Instruction Manual

SKX-800 EIGHT-CHANNEL TEMPERATURE METER
INSTRUCTION MANUAL
Version 1.1 (Aug, 2024)

⚠ **Caution**

- This controller is intended to be used with proper safety equipment under normal operating conditions. Failure or malfunction of the controller 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. To prevent harm to you and to the equipment, this item must be incorporated into and maintained as a part of the control system under the appropriate environment.
- This warranty is limited to the controller only. See auberins.com for warranty information.

1. Features & Specifications:

1) Eight channel temperature readout & control in 160x80mm size meter. User can set different set temperature and control parameters for each channel.

2) Available sensor input types:

Thermocouple (temperature input): K, J, T, E, S

Resistance thermometer (temperature input): Pt100, CU50

3) Outputs: 3A resistive dry relay output, 24-250V AC/DC This output can be used as main output or absolute alarms.

4) Control modes: PID, On/off modes

5) This controller has auto-tuning function to optimize its control P, I and D settings.

6) Accuracy: ±0.5% Full scale.

7) Sampling rate: 2 sec

8) Ambient temperature: 32 ~ 122°F or 0 ~ 50°C

9) Ambient humidity: ≤ 85 % RH.

10) Meter size: 160x80x110 mm. Panel cutout: 156x76 mm

11) Power Supply: 85-240V AC/DC, 50/60Hz.
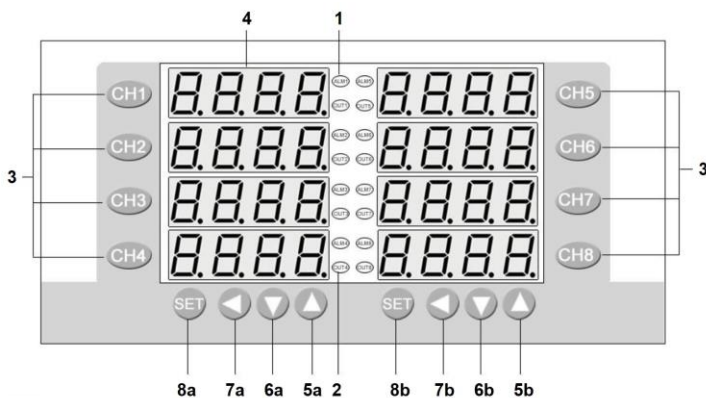
12) Wattage: less than 5W

2. Front Panel

Figure 1. Front keypad and indicator

1. ALM indicator (ALM1 ~ 8): Not available in this model
2. Output indicator (OUT1 ~ 8): It is synchronized with control output and the power to the load. When it is on, the output for channel n is enabled.
3. Menu selection key (CH1 ~ 8): Hold this key for 3s to enter the parameter menu for that channel.
4. PV display: Display the measured value for that channel (PV).

5. Up key: Increases numeric value of the setting value. Key 5a for channel 1 ~ 4, key 5b for channel 5 ~ 8.
6. Down key: Decrease numeric value of the setting value. Key 6a for channel 1 ~ 4, key 6b for channel 5 ~ 8.
7. Shift key: Shift digits when settings are changed. Key 7a for channel 1 ~ 4, key 7b for channel 5 ~ 8.
8. SET key: Hold this key for 3s to enter system parameter menu. Key 8a for channel 1 ~ 4, key 8b for channel 5 ~ 8.

Setting notes:

For channel 1 ~ 4, in parameter setting mode, channel 1 display will show the parameter name. Channel 2 display will show the parameter value. To change any parameter, use left keypads (5a, 6a, 7a and 8a) to operate.

For channel 5 ~ 8, in parameter setting mode, channel 5 display show the parameter name. Channel 6 display will show the parameter value. To change any parameter, use the right keypads (5b, 6b, 7b and 8b) to operate.
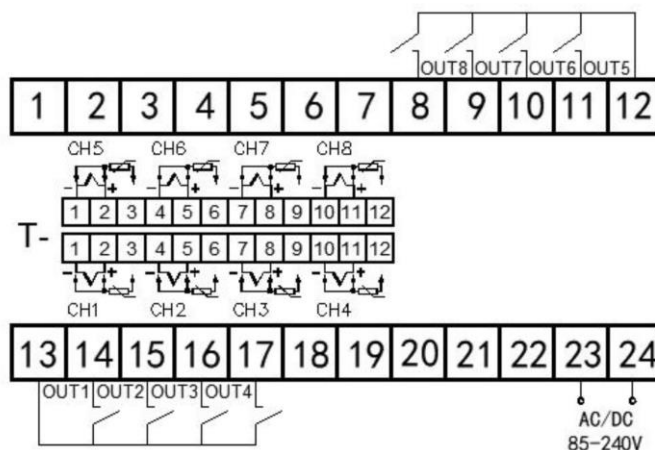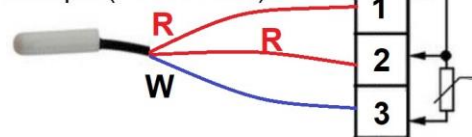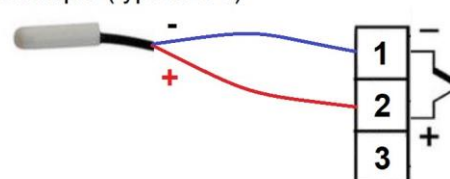
3. Terminal Wiring

Figure 2. Terminals

Figure 3. Thermocouple/RTD wiring examples

Channel 1 sensor wiring example:

For three wires PT100 RTD, it has two same color wires and one different color wire. Connect one different color wire on pin 3. Connect two same color wire on pin 1 and 2.

For two wires PT100 RTD, connect one wire on pin 2. Connect another wire on pin 3. Connect one jumper from pin 1 to 2.

For thermocouple, connect positive wire on pin 2. Connect negative wire on pin 1. For US color code (type K), yellow is positive and red is negative. For import color code (type K), red is positive and blue is negative.

4. Parameter Setting

Table 1. Parameter list

| Code	Name	Description	Setting range	Initial Setting
System parameters (first layer of menu)				
LocK	Parameter lock	LOCK = 18: all parameters unlocked LOCK ≠ 18, all parameters locked	0 ~ 50	18
TS	Input type	Thermocouple: K, E, J, T, S; RTD: Cu50; Pt2 (pt100)	-	K
ALP		Reserved parameter	-	0
Kt	Cycle time	Output cycle time	-	10
Dp	Decimal point position	Set the position of the decimal point for the measured value.	0-1	1
P-SH	Display high limit	Input display range.		999.9
P-SL	Display low limit			0.0
CF	Display unit	C: Celsius F: Fahrenheit	C, F	C
Addr		Reserved parameter	-	1
Baud		Reserved parameter	-	9600
Parameters for each channel (second layer of menu)				
"n" is the channel number. For example, SP1 is the set value for channel 1				
SP(n)	Set Value for channel 1 ~ 4	Set the temperature set value (SV) for each channel	P-SL ~ P-SH	100.0
AL(n)		Reserved parameter		300.0
Pb(n)	Input offset	Pb is used to set an input offset to compensate the error produced by the sensor or input signal itself.	±20.0	0.0
kP(n)	Proportional Constant	Set when PI or PID control is performance. **When P = 0, the controller is under ON/OFF mode. This parameter will in use when it is not zero.**	1 ~ 100	0.0
kI(n)	Integral time	Eliminates offset occurring in proportional control.	0 ~ 3000	240
kd(n)	Derivative time	Prevents overshoot and/or undershoot caused by integral action effect.	0 ~ 2000S	30
Hy(n)	Hysteresis band (for ON/OFF mode)	The Hysteresis Band parameter Hy is also referred as Dead Band, or Differential. This 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.	0.1 ~ 50.0	0.5
AT(n)	Auto tuning	1: Auto-tune is ON 0: Auto-tune is OFF	On, off	Off
COL(n)	Control mode	0: Heating mode 1: Cooling mode	0 ~ 1	0
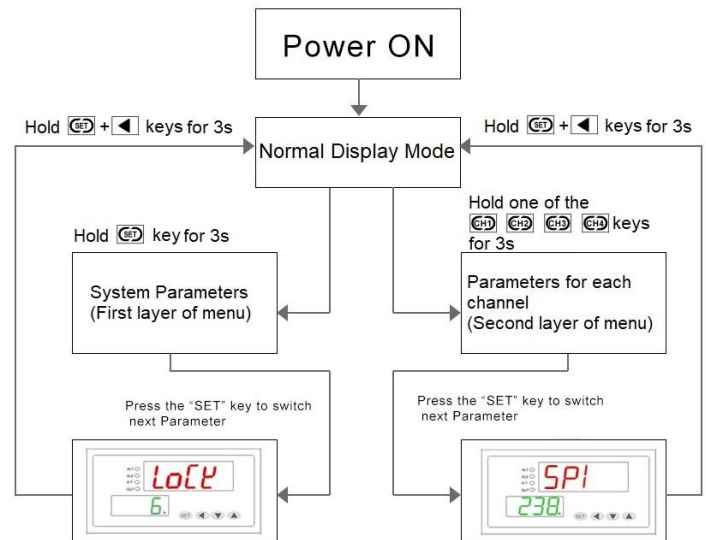
Figure 4. Operation flow chart

4.1 Change system parameters (first layer of menu)
Hold SET key for about 3 seconds and you will enter the first level menu. Channel 1 or 5 display will show the parameter name and channel 2 or 6 display will show the parameter value. Press ◄(shift key), ▲ and ▼ keys to change the parameter value. Press SET key to save the change and change to the next parameter.

4.2 Change parameters for each channel (second layer of menu)
Hold CH1 ~ CH8 key for about 3s to enter the parameters for that channel. Similarly, press ◄(shift key), ▲ and ▼ keys to change the parameter value. Press SET key to save the change and change to the next parameter.

For Channel 1 ~ 4, use the left keypad (5a, 6a, 7a and 8a) to operate. For Channel 5 ~ 8, use the right keypad (5b, 6b, 7b and 8b) to operate.

5. Alarm & output modes
This thermometer has four separate dry relay outputs. They can be used as fully functional PID outputs (relay outputs), or they can be used as absolute high/low alarm or ON/OFF control mode.

For absolute high temperature alarm, please set kP(n) to 0 and COL(n) as 1. So when PV(n) is over SP(n) + Hy(n), output will be enabled. When PV(n) is below SP(n) – Hy(n), output will be disabled.

For absolute low temperature alarm, please set kP(n) to 0 and COL(n) as 0. So when PV(n) is below SP(n) - Hy(n), output will be enabled. When PV(n) is over SP(n) + Hy(n), output will be disabled.

ON/OFF mode will be very similar to the alarm above. Please set kP(n) to 0 and set COL(n) to 0 as heating mode and 1 as cooling mode. Then, set the Hy to the desired range based on control precision requirements. Smaller Hy values result in tighter temperature control, but also cause the on/off action to occur more frequently.
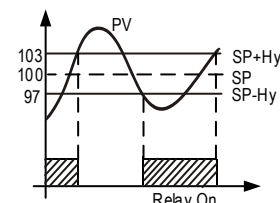

Figure 5. Output example. kP(n) = 0, COL(n) = 0. Low temperature alarm or heating mode. Relay off when PV ≥ SP + SV; relay on when PV ≤ SP – SV.

6. Auto-tune.

Auto-tune is only needed if you want to use the PID mode in this meter. For first-time users, or if the current control result is not good enough, users may need to use auto-tune function to let the controller determine the parameters automatically. If the auto tuning results are not satisfactory, you can manually fine-tune the PID constants for improved performance. Or you can try to modify the initial PID values and perform auto tune again. Sometimes the controller will get the better parameters.

To start auto-tune, users need to set the At parameter for that specific channel to 1. Please set the set point (SP) and hysteresis band (Hy) properly before the auto-tune. During this process, the instrument executes the on-off control. After 2-3 times on-off action, the microprocessor in the instrument will analyze the period, amplitude, waveform of the oscillation generated by the on-off control, and calculate the optimal control parameter value. The instrument begins to perform accurate artificial intelligence control after auto tuning is finished. Generally, you will need to perform auto tuning once. After the auto tuning is finished, the instrument will set parameter "At" to 0 automatically. This will prevent an accidental repeat of the auto-tuning process.

Note:
1. If there is a power outage during the auto-tune, once power is resumed, the auto-tune process will be resumed as well.
2. To exit the auto-tune, please change parameter At back to 0.
3. Auto-tune is only for one channel only. For optimize results, it is recommended to run auto-tune for each channel separately.

Auber Instruments Inc.
5755 North Point Parkway, Suite 99,
Alpharetta, GA 30022
www.auberins.com
Email: info@auberins.com