

User Manual LTC-70 Commercial Cabinet Temperature Controller

1. Product overview

1.1 Configuration

A	30	17/10/NO	10/NO	10/NO	10/NO	S	2	B	C / L	W	NO-110-220
	Compressor	Defrost	Fan	Light	Defog	Cabinet temperature sensor	Evaporator sensor	Buzzer	C:Insert way L:Wire connection	The color of the panel w: white b: black N: customer settings	NO-110/220 Power supply 110 Only used for 110V 220 Only used for 220V
Ex.:A(30.17.10.10.10)S2.L.w = (Compressor30A.Defrost17A.Fan10A.Light10A.Defog10A)Above two sensors . Wire connection . white panel											

Note: The number represents the relay contact capacity.

1.2 Application

- LTC-70 can be used in air cooling vertical cabinets, medium and low temperature medicine cabinets, kitchen cabinets, supermarket display cases and split cabinets, air curtain cabinets, island cabinets, convenient cabinets, wine cabinets, etc.
- The controller adopts modular design concept. Users can select defrost, fan, light/external alarm according to their demands, defog.
- Optional is evaporator sensor, condenser sensor, door switch and buzzer.
- Refrigeration relay output reaches up to 30A/240VAC, which can directly drive single-phase 1.5HP compressor.
- Color digital display, work status symbol display, temperature display resolution 0.1, front panel waterproof grade IP65.
- It has temperature sensor self-test function. It is equipped with multiple protection and alarm modes in case system fault is detected.
- Temperature measuring unit switches between Celsius and Fahrenheit.
- With the function of synchronous defrost switch signal detection, it can form a network of real-time timing synchronous defrost.
- Two modes for over cabinet temperature alarm: absolute value and relative value.
- Light/external alarm relay can be selected by the software. When external alarm relay is enabled, remote alarm bell can be connected.
- With the complete control logic of hot-gas defrost start without the pressure difference in the refrigerant pipe, to prevent compressor from starting with the pressure so as to lengthen its service life.

2. Operation and display panel



3. Specification

Mounting size: 137.5 *33 mm Product size: 148 *43.5 *47.5 mm

4. Technical parameters

- Temperature measuring range: -50℃~90℃ or -58°F~194°F (only when sensor calibration is set as 0)
- Temperature control range: -50℃~85℃ or -58°F~185°F
- Resolution: 0.1℃ or 1°F
- Accuracy: ±1℃(-40℃~50℃), ±2℃(51℃~70℃), ±3℃(others); or ±2°F(-40°F~122°F), ±4°F(123°F~158°F), ±6°F(others)
- Power supply: 220VAC ±10% 或 110VAC ±10% 或 110VAC-220VAC ±10% 50/60Hz(Customized according to requirements)
- Overall power consumption: <5W
- Input: cabinet sensor, evaporator sensor, condenser sensor / door switch (When the door is open, sensor outputs normally open signal) .(When door is open, sensor signal: normal open)
- Front panel waterproof grade: IP65
- Operating ambient temperature: 0℃~55℃
- Storage temperature: -25℃~75℃
- Relative humidity: 20%~85% (non-condensing)

5. Indicator status description

Indicator	Symbol	Status	Meaning
Setting	Set	ON	Parameter settings
		OFF	Temperature measuring and controlling status
Refrigeration		ON	Refrigeration runs.
		OFF	Refrigeration stops.
		FLASH	Refrigeration delays.
Defrost		ON	Defrost runs.
		OFF	Defrost stops.
Fan		ON	Fan runs.
		OFF	Fan stops.
Defrost dripping	drip	ON	Start defrost dripping
		OFF	Stop defrost dripping
Door signal		ON	Door switch turns on.
		OFF	Door switch turns off.
Defog		ON	Defogging runs.
		OFF	Defogging stops.

6. Parameter list

Menu	Description	Setting range	Default	Unit
User menu				
St	Temperature set-point	Lower limit ~ Upper limit	4℃	℃/°F
Po	Administrator menu password	(Password is 55 and cannot be changed)	00	/
Administrator menu				
C1	Control hysteresis	0.5℃~9.0℃	4.0℃	℃/°F
		1°F~20°F		
C2	The Min interval between switch-off	0~60	5	min
C3	Min interval between initial switch-on	0~90	5	min
C4	Cabinet sensor calibration	-10.0℃~10.0℃	0.0℃	℃/°F
		-20°F~20°F		
C5	Lower limit of temperature set-point	-50℃~ Temperature set-point	-2℃	℃/°F
		-58°F~ Temperature set-point		
C6	Upper limit of temperature set-point	Temperature set-point~85℃	22℃	℃/°F
		Temperature set-point~185°F		
C7	Max standby time after Min interval	0~90	9	min
C8	Min refrigeration running time	0~90	0	min
d1	Evaporator sensor selection	0: Disabled	1	/
d2	Evaporator sensor calibration	-10.0℃~10.0℃	0.0℃	℃/°F
		-20°F~20°F		
d3	Defrost cycle calculation	0: Accumulated refrigeration time	1	/
d4	Defrost cycle	0~90	2	hour
d5	Defrost status display	0: Display cabinet temperature;	2	/
d6	Max defrost time	1~90	25	min
d7	Defrost stop temperature	0℃~50℃	12℃	℃/°F
		32°F~122°F		
d8	Dripping time after defrost	0~60	2	min
d9	Cabinet temperature display delay	0~90	10	min
d10	Defrost start delay	0~60	10	min
d11	Defrost mode	0: Electric heating defrost	0	/
F1	Fan running mode	0: Fan and compressor run or stop simultaneously	3	/
F2	Fan start delay after the controller is	0~60	4	min
F3	Fan start delay after defrost	0~60	2	min
F4	Lowest fan running temperature	-50℃~ Highest fan running temperature	-12	℃/°F
		-58°F~ Highest fan running temperature		
F5	Highest fan running temperature	Lowest fan running temperature~85℃	-5	℃/°F
		Lowest fan running temperature~185°F		
A1	Compressor run and stop in a	0: Disabled	1	/
A2	Compressor stop time in the mode of	1~60	5	min
A3	Compressor start time in the mode of	1~60	30	min
A4	Buzzer alarm output switch	0: Disabled	1	/
A5	Cabinet temperature lower limit alarm value	-50℃~ Cabinet temperature upper limit alarm value	-10℃	℃/°F
		-58°F~ Cabinet temperature upper limit alarm value		
A6	Cabinet temperature upper limit alarm value	Cabinet temperature lower limit alarm value~85℃	24℃	℃/°F
		Cabinet temperature lower limit alarm value~185°F		

Menu	Description	Setting range	Default	Unit
A7	Over temperature limit alarm delay	0~60	20	3 min
A8	Initial over temperature limit alarm	0~60	40	3 min
A9	Upper deviation in over temperature alarm	1℃~30℃	10℃	℃/°F
		1°F~60°F		
A10	Lower deviation in over temperature alarm	1℃~30℃	5℃	℃/°F
		1°F~60°F		
A11	Over temperature alarm mode	0: Absolute temperature point	0	/
A12	Light/Alarm relay selection	0: Light output	0	/
do1	Control output of door switch	0: Door switch is canceled.	0	/
do2	Whether buzzer responds when the	0: No	0	/
cd1	Condenser sensor selection	0: Disabled	0	/
cd2	High condenser temperature alarm start value	30℃~90℃	55℃	℃/°F
		86°F~194°F		
cd3	Lower hysteresis of condenser in high temperature alarm	1℃~15℃	5℃	℃/°F
		2°F~30°F		
u1	Celsius /Fahrenheit selection (note ②)	00: Fahrenheit	01	/
		01: Celsius		

Note 1:Valid only when the cabinet sensor is working normally.

Note 2:After switch between Celsius/Fahrenheit ,users need to adjust all related parameters to make sure correct parameter settings.

Note 3:Product parameters if any adjustment, this manual is not further notice.

7. Keys function

7.1 Keys description

Name	Functions	Action
	Enter measuring and controlling mode, it displays normal measured and control value	Press and hold for 3s
	Exit measuring and controlling mode, it displays "—" (except for light control)	Press and hold for 3s
SET	Enter the status of parameter settings	Press and hold for 3s
	Switch between menu and parameters	Press and respond
RST	View evaporator sensor temperature value	Press and respond
	Exit parameter setting status	Press and respond
	Forced switch between refrigeration, defrost/defrost delay and defrost dripping	Press and hold for 3s
▲	Adjust menu and parameters	Press and respond
	Upload parameters to copy card	Press and hold for 3s
▼	Adjust menu and parameters	Press and respond
	Download parameters from copy card	Press and hold for 3s
	Turn on/off light	Press and respond
	Turn on/off defogging	Press and respond

7.2 Keys operation

1) Measuring and controlling mode

In temperature measuring and controlling status, press the key for 3 seconds to exit normal temperature measuring and controlling mode, i.e. to shut down current output (except light control); it displays "-." at this time. Then press for 3 seconds to enter normal temperature measuring and controlling mode; other relays (except light relay) run as the controller is energized for the first time; it displays the measured value.

2) Parameter adjustment

In temperature measuring and controlling status, press the key **SET** for 3 seconds to enter user menu; it displays St. Press **SET** again to view the value of St; press **▲** or **▼** to modify the temperature set-point. When it displays St, press **▲** to display Po, then press **SET** to display 00, use **▲** or **▼** to enter administrator menu password. When it displays St, press **▲** to display Po, then press **SET** to display 00, use **▲** or **▼** to enter administrator menu password. After entering the password, press **SET** to confirm and display Po. The controller will automatically verify the password. When it passes verification (enters administrator menu), press **▲** or **▼** to select parameter items St, Po, C1, C2.....u1 (i.e. any parameter items of user menu and administrator menu). If verification fails, the controller will stay at St and Po without displaying other parameter items.

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When certain parameter item is selected, press **SET** to set the parameter, press ▲ or ▼ to adjust the value, and then press **SET** to return to the menu.

In parameter setting status, press the key $\frac{SET}{\text{ESC}}$ or press no key within 30 seconds to exit parameter settings and automatically save the current parameter value.

Note: The password input of administrator menu is only valid for single entering. After exiting parameter settings by pressing $\frac{SET}{\text{ESC}}$, to adjust parameter next time requires inputting the correct password again.

3) Temperature view:

In temperature measuring and controlling status, press $\frac{SET}{\text{ESC}}$ to view the current measured temperature value of evaporator sensor (Note: evaporator sensor is enabled and works properly).

4) Manually forced operation

In temperature measuring and controlling status, press $\frac{SET}{\text{ESC}}$ for 3 seconds to force switch between refrigeration, defrost/defrost delay, defrost dripping; press $\frac{SET}{\text{ESC}}$ to turn on or off the light (Only valid when light/alarm relay is used as light relay and there is no linkage between light control and door switch.); press $\frac{SET}{\text{ESC}}$ to open or close defogging output; press $\frac{SET}{\text{ESC}}$ for 3 seconds to shut down current measuring and controlling output (except light control).

8. Control output

8.1 Refrigeration

In normal status:

When cabinet temperature > temperature set-point (St) + control hysteresis (C1), and the Min interval between switch-off of the compressor and the successive switch-on elapses, refrigeration outputs;

When cabinet temperature < St, and the continuous refrigeration running time > C8, refrigeration stops;

When cabinet temperature is between St and St + C1, refrigeration stops, the Min interval between switch-off of the compressor and the successive switch-on and C7 elapse, refrigeration outputs.

Note: The Min interval between switch-off of the compressor and the successive switch-on is calculated per C3 after the controller is energized for the first time, and it will be calculated per C2 later on.

In cabinet sensor fault:

A1=0, "run/stop in a proportional time" is disabled, and refrigeration stops;

A1=1, "run/stop in a proportional time" is enabled, and the compressor runs in cycle according to A3 and A2.

8.2 Defrost:

1) d4 = 0, defrost is disabled.

2) d4 ≠ 0, not in the state of defrost nor defrost dripping:

① Evaporator sensor is enabled (d1 = 1), and evaporator sensor temperature > defrost stop temperature (d7), defrost cannot be started;

② d1 = 1, and evaporator sensor temperature < d7 or evaporator sensor is disabled (d1 = 0) (In any of the following conditions defrost cannot be started) :

a. When defrost cycle (d4) elapses, defrost starts;

Note: d4 is calculated according to the selected natural time (d3 = 1) or accumulated refrigeration time (d3 = 0) ;

b. Press $\frac{SET}{\text{ESC}}$ for 3 seconds to start defrost;

c. If the door switch works as the input interface of synchronous defrost signal (do1 = 4), when the door opens, i.e. the external synchronous defrost signal inputs, defrost starts.

Note: When defrost start delay (d10) elapses, defrost outputs.

3) In defrost state (defrost stops in any of the following conditions) :

① Evaporator sensor is enabled (d1 = 1), and evaporator sensor temperature > d7, defrost stops;

② When Max defrost time (d6) elapses, defrost stops;

③ Press $\frac{SET}{\text{ESC}}$ for 3 seconds to stop defrost.

4) In defrost dripping state, refrigeration output is disabled within dripping time after defrost (d8), drips will be drained during this period. After d8 elapses, it enters the status of refrigeration cycle.

Note: During defrost, it displays:

d5=0: actual cabinet temperature;

d5=1: dEF during defrost and cabinet temperature display delay after defrost (d9); cabinet temperature after d9 elapses;

d5=2: dEF during defrost and defrost dripping;

d5=3: cabinet temperature on defrost start during defrost and defrost dripping

Defrost mode:

d11=0: Electric heating defrost

d11=1: Hot gas defrost

8.3 Fan:

Fan running mode:

F1 = 0: Fan and compressor run or stop simultaneously;

F1 = 1: Fan runs continuously, and stops during defrost;

F1 = 2: Fan runs continuously, and stops during defrost and defrost dripping;

F1 = 3: Fan runs continuously and stops during defrost. Fan starts after F3 elapses.

F1 = 4: Fan is controlled by defrost sensor temperature, and stops during defrost. (Fan stops when defrost sensor temperature > highest fan running temperature (F5), defrost sensor temperature < lowest fan running temperature (F4), defrost sensor fails, defrost sensor is disabled (d1=0), and in the status of defrosting)

do1 = 1 or 3, when cabinet door is open, fan turns off; when the door is closed, fan returns to the running status before the door is open.

Note: When fan start delay after the controller is energized for the first time (F2) elapses, fan is allowed to run.

8.4 Light:

do1=0 or 1 or 4: Press $\frac{SET}{\text{ESC}}$ to turn on the light, and press it again to turn off the light.

do1=2 or 3: When door is opened / closed, the light is turned on / off.

Note: A12 = 0, light/alarm relay works as light relay. Light relay will close when the light is turned on and it will open when the light is turned off.

8.5 Defog

Press $\frac{SET}{\text{ESC}}$ to start defogging. Press it again to stop defogging.

8.6 Internal alarm

Temperature sensor fault alarm:

When cabinet sensor fails, it displays E1;

When evaporator sensor fails, it displays E2;

When condenser sensor fails, it displays E3;

High condenser temperature alarm: If the condenser sensor is enabled (cd=1), when the condenser temperature > cd2, it will alarm and display cH, not affecting control output. When the temperature falls back to cd2 – cd3, the alarm is released.

Over cabinet temperature alarm mode:

A11=0, the alarm mode is absolute temperature point. When cabinet temperature > cabinet temperature upper limit alarm value (A6) and over cabinet temperature alarm delay elapses, it displays rH. When cabinet temperature < A6, alarm is released. When cabinet temperature < cabinet temperature lower limit alarm value (A5), and over cabinet temperature alarm delay elapses, it displays rL. When cabinet temperature > A5, alarm is released.

A11=1, the alarm mode is set-point + over temperature alarm deviation. When cabinet temperature > temperature set-point (St) + upper deviation in over temperature alarm (A9) and over cabinet temperature alarm delay elapses, it displays rH. When cabinet temperature < St + A9, alarm is released. When cabinet temperature < St - lower deviation in over temperature alarm (A10), and over cabinet temperature alarm delay elapses, it displays rL. When cabinet temperature > St – A10, alarm is released. Note: Over cabinet temperature alarm delay is calculated per A8 after the controller is energized for the first time, and it will be calculated per A7 later on.

If buzzer alarm output switch is enabled (A4 = 1), buzzer beeps when it alarms and door switch is turned on (do2 = 1). When all alarm is released and door switch is turned off (do2 = 1), buzzer mutes or press any key to mute beeping.

Alarm code	Causes
E1	Cabinet sensor fault
E2	Evaporator sensor fault
E3	Condenser sensor fault
cH	High condenser temperature alarm
rH	High cabinet temperature alarm
rL	Low cabinet temperature alarm

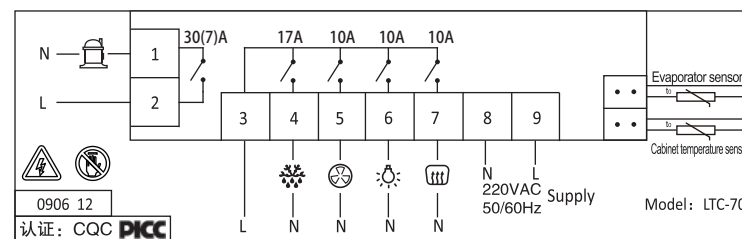
8.7 External alarm output (A12=1):

The external alarm relay will close when there is alarm or door switch is turned on (do2 = 1), and it will open when all alarm is released and door switch is turned off (do2 = 1).

8.8 Controller output status description

Defrost mode / System status	Electric heating defrost	Hot gas defrost
	Refrigeration output	Compressor is on. Electric heating is off
Defrost delay	Compressor is off. Electric heating is off.	Compressor is off. Four-way valve is on.
Defrost output	Compressor is off. Electric heating is on.	Compressor is on. Four-way valve is on.
Defrost dripping	Compressor is off. Electric heating is off.	Compressor is off. Four-way valve is on.

9. Wiring diagram



Note :Please refer to the actual wiring diagram on the product.

10. Safety rules:

★ Danger:

- 1) Do distinguish the ports of sensor lead, power line and output relay. Please do not connect lines wrong. The relay cannot be overloaded.
- 2) Wiring requires disconnection of power supply first.

★ Warning:

The controller is forbidden to be used in water or too humid environment, high temperature, strong electromagnetic interference or strong corrosion environment.

★ Notice:

- 1) The power voltage must be in accordance with the voltage labeled on the controller. Please ensure the stability of power voltage.
- 2) Suggest to keep suitable distance between sensor lead and power line to avoid possible interference.
- 3) In installing evaporator sensor, the sensor should be placed closely to the copper pipe 5 cm to the evaporator inlet. Please ensure the sensor keeps good contact with the copper pipe.
- 4) Remove the sensor by slightly plugging out its end downwards.