the power connections on the terminal block as shown in the Dimensions & Wiring section on page one. Note your model number indicates what input voltage is acceptable for this unit.
1. "HV" designates the unit can accept input voltage of between 110 and 240 VAC
2. "LV" designates the unit can accept input voltage of 12 or 24 VAC or 24 VDC. On low voltage versions, the TC-9102 will have only a 240VAC and Common terminal block. There is no polarity on this terminal block for low voltage inputs.

The input power is independent of the power that can run through the relays. On all models, regardless of the input voltage, the control relays can accept up to 240 VAC power at up to 20 AMPs. Connect the heating and cooling equipment to the normally open (NO) relay terminal block connectors as appropriate.

Pre-Wired Models

The pre-wired version of the TC and TCA-9102 series temperature controllers comes with a wiring harness that allows the user to plug the controller directly into a 110VAC power outlet (50 or 60hz, not to exceed 15 amps). The power from the wall outlet is passed through the controller to the female power cord which the user may plug an appliance or other device into to be powered by the TC/TCA-9102 controller based on the temperature control settings desired by the user.

This is a high voltage device operating on 110 volts, so great caution needs to be taken when opening the case to review or change the temperature sensor or on our TCA models, to connect an alarm output device to the alarm output relay connection.

Do not open the plastic enclosure unless reviewing or changing the temperature sensor. On the TCA models, the user may open the case to connect an alarm related device to the controller's Alarm Output Relay Connection.

WARNING: To avoid the risk of electrical shock, disconnect all power sources to the controller and the equipment before wiring any connections. More than one disconnect may be required to completely de-energize the control and the equipment.
IMPORTANT: All wiring must conform to local, national and regional regulations. Use copper conductors only for all wire connections. Do not exceed the electrical ratings for the TC/TCA-9102 series control or the equipment it is wired to.

Sensor Connections:

Sensor connections are on
the smaller circuit board

Sensor Connections
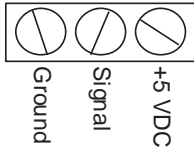
Ground Signal +5 VDC

Sensor Type	Ground	Signal	+5 VDC
PTC or RTD sensor	Black	White	NA

Alarm Output Relay Connection (TCA Models Only):
This is a separate dry relay contact that only closes when temperatures go above or below user specified limits. This is most often used to turn on a remote siren, light or to trigger another remote alarm system via contact closure. In addition, the TCA models can connect to one of Control Product's Temperature Alarm Phone Dialers. These devices will detect the alarm contact closure and start to call up to three phone numbers to warn the user of temperature extremes. Go to www.controlproductsonline.com for details on our Deluxe FreezeAlarm (FA-D2) or the new TempAlarm Dialer Pro (FA-900E).

NEMA 4X versions
The Pre-wired NEMA 4X version of the TC/TCA-9102 comes with all NEMA ready connections. Standard units require the user to provide a 7/8" NEMA 4X rated connector for the main wiring access opening at the bottom of the case. Device will not be NEMA 4X conforming without this connector on Non-wired units.

Sensor Connection:
The sensor may already be connected, but if not or if you ordered the RTD sensor option, you may need to connect this sensor to the sensor connections.   If you connected the optional RTD sensor, you will need to change the sensor selection menu in the Hidden Access menus to get an accurate temperature sensor reading, then power down the controller by unplugging it from the power outlet and then plug it back in to set the temperature setting permanently. See sensor connections on previous page.

Replacing Temperature Sensor:
If you are replacing the PTC or RTD temperature sensor, make sure the unit is unplugged from the power outlet and then connect the new sensor. Upon powering up the unit again, the new sensor should be recognized. You may need to go through the field calibration mode to calibrate the sensor to a known temperature.

Sensor Errors:
Once the unit is powered up and the proper sensor is connected, the controller will display the current temperature. If the current temperature does not appear to match the actual current temperature, you will have an opportunity to calibrate the sensor. If the display is showing "**Shrt**" or "**OPEn**", it means the sensor connection has a problem. "**Shrt"** indicates there is a short in one of the wires of the sensor or in the sensor itself. "**OPEn"** indicates a cut wire or open connection on one of the sensor's wires.

The TCA-9102 also has a normally open dry alarm relay contact that closes when the unit is in alarm. This can be used to turn on a light, siren or to trigger one of our alarm dialers (sold separately).

How the Controller Works

When programming the TCA-9102 temperature controller, it is important to determine how the TCA-9102 controller should operate for your specific application. You will need to know if you are using the controller in a heating application, a cooling application or with a dual stage unit, it can even be used for both a heating and cooling application.
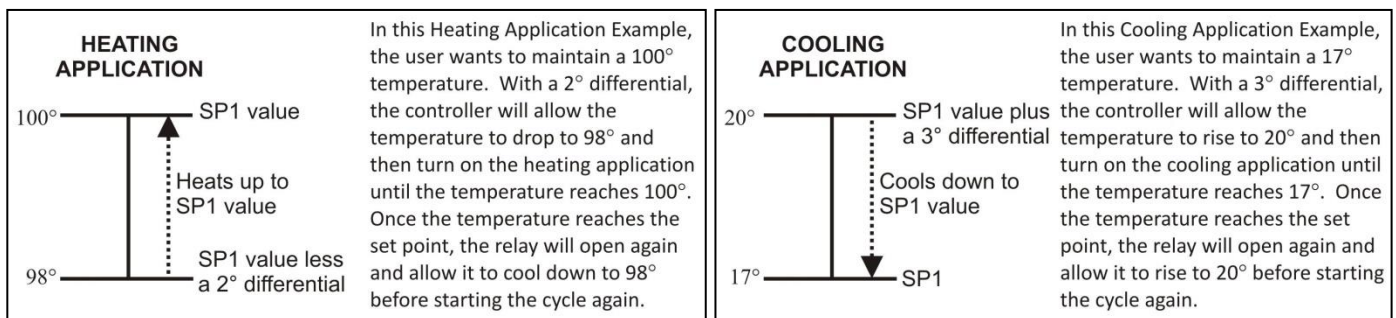
There are three different programming parameters that determine how the TCA-9102 controller will operate for your specific application. Dual stage units have separate programming parameters for each stage.

1. Temperature Set Point: The relays will always turn OFF or open when the temperature set point is reached.
2. Operating Mode (COOL, HEAT or OFF): This setting determines the application the controller is being used for.
3. Differential Setting: This is the number of degrees above or below the temperature set point the temperature is allowed to rise or fall (depending up on the Operating Mode).

Temperature Set-Point Programming Functions:
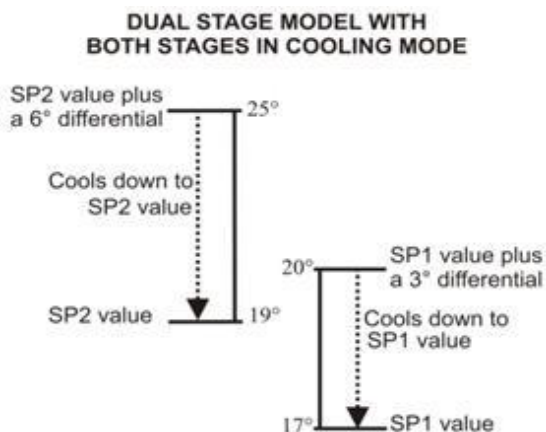
Single Stage Applications:

On single stage models, the controller will either turn on or off the heating or cooling application based on the *Temperature Set Point* set in the Set Point Programming function and the *Differential* set in Hidden Access Programming Function. The diagrams below show how a single stage model operates for either a heating or cooling application.

HEATING APPLICATION

100° — SP1 value

Heats up to SP1 value

98° — SP1 value less a 2° differential

In this Heating Application Example, the user wants to maintain a 100° temperature. With a 2° differential, the controller will allow the temperature to drop to 98° and then turn on the heating application until the temperature reaches 100°. Once the temperature reaches the set point, the relay will open again and allow it to cool down to 98° before starting the cycle again.

COOLING APPLICATION

20° — SP1 value plus a 3° differential

Cools down to SP1 value

17° — SP1

In this Cooling Application Example, the user wants to maintain a 17° temperature. With a 3° differential, the controller will allow the temperature to rise to 20° and then turn on the cooling application until the temperature reaches 17°. Once the temperature reaches the set point, the relay will open again and allow it to rise to 20° before starting the cycle again.

Dual Stage Applications:

With dual stage models, each stage is independent, so one stage can be set as a cooling stage and the other a heating stage, or both can be cooling or heating stages. When both stages are set to heating or cooling mode, each stage can have any set point or differential value desired. If one stage is heat and the other is cool, however, there is a limitation on how you can set the temperature set points to prevent the controller from having both heating and cooling applications running at the same time.
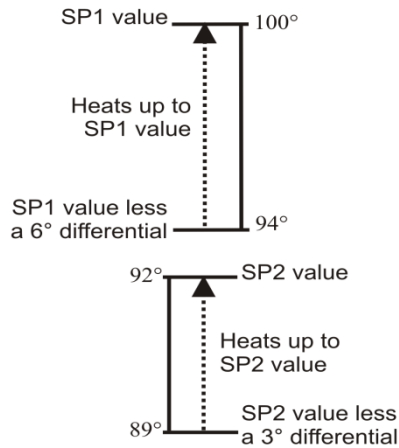
When both stages are in COOL or HEAT modes, the temperature set points can overlap or be separated by any number of degrees. When using both HEAT and COOL applications in a dual stage controller, the controller will not let the user set temperature set points that overlap. The TCA-9102 controller automatically enforces a 2 second delay between one stage turning off and another stage starting. The following diagrams show examples of how the Dual Stage TCA-9102 controller can be configured in different applications.

DUAL STAGE MODEL WITH BOTH STAGES IN COOLING MODE

SP2 value plus a 6° differential — 25°

Cools down to SP2 value

SP2 value — 19°

20° — SP1 value plus a 3° differential

Cools down to SP1 value

17° — SP1 value

With both stages in the cooling mode, one can "stage" cooling phases. The example on the left shows stage 1 turning on to cool to bring the temperature down to 17°. If the temperature continues to rise for some reason, stage 2 kicks in at 25° to boost the cooling down.

Alternately, each stage could be separated by any number of degrees.

**DUAL STAGE MODEL WITH
BOTH STAGES IN HEATING MODE**

SP1 value ─── ↑ ── 100°

Heats up to
SP1 value

SP1 value less ─── 94°
a 6° differential

92° ─── SP2 value

Heats up to
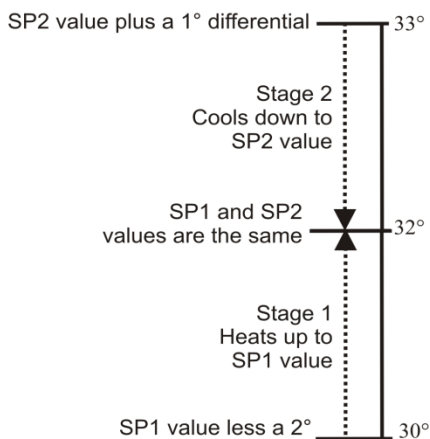SP2 value

89° ─── SP2 value less
a 3° differential

In this example, both stages are set to HEAT, but the stages are separated by 2 degrees.

When both stages are set to either HEAT or COOL modes, the stages can have the same temperature set-point, be separated by any number of degrees or they can overlap as shown above.

With dual stages, the TCA-9102 can be used in a wide variety of applications.

**DUAL STAGE MODEL WITH BOTH
HEAT AND COOL STAGES**

SP2 value plus a 1° differential ─── 33°

Stage 2
Cools down to
SP2 value

SP1 and SP2 ─── 32°
values are the same

Stage 1
Heats up to
SP1 value

SP1 value less a 2° ─── 30°

It is possible to maintain a very tight temperature range by setting one stage as a cooling stage and one stage as a heating stage.

In the example on the left, stage 1 will heat up to 32°. At 32°, the heating application will turn off and allow the application to rise to 33° at which time the cooling stage will turn on. The cooling stage will turn off when the temperature reaches 32°.

Although both temperature set points can be set at the same temperature, the TCA-9102 requires a minimum differential of 1 degree or more. In addition, the controller enforces a 2 second delay between one stage turning off and the other stage turning on. This is designed to reduce the possibility of tripping circuit breakers should both the heating and cooling elements be on at the same time.

Programming Instructions

Programming the TCA-9102 series temperature controller is completed through two separate programming sequences:
1. Temperature Set-Point and Temperature Alarm Set Point Programming Functions
2. Hidden Access Programming Functions for operation mode, differential, high & low set point limits, calibration, F/C selection, short cycle delay time, temperature sensor selection, temperature alarm delay and lock-out functions.

The programming menus are set up to display a program function first, followed by the numeric value or feature value. You can change that value and then press the ENTER key to save the value, then press the MODE key to move to the next programming function. The program functions are displayed with shortened text to represent the function that is to be programmed. For a detailed explanation of all the program functions, see page 7.

WHAT HAPPENS DURING A POWER FAILURE?
All settings on the TCA-9102 temperature controllers are saved in non-volatile memory which means they will stay programmed even if the power is cut to the unit. This is crucial during a power failure since the unit will return to normal operating function once the power is restored. The highest and lowest temperature logged will also be retained in memory unless they immediately are different upon power being restored.

SAVING YOUR CHANGES:
To save your changes, you MUST press the ENTER value whenever you make a change to any program setting.

EXITING THE MENUS:
You can exit the menus in one of several ways. If you make changes, you will need to press the ENTER button after every change or your values will not be saved!
1. Pressing the [MODE] button will cycle through each programming function and function value. At the end of the menu, the unit will go blank for several seconds and then return the current temperature to the display.
2. Pressing and holding the [MODE] button for five seconds will allow you to exit the menu without having to cycle through the menus.
3. When a programming function is displayed, you can press the down and up arrows to move through the various programming options to select the one you wish to change. If you get to the last menu and press the down arrow one more time, the unit's display will go blank for several seconds and then return with the current temperature displayed.

**PROGRAMMING TEMPERATURE SET POINT AND TEMPERATURE ALARM SET POINTS:**
- *It is assumed the unit is powered up and the current temperature is displayed.*
- *Shaded sections are only applicable to Dual Stage Units.*

Step	PRESS	DISPLAYED	FUNCTION or INSTRUCTIONS
1	[MODE]	**HLog**	HLoG represents the High Temperature Logging Feature. The next value to be displayed will be the highest temperature the unit's sensor has detected since the last reset or power up.
2	[MODE]	Flashing High Log value	This is the highest temperature the sensor detected since the unit was powered up or since the last reset. To reset this value to the current temperature, press the ENTER button. The current temperature should be displayed and stop flashing.
3	[MODE]	**LLog**	LLoG represents the Low Temperature Logging Feature. The next value to be displayed will be the lowest temperature the unit's sensor has detected since the last reset or power up.
4	[MODE]	Flashing Low Log value	This is the lowest temperature the sensor detected since the unit was powered up or since the last reset. To reset this value to the current temperature, press the ENTER button. The current temperature should be displayed and stop flashing.
5	[MODE]	**SP1**	SP1 represents Set Point #1 for the first stage. On single stage models, there will only be one set point value, but on dual stage models, there will also be a SP2 as shown below.
6	[MODE]	Flashing Temp Value	Using the ↓↑ keys, adjust the temperature set point value for stage 1.
7	[ENTER]	SP1 value is displayed.	Pressing ENTER saves the value and displays it without flashing.
8	[MODE]	**SP2**	**For DUAL STAGE models ONLY,** SP2 will appear, giving you the ability to program the temperature set point for the second stage.
9	[MODE]	Flashing Temp Value	**DUAL STAGE MODELS ONLY:** Using the ↓↑ keys, adjust the temperature set point value for stage 2.
10	[ENTER]	SP2's value is displayed	**DUAL STAGE MODELS ONLY:** Pressing ENTER saves the value and displays it without flashing.
11	[MODE]	**HTA**	The next programming parameter is High Temp Alarm Set Point. HTA is displayed.
12	[MODE]	Flashing HTA value	Using the ↓↑ keys, adjust the high temperature alarm set point.

Step	PRESS	DISPLAYED	FUNCTION or INSTRUCTIONS
13	ENTER	HTA's value is displayed	Pressing ENTER saves the value and displays it without flashing.
14	MODE	**LTA**	The next programming parameter is Low Temp Alarm Set Point. LTA is displayed.
15	MODE	Flashing LTA value	Using the ↓↑ keys, adjust the low temperature alarm set point.
16	ENTER	LTA's value is displayed	Pressing ENTER saves the value and displays it without flashing.
Exit	MODE	Blank Screen	For a few seconds, the screen will go blank and then the current temperature will be displayed. This signifies the end of this programming menu.

PROGRAMMING THE HIDDEN ACCESS MENU FUNCTIONS:
- *It is assumed the unit is powered up and the current temperature is displayed.*
- *Shaded sections are only applicable to Dual Stage Units.*
- *For detailed explanation of the individual programming options, go to the end of this programming guide.*

Step	PRESS	DISPLAYED	FUNCTION or INSTRUCTIONS
1	↓ + MODE	**OP1**	Press and hold the DOWN ARROW key and then press the MODE button. OP1 will be displayed representing the Operating Mode for Stage 1.
2	MODE	Flashing OP1 value	Using the ↓↑ keys, select between the HEAT, COOL or OFF operating mode for stage 1.
3	ENTER	OP1's value is displayed	Pressing ENTER saves the value and displays it without flashing.
4	MODE	**OP2**	**On DUAL STAGE UNITS only, the unit displays OP2, representing the operating mode for Stage 2.**
5	MODE	Flashing OP2 value	Using the ↓↑ keys, select between the HEAT, COOL or OFF operating mode for stage 2.
6	ENTER	OP2's value is displayed	Pressing ENTER saves the value and displays it without flashing.
7	MODE	**dF1**	**dF1** will be displayed representing the differential for Stage 1.
8	MODE	Flashing dIf1's value	Using the ↓↑ keys, adjust the differential setting for stage 1.
9	ENTER	dIf1's value is displayed	Pressing ENTER saves the value and displays it without flashing.
10	MODE	**dF2**	**ON DUAL STAGE UNITS only, dF2** will be displayed representing the differential for Stage 2.
11	MODE	Flashing dIf2's value	Using the ↓↑ keys, adjust the differential setting for stage 2.
12	ENTER	dIf2's value is displayed	Pressing ENTER saves the value and displays it without flashing.
13	MODE	**HSL1**	**HSL1** will be displayed representing the High Set Point Limit for Stage 1.
14	MODE	Flashing HSL1's value	Using the ↓↑ keys, adjust the high set point limit for stage 1.
15	ENTER	HSL1's value is displayed	Pressing ENTER saves the value and displays it without flashing.
16	MODE	**LSL1**	LSL1 is displayed representing the Low Set Point Limit programming parameter.

Step	PRESS	DISPLAYED	FUNCTION or INSTRUCTIONS
17	MODE	Flashing LSL1's value	Using the ⬇⬆ keys, adjust the low set point limit for stage 1.
18	ENTER	LSL1's value is displayed	Pressing ENTER saves the value and displays it without flashing.
19	MODE	**HSL2**	**On DUAL STAGE UNITS only, the unit displays HSL2, representing the High Set Point Limit for Stage 2.**
20	MODE	Flashing HSL2's value	Using the ⬇⬆ keys, adjust the high set point limit for stage 2.
21	ENTER	HSL's value is displayed	Pressing ENTER saves the value and displays it without flashing.
22	MODE	**LSL2**	**On DUAL STAGE UNITS only, the unit displays LSL2, representing the Low Set Point Limit for Stage 2.**
23	MODE	Flashing LSL2's value	Using the ⬇⬆ keys, adjust the low set point limit for stage 2.
24	ENTER	LSL2's value is displayed	Pressing ENTER saves the value and displays it without flashing.
25	MODE	**CAL**	CAL is displayed, representing the temperature sensor calibration adjustment.
26	MODE	Flashing CAL value	Using the ⬇⬆ keys, adjust the calibration value of the temperature sensor. This can be adjusted $\pm$ 30° from the reading on the display.
27	ENTER	CAL value is displayed.	Pressing ENTER saves the value and displays it without flashing.
28	MODE	**F** or **C** is displayed	This is where you select if the unit should display in Fahrenheit or Celsius degrees. Press MODE to change the selection.
29	MODE	Flashing F or C	Use the ⬇⬆ keys to toggle between "F" and "C".
30	ENTER	F or C is displayed	Pressing ENTER saves the value and displays it without flashing.
31	MODE	**SCYC**	SCYC represents the Short Cycle Delay Time. You select a value in minutes anywhere from 0 to 15 minutes. Press MODE to change the selection.
32	MODE	Flashing SCYC value	Using the ⬇⬆ keys, set your desired Short Cycle Delay time.
33	ENTER	SCYC value is displayed	Pressing ENTER saves the value and displays it without flashing.
34	MODE	**tAd**	tAd represents the Temperature Alarm Delay time. You select a value in minutes anywhere from 0 to 60 minutes. Press MODE to change the selection.
35	MODE	Flashing tAd value	Using the ⬇⬆ keys, set desired Temperature Alarm Delay time.
36	ENTER	tAd value is displayed	Pressing ENTER saves the value and displays it without flashing.
37	MODE	**SEnS**	SEnS allows you to select from one of two different sensor options. Press MODE to change the selection.
38	MODE	Flashing **Ptc** or **rtd**	Use the ⬇⬆ keys to toggle between "rtd" and "Ptc".
39	ENTER	Ptc or rtd is displayed	Pressing ENTER saves the value and displays it without flashing.

Step	PRESS	DISPLAYED	FUNCTION or INSTRUCTIONS
40	MODE	**LOC**	This is the Lock-Out feature that prevents users from changing all programmable functions or just the temperature alarm set points. Press MODE to turn this ON or OFF.
41	MODE	**ALL, ALAr** or **OFF** flashes	Use the ⬇⬆ keys to toggle between "ALL", "ALAr" or "OFF"
42	ENTER	ALL, ALAr or OFF is displayed	Pressing ENTER saves the value and displays it without flashing.
43	MODE	Display goes blank	Pressing MODE at the end of this menu results in the display going blank for several seconds followed by a display of the current temperature reading from the temperature sensor.

EXPLANATION OF PROGRAMMING PARAMETER SETTINGS:

HLog & LLog   **HIGH AND LOW LOGGING VALUES** The TCA-9102 series has a logging feature that keeps track of the highest and lowest temperatures that have been detected by the attached temperature sensor. These values are displayed after the HLog or LLog program function. To reset the values to the current temperature, press the ENTER button. The current temperature will then be the new logged value. If power goes out, the unit will retain the last logged highest and lowest temperatures, unless the temperatures upon power being restored are further out of range.

SP1 & SP2   **TEMPERATURE SET POINT** This is the temperature you wish to maintain for each stage. The TCA-9102D model has two independent relay stages. The TCA-9102S is a single stage model. See page 2 for an explanation of how the TCA-9102 uses these set points in conjuction with the differential setting.

HTA & LTA   **HIGH AND LOW TEMPERATURE ALARM SET POINT** Since this is an alarm, you can set both a high and a low temperature at which you wish the alarm to sound. The TCA-9102 will sound an audible alarm, flash the current temperature and close a dry contact relay when in alarm.

OP1 and OP2   **OPERATING MODE**   Select the type of application this controller will be working with. Is it a heating application or a cooling application. If you don't wish to use this relay at all, select the OFF mode. Only Dual stage units will haven a "OP2" mode. Factory default is COOL.

dF1 and dF2   **DIFFERENTIAL**   This represents the number of degrees from the temperature set point the controller allows the temperature to rise or fall before closing the relay control. See diagrams above. This is always a positive number from 1 to 30. Zero is not allowed as a differntial value. Only Dual Stage units will have a "dF2" option. The factory default setting is 3.

HSL1 and HSL2   **HIGH SET POINT LIMIT** and **LOW SET POINT LIMIT**   This is a tamper proof option that allows a user to
LSL1 and LSL2   set maximum and minimum temperature set point limits to which a user can adjust the temperature set point. If a user only wants people to be able to adjust temperature a few degrees, they can set very tight High and Low Set Point Limits. Both High and Low set point limits can be set to the same temperature to prevent any change in temperature set point. Only dual stage units have HSL2 and LSL2 options. Factory default value is 100° for the High Set Point Limits and 0° for the Low Set Point Limits.

CAL   **CALIBRATION**   This option allows a user to field calibrate the temperature sensor. If the actual temperature is 2 degrees higher than what the TCA-9102 is displaying, the user can enter a value of 2 in the calibration option to make the TCA-9102 controller display the correct temperature. You can enter a calibration value anywhere from -30 to +30. Factory set at zero.

F or C   **TEMPERATURE SCALE**   This option allows you to have the TCA-9102 display in either Fahrenheit or Celsius degrees. Factory default is Fahrenheit.

SCYC   **SHORT CYCLE DELAY TIME**   The short cycle protection feature prevents the controller from short cycling a compressor. A short cycle condition is when a relay controlling a compressor or other equipment cycles on and off too quickly, possibly causing compressor or equipment damage. The minimum time between relay state change is determined by the value entered in the Short Cycle Delay Time option. Enter a value anywhere from 0 to 15 minutes. Factory default is 0 minutes.

tAd **TEMPERATURE ALARM DELAY** The Temperature Alarm Delay feature prevents the alarm from going off immediately upon a temperature going out of range. Instead, the unit will wait a specified number of minutes before going into alarm mode. This is helpful for applications where there may be defrost cycles or where the user may leave a refrigerator door open during loading and they don't want an alarm condition to occur at that time. Set this alarm delay anywhere from 0 to 60 minutes. Factory default is 0 minutes.

SEnS **SENSOR SELECTION** Choose if you have our PTC or RTD sensor connected. Factory default is PTC.

LOC **LOCK OUT FEATURE** This feature allows the user to prevent anyone from adjusting the temperature set point and temperature alarm set point values. If a person attempts to change any value, the display will show LOC for a short period of time to show the user these adjustments are off-limits. Three options are available. Factory default is OFF.
  1. ALL   Locks out all functionality of the Temperature Set Point menus. No changes can be made.
  2. ALAr   Locks out only the High and Low alarm set point menus, preventing someone from changing the high and low temperature alarm setpoint values.
  3. OFF   This allows a user full access to the Temperature Set Point and Alarm Set Point menus.

Normal Operation

During normal operation, the current temperature will be displayed. Relay indicator lights will be illuminated only if relays are in the closed position.

Relay Operation:
  1. Relays will always open when the temperature set point is reached.
  2. Relays will always close when the temperature set point, plus or minus the differential value is reached.
  3. On a dual stage unit, if using one relay for HEAT and the other for COOL, the TCA-9102 will not allow the relays to be both on at the same time. There will a minimum of 2 seconds between turning one stage off and turning another stage on. This is designed to eliminate the possibility of a simultaneous switch between heating and cooling that could cause a circuit breaker to trip.

Alarm Operation

During an Alarm Condition:
If the temperature gets above or below the high or low Temperature Alarm Set Points as programmed in the Set Point Menu, the unit will go into alarm and the following will occur:
  1. The display will flash the current temperature.
  2. The unit will sound a beep once every two seconds.
  3. The Normally Open Alarm Relay will close, allowing for a light or siren to turn on or to trigger an alarm dialer or auxiliary security system. Emerson Control Products offers several alarm dialers that can automatically call up to three phone numbers if the TCA-9102 goes into alarm mode.

Silencing the Alarm:
The user can silence the audible alarm for up to 60 minutes or turn off the audible alarm entirely by pressing either the MODE or SET buttons during an alarm condition.

PRESSING ONCE   Silences the alarm for 15 minutes. "15" is displayed for 2 seconds followed by the flashing current temperature.

PRESSING TWICE   Silences the alarm for 60 minutes. "60" is displayed for 2 seconds followed by the flashing current temperature.

PRESSING THREE TIMES Silences the alarm indefinitely.   "OFF" is displayed for 2 seconds followed by the flashing current temperature.

This alarm timer automatically resets when the alarm condition is corrected and unit returns to normal operation.

NOTE: Silencing the alarm DOES NOT change the status of the normally open alarm relay output or the flashing visual display. The alarm relay will remain closed until the temperature returns to a normal range.

FAILED TEMPERATURE SENSOR ALARM:
The TCA-9102 can determine when the temperature sensor is defective or damaged and will alarm when such a condition occurs. If the sensor has a cut wire or an open circuit, the display will flash "OPEn". If there is a short in the sensor wire or the sensor element, the display will flash "Shrt". In both cases, the on-board audible alarm will sound and the normally open alarm relay contact will close. When this alarm occurs, the audible alarm cannot be silenced. Power must be cut to the controller to silence the alarm. In addition, all controller functions will cease to operate until the problem with the sensor is fixed.

Technical Support & Contact Info

If you have further questions about the operation of your TCA-9102 Temperature Controller and Alarm, please contact our Customer Service department in one of the following methods:

> Phone: 800-880-6000
> Fax: 952-448-1606
> Email: cpi-customerservice@emerson.com
> Web: www.controlproductsonline.com

MODELS AVAILABLE (Made in USA)	
TCA-9102S-LV	Single stage, power = 12 or 24 VAC, 24 VDC
TCA-9102D-LV	Dual stage, power = 12 or 24 VAC, 24 VDC
TCA-9102S-HV	Single stage, power = 120 or 240 VAC
TCA-9102D-HV	Dual stage, power = 120 or 240 VAC

Warranty

Emerson Control Products warrants this product to be free from defects in material and workmanship under normal use for one year and is not responsible for consequential damages or installation costs of any nature. Exposure to contaminants and extreme environmental conditions such as moisture, temperature, chemicals, etc. may cause the unit to degrade or fail. Emerson Control Products accepts no liability for product applications or customer application testing.

Custom Design & Modifications

Emerson Control Products specializes in complete design and manufacture of electronic controls. In addition to making any desired modifications to this product, we can design a unique control specific to your application. Please consult our Customer Service Department for further information on these services.

Menu Flow Charts

Flow charts showing the menu structure on the unit are on the following pages.

Powered up unit displays temperature of any attached sensors. If error message appears, check sensor and power connections.

TCA-9102 SET POINT PROGRAMMING MENUS

Shaded boxes are only used on dual stage units.

MODE ↓

High Temp Log Hlog is displayed.

—MODE→ The highest logged value is displayed since the last reset. Press ENTER to reset.

—ENTER→ Logged value is reset to current temperature.

UP/DWN arrows —MODE—

Low Temp Log Llog is displayed.

—MODE→ The lowest logged value is displayed since the last reset. Press ENTER to reset.

—ENTER→ Logged value is reset to current temperature.

UP/DWN arrows —MODE—

Program temp set point for 1st stage SP1 is displayed.

—MODE→ SP1's value is displayed & flashes. UP/DWN arrows to adjust.

—ENTER→ SP1 value is displayed steady and saved.

UP/DWN arrows —MODE—

Program temp set point for 2ND stage SP2 is displayed.

—MODE→ SP2's value is displayed & flashes. UP/DWN arrows to adjust.

—ENTER→ SP2 value is displayed steady and saved.

UP/DWN arrows —MODE—

Program High Temp ALARM set point. HTA is displayed

—MODE→ HTA's value is displayed & flashes. UP/DWN arrows to adjust

—ENTER→ HTA value is displayed steady and saved.

UP/DWN arrows —MODE—

Program Low Temp ALARM set point LTA is displayed

—MODE→ LTA's value is displayed & flashes. UP/DWN arrows to adjust

—ENTER→ LTA value is displayed steady and saved.

—MODE—

Unit display goes blank for 2 seconds and then returns to display the current temperature.

TCA-9102 HIDDEN ACCESS MENUS

Powered up unit displays temp of any attached sensors. If no sensors attached, unit displays sensor error message, per spec. Recommended sensors be attached before proceeding with programming

Shaded boxes are only used on dual stage units.

TO ACCESS HIDDEN MENUS
Press Down Arrow
+ MODE

Operation Mode for SP1. OP1 is displayed —MODE→ HEAt/COOL/OFF mode for SP1 flashes. Arrows toggle selection —ENTER→ Selected value is steady and saved.

—MODE—

Operation Mode for SP2. OP2 is displayed —MODE→ HEAt/COOL/OFF mode for SP2 flashes.. Arrows toggle selection —ENTER→ Selected value is steady and saved.

—MODE—

dif1 is displayed for Differential setting for SP1 —MODE→ Differential value for SP1 flashes. Arrows to change value. —ENTER→ Selected value is steady and saved.

—MODE—

dif2 is displayed for Differential setting for SP2 —MODE→ Differential value for SP2 flashes. Arrows to change value. —ENTER→ Selected value is steady and saved.

—MODE—

High Set Point Limit HSL1 is displayed —MODE→ High set point value for SP1 flashes. Arrows to change value. —ENTER→ Selected value is steady and saved.

—MODE—

Low Set Point Limit LSL1 is displayed —MODE→ Low set point value for SP1 flashes. Arrows to change value. —ENTER→ Selected value is steady and saved.

—MODE—

High Set Point Limit. HSL2 is displayed —MODE→ High set point value for SP2 flashes. Arrows to change value. —ENTER→ Selected value is steady and saved.

—MODE—

L:ow Set Point Limit. LSL2 is displayed —MODE→ Low set point value for SP2 flashes. Arrows to change value. —ENTER→ Selected value is steady and saved.

—MODE—

Temp Set point menu Lock-out. LOC is displayed. —MODE→ ON, ALAr, or OFF flashes. Use arrows to select option. —ENTER→ Selected option is steady and saved.

—MODE—

Temp. Sensor selection. Ptc or rtd is displayed. —MODE→ Ptc or rtd flashes. Use arrows to toggle to selection. —ENTER→ Selected value is steady and saved.

—MODE—

Temperature Alarm Delay. tAd is displayed. —MODE→ Temp Alarm Delay time begins flashing. Arrows to change. —ENTER→ Selected value is steady and saved.

—MODE—

Short Cycle Delay Time. SCYC is displayed. —MODE→ Short cycle delay time begins flashing. Arrows to change. —ENTER→ Selected value is steady and saved.

—MODE—

F/C selection. F or C is displayed. —MODE→ F or C flashes. Use arrows to toggle for selection —ENTER→ Selected value is steady and saved.

—MODE—

Calibration. CAL is displayed —MODE→ Calibration value flashes. Arrows to change value. —ENTER→ Selected value is steady and saved.

—MODE—

Wiring Diagrams

⚠ **CAUTION**

This is a suggested wiring method. It is recommended users consult a licensed electrician when wiring high voltage devices. Always disconnect all power before doing any wiring. Never wire this device outside or during an electrical storm. The models listed above are approved for indoor use only consult with the provided instruction manual for full safety guidelines and operation instructions.

120VAC Wiring Diagram for TC/HC 9100 Series Controllers

Use this wiring aid if your incoming power and outgoing loads are both running a maximum of 120VAC.

This wiring diagram applies to the following models:
• TC-9102S-HV (HV2)
• TC-9102D-HV (HV2)
• TCA-9102S-HV (HV2)
• TCA-9102D-HV (HV2)
• HC-9102S-HV (HV2)
• HC-9102D-HV (HV2)
• HCA-9102S-HV (HV2)
• HCA-9102D-HV (HV2)

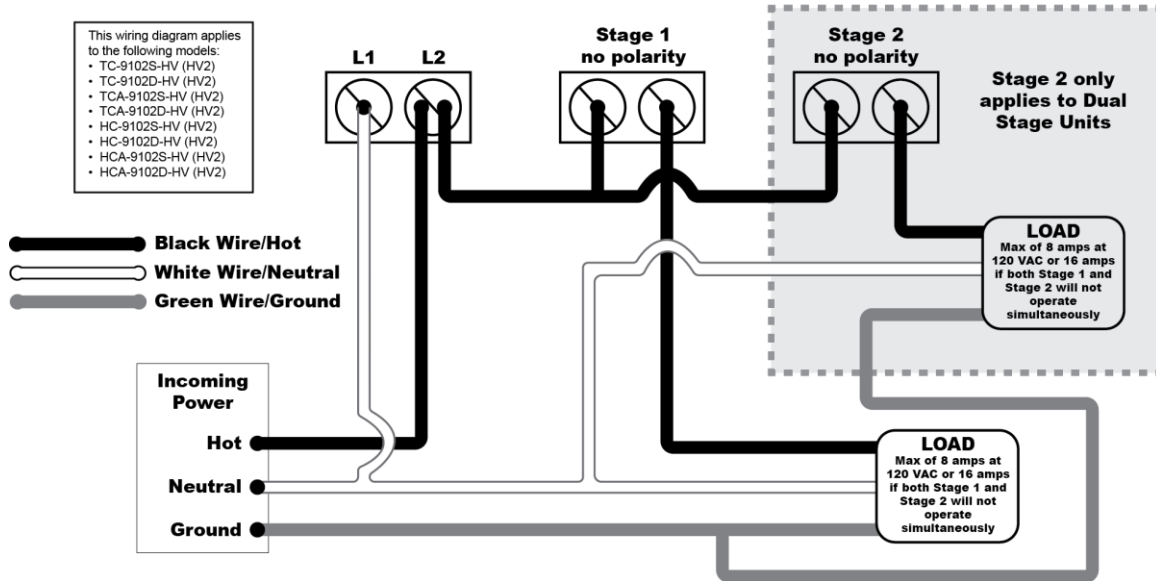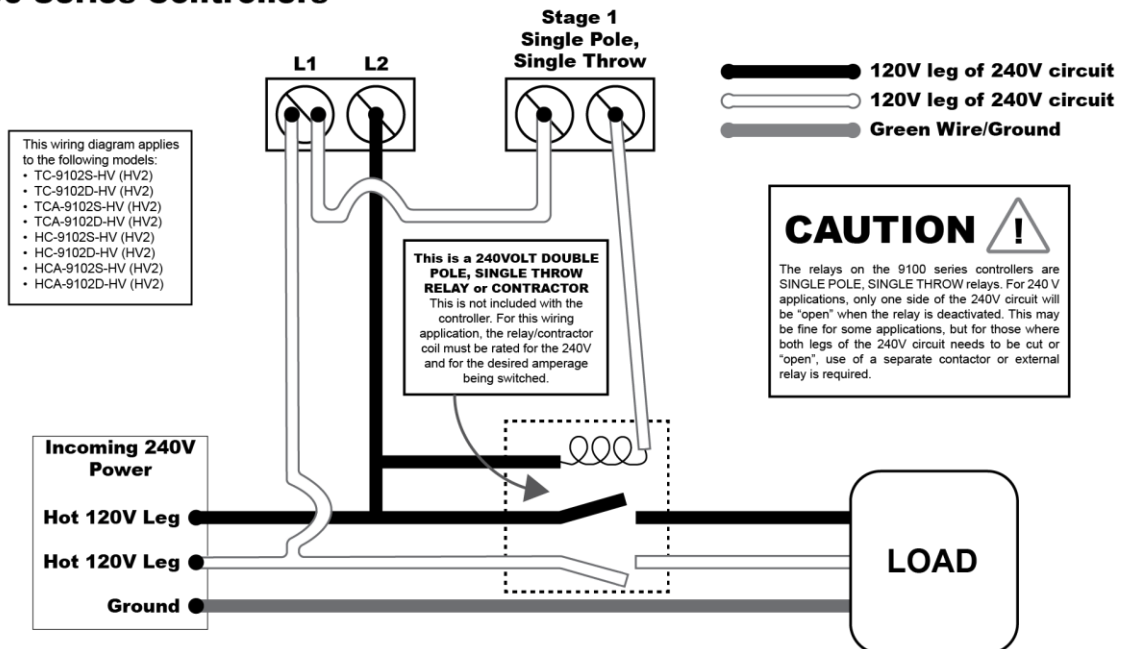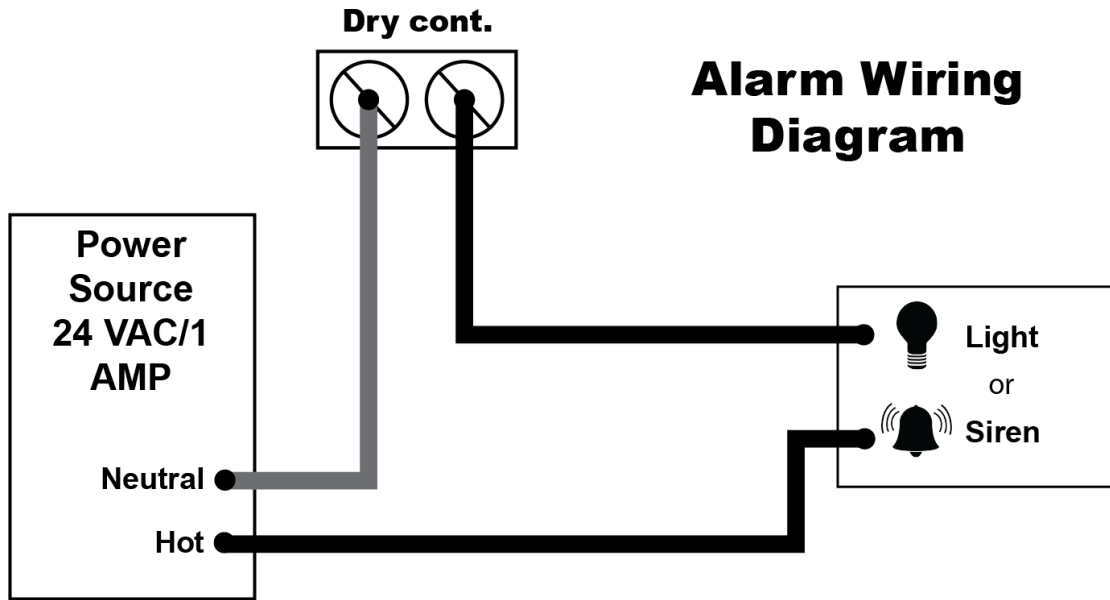**L1** **L2**

Stage 1 no polarity

Stage 2 no polarity

Stage 2 only applies to Dual Stage Units

■ **Black Wire/Hot**
▭ **White Wire/Neutral**
▬ **Green Wire/Ground**

LOAD
Max of 8 amps at 120 VAC or 16 amps if both Stage 1 and Stage 2 will not operate simultaneously

Incoming Power

Hot ●

Neutral ●

Ground ●

LOAD
Max of 8 amps at 120 VAC or 16 amps if both Stage 1 and Stage 2 will not operate simultaneously

240VAC Wiring Diagram for TC/HC 9100 Series Controllers

NOTE: Know the equipment you will be using with this temperature controller. Consult with a certified electrician if you have ANY concerns or questions about wiring this device to your equipment. Emerson Control Products assumes no responsibility or damge to this device, your equipment, person or property.

L1 **L2**

Stage 1 Single Pole, Single Throw

■ **120V leg of 240V circuit**
▭ **120V leg of 240V circuit**
▬ **Green Wire/Ground**

This wiring diagram applies to the following models:
• TC-9102S-HV (HV2)
• TC-9102D-HV (HV2)
• TCA-9102S-HV (HV2)
• TCA-9102D-HV (HV2)
• HC-9102S-HV (HV2)
• HC-9102D-HV (HV2)
• HCA-9102S-HV (HV2)
• HCA-9102D-HV (HV2)

This is a 240VOLT DOUBLE POLE, SINGLE THROW RELAY or CONTRACTOR
This is not included with the controller. For this wiring application, the relay/contractor coil must be rated for the 240V and for the desired amperage being switched.

CAUTION ⚠

The relays on the 9100 series controllers are SINGLE POLE, SINGLE THROW relays. For 240 V applications, only one side of the 240V circuit will be "open" when the relay is deactivated. This may be fine for some applications, but for those where both legs of the 240V circuit needs to be cut or "open", use of a separate contactor or external relay is required.

Incoming 240V Power

Hot 120V Leg ●

Hot 120V Leg ●

Ground ●

LOAD

Dry cont.

Alarm Wiring Diagram

Power Source 24 VAC/1 AMP

Neutral

Hot

Light

or

Siren

1724 Lake Drive West
Chanhassen, MN 55317 USA

MADE IN USA
Printed in the USA