Instruction Manual

SWA-24X2C PID Temperature Controller with Timer

(SWA-2442C/2452C)

Version 1.4 (Nov, 2016)

1. Caution

- This controller is intended to control equipment under normal operating conditions. If failure or malfunction of the controller may lead to abnormal operating conditions that may result in personal injury or damage to the equipment or other property, devices (limit or safety controls) or systems (alarm or supervisory) intended to warn of or protect against failure or malfunction of the controller must be incorporated into and maintained as part of the control system.
- Installing the rubber gasket supplied will protect the controller front panel from dust and water splash (IP54 rating). Additional protection is needed for higher IP rating.
- This controller carries a 90-day limited warranty. This warranty is limited to the controller only.

2. Specifications

Table 1. Specs of SWA-2442C and SWA-2452C.

Input Type	Thermocouple: K, E, J, T, S. RTD: Pt100, Cu50
Input Range	K (-20~2370ºF), S (-20~2912ºF), T (-190~750ºF), E (-20~1290ºF), J (-20~1651ºF), Pt100 (-200~1100ºF) Cu50(-56~302ºF)
Display	Two lines, four digits. Temp & Time or Temp & Set Temp.
Display Resolution	Temperature: 1°C/°F and 0.1°C/°F Time: 1 Second/ Minute.
Accuracy	Temperature: ±0.5% of full input range. Time: 1 Second.
Control Mode	Temperature: PID, Manual control, On-Off, Time: Timed PID, Timed On-Off
Timer Mode	Count up, Count down
Timer Range	1 ~ 9999 second/ minute
Anti-Short Cycle Delay Timer Range	1 ~ 200 minute
Control Output	Relay output: N.O. contacts: 10 A at 120 VAC, 10 A at 240 VAC, 10 A at 30 VDC SSR control output: 12 VDC, 50 mA
Alarm	Process high/low alarm
Alarm Output	Relay: 3 A at 240 VAC, 5 A at 120 VAC, or 3 A at 30 VDC
Power Supply	90 ~ 265 VAC / 50 ~ 60 Hz
Dimension	1.89'' x 1.89'' x 4.25'', or 48 x 48 x 108 mm (1/16 DIN).
Insertion Depth	From front panel: 3.95" or 100 mm
Panel Cutout	1.75 x 1.75" or 44.5 x 44.5 mm

3. Terminal Assignment

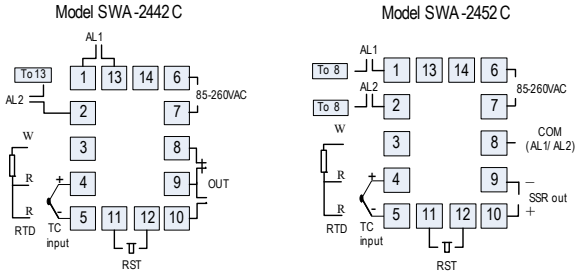

Figure 1. Pin assignment of SWA-2442C and SWA2452C.

3.1 Sensor Connection

Please refer to table 3 for the input sensor type (Sn) setting codes. The initial setting for input is for a K type thermocouple. Set Sn to the right sensor code if another sensor type is used.

3.1.1 Thermocouple

The thermocouple should be connected to terminals 4 and 5. Make sure that the polarity is correct. There are two commonly used color codes for the K type thermocouple. US color code uses yellow (positive) and red (negative). Imported DIN color code uses red (positive) and green/blue (negative). The temperature reading will decrease as temperature increases if the connection is reversed.

When using ungrounded thermocouple that is in touch with a large conductive subject, the electromagnetic field picked up by the sensor tip might be too large for the controller to handle, the temperature display will change erratically. In that case, connecting the shield of thermocouple to terminal 5 (circuit ground of the controller) might solve the problem. Another option is to connect the conductive subject to terminal 5.

3.1.2 RTD sensor

For a three-wire RTD with standard DIN color code, the two red wires should be connected to the terminals 4 and 5. The white wire should be connected to terminal 3. For a two-wire RTD, the wires should be connected to terminals 3 and 4. Jump a wire between terminals 4 and 5. Set controller input type Sn to Pt.

3.2 Power to the Controller

The power cables should be connected to terminals 6 and 7. Polarity does not matter. It can be powered by 120 V or 240 VAC power source. Neither a transformer nor jumper is needed to wire it up. For the sake of consistency with the wiring example described later, we suggest you connect the neutral wire to terminal 6 and hot to 7.

3.2.1 Reset terminals

Terminals 11 and 12 are for connecting to a reset switch. If you need to start the timer after controller is powered up, you should short these two terminals together with a jumper wire. To use the reset function, these terminals should be connected to a switch. Open the contact of the switch will rest the timer. Close the contact of the switch will start the timer. Some applications may need a NO contact and other may need NC contact switch.

3.3 Control output connection

The SSR control output of the controller SWA 2452C provides a pulsed 12 VDC signal for the SSR. The relay output of the controller SWA 2442C can be used to turn on a contactor or a solenoid valve. It can drive a small heater directly if the heater draws less than 10 Ampere when connected to 120 VAC power source.

3.3.1 Connecting the load through SSR (for SWA-2452C)
Connect terminal 10 to the positive input and terminal 9 to the negative input of the SSR. See Figure 8 for details.

3.3.2 Connecting the load through a contactor (for SWA-2442C)
Assuming the controller is powered by 120 VAC and the contactor has a 120 VAC coil, jump a wire between terminals 9 and 7. Connect terminal 10 to one lead of the coil and terminal 6 to the other lead of the coil. Please see Figure 7 for example.

3.3.3. Connecting the heater (or cooler) directly from the internal relay
Assuming the controller and the load (heater or cooler) are powered by the same voltage. Jump a wire from terminal 9 to 7. Connect terminal 10 to the one lead of the load and terminal 6 to the other lead of the load. Please see Figure 9 for details.

3.4 For first time users without prior experience with PID controllers, the following notes may prevent you from making common mistakes.

3.4.1 Power to the heater does not flow through terminal 6 and 7 of the controller. The controller consumes less than 2 watts of power. It only provides a control signal to the relay. Therefore, wires in the 18 to 26 gauge range should be used for providing power to terminals 6 and 7. Thicker wires may be more difficult to install.

3.4.2 The control relay output (for SWA-2442C) and the alarm output are dry single pole switches. They do not provide power by themselves.

3.4.3 SSR output power does not come from the input of the SSR. The output of the SSR is a single pole switch between terminals 1 and 2 of the SSR. The input of the SSR is for control, or triggering the SSR. (Please note we are talking about the SSR itself, not the SSR control output of the controller). When switching a North American 240V AC power, the heater will be live even when the SSR is off. Users should install a double pole mechanical switch to the power input.

3.4.4. For all controller models listed in this manual, the power is controlled by regulating the duration of on time for a fixed period of time. It is not controlled by regulating amplitude of the voltage or current. This is often referred as time proportional control. If the cycle rate is set for 100 seconds, a 60% output means controller will switch on the power for 60 seconds and off for 40 seconds (60 / 100 = 60%). Almost all high power control systems use time proportional control because amplitude proportional control is too expensive and inefficient.

4. Front Panel and Operation

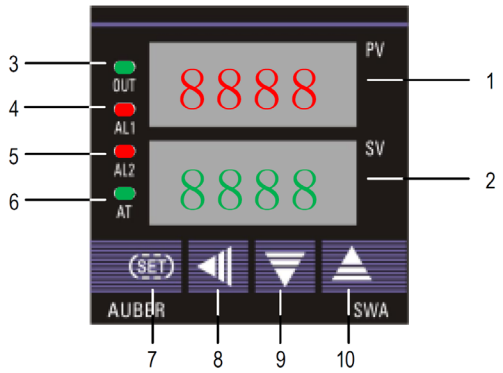

Figure 2. Front panel of SWA-24X2C.

1. PV display: Indicates the sensor read out, or process value (PV).
2. SV display: Indicates the time when timer is used. If timer is deactivated, it indicates the set temperature (SV). In manual control mode, an "H" is displayed on the most left digit to indicate number is for percentage of output (%).
3. Output indicator: It is synchronized with control output (terminal 9 and 10), and the power to the load. When it is on, the heater (or cooler) is powered.
4. AL1 indicator: It is synchronized with ALM relay. When timer is on, it works as the timer relay output indicator. When timer is deactivated, it lights when Alarm 1 condition meets.
5. AL2 indicator: It lights up when Alarm 2 condition meets.
6. Auto-tune indicator: It lights up when auto-tune starts.
7. SET key: Press and hold this key for 3 seconds will enter the temperature control parameter setting mode. When the controller is in temperature, or timer parameter setting mode, press this key momentarily will lead the display to the next parameter.
8. Automatic/Manual function key/Data shift key ◄: press ◄ for 3 seconds to enter manual tuning mode. Press ◄ for 3 seconds again to exit.
9. Decrement key ▼: Decreases numeric value of the setting value. Press for 3 seconds to enter the timer setting mode.
10. Increment key ▲: Increases numeric value of the setting value. Press for 3 seconds to enter the temperature setting mode.

4.1 Display Modes

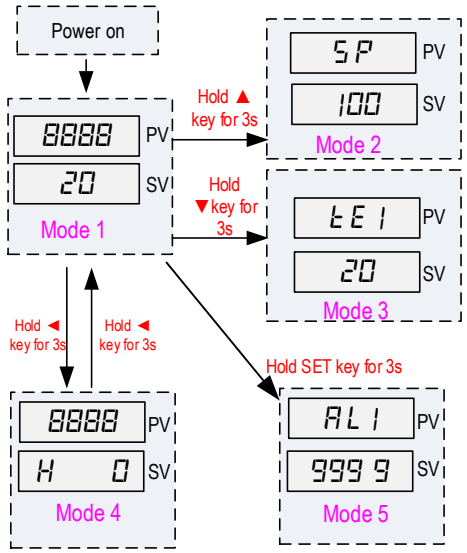

Figure 3. Display modes.

Display mode 1: Normal operation display. PV is the abbreviation for Process Value. SV is the abbreviation for Set Value. When the power is turned on, the upper display window shows the measured temperature value. If the timer is used, the lower window shows set timer value. When timer starts, it shows the time as it counts up or down. If the timer is disabled (INT = 0), the lower display shows the set temperature.

Display mode 2: Changing temperature set value (SV) Press the ▲ key for 3 seconds, and then release it. The decimal point on the lower right corner will start to flash. Press the ▼ or ▲ key to change SV until the desired value is displayed. If the change of SV is large, press the ◄ key to move the flashing decimal point to the desired digit that needs to be changed. Then press the ▼ or ▲ key to start changing SV from that digit. The decimal point will stop flashing after no key is pressed for 3 seconds. The changed SV will be automatically registered without pressing the SET key.

Display mode 3: Timer parameter set up. Press the ▼ key for 3 seconds to change the display status into timer parameter setting mode. The upper display window shows the timer parameter symbol to be changed, the lower display shows its value. Press the ◄, ▼ or ▲ to change the setting. Then, press SET to go to next parameter. If no key is pressed for 10 seconds, the display will return to mode 1 automatically. The change of value will take effect without the need for pressing the SET key.

Display mode 4: Manual mode. Press the ◄ key for 3 seconds to enter the manual mode. In this mode, the lower display has an H on the most left. The

number on the right is the percentage of power output. Press the ▼ or ▲ to adjust the power. Press the ◄ key for 3 seconds again to exit this mode. For more details, please see 4.6.4.

Display mode 5: Temperature control parameter setting. Press the SET key for 3 seconds to enter the temperature control parameter setting mode. The upper display window shows the parameter symbol to be changed, the lower display shows its value. Press ◄, ▼ or ▲ to change the setting. Then, press SET to go to next parameter. If no key is pressed for 10 seconds, the display will return to mode 1 automatically. The change of value will take effect without the need for pressing the SET key. Figure 4 shows the flow chart of the parameters. Note: If the controller is locked (see 4.14), only limited parameters (or no parameters) can be changed.

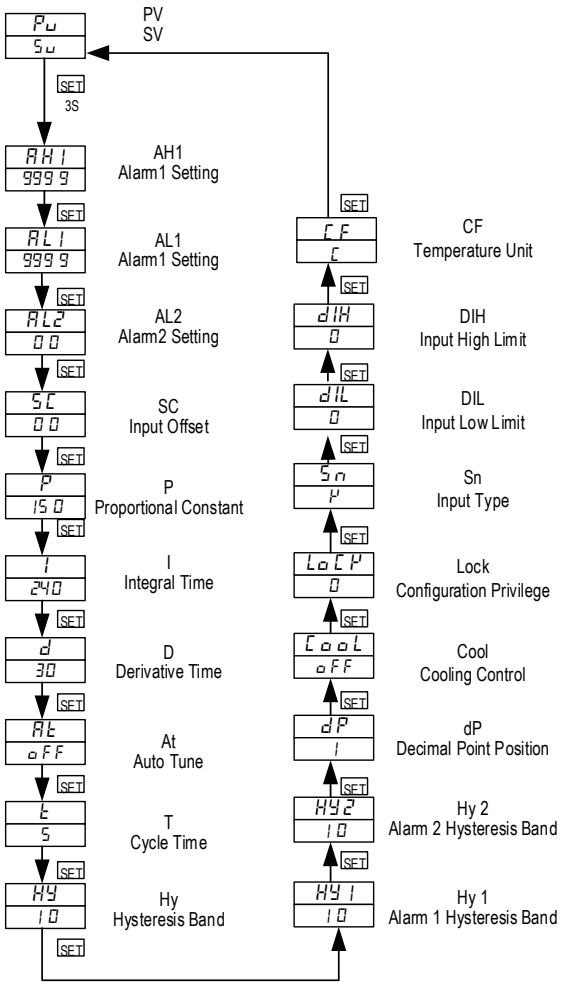

Figure 4. Flow chart of how to change system parameters.

4.2 System Parameters

Table 2. System parameters.

Mode 2: Press ▲ key for 3 seconds then release					
Code	**Sign**	**Description**	**Setting Range**	**Initial Setting**	**Note**
SV	SV	Set Value	Decided by DIL, DIH	100	
Mode 5: Press SET key for 3 seconds then release					
AH1	AH1	Alarm 1, high limit	-1999 ~ +9999 ˚C or ˚F	120	4.3
AL1	AL1	Alarm 1, low limit	-1999 ~ +9999 ˚C or ˚F	80	4.3
AL2	AL2	Alarm 2, low limit	-1999 ~ +9999 ˚C or ˚F	50	4.3
SC	SC	Input offset	-20 ~ 20	0.0	4.11
P	P	Proportional Constant	0.1 ~ 200.0	15.0	4.6
I	I	Integral time	0 ~ 2000	240	
d	D	Derivative time / delay time	0 ~ 200	30	
AT	At	Auto-tune	On/off	off	4.5
t	t	Cycle time	2 ~ 120	2 or 120	4.7
HY	Hy	Hysteresis band	0.1 ~100.0	1.0	4.4
HY1	Hy1	Alarm 1 hysteresis band	0.1 ~100.0	1.0	4.3
HY2	Hy2	Alarm 2 hysteresis band	0.1 ~100.0	1.0	4.3
dP	dP	Decimal point position	0 or 1	1	4.9
CooL	CooL	Cooling control	On/Off	Off	4.12
ALP	ALP	Alarm definition	0 ~ 1	0	4.3
LoCK	Lock	Configuration privilege	0 ~ 50	0	4.14
Sn	Sn	Input type	See Table 3	K	4.8
dIL	dIL	Input low limit	-1999 ~ dIH	0	4.10
dIH	dIH	Input high limit	dIL ~ 9999	999	4.10
CF	CF	Temperature unit	C, F	C	4.13
Mode 3: Press ▼ key for 3 seconds and release					
tE1	TE1	Timer 1	0 ~ 9999	10	4.15
uPt	UPT	Timer unit and timer mode	0 ~ 4	0	4.16
Int	INT	Timer control mode	0 ~ 1	1	4.17

4.3 Alarm parameters

This controller has two alarms, Alarm 1 and Alarm 2. Alarm 1 has a red LED indicator on the front panel marked as AL1 and a N.O. relay output between the terminals 1 and 8 of SWA-2452C (terminals 1 and 13 of SWA-2442C) that marked as AL1. AL1 and Alarm 1 are synchronized. When AL1 LED lit, AL1 relay pulls in. Alarm 2 also has a red LED indicator on the front panel marked as AL2 and a N.O. relay output between terminal 2 and 8 of SWA-2452C (terminal 2 and 13 of SWA-2442C). The Alarm 1 and timer share the same AL1 relay. When AL1 relay is used for Alarm 1, there is no timer output. When AL1 relay is used for timer output, there is no alarm 1 output.

Alarm 1 is configured by three parameters: ALP, AH1, AL1, and Hy1. ALP defines the configuration of alarm for Alarm 1: **ALP = 0**, Alarm 1 is enabled, relay AL1 is used as Alarm 1 output; **ALP = 1**, Alarm 1 is disabled, relay AL1 is disabled.

AH1 and AL1 define the Alarm 1 for the process temperature. AH1 is for the high limit alarm. AL1 is the low limit alarm. Hy1 is the hysteresis band of Alarm 1. In heating mode, for the high limit alarm, the alarm will turn off when the temperature is Hy1 degree below high limit alarm (AH1-Hy1); for low limit alarm, the alarm will turn off when temperature is Hy1 degree above the low limit alarm (AL1 + Hy1).

The Alarm 2 is available only in timer mode when INT = 1. But it won't be activated until the preset time is reached (timer has finished counting). The purpose of Alarm 2 is to notify the operator that process temperature (PV) has dropped below AL2 (low limit alarm). When activated, AL2 indicator will lid, AL2 relay will be active and stay closed. The Hy2 setting should be ignored in this situation.

4.4 Hysteresis Band "Hy"

The Hysteresis Band parameter Hy is also referred as Dead Band, or Differential. It permits protection of the on/off control from high switching frequency caused by process input fluctuation. Hysteresis Band parameter is used for on/off control, as well as the on/off control at auto tuning. For example: When controller is set for on/off heating control mode, the output will turn off when temperature goes above SV+ Hy and on again when it drops to below SV-Hy.

4.5 At (auto-tuning)

The auto-Tuning function (also called self-tuning) can automatically optimize the PID parameters for the system. The auto-tuning function will use the on/off mode to heat up the system until it passes the set point. Then let it cool down. It will repeat this about three times. Based on the response time of the system, the built-in artificial intelligence program will calculate and set the PID parameters for the controller. If your system has a very slow response, the auto tuning could take a long time.

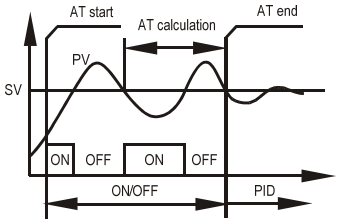

Figure 5. Auto tuning

To activate auto-tuning, enter the parameter setting mode, set At = ON. The "AT" LED on the left lower corner of the controller will light up. Auto-tune will finish when the AT LED turns off. The newly calculated PID parameters are set and used for the system. Please note that auto-tuning is only for PID control mode. There is no need for auto-tune when using ON/OFF mode (when P = 0).

To stop the auto-tuning, enter the parameter setting mode, set At = OFF. Then, the previous PID parameters values are resumed.

4.6 Control action explanations

4.6.1 PID

The values of the P, I, and D parameters are critical for good response time, accuracy and stability of the system. Using the Auto-Tune function to automatically determine these parameters is recommended for the first time user. If the auto tuning result is not satisfactory, you can manually fine-tune the PID constants for improved performance.

Proportional Constant (P): P is also called the proportional band. Its unit is the degree of temperature. e.g. P = 50 means the proportional band is 50 degree. Assuming the set temperature (SV) = 200. When integral, I, and derivative, d, actions are removed - the controller output power will change from 100% to 0% when temperature increases from 150 to 200 °C. The smaller the P value is, the stronger action will be for the same temperature difference between SV and PV. ***Please note: for On/off control mode, P is set to 0.***

Integral time (I): Brings the system up to the set value by adding to the output that is proportional to how far the process value (PV) is from the set value (SV) and how long it has been there. When I decreases, the response speed is faster but the system is less stable. When I increases, the response speed is slower, but the system is more stable. When I = 0, the integration is turned off. It becomes to a PD controller that is useful for very slow system.

Derivative time (d): Responds to the rate of PV change, so that the controller can compensate in advance before |SV-PV| gets too big. A larger number increases its action. Setting d-value too small or too large would decrease system stability, causing oscillation or even non-convergence. Normally, d is set to ¼ of the I value. However, when the controller is in On/off mode (P = 0) and cooling control is turned on, d means Delay Timer of the Anti-Short Cycle Delay (Asd) function. The delay time ranges from 1-200 minutes. (See 4.6.3 for details).

4.6.2 On/Off control mode

It is necessary for inductive loads such as motors, compressors, or solenoid valves that do not like to take pulsed power. It works like a mechanical thermostat. When the temperature passes the SV+Hy, the heater will turn off. When the temperature drops back to SV-Hy, the heater will turn on again. (In cooling mode, the cooler turns on when temperature passes SV+Hy, and turns off when temperature drops back to SV-Hy). **To use the On/off mode, set P = 0 and Hy to the desired band.** Then, the I and D parameter is not used when controller is in heating mode. It can be left at any value. In the cooling mode, the D value is used for Anti-Short Delay time. Its value is in minutes (See 4.6.3 for details).

4.6.3 Cooling control

When controller is used for cooling control and load is a compressor, it should not turn on the compressor when its refrigerant is at high pressure (just after turned off). Otherwise, the compressor can be damaged in short time. Two methods are commonly used to prevent the rapid cycling of the compressor. One is to use on/off control mode (instead of the PID control mode) with wide enough hysteresis band, and long cycle rate. The other is to use the Anti-Short Cycle Delay (ASd) function. ASd establishes the minimum time that the N.O. contacts remain open (after reaching cutout) before closing again. The delay overrides any Load Demand and does not allow the N.O. contacts to close until the set time-delay value has elapsed. ASd gives time to release the refrigerant pressure through evaporator. This controller allows the user to use both methods to protect the compressor. You should set the P = 0 for on/off mode. Hy should not be less than 2 degree unless you really need a tight control. The cycle rate should be set for 20 second or longer. The D is typically set to 4- 6 (minutes).

4.6.4. Manual mode

Manual mode allows the user to control the output as a percentage of the total heater power. It is like a dial on a stove. The output is independent of the temperature sensor reading. One application example is controlling the strength of boiling during beer brewing. You can use the manual mode to control the boiling so that it will not boil over to make a mess. The manual mode can be switched from PID mode but not from on/off mode. This controller offers a "bumpless" switch from the PID to manual mode. If the controller outputs 75% of power at PID mode, the controller will stay at 75% when it is switched to the manual mode, until it is adjusted manually. See Figure 3 for how to switch the display mode. **To activate the manual control**, pressing the ◄ key for 3 seconds or until the bottom display shows H at the most left digit. The H indicating the controller is in manual mode. The number at the right is the percentage of output. Press the ▼ or ▲ key to adjust the power. To switch back to PID mode, pressing the ◄ key for 3 seconds or until the H disappeared.

4.7 Cycle time "t"

It is the time period (in seconds) that the controller uses to calculate its output. e.g. When t = 2, if the controller decides output should be 10%, the heater will be on 0.2 second and off 1.8 seconds for every 2 seconds. Smaller t values result in more precision control. For SSR output, t is set at the minimum (2 seconds). For relay or contactor output, it should be set longer to prevent contacts from wearing out too soon. Normally it is set to 20~40 seconds.

4.8 Input sensor type

Table 3. The code and measurement range for acceptable input sensors.

Sn Code	Input Device	Display Range (˚C)	Display Range (˚F)
Cu50	Cu50 (RTD)	-49 ~160	-56 ~ 302
Pt	Pt100 (RTD)	-199 ~610	-198 ~1111
K	K (thermocouple)	-30 ~ 1300	-20 ~ 2370
E	E (thermocouple)	-29 ~ 905	-20 ~ 1292
J	J (thermocouple)	-29 ~ 905	-20 ~ 1651
T	T (thermocouple)	-198 ~ 400	-190 ~ 750
S	S (thermocouple)	-29 ~ 1619	-20 ~ 2912
0 - 5	0 ~5 V (0 ~10 mA)	Not available for this model.	
1 - 5	1 ~5 V (4 ~20 mA)		

4.9 Decimal point setting "dP"

In case of thermocouple or RTD input, dP is used to define temperature display resolution.
dP = 0, temperature display resolution is 1º (C or F);
dP = 1, temperature display resolution is 0.1º (C or F).
The temperature will be displayed at the resolution of 0.1º for input below 1000º and 1º for input over 1000º (C or F).

4.10 Limiting the control range, DIL and DIH

1) For temperature sensor input, the DIL and DIH define the set value range. DIL is the low limit, and DIH is the high limit.
Sometimes, you may want to limit the temperature setting range so that the operator cannot set a very high temperature by accident. If you set the DIL = 100 and DIH = 130, operator will only be able to set the temperature between 100 and 130.
2) For linear input devices, DIL and DIH are used to define the display span. If the input is 0 ~ 5 V. DIL is the value to be displayed at 0 V and DIH is the value at 5 V.

4.11 Input offset "SC"

SC is used to set an input offset to compensate the error produced by the sensor or input signal itself. For example, if the controller displays 5ºC when probe is in ice/water mixture, setting Pb = -5, will make the controller display 0ºC.

4.12 Heating, and Cooling Mode Selection "COOL"

When COOL = ON, the controller is set for cooling control.
When COOL = OFF, the controller is set for heating control.

4.13 Temperature Unit Selection, Celsius or Fahrenheit, "C, F"

This parameter sets temperature units, C for Celsius, F for Fahrenheit. When it is for current or voltage input, this parameter is voided.

4.14 Lock up the settings, parameter "LOCK"

To prevent the operator from changing the settings by accident, you can lock the parameter settings after initial setup. Table 4 shows the privileges associated with each lock code.

Table 4. LOCK parameter.

LOCK value	SV Adjustment	Other parameters
0	Yes	Yes
1	Yes	Locked
2 and up to 50	No	Locked

Note: to limit the control temperature range instead of completely locking it, please refer to section 4.10.

4.15 Set Time for Timer "TE1"

TE1 is for setting value for the timer. Press ▼ for 3 seconds and change the value directly.

4.16 Time Unit and Timer Counting Mode "UPT"

UPT = 0, timer counting down in seconds
UPT = 1, timer counting down in minutes
UPT = 2, timer counting up in seconds
UPT = 3, timer counting up in minutes
UPT = 4, timer counting down in minutes (time displayed in four digits with flashing decimal point).

4.17 Timer control mode "INT" *

INT = 0. **The timer is disabled.** The controller functions as a regular dual display controller. The lower display shows the set temperature instead of time.
INT = 1. The timer starts after the temperature reaches set point. When set time reaches, controller's output stops. Please check the flow chart in Figure 6 for how does this mode work.

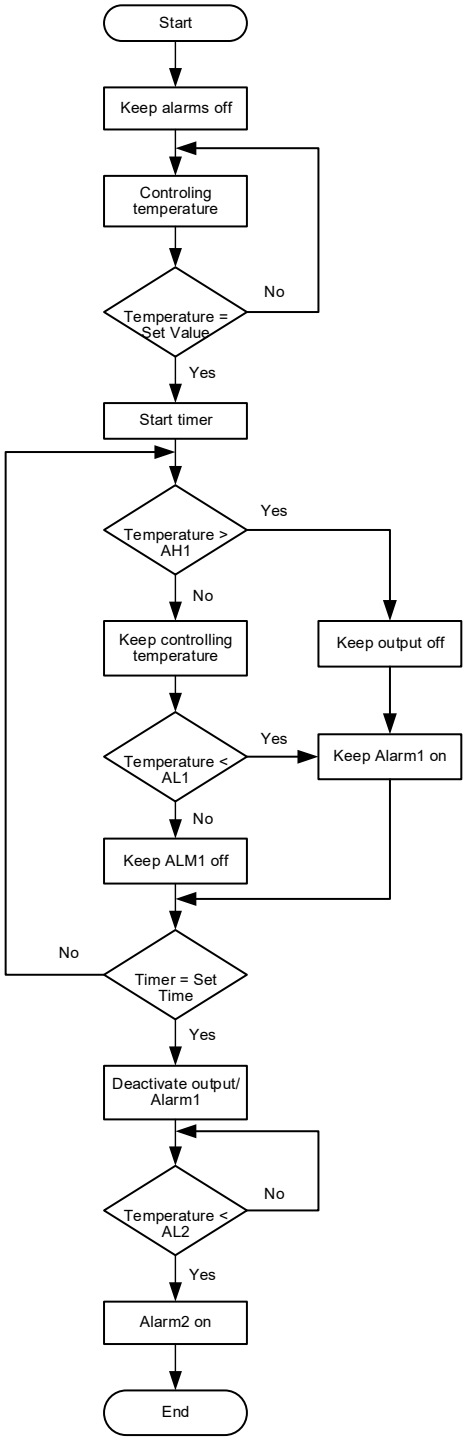

Figure 6. Flow chart of timer mode INT=1.

Special note on INT = 1:

1) When INT = 1, timer is enabled. The bottom of the display is for time.
2) Terminal 11 and 12 have to be connected.
3) Once the Alarm2 is activated as the temperature drops below AL2 (SV < AL2), the AL2 relay will pull in. This alarm will stay on until the controller is reset (by reset terminal 11 and 12) or powered off.
4) Timer can be started either at power up of the controller or by the reset switch. The reset switch (a momentary normally closed NC switch) needs to be connected between terminal 11 and 12.

5. Application Examples

5.1 Powder Coating Oven

A powder coating oven needs to heat up to 375°F, hold the temperature for 20 minutes, then the heater should be turned off, and turn on the buzzer when the temperature drops below 90°F. The application needs a controller SWA-2442C, a 40 A / 240 V contactor, a thermocouple and a buzzer with a 220VAC power source.

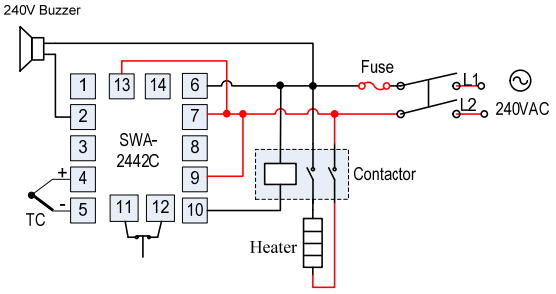

Figure 7. Wiring of SWA-2442C for power coating oven.

For this application, keep the controller in heating mode (Cool = off), set input type to type K thermocouple (Sn = 0), temperature unit to F (CF = F), set the following parameters to SV = 375, AL2 = 90, ALP = 0, tE1 = 20, UPT = 3, INT = 1.

5.2 Heat Treatment Oven with Solid State Relay

In this example, an oven with 240VAC heating element is controlled by a SWA-2352C through a solid state relay. The wiring diagram is given in Figure 8.

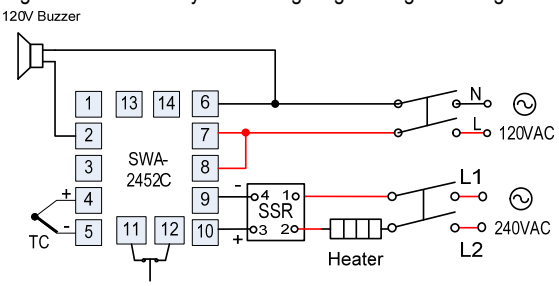

Figure 8. Wiring of SWA-2452C for a heater with SSR.

5.3 Heat Press for Heat Transfer Printing

This example assumes the heater is less than 1000 W. For larger heater, please refer to example 5.1. If you jump a wire between terminal 1 and 2, when alarm 1 or alarm 2 is activated, this buzzer will be activated. The wiring diagram is given in Figure 9.

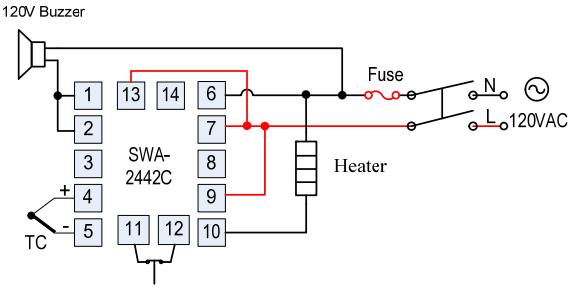

Figure 9. Wiring of SWA-2442C for a low power heater.

6. Trouble Shooting

6.1 Timer does not start to count

Check the connection between terminal 11 and 12. These two terminals has to be connected to enable the timer to start.

6.2 No heating

The OUT LED is synchronized with output relay. If there is no heat when it is supposed to, check the OUT first. If it is not lit, the controller parameter setting is wrong. If it is on, check external switching device (if the relay is pulled-in, or the SSR s red LED is on). If the external switching device is on, then the problem is either the external switching device output, its wiring, or the heater. If the external switching device is not on, then the problem is either the controller output, or the external switch device.

6.3 Poor accuracy

Please make sure calibration is done by immersing the probe in liquid. Comparing with reference in air is not recommended because response time of sensor depends on its mass. Some of our sensor has response time > 10 minutes in the air. When the error is larger than 5°F, the most common problem is improper connection between the thermocouple and the controller. The thermocouple needs to be connected directly to the controller unless thermocouple connector and extension wire is used. Copper wire or thermocouple extension wire with wrong polarity connected on the thermocouple will cause the reading drift more than 5°F.

6.4 On on/off mode, although hysteresis is set to 0.3, unit is running 5 degrees above and below.

If the Hy is very small and temperature change very fast, user needs to consider the delay of the cycle time (the parameter t). For example, if cycle time is 20 seconds, when the temperature passes the SV + Hy after the very beginning of a 20 seconds, relay will not act until it starts the next cycle 20 seconds later. The temperature could be much higher than the set point. User may change the cycle time to a smaller value, such as 2 seconds, to get a precise control.

6.5 Display "HH"

This is an input error message. The possible reasons are: the sensor is not connected or not connected correctly; the sensor input setting is wrong; or the sensor is defective. In this case, the instrument terminates its control function automatically. If this happens when using thermocouple sensor, you can short terminal 4 and 5 with a copper wire or paper clip. If the display shows ambient temperature, the thermocouple is defective. If it still displays "HH", check the input setting, Sn, to make sure it is set to the right thermocouple type. If the Sn setting is correct, the controller is defective. For RTD sensors, check the input setting first because most controllers are shipped with the input set for thermocouples. Then check the wiring. The two red wires should be connected to terminals 4 and 5. The white wire should be connected to terminal 3.

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