CDC80..: instructions for installation and use

Before you proceed with the installation of the CDC 80, we suggest you read this entire instruction sheet carefully, to obtain maximum performance and safety.

CDC 80 is a compact defrost controller for small and medium-sized fridge's, freezers, coldrooms or display counters, capable of driving medium power loads directly. It integrates the following functions:

- **THERMOSTAT**
- **DEFROST CONTROL AND OPTIMISATIONS**
- **REMOTE DEFROST CONTROL**
- **EVAPORATOR FAN CONTROL**
- **DOOR SWITCH INPUT**
- **MULTI SOURCE ALARM CONTROL**
- **THERMAL MASS SIMULATION**
- **SERIAL COMMUNICATION WITH PC OR REMOTE DISPLAY**

1. Installation

1.1 The instrument must be snapped on a 0.7.. 1.5mm thick panel, through a 182x81mm. Make sure that there is no gap between the rubber gasket and the panel.

1.2 For proper functioning the instrument needs an ambient temperature between -10 ...+50 C and 15%...80% rH.
To reduce the effects of electro-magnetic interference, place the cables carrying signals (probes and serial connections) and the controllers as far away as possible from the power lines.

1.3 Probes, power supply and outputs/inputs must be wired strictly following the diagram appearing on the technical sheet. The probe screen must not be connected to any other leads.
WARNING!: the back of the instrument is connected to the mains. Beware of **electrical shocks;** an accidental contact may be fatal to persons or animals.

1.4 Probe 1 measures "air temperature" and is used for thermostat function; probe 2 measures the evaporator temperature and must be secured to it in a place where maximum formation of frost occurs.

1.5 The remote defrost input needs an external activation voltage between 10...16 Vac; 10 mA. When the circuit is closed defrost starts.

1.6 The door switch must be of a type suitable to control an electronic circuit; the contact must be closed. The auxiliary input (!), if closed, lights up the relevant LED on the panel. It may be used, as an example, to signal a failure in the refrigerating unit.

CAUTION:
-Where delicate or valuable products have to be maintained in special conditions, we recommend not to use the same instrument for both control and limit functions.

-If the relays switch a large load frequently, we suggest you contact us to obtain information about the relay contact life.

2. Displays

In some cases, owing to the structure of the cabinet or air stratification, the probes can not measure the desired temperature. If necessary, through the parameters **oS1, oS2** and **oS3** the temperatures **t1** and **t2** measured by the probes can be adjusted in order to obtain the desired values for computing: thermostat T1=t1+oS1; defrost T2=t2+oS2; display T3=t1+oS3
Ex.: setpoint= -20; oS1= -2; oS3= +6, temperature t1 will be controlled at –18 and the display will show –12 .

1.6 At the power up, the display shows "_" for 5 sec. during which the unit carries out a self-check. Then, if the CDC isn't in stand-by, temperature T3 appears.

1.7 To display the instantaneous temperatures T1, T2 or T3 press [DOWN] , [DEFR] or [ALT] respectively.

2.3 The optional remote display CDCREMOTO repeats the indications of the controller to which it is connected, except during the alarms which are indicated with "_". When a fault in communication occurs, the remote unit shows "..-.." (only the line in the centre).

2.4 Through the serial communication it is possible to switch off the controller; this stand-by status is signalled by a permanent "---" also, if the local settings are remotely inhibited, when attempting to perform any changes the display shows "inh".

* When writing [KEY]+[KEY] it's meant that keys are presses sequentially and kept pressed.

3. THERMOSTAT FUNCTION

at power-up the cooler start is delayed by the sum of **coF** and **crS**; thist latter is used in those applications where it is necessary to avoid several simultaneous compressor starts which may cause line overload. For ex.: coF=03, crS=05; aster power-up, at least 03 min, and 05 sec, must elapse before the cooler starts.
CoF and **con** are, respectively, the cooler minimum off and on time. The relay which controls the cooler, after switching off/on or on/off, will remain in that status for at least the pre-programmed time. When you have to maintain a very small hysteresis **hYS,** we recommend to program a suitable value for **coF** and **con** to ensure a long life to relay/contactor and compressor.
The temperature control is based on the comparison between temperature T1 and setpoint, of which value is displayed by pressing [thermostat key]. To change it, keep [thermostat key] pressed and by pushing the up and down arrows, select the desired value within the limits **SPL** and **SPh**.
The cooler on switching temperature is achieved by adding **hYS** to the setpoint.
Ex.: setpoint=-20°C; hYS=04, the relay is off with T1=20°C and on with T1=-16°C.
When a failure or over range of probe 1 occurs, the display shows "PF1" and the cooler run isn't controlled according to setpoint but determined by **cdc** which represents the cooler duty cycle, i.e. (on time)/(10 minute cycle). For Ex.: 04= 4 min. on time, 6 min. off time.

The **cdc** value has to be set taking into consideration the normal cooler duty cycle. This function allows to avoid damage to the goods when the actual temp. can't be measured as a result of probe failure.

4. Defrost Start

The moment when defrost must be started can be chosen according to:

4.1 REGULAR INTERVAL: this counting system, which is selected with **doP=con,** provides constant time between defrosts, determined by **drE.**

4.2 FROST ACCUMULATION: in this case, **doP=Acc,** the built-in timer counts only when a frost growth condition occurs (i.e. fin temperature lower than 0 C and below the dew point) until reaching the **drE** time. This optimisation system is particularly effective when the evaporator works at around 0 C; the defrost frequency is function to the thermal load and the climatic condition (external air temp. and humidity). If setpoint is much lower than 0 C, the frequency mainly depends on the cooler on times. Ex. if the cooler cycle is 5 min. run and 5 min. stop and **drE**=04h, defrost will Takes place every 8h approx.

4.3 REMOTE START: it allows to start a defrost remotely regardless of the time elapsed. This function permits to carry out defrosts not homogeneously spread in time or according to a given program. The activation of the remote start ANTICIPATES a defrost of which start is however determined by **drE**. In other words, when drE=12, if within 12 hours since the last defrost the controller does not receive the start signal, defrost will however take place. This function overlap avoids that a fault in the remote control or in the connection excludes any defrost.

4.4 MANUAL DEFROST: it is possible to manually start or abort defrost by pushing [DEFR.] + [MAN.].

5. Defrost Function

Regardless of the defrost start cause, the parameters that control it are: **dLi** determines the evaporator temp. which terminates the heating phase; **dto,** if greater than 0, provides a time-out for the heating phase. If set at 0, the evaporator heating only ends when temperature **dLi** is reached (time-out is excluded) or when the remote contact is opened.

After the heating phase, the dripping time **drP**, by delaying the cooler re-start, allows a homogeneous heat spread all over the evaporator and the drain of drops of water.

During defrost the display is controlled according to the parameter **diS** , if 00 the temperature continues to be displayed. If **diS**= -01, then the display shows "dEF" since defrost start as long as the temperature T1 is higher than setpoint+hyst. By programming a value between 1 and 30 min., after the defrost "dEF" is still displayed until the time programmed has elapsed unless the above condition is reached before.

The ice melting method, determines the activation of the outputs and is chosen among the following:

5.1 AIR BLOWING: **dty=Fan,** this method is applicable where the setpoint is higher than 0 C and no heating element is used. In this case the

evaporator fans are kept on, cooler and defrost outputs are off.

5.2 ELECTRIC HEATER: **dty=ELE,** when defrost starts, the cooler is switched off and the defrost output on.

5.3 HOT GAS: **dty=GAS,** this method uses the hot gas coming out of the compressor to heat the evaporator therefore defrost and cooler outputs are on.

After a power failure the defrost time re-starts the counting from the point where it is interrupted, with 30 min. approximation. Nevertheless, the start is delayed by an amount of time that is determined by the **crS** value expressed in minutes. This function is used in those applications where it's necessary to avoid simultaneous defrost start of several plants.

For ex. **crS**=02; if a power failure occurs after 04h51 of timer counting and returns after 5 min., the timer is reloaded with 04h28.

The defrost LED is lit when the corresponding output is On; it blinks during defrost through "air blowing" and dripping time.

When probe 2 is faulty, any new defrost is inhibited.

6. Evaporator Fan Control

To obtain the best temperature and humidity regulations within the refrigerator, it's important to suitability control the evaporator fans during the cooler process. With parameter **Fct** the fans can be controlled in three different ways. With –01, the fans work continuously; if 00 the fans are stopped simultaneously with the cooler. By setting a value between 1 and 10 min., after the cooler stops, the fans continue to run for the programmed amount of minutes. The fans are switched on simultaneously with the cooler.

During and immediately after defrost, the fans are controlled by the parameters **Fid** and **FrS.**

6.1 FAN STOP: **Fid=00,** at the start all through defrost the fans are off; they are switched on again, after compressor re-start, when the evaporator reaches the **FrS** temperature.

6.2 PARTIAL VENTILATION: **Fid=01;** in this case the fans are active as long as the evaporator has a temperature lower then **FrS.**

6.3 CONTINUOUS VENTILATION: **Fid=02;** all through defrost the fans are on (even with dty=ELE or GAS).

7. Door input, Light and Stand-by

7.1 When the door is opened, the fans are stopped immediately and, if it remains open, after 5 mins. THE COOLER STOPS TOO. "ALM" blinks on the display, alarm raly and buzzer are switched on. The alarm signallings are permanently switched off by pressing any of the pushbuttons or by closing the door. In this letter case, cooler and fans resume their normal operation.

7.2 This light output is controlled directly by pressing the suitable key on the front. The on/off status is signalled by an LED, stored and resumed after a power failure.

7.3 The stand-by signalled by permanent "_", switches off all the outputs and puts the instruments to rest mode. CDC 80 can be put in or exit from stand-by by keeping key [O/I] pressed for 3 sec. This status is stored and

resumed after a power failure.

8. Alarm Function and Probe Failure

A check on the correct refrigeration plant function can be performed by monitoring temperature T1, T2 or T3, selectable via **Ain** parameter. **Alo** and **Ahi** determine, respectively, the lower and higher temperature alarm threshold.
AdL allows the control of the alarm function: with –01 the temperature alarm is excluded, while, if this parameter is 00, the alarm output is on immediately when the condition is detected. If **AdL** is programmed between 01 and 120 min. the temperature must constantly remain over the alarm threshold for the chosen time, before the signally takes place.
When the alarm is entered "ALM" blinks on the display, relay and buzzer are switched on. The signallings remain, **even when the alarm condition is over**, until the alarm is "acknowledged" by pressing any key. Now, if the temperature is within the alarm limits, any alarm indication disappears. Otherwise the current temperature is displayed alternating with "ALM", the relay is always on and, for 1 min. every 30, and the buzzer beeps; all this happens as long as the alarm condition persists.
As a result of probe failure or overrange, the display shows "PF1" or "PF2", the alarm output is switched on immediately, regardless of the set delay. Also in this case the condition must be acknowledged by pressing any key.
The alarm output contact is also closed when the instrument is powerless.
During defrost and dripping, the high alarm monitoring is inhibited.

9. Thermal Mass Simulation

This function has the purpose to simulate the behaviour of the thermal mass inside the refrigerator. It allows to avoid rapid fluctuations of the displayed temperature, resulting for example from door opening or defrost, but also to reduce hunting due to temperature control.
By setting a value for **SiM** parameter between 01 and 200 you define the mass to simulate; if set at 00 the display shows the instantaneous temperature T3=t1+oS3. The greater the programmed value, the greater the resulting slow down will be (ex. 100 approx. simulates a 0.5 l bottle of water).

10. Probe Re Calibration

Should it be necessary to recalibrate the unit, for instance in consequence of probe replacement, then act in the following way: get an accurate reference thermometer or calibrator; make sure that the offset **oSx** of the probe to be re-calibrated is 00; switch off then on the unit. During the self check (5 sec. from power-up), press [DEFR.]+[THERM.]+[DOWN]: **0A1** and **0A2** allow 0 C calibration, i.e. a constant offset across the whole range of the respective probe. **SA1** and **SA2** allow high temperature calibration to rectify a span error. After selecting the desired parameter, press [THERM.]+[UP] or [DOWN] to match the read-out value with one of the reference instruments (make sure the temp. is stable).

Exit from the recalibration occurs after 10 sec. of no key activation. Therefore, to avoid exit, keep [THERM.] pressed as long as you need.

11. Setup

CDC configuration is achieved by programming the control parameters, access to it is obtained by pressing [DOWN] + [THERM.] + [UP] for 4 sec. Scroll through the parameters by pressing [UP] or [DOWN] until you select the desired parameter. Check its value by means of [THERM.] and change it via [THERM.] + [UP] or [DOWN]. Exit from the SETUP occurs after 10 sec. of no key activation. To help yourselves during programming, refer to the table annexed.

12. Auxiliary Functions

CDC 80 can be fitted with RS485 serial port, in order to take part as a peripheral in a data communication network managed by a master PC supervisor. The database puts all measurement and control data on line as well as the output status. **Adr** is the unit identification number within the network.
Through serial communication it's also possible to change all control parameters (setpoint and set-up), start defrost cycle put the controller in stand-by or inhibit the instrument keyboard in order to avoid unauthorised access to the programming function.

WARRANTY

LAE electronic Srl warrant that their products are free of any defects in workmanship and materials for a period of 1 (one) year from date of production shown on the enclosure. LAE electronic Srl shall only repair or replace those products of which defects are due to LAE electronic Srl and recognised by their technicians. LAE electronic Srl are not liable for damages resulting from malfunctions of the products.
Defects due to exceptional operating conditions, misapplication and/or tampering will avoid the warranty.
All transport charges for returning the product to the manufacturer, after prior authorisation by LAE electronic Srl, and for the return to the purchaser are always for the account of the purchaser.

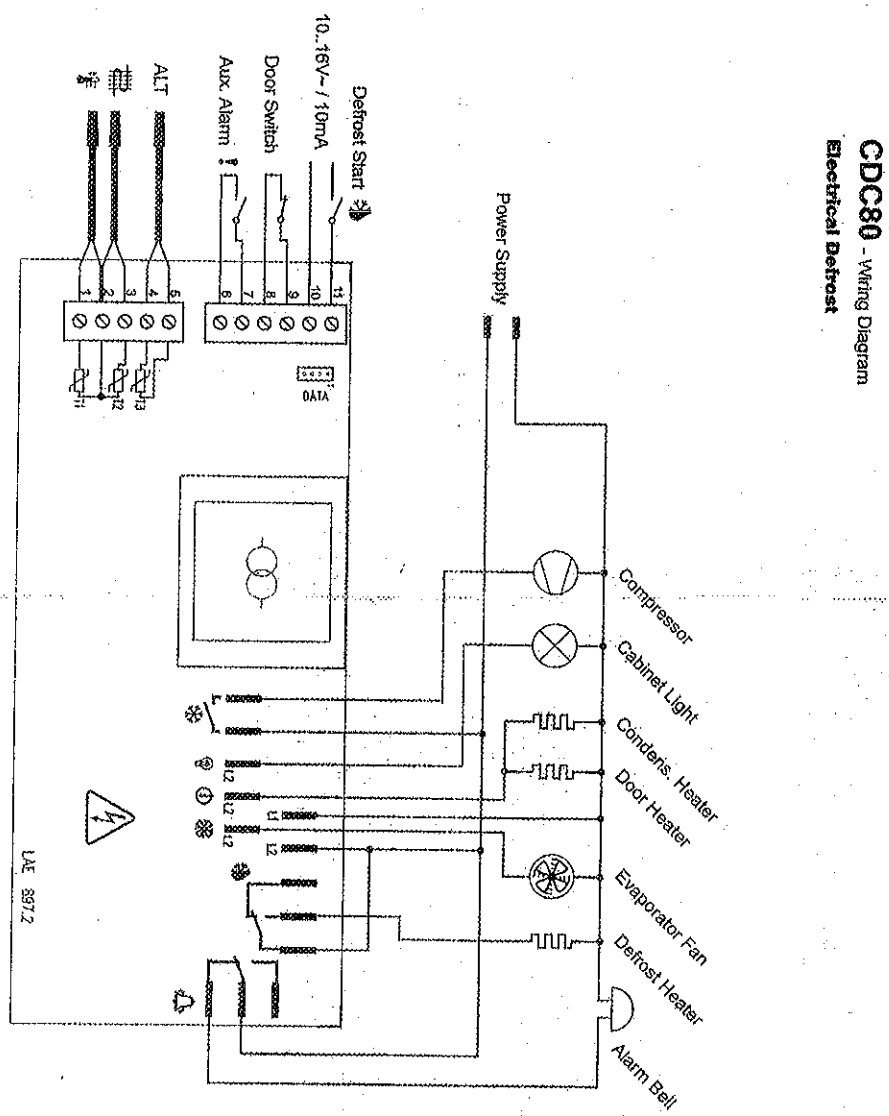
TECHNICAL DATA

Dimensions.....192x96x60mm
Operating temp.....-10 C...+50 C
Range..... -50 ...+150
Resolution..... 01
Sensor type.....PTC 1000
Relay rating.....ref. to data on unit
Probe connections.....terminal blocks
Relays and supply.....faston 6.3 mm

Power supply.....230 Vac, 10%; 50/60Hz
Consumption.....4VA
Front protection.....IP54

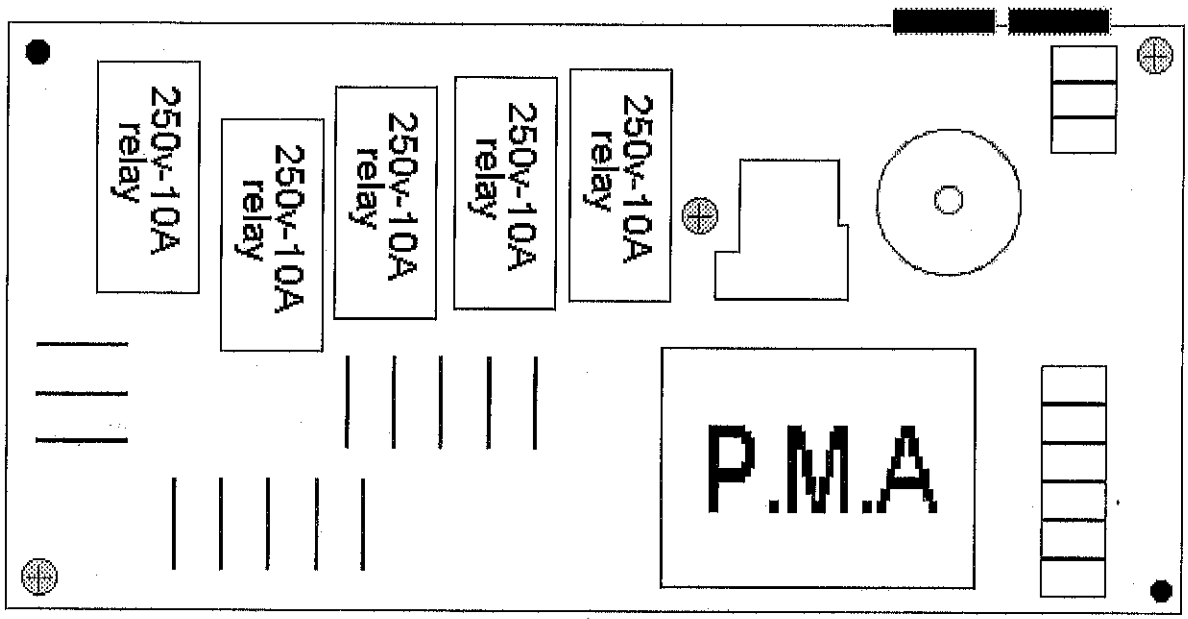
Par. N	Mnemonic and description	Minimum and maximum limit	Factory setting
1	**SPL** cooler minimum set	-50... ...+150	-30
2	**SPh** cooler maximum set	SPL... ...+150	+20
3	**hyS** cooler hysteresis	+01... ...+20	+02
4	**coF** cooler min. off time	00... ...10min.	00 min.
5	**con** cooler min. on time	00... ...10 min.	00 min.
6	**cdc** cooler duty cycle	00... ...10(0)%	05(0)%
7	**crS** cooler re-start	00... ...120 sec.	00 sec.
8	**drE** defrost repetition time	01... ...99 hours	06 hours
9	**dLi** defrost limit temperature	+01... ...+70	+10
10	**dto** defrost time out	00... ...120 min.	30 min.
11	**drP** dripping time	00... ...10 min.	03 min.
12	**diS** display in frost	-01...0... ...30 min.	10 min.
13	**dty** defrost type	Fan; ELE; GAS	ELE(ctrical)
14	**doP** defrost optimisation	con; Acc	con(tinuous)
15	**Fct** evaporator fan control	-01...00... ...10 min.	01 min.
16	**FrS** fan re-start after defrost	-50... ...+150	-10
17	**Fid** ventilation in defrost	00=off; 01=Te<FrS; 02=always on	00
18	**ALo**	-50...	-32

	low alarm threshold	...+150	
19	**Ahi** high alarm threshold	ALo... ...+150	+22
20	**AdL** temperature alarm delay	-01...00 120 min.	10 min.
21	**Ain** alarm input selection	01, 02, 03	01
22	**oS1** thermostat probe offset	-20... ...+20	00
23	**oS2** evaporator probe offset	-20... ...+20	00
24	**oS3** displayed probe offset	-20... ...+20	00
25	**SiM** thermal mass simulation	00... ...200	00
26	**Adr** peripheral number	000... ...255	01


CDC80 - Wiring Diagram
Electrical Defrost
Power Supply
Defrost Start
10..16V~ / 10mA
Door Switch
Aux. Alarm
ALT
DATA
Compressor
Cabinet Light
Condens. Heater
Door Heater
Evaporator Fan
Defrost Heater
Alarm Bell
LAE 8572

Important installation instruction
CDC80

Shown below is a simplified view of the circuit board.

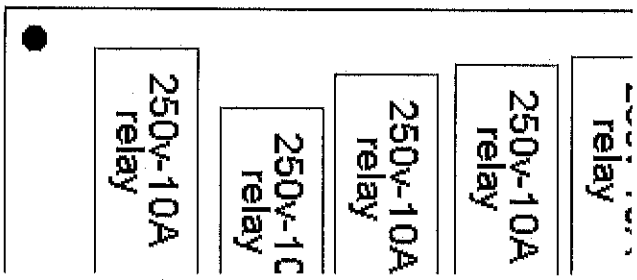


The are three screws shown:

- Bottom left corner
- Top right corner
- Centre of board

The remaining corners top left and bottom right, are secured when the back panel is screwed securely in to place.

When the corner shown below is not securely held in place by the black plastic back cover, the PCB will move when the control buttons are pressed. This slight movement prevents proper access to the set-up functions.



Ensuring that all three circuit board screws and the two back cover screws are firmly secure will allow successfull access to the set-up functions.