SEQUENCE CONTROLLER

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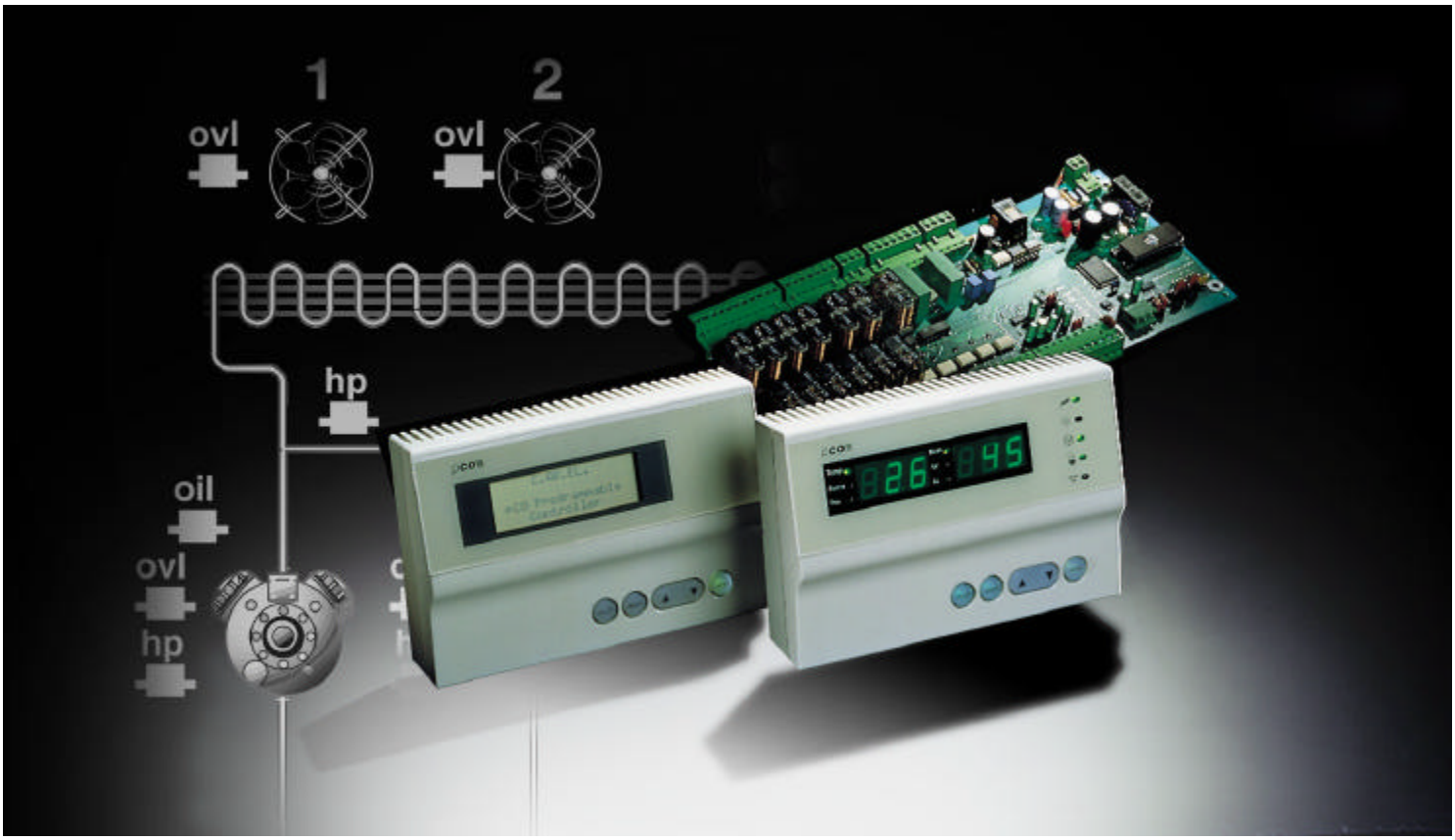

User manual

Programme code: **SEQ3.04**

Ref:

CAREL
Technology & Evolution

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OPERATING LIMITS

The McQuay sequencer is capable of controlling a system of Chillers or Heat Pumps, installed in a single system, in order to control the common leaving water temperature of the evaporators, for improved and complete system management.

The McQuay sequencer can control up to a maximum of 10 units installed in a single system,
The control point is a temperature probe installed in the common leaving water pipe from the units, reference ELWT (Evaporator Leaving Water Temperature)

The McQuay sequencer also has a second temperature probe CWTR (Cooling Tower Water Return) capable of controlling the cooling tower steps in the case where some water-condensed refrigerators are installed in the system (series WHR, WHS, PFS, WHZ, PEH, PFH, WSC, WDC).
In the case where a CTWR probe is installed, the number of units which can controlled is limited,
The sequener can only control a maximum number of 10 devices.

Example:

a) Up to 10 air-cooled units (ALS, ALR, AGR, ALZ) without any added control requiring the use of digital outputs.
b) In the case where cooling tower control is required, the maximum number of units controlled cannot exceed 10 minus GT,
GT being the number of Tower Steps to be controlled.
c) In the case where cooling tower control by inverter is required (without added On/Off steps), the maximum number of units controlled is 10.
d) In the case where control of a bypass valve on the cooling circuit is required, as well as tower step control, the maximum number of units that can be controlled is 10 minus GT, GT being the number of Tower Steps to be controlled.

The system also permits the following functions:

1) **Setpoint Reset**: With an external signal of 4-20mA, it is possible to vary the system's cooled water control setpoint. 4mA relates to the minimum setpoint value (St3) and 20mA relates to the maximum setpoint value (St4). A value below 4mA disables this function.

2) **Load limiter**: With an external signal of 4-20mA, it is possible to limit the number of refrigerators in terms of limiting electrical absorption at certain periods of the day. The number of units set will be subdivided proportionally in terms of the external signal set. The system divides the difference between the maximum and minimum signal (20-4 = 16 mA) by the number of refrigerators set in the controller and the enables/disables for each increase in signal sent.

eg.: for 8 refrigerators set, we have 16mA : 8= 2mA/refrigerator. Every 2 mA enables or disables a refrigerator.

3. **Ambient compensation**: With the installation of an ambient sensor, it is possible to vary the setpoint of the cooled water in terms of external air. This option allows an energy saving in low-load periods.

1 FEATURES OF THE PROGRAMME

The programme allows full management of a refrigerator plant consisting of several refrigerators.
The features of the system are as follows:

- display and control of the measured sizes;
- possible configuration of the number of refrigerators to be controlled;
- LED display of alarms and their audible signals by means of a buzzer;
- programming of the configuration parameters and of some operational parameters with access protected by a password;
- modification of the basic operating parameters (setpoints, differentials, alarm thresholds, timers);
- LED display of the active functions;
- printout of the alarms detected and, at intervals, the state of the main variables of the machine;
- by time band programming it is possible to operate the devices controlled by probe 1 from a second setpoint *(secondary)* so as to save energy during the programmed hours and days;
- connection to a supervisory/remote controlled assistance serial line according to RS422/RS485 standard and Carel's communication protocol.

2 USER INTERFACE

2.1 Keyboard-display terminal: front panel view with front door closed

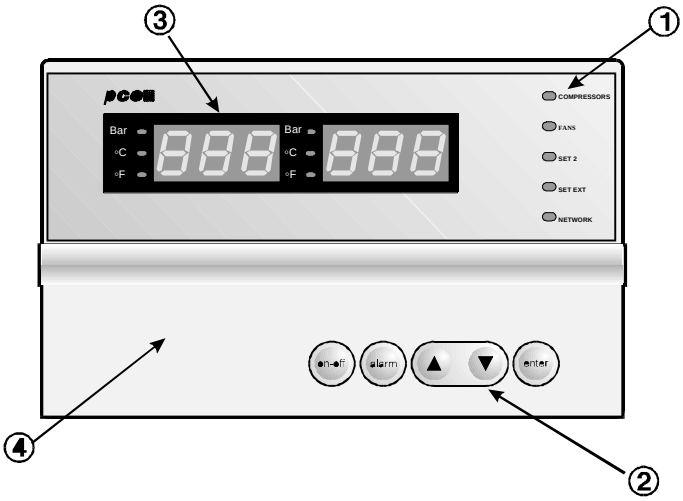


Figure 1

Figure 1 references

1. External function-indicator LEDs
2. Rubber external buttons
3. LED display
4. Front window

2.2 Silicone rubber external buttons

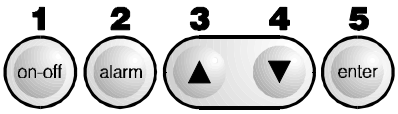


Figure 2

References Figure 2

1. *On/off* button: turns the unit on and off. When the unit is on, the LED button is lit (a green colour)
   - an unlit LED indicates that the unit is OFF;
   - a flashing LED indicates that the unit has been turned off by a supervisor or by remote control, by means of a digital input;
2. *Alarm* button: it is used to display the alarms, to reset them manually and to silence the buzzer.
   If the button is lit (red), it means that at least one alarm has been detected.
3. The arrow pointing *upwards* sets the values of the control parameters (not back lit), or to disable manual procedure.
4. The arrow pointing *downwards* sets the values of the control parameters (not back lit), or to disable manual procedure.
5. *Enter* button: to scan the messages on the display. The button is continuously lit (yellow light) and indicates that the power is On.

2.3 Front view with front door open

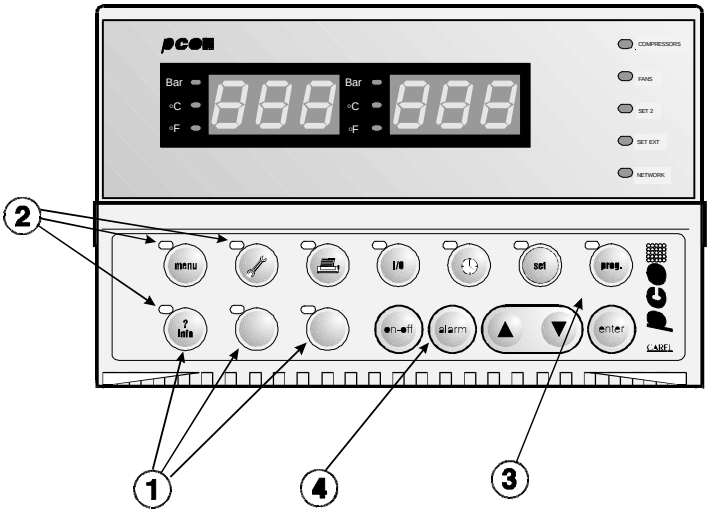


Figure 3

Figure 3 references

1. Polycarbonate - coated mechanical buttons
2. Function indicator LEDs
3. Adhesive polycarbonate
4. Silicone rubber buttons.

2.4 Use of the buttons

permits display of values detected by the probe ELWT (cooled water) and by probe CTWR (cooling water)

permits access to the values related to the hour counters, to the manual procedure of the devices connected and to probe setting

gives access to the set of parameters for operating the printer (where required)

permits display of the status of inputs and outputs, both digital and analogue

permits display/programming of the clock (if present) and of related time bands with setpoint variation

permits display and setting of the setpoints

permits setting of the various operating parameters (protections, thresholds), as well as the parameters relating to unit configuration

permits display of the version of the programme to be applied

The LEDs beside the listed buttons light up when pressed, and remain in this status until any one of the above-mentioned buttons is pressed.

2.5 Display

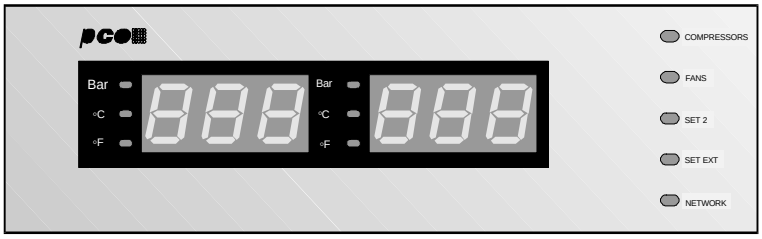


Figure 4

Features

- number of digits: 6
- colour: green
- height: 13mm
- number of side indicator LEDs: 5
- number of LEDs indicating the displayed function: 3+3

2.6 Function indicator LEDs

The 5 LEDs placed beside the display have the following meaning:

1. LED On at least one refrigerator, controlled by probe ELWT, is enabled;
   Flashing LED at least one refrigerator, controlled by probe ELWT, is in waiting phase, meaning that its operation has been requested, but it remains off until its internal timers have been elapsed;
   LED Off no refrigerator, controlled by probe ELWT, is enabled;
2. LED On at least one step of cooling tower, controlled by probe CTWR, is enabled;
   LED Off no step of cooling tower, controlled by probe CTWR, is enabled;
3. LED On night setpoint is enabled (dual setpoint);
4. LED On indicates that setpoint variation is coming from an analogue input (external setpoint);
5. LED On indicates that communication with monitoring network is enabled;

The 6 LEDs placed in the display indicate the unit of measure of the values detected by the two linked probes (settings made in the programming-code section):

bar **pressure (not used);**
°C temperature in degrees Celsius;
°F in degrees Fahrenheit

3 LIST OF PARAMETERS

All parameters in boldface are described from page 12

In the following tables there are two *Default* columns: in the right column there are the values determined by McQuay. Default values are stored in the memory of every system (see page 21). In the left column the user may write his/her own values as a memo.

Maintenance button

Code	*Description*	*Default*		*DefinedLimits*	*Units of measure-ment*
t1	refrigerator 1 operating hour display			0÷999999	h
t2	refrigerator 2 operating hour display			0÷999999	h
t3	refrigerator 3 operating hour display			0÷999999	h
t4	refrigerator 4 operating hour display			0÷999999	h
t5	refrigerators operating hour display			0÷999999	h
t6	refrigerator 6 operating hour display			0÷999999	h
t7	refrigerator 7 operating hour display			0÷999999	h
t8	refrigerator 8 operating hour display			0÷999999	h
t9	refrigerator 9 operating hour display			0÷999999	h
t10	refrigerator 10 operating hour display			0÷999999	h
t11	device 11 operating hour display			0÷999999	h
t12	device 1/valve inverter operating hour display (only if device 1/valve inverter is enabled)			0÷999999	h
PSt	password for access to subsequent parameters		0	0÷999	
th	refrigerator operating-hour threshold		0	0÷999	hx1000
r1	reset of refrigerator 1 operating-hour number		0	0→disable 1→enable	
r2	reset of refrigerator 2 operating hour number		0	0→disable 1→enable	
r3	reset of refrigerator 3 operating hour number		0	0→disable 1→enable	
r4	reset of refrigerator 4 operating hour number		0	0→disable 1→enable	
r5	reset of refrigerator 5 operating hour number		0	0→disable 1→enable	
r6	reset of refrigerator 6 operating hour number		0	0→disable 1→enable	
r7	reset of the refrigerator 7 operating hour number		0	0→disable 1→enable	
r8	reset of the refrigerator 8 operating hour number		0	0→disable 1→enable	
r9	reset of the refrigerator 9 operating hour number		0	0→disable 1→enable	
r10	reset of refrigerator 10 operating hour number		0	0→disable 1→enable	
r11	reset of device 11 or fan inverter operating hour number		0	0→disable 1→enable	
r12	reset of device 1/valve inverter operating hour number		0	0→disable 1→enable	
n1	refrigerator 1 manual operation enable		0	0→disable 1→enable	
n2	refrigerator 2 manual operation enable		0	0→disable 1→enable	
n3	refrigerator 3 manual operation enable		0	0→disable 1→enable	
n4	refrigerator 4 manual operation enable		0	0→disable 1→enable	
n5	refrigerator 5 manual operation enable		0	0→disable 1→enable	
n6	refrigerator 6 manual operation enable		0	0→disable 1→enable	
n7	refrigerator 7 manual operation enable		0	0→disable 1→enable	
n8	refrigerator 8 manual operation enable		0	0→disable 1→enable	
n9	refrigerator 9 manual operation enable		0	0→disable1→enable	
n10	refrigerator 10 manual operation enable		0	0→disable 1→enable	
n11	device 11 or fan inverter manual operation enable		0	0→disable 1→enable	
n12	device 1/valve inverter manual operation enable		0	0→disable 1→enable	
CL1	Probe ELWT calibration (cooled water sensor)		0	-5.0÷5.0	°C/F°/
CL2	probe CTWR calibration (tower water sensor)		0	-5.0÷5.0	°C/F°/
CL3	probe OAT calibration (ambient sensor)		0	-5.0÷5.0	°C/F°
CL3	probe 3 calibration (only if P22=1)		0	-5.0÷5.0	°C/F°

Printer button

Code	*Description*	*Default*		*Defined Limits*	*Units of measure-ment*
Pr1	immediate printing request (only if P42=1)		0	0→disable 1→enable	
Pr2	cyclic printing time setting (only if P42=1)		60	0÷999	min

I/O button

Code	*Description*	*Default*		*Defined limits*	*Units of measure-ment*
Ai1	Temperature of water controlled by sensor ELWT (evaporator)			-99÷99.9	°C/F°/bar
Ai2	Temperature of water controlled by sensor CTWR (tower)			-99÷99.9	°C/F°/bar
Ai3	Ambient temperature (OAT sensor)			-99÷99.9	°C/°F/bar
Ai4	Remote on/off status			0→off; 1→on	
i1	Refrigerator 1 alarm relay status			0→off; 1→on	
i2	Refrigerator 2 alarm relay status			0→off; 1→on	
i3	Refrigerator 3 alarm relay status			0→off; 1→on	
i4	Refrigerator 4 alarm relay status			0→off; 1→on	
i5	Refrigerator 5 alarm relay status			0→off; 1→on	
i6	Refrigerator 6 alarm relay status			0→off; 1→on	
i7	Refrigerator 7 alarm relay status			0→off; 1→on	
i8	Refrigerator 8 alarm relay status			0→off; 1→on	
i9	Refrigerator 9 alarm relay status			0→off; 1→on	
i10	Refrigerator 10 alarm relay status			0→off; 1→on	
i11	Device 11 alarm relay status			0→off; 1→on	
i12	low pressure/flow regulator alarm status			0→off; 1→on	
Ao1	system flow regulator status			0÷10.0	volt
Ao2	display of device 1/valve inverter status			0÷10.0	volt
o1	refrigerator 1 status			0→off; 1→on	
o2	refrigerator 2 status			0→off; 1→on	
o3	refrigerator 3 status			0→off; 1→on	
o4	refrigerator 4 status			0→off; 1→on	
o5	refrigerator 5 status			0→off; 1→on	
o6	refrigerator 6 status			0→off; 1→on	
o7	refrigerator 7 status			0→off; 1→on	
o8	refrigerator 8 status			0→off; 1→on	
o9	refrigerator 9 status			0→off; 1→on	
o10	refrigerator 10 status			0→off; 1→on	
o11	refrigerator 11 status			0→off;1→on	

Clock button

Code	*Description*	*Default*		*Defined Limits*	*Unit of measure-ment*
C1	hour display			0÷23	h
C2	minute display			0÷59	min
C3	day display			1÷31	
C4	month display			1÷12	
C5	year display			0÷99	
PSC	password that allows access to subsequent parameters		0	0÷999	
C6	hour setting		0	0÷23	h
C7	minute setting		0	0÷59	min
C8	day setting		0	1÷31	
C9	month setting		0	1÷12	

C10	year setting		0	0÷99	
C11	band start hour with secondary set		0	0÷23	h
C12	band end hour with secondary set		24	0÷24	h
C13	Sunday with secondary set		0	0→no; 1→yes	
C14	Monday with secondary set		0	0→no; 1→yes	
C15	Tuesday with secondary set		0	0→no; 1→yes	
C16	Wednesday with secondary set		0	0→no; 1→yes	
C17	Thursday with secondary set		0	0→no; 1→yes	
C18	Friday with secondary set		0	0→no; 1→yes	
C19	Saturday with secondary set		0	0→no; 1→yes	
C20	half a day exclusion		0	0÷7	
C21	exclusion start		0	C11÷C12	h
C22	exclusion end		0	C21÷C12	h

Setpoint button

Code	*Description*	*Default*		*Defined Limits*	*Unit of measurement*
Sd1	display of probe ELWT current setpoint			St3÷St4	°C/°F/bar
St1	local probe ELWT setpoint setting		7.0	St3÷St4	°C/°F/bar
St2	local probe CTWR setpoint setting (only if there are tower steps)		30.0	St5÷St6	°C/°F/bar
Si1	device 1/valve inverter setpoint setting		2.5	St3÷St4	°C/°F/bar
Si2	fan inverter setpoint setting		16.0	St5÷St6	°C/°F/bar
PSS	password for access to subsequent parameters		0	0÷999	
St3	probe ELWT minimum setpoint setting		4	-99÷99.9	°C/°F/bar
St4	probe ELWT maximum setpoint setting		10.0	-99÷99.9	°C/°F/bar
St5	probe CTWR minimum setpoint setting		25.0	-99÷99.9	°C/°F/bar
St6	probe CTWR maximum setpoint setting		45.0	-99÷99.9	°C/°F/bar
St7	dual setpoint setting		6.0	-99÷99.9	°C/°F/bar
d1	probe ELWT differential setting		3.0	0÷20.0	°C/°F/bar
d2	probe CTWR differential setting		1.0	0÷20.0	°C/°F/bar
d3	device 1/valve inverter differential		1.0	0÷20.0	°C/°F/bar
d4	fan inverter differential setting		2.0	0÷20.0	°C/°F/bar
Sr1	device 1 inverter step		0.2	0÷10.0	Volt
Sr2	device 1 inverter deviation setting		0	0÷20.0	°C/°F/bar
Sr3	device 1 inverter minimum aperture		0	0÷10.0	Volt
Sr4	device 1 inverter minimum aperture always applied		0	0→disable 1→enable	
SH1	evaporator high water temperature threshold (probe ELWT)		30.0	-99÷99.9	°C/°F/bar
SL1	evaporator low water temperature threshold (probe ELWT)		3.0	-99÷99.9	°C/°F/bar
SH2	tower high water temperature threshold		50	-99÷99.9	°C/°F/bar
SL2	tower low water temperature threshold		20	-99÷99.9	°C/°F/bar
dH1	evaporator high water temperature alarm delay		30	0÷999	min
dL1	evaporator low water temperature alarm delay		3	0÷999	min
dH2	tower high water temperature alarm delay		3	0÷999	min
dL2	tower low water temperature alarm delay		30	0÷999	min
SC	external area temperature compensation setpoint		35.0	-99÷99.9	°C/°F/bar
dC	external area temperature compensation differential		5.0	-50.0÷50.0	°C/°F/bar
dt	external area temperature compensation delta		2.0	-99÷99.9	°C/°F/bar

Programming button

Code	*Description*	*Default*		*Defined Limits*	*Unit of measure-ment*
PSn	password for access to programming section		0	0÷999	
P1	probe ELWT type (refrigerated water control)		2	0→absent 2→passive	
P4	number of devices controlled by probe ELWT		5	0÷11	
P5	number of devices operating in the event of probe ELWT failure		2	0÷P4	
P6	number of chokes		0	0÷3	
P10	minimum refrigerator start-up time		180	0÷999	s
P11	minimum refrigerator stop time		180	0÷999	s
P12	minimum time between start-ups of different refrigerators		300	0÷999	s
P13	minimum time between start-ups of same refrigerator		360	0÷999	s
P14	regulation with neutral zone or lateral band - probe ELWT circuit		0	0→neutral z. 1→lat. band	
P17	minimum refrigerator start-up request time		20	0÷999	s
P18	minimum refrigerator start-up stop time		10	0÷999	s
P19	refrigerator rotation enable		2	0→ disabled 1→FIFO 2→on time	
P22	air temperature probe enable		1	0→disable 1→enable	
P23	Setpoint ambient compensation enable		0	0→disable 1→enable	
P24	probe CTWR type (set 0 unless tower controlled)		2	0→absent 2→passive	
P27	number of Cooling Tower steps		0	0÷11	
P28	minimum time between cooling tower step start-ups		2	0÷999	s
P29	regulation with neutral zone - cooling circuit		0	0→neutral z.	
P32	time between Tower step start-up requests		5	0÷999	s
P33	time between Tower step stop requests		5	0÷999	s
P34	Tower step rotation enable		1	0→disable 1→enable	
P35	Tower conrol fan inverter enable		0	0→disable 1→enable	
P36	flow regulator alarm delay		40	0÷999	s
P37	self-start procedure enable		1	0→disable 1→enable	

P39	°C or °F display		0	0→°C;→°F	
P40	remote on/off enable		1	0→disable 1→enable	
P41	clock enable		1	0→disable 1→enable	
P42	printer enable		0	0→disable 1→enable	
P43	identification number		1	0÷999	
P44	automatic or manual reset alarms		0	0→autom. 1→manual	
P45	alarm relay operation delay		0	0÷999	min
P46	ON/OFF button disable with machine ON		0	0→disable 1→enable	
P47	serial communication baud-rate		1	0→1200 1→2400 2→4800 3→9600 4→19200	
P61	machine stop mode		0	0→full 1→partial	
P62	cold/hot		0	0→cold 1→hot	

Info button

Code	*Description*	*Default*		*Defined Limits*	*Unit of measure-ment*
If1	programme version				

4 ALARM DESCRIPTION

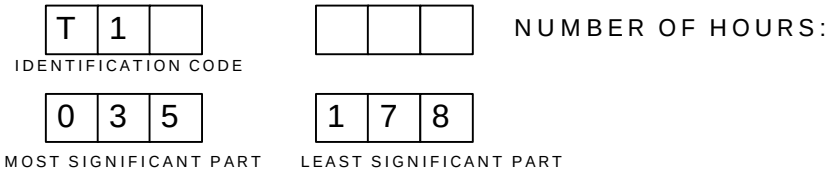
For description of how to control *Alarms*, see parameter **P44** on page 18

Alarm button

Code	*Description*	*Effect*	*Check*
AL 1	Refrigerator 1 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 2	Refrigerator 2 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 3	Refrigerator 3 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 4	Refrigerator 4 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 5	Refrigerator 5 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 6	Refrigerator 6 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 7	Refrigerator 7 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 8	Refrigerator 8 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 9	Refrigerator 9 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 10	Refrigerator 10 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 11	Device 11 operating hours threshold exceeded	Indication	Threshold and number of hours
AL 12	Bypass inverter/valve hours threshold exceeded	Indication	Threshold and number of hours
AL 13	Eprom not operational	Indication	*Reset factory values and stop MicroTechII.* If when starting up again AL13 still on, replace *board*
AL 14	Probe ELWT not connected or not operational		Connections of probe ELWT
AL 15	Probe CTWR not connected or not operational		Connections of probe CTWR
AL 17	Absence of flow alarm	Total refrigerator lock	Wiring of the digital input 12
AL 18	Refrigerator 1 alarms	Indication	Wiring of the digital input 1
AL 19	Refrigerator 2 alarms	Indication	Wiring of the digital input 2
AL 20	Refrigerator 3 alarms	Indication	Wiring of the digital input 3
AL 21	Refrigerator 4 alarms	Indication	Wiring of the digital input 4
AL 22	Refrigerator 5 alarms	Indication	Wiring of the digital input 5
AL 23	Refrigerator 6 alarms	Indication	Wiring of the digital input 6
AL 24	Refrigerator 7 alarms	Indication	Wiring of the digital input 7
AL 25	Refrigerator 8 alarms	Indication	Wiring of the digital input 8
AL 26	Refrigerator 9 alarms	Indication	Wiring of the digital input 9
AL 27	Refrigerator 10 alarms	Indication	Wiring of the digital input 10
AL 28	Device 11/fan inverter lock	Indication	Wiring of the digital input 11
AL 29	Probe ELWT high temperature threshold exceeded	Indication	Check high temperature threshold
AL 30	Probe ELWT low temperature threshold exceeded	Indication	Check low temperature threshold
AL 31	Probe CTWR high temperature threshold exceeded	Indication	Check high temperature threshold
AL 32	Probe CTWR low temperature threshold exceeded	Indication	Check low temperature threshold
AL 33	Number of refrigerators selected exceeds the outputs actually available	Indication	Indication - check number of refrigerators selected
AL 34	Ambient Probe 3 not connected or not operational		Wiring of ambient probe
AL 35	Clock board failure or not connected	Time band lock	Board connection

5 DESCRIPTION OF PARAMETERS

t1÷t12 - refrigerator hour display
These parameters indicate the number of operating hours of the individual refrigerators. When displaying these parameters, the identification number code alternates, every two seconds, with the number of operating hours of the refrigerator corresponding to the code.



When the number of operating hours of the individual refrigerator exceeds the operating hour threshold (th), indication is given by alarms AL 1 ÷ AL 12. ***Caution*:** when the analogue outputs dedicated to the fan inverter and to the device 1/valve inverter are used (parameters t11 and t12), the displayed operating hours refer to the calculation with the corresponding outputs at a value higher than 0 volt.

th - operating hour threshold
When the operating hours of the refrigerator exceed this value, an alarm signal is produced, indicating that maintenance of the refrigerator is needed. If this parameter is given the value 0, this control is automatically excluded.
Caution. setting must be made in h x 1000.

n1÷n12 - manual operation of the refrigerators
These parameters permit manual activation of the individual device, without the help of timers, rotation, and independently of the values measured by the probes. The sole support of control in manual operation is alarm management. Manual activation of the inverter devices makes it possible to force their analogue outputs to the value of 10 volts. The manual procedure can be activated only if the unit is OFF. Therefore, all the parameters n1÷n12 are not enabled if the unit is ON. The flashing LED of the menu button indicates that the manual procedure is enabled. If, after pressing the menu button, the “Up” button or “Down” button, is kept pressed down for more than 2 seconds, the whole manual procedure is disabled. In any case, the manual procedure is automatically completed after 30 minutes.

CL1, CL2, CL3 - probe calibration
These parameters allow software calibration of the probes ELWT, CTWR and OAT. The value given to these parameters is actually added (positive value) or subtracted (negative value) to the measurements detected by the respective probes. The offset of calibration may be changed from -5.0 to +5.0 with the accuracy of one decimal point. The CL3 parameter is visible only when the relative probe OAT (P22=1) has been selected.

Pr1 - immediate printing request
This parameter allows the printout of the unit ‘s main data such as: values detected by the probes, active devices and the setpoints programmed.

Pr2 - cyclic printing time
This parameter indicates the cyclic printing time, i.e. the T period between one printout and the next.

Ai3 - meaning of the analogue input B3 (see figure 30).
This parameter allows the display of the value detected by the third analogue input that can be:
- variable setpoint by using a potentiometer (P21=1);
- if the parameter is P21=0 and P22=1, then the detected value represents the temperature probe of the ambient air (necessary for controlling the setpoint compensation).

i11 - digital input ID11 (see figure 30).
This parameter allows the display of the status of digital input no.11. This input can be:
- the shutdown of device no.11 if it has been previously selected;
- the shutdown of the fan inverter if device no.11 has not been selected.

C11=C12 - selection of the start and end time of the reduced setpoint.
The parameter C11 allows the start of time bands with reduced setpoint to be set; the parameter C12 makes it possible to set the end hour. *Examples*:
- Time band during the day. C11=12, C12=16: the reduced setpoint is enabled from 12:00 a.m. to 3:59 p.m.;
- Time band between two successive days. C11=14, C12=9: the reduced setpoint is enabled from 2:00 p.m. to 8:59 a.m. of the following day;
- C11=C12: the reduced setpoint is enabled throughout the whole day (24 hours).

IMPORTANT: *Never set the value C11=C12=0*.

C20= selection of the day with time band exclusion.
The parameter allows time band exclusion with secondary setpoint for a selected day. The start hour (C21) and end hour (C22) are programmable. The data that can be selected are the following:
0 time band exclusion not enabled;
1 time band exclusion with secondary set for the day of Monday;
2 time band exclusion with secondary set for the day of Tuesday;
3 time band exclusion with secondary set for the day of Wednesday;
4 time band exclusion with secondary set for the day of Thursday;
5 time band exclusion with secondary set for the day of Friday;
6 time band exclusion with secondary set for the day of Saturday;
7 time band exclusion with secondary set for the day of Sunday.

C21 - time band exclusion start.
The start of time band exclusion with secondary set is required (see parameter C20).

C22 - time band exclusion end.
The end of time band exclusion with secondary set is required (see parameter C20).
Caution: *do no enable at the same time the time bands with reduced setpoint and regulation of setpoint from analogue input because both options have priority over the setpoint set.*

St3, St5 - minimum setpoint
They establish the minimum value that can be set for the setpoints. The user is prevented from entering a setpoint lower than the value St3(ELWT) and a setpoint lower than the value St5. (CTWR)

St4, St6 - maximum setpoint
These points establish the maximum value that can be set for the setpoints. The user is prevented from entering a setpoint higher than the value St3(ELWT) and a setpoint higher than the value St5. (CTWR).

St7 - secondary setpoint
Allows setting of secondary setpoint, that is valid when time bands are enabled.

d1, d2 - device differentials
These parameters establish the values of the differentials of the devices managed by probe ELWT and CTWR .

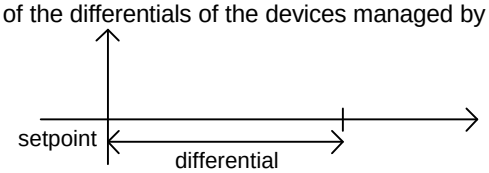


Figure 5

d3, d4 - inverter differentials
In addition to the setpoint of the relevant circuit, the differential is the working value for calculating the inverter end of stroke point, i.e. the value measured to which an output of 10 volts corresponds.

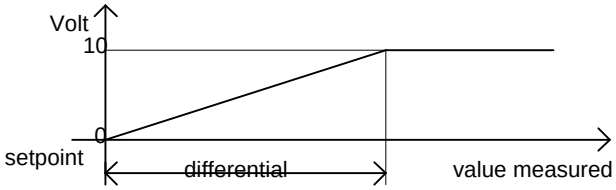


Figure 6

Where either d3 or d4 are concerned, the differential refers to the device 1/valve inverter or to the fan inverter respectively. These parameters are visible only if the outputs for the inverter (P20=1 and P35=1) are provided for. Furthermore, in the case of the circuit 1/valve inverter, the side band control must be selected (P14=1).

Sr1 - device 1 inverter step (see figure 14).
The parameter is visible only if the presence of the inverter on device 1 has been selected, and also control is in neutral zone. It establishes the increase and decrease of device 1 inverter (see parameter P20).

Sr2 - device 1 inverter deviation (see figure 14).
The parameter is visible only when the presence of the inverter on device no. 1 has been selected, and control is in neutral zone. It is essential for calculating device no. 1 inverter connection (see parameter P20).

Sr3 - minimum opening of device 1/valve inverter.
The parameter is visible only when the presence of the inverter on device no.1/valve has been selected. This parameter makes it possible to apply a minimum voltage to the inverter/valve output. If the conditions require application of a value below Sr3, this value is compulsory.

Sr4 - minimum opening of device 1/valve inverter continuously applied.
The parameter is visible only when the presence of the inverter on device no.1/valve has been selected (parameter P20). If SR4 is equal to 1, the minimum opening of device 1/valve inverter (parameter Sr3) is applied even in case of an alarm being present on this device or when (if P14=0) compressor 1 is OFF. Only when the unit is OFF does the output of the inverter/valve remain at 0 in all cases.

SH1, SH2 - high temperature alarm threshold
It represents the threshold of high of probe ELWT and CTWR respectively. When the value detected by the probe exceeds the set value, the alarm is activated.

SL1, SL2 - low temperature alarm threshold
It represents the threshold of low of probe ELWT and CTWR respectively. When the value detected by the probe falls below the set value, the alarm is activated.
SC, dC, dt - setpoint, differential and compensation delta
See parameter P23.

P1, P24 - probe type
The parameters make it possible to specify the type of probes used. The following selections are available.
0 probe is absent;
2 temperature NTC probe;

P4 - number of refrigerators controlled by probe ELWT
The parameter represents the number of refrigerators controlled by probe ELWT. The number of refrigerators may range from 0 to 11. If 11 devices are selected, it is not possible to connect any cooling tower step to the secondary circuit.

P5 - number of refrigerators operating with probe ELWT out of order
In the case where the alarm of probe ELWT is found to be broken or not connected (AL14), parameter P5 indicates the minimum number of refrigerators ON.

P9 - choke operation in full/part mode (not enabled)

P10 - minimum refrigerator operating time
This sets the minimum refrigerator operating time (in seconds). As a consequence, when enabled, the devices must remain ON for the same length of time as the one set by the above-mentioned parameter.

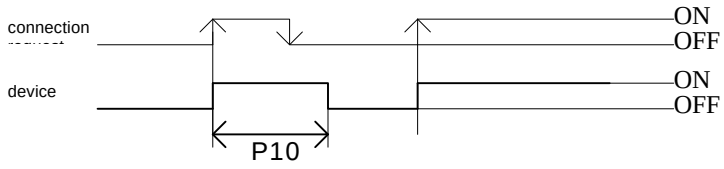


Figure 7

P11 - minimum refrigerator stop time
This sets the minimum refrigerator stop time. The refrigerators are not started again unless the minimum time set from the last stop time has elapsed.

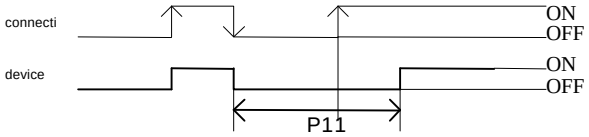


Figure 8

P12 - minimum time between startups of different refrigerators
This represents the minimum time that must elapse between the startup of one refrigerator and the next. This parameter allows simultaneous starts to be avoided.

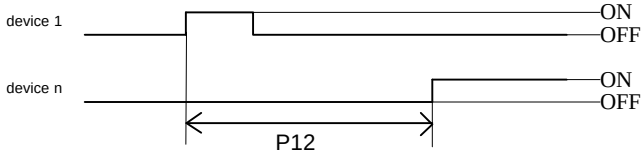


Figure 9

P13 - minimum time between successive startups of same refrigerator device
This sets the minimum time that must elapse between two startups of the device, regardless of the measurement detected and of the setpoint. This parameter makes it possible to limit the number of startups per hour. For example, if the maximum allowed number of connections is equal to 10, it is only necessary to set a value of 360 seconds to guarantee this limit is observed.

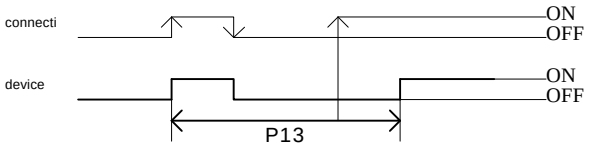


Figure 10

P14, P29 regulation with "lateral band" or "neutral zone"
These parameters indicate the activation mode of the refrigerators enabled.
In lateral band the refrigerators are positioned proportionally within the controlled differential.
Example:

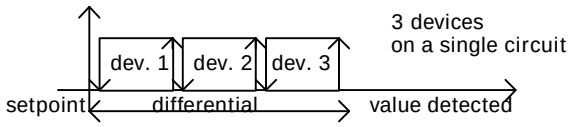


Figure 11

In neutral zone there is a zone where no refrigerator is activated or deactivated.
The activation point of the refrigerators is when the measure detected exceeds the neutral zone (measure detected>set+differential). The number of refrigerators to be activated is variable, depending on the time elapsed in this condition. The refrigerators are stopped when the measure detected falls below the neutral zone (measure detected <set), and in this case too it depends on the time. See timers P17, P32 and P18, P33.

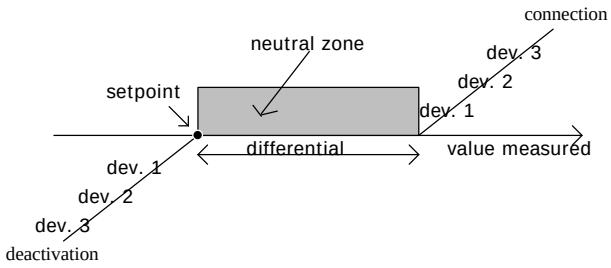


Figure. 12

P15, P30 - type of regulation
These parameters indicate the type of regulation of circuits ELWT and CTWR, and are valid only if lateral band control is selected (P14=1 and/or P29=1). The regulation may be Proportional or Proportional + Integral.

P16, P31 - integration time
These parameters indicate the integration time of circuits ELWT and CTWR, if a Proportional + Integral regulation has been selected (P15=1 and/or P30=1).

P17, P32 - minimum refrigerator startup request time
These parameters allow the setting of the time between successive requests for startup of the refrigerators controlled by probes ELWT and CTWR.
They are present only if control is in neutral zone.

P18, P33 - minimum refrigerator stop request time
These parameters allow the setting of the time between successive requests for stop of the refrigerators controlled by probes ELWT and CTWR. They are present only if control is in neutral zone.

P19 - refrigerator rotation enable
This parameter allows the rotation type to be selected
0= rotation disabled: last refrigerator to be started up is first to be stopped.
1= "FIFO" rotation: first refrigerator to be started up is first to be stopped; machines are stopped in order of startup.
2= "in-time" rotation: first refrigerator to be started up is the one with the lowest number of operating hours, the first to be stopped is the one with the highest number of operating hours.

P20 - selection of device no. 1/valve inverter
This parameter enables the presence of the inverter on device no.1 of circuit 1, controlled by probe 1, or of a 0-10 Volt valve, depending on the presence of neutral-zone or lateral-band regulation.
This is displayed if P1>0 and P4>0 and if chokes (P6>0) and Neutral Zone (P14=0) have not been enabled at the same time.
Therefore the parameter is displayed if: P1>0, P4>0, P6=0, P14=0;
P1>0, P4>0, P6>0, P14=1.

case 1 - presence of lateral-band regulation
Control involves the setting of a setpoint (SI1) and a differential (d3). When the value detected by probe 1 is lower than or the same as the value of the valve setpoint, there are 0 volts at the output dedicated to this device. As the value detected by probe 2 deviates from the set point, the analogue output increases in proportion to the deviation until it reaches 10 volts when the value detected is the same as or higher than the setpoint + differential.

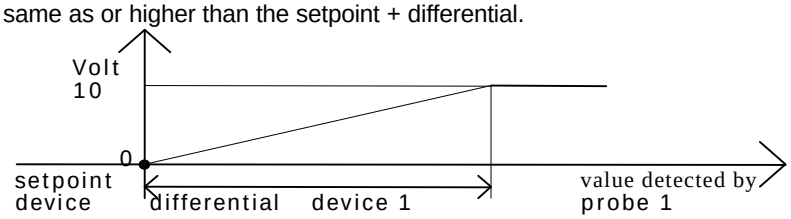


Figure 13

case 2 - presence of neutral-zone regulation
Control requires the setting of a deviation (Sr2) from the setpoint.
The output of device 1 inverter increases when the reading of probe 1 exceeds the value of the neutral zone setpoint (St1) + deviation of device 1 inverter (Sr2). The decrease takes place when the probe 1 reading is below the value of the neutral zone setpoint. In the zone included between the neutral zone set point and the neutral zone setpoint + deviation of the device 1 inverter, the inverter output does not change at all; for this reason the zone is called inverter neutral zone. The output of the inverter increases/decreases at each cycle of the programme, about every second, of the value defined as inverter step (Sr1).

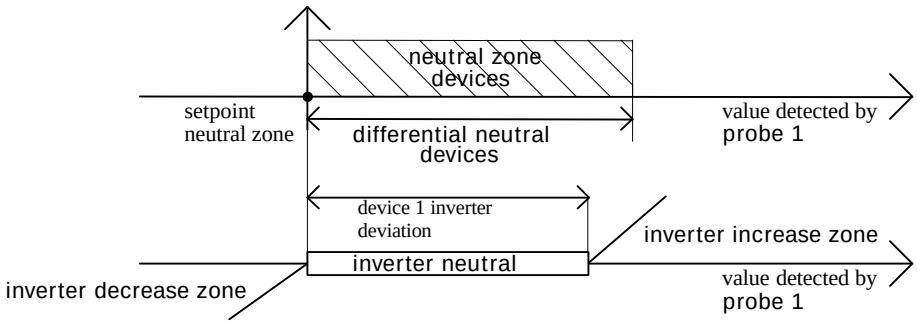


Figure 14

Caution: when device no.1/valve inverter is enabled and regulation takes place with neutral zone, activation of the devices occurs as follows:
- device no.1, which is controlled by the inverter, is activated as soon as startup is requested;
- if the request remains, the output of device no.1 inverter is increased;
- if the request is still present, and the output of the inverter reaches 10 Volts, the other devices are requested, one at a time, with rotation (if selected) and according to the timers.

The stop stage occurs as follows:
- the inverter output is decreased;
- when the inverter output has already reached 0 Volts, the other devices are stopped, one at a time, according to the timers and rotation;
- the last device that is stopped is no.1.

P21 - function not enabled

P22 - external air temperature probe enable (see figure 30)
This parameter enables the presence of an external air temperature probe with the possibility of effecting compensation of the setpoint relating to probe ELWT.

P23 - probe 1 compensation enable
If parameter P22 is activated (P22=1), then it is possible to enable the procedure of compensation (positive or negative). This procedure allows the setpoint of the refrigerated water to be varied according to the values read by the external air temperature probe. More precisely, a proportional quantity is added (or deducted) to the setpoint of the primary circuit according to the compensation delta set and when varying the external air temperature between two values defined by a setpoint and a compensation differential. The maximum value that can be added (or deducted) to the setpoint of the primary circuit is equal to the compensation delta (see figure below).

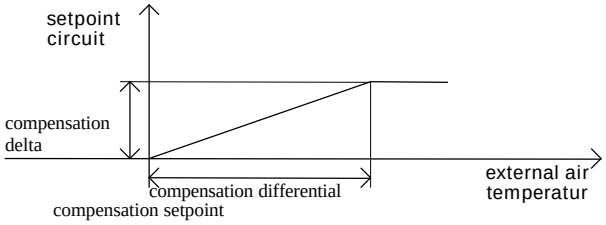


Figure 15

P27 - number of cooling tower steps
This parameter makes it possible to define the number of tower steps controlled by probe CTWR. The steps can vary from 0 to 11, but this parameter depends also on the number of refrigerators controlled by probe ELWT (parameter P4). This means that if no refrigerator controlled by probe ELWT is connected, the Tower steps controlled by probe CTWR can be 11 at most, but, if the refrigerators controlled by probe ELWT are 11, no Tower step can be controlled by probe CTWR (case of 11 air-condensed refrigerators).

P34 – tower step rotation selection
The parameter allows the rotation of the tower steps controlled by probe CTWR.
The rotation being implemented is of the “FIFO” type: the first to be started up is the first to be stopped

P35 - fan inverter enable for tower control
The fan inverter can be enabled by this parameter.
Enabling the control of fan inverter involves setting a setpoint inverter (SI2) and a differential inverter (d4). When the value detected by probe CTWR is less than or equal to the value of the setpoint inverter, the output dedicated to this device shows 0 volts.
As the value detected by probe 2 deviates from the setpoint inverter, the analogue output increases in proportion to the deviation until it reaches the value of 10 Volts when the value measured is equal to or greater than the setpoint inverter + differential inverter.

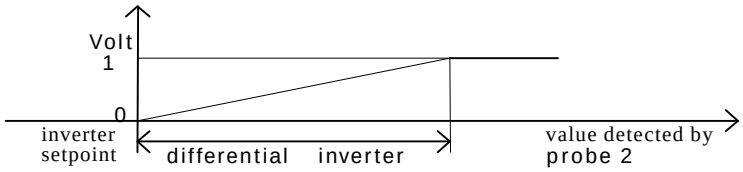


Figure 16

P37 - autostart procedure enable
This allows the selection of the autostart procedure. When the procedure is enabled, if the unit is in the ON status before a black-out, after the black-out period, the ON status is automatically restored.

P38 - not enabled

P39 - °C or °F
Defines the unit of measurement.
0 temperature in degrees Centigrade
1 temperature in degrees Fahrenheit
When changing from one measurement system to the other, automatic conversion of the values measured on the analogue inputs is given.
Caution: *the automatic conversion does not take place for the parameters. The user must update them when changing them*

P40 - remote on/off enable
If the value of the parameter is 1, it is possible to use the fourth analogue input (B4) to start up or stop the unit:
contact open → unit off *contact closed* → unit on

P41 - clock enable
In case the clock board is used, this parameter must be set at 1, otherwise it is not possible to have access to the clock section.

P42 - printer enable
In case of connection to a serial printer this parameter must be 1, otherwise it is not possible to have access to the printer section.

P43 - identification number
The parameter allows the setting of the unit identification number (useful only in case of connection to a system of supervision and/or remote assistance).

P44 - alarms with automatic or manual reset
P44=0 Þ automatic. In the event that one or more alarm conditions are detected, these are indicated by:
- red LED below "alarm" key lit;
- buzzer activated;
- alarm relay (switching relay normally on) opens

Pressing "alarm" key silences the buzzer and the alarm codes are displayed. *If the causes of the alarms are reset,* the status of the indication alarm relays becomes:
- alarm relay disconnects (switches from NO a NC);
- the buzzer, if it has not been disconnected by pressing "alarm" button, is de-activated;
- red LED below "alarm" button flashes.

If in this situation new alarms are operated, the initial situation is shown.
The flashing red LED tells the user that there have been alarms during the day and that now these have already been restored. The codes of the alarms remain, however, in the memory, so that, by pressing the "alarm" button, they can be displayed. If after having displayed them, the "alarm" button is pressed again, they are cancelled and the red LED also finally goes out.

P44=1 Þ manual. In the event that one or more alarms are detected, they are indicated by:
- red LED below "alarm" button lit;
- buzzer activated;
- alarm relay (switching relay normally on) opens

Pressing the "alarm" button silences the buzzer and alarm codes are displayed.
If the causes of the alarms are reset, the flashing red LED tells the user that there have been alarms during the day, and that they have already been restored. In this situation the alarm relay remains with contact NC closed to indicate fault.
If in this situation new alarms are operated, the initail situation is shown.
Cancellation is made by pressing "alarm" during alarm message display. If the causes have actually been cancelled, the status of the indication devices becomes:
- alarm relay disconnects (switches from NO a NC);
- the buzzer, if it has not been silenced yet by pressing "alarm" button, is de-activated;
- red LED below "alarm" button is disconnected.

On the other hand, if the causes of the alarms have not been cancelled, the initial situation is shown.

P45 - delay in activating alarm relay
The parameter allows the user to set a delay time (in minutes) between the activation of any alarm and the start of the indication relay (digital output no.11). If P45 is set at 0, alarm relay activation is immediate.

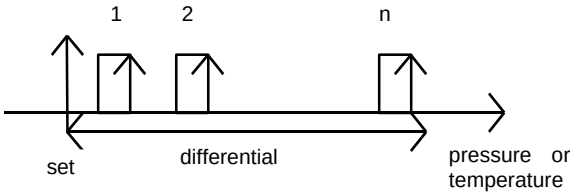
P46 - "On-Off" button disable from refrigerator ON
This parameter makes it possible to disable the operation of the "on-off" button for disconnecting the unit. If parameter 46 is set at 0, the "on-off" button can either connect or disconnect the unit; if parameter 46 is set st 1, the "on-off" button can only connect the unit.

P47 - serial communication baud-rate
This parameter permits the serial communication baud-rate to be selected. When the RS485 serial board is connected it is possible to choose the data transmission speed :
0 1200 baud
1 2400 baud
2 4800 baud
3 9600 baud
4 19200 baud.

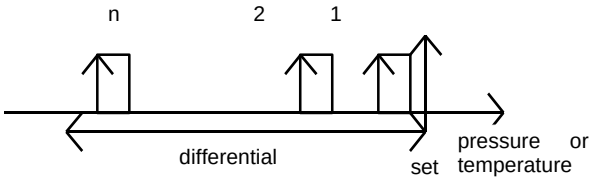
P61 - not enabled

P62 - cold/hot
With this parameter it will be possible to decide whether the devices belonging to circuit ELWT are used to produce cold (P62=0; e.g. refrigerators) or hot (P62=1; e.g. heat pumps).

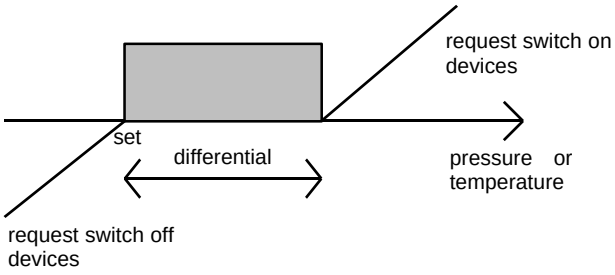
- *proportional band*
- *cold*



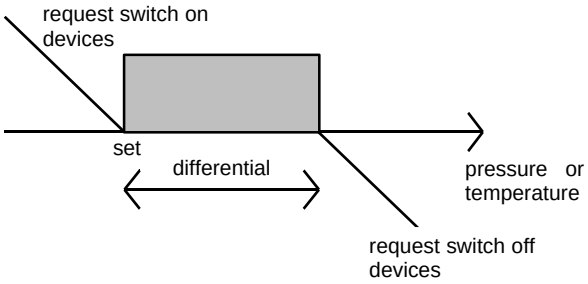
- *proportional band*
- *warm*



- *neutral zone*
- *cold*



- *neutral zone*
- *warm*



AL13 - EEPROM not operating
In case of an EEPROM failure (chip within the device) this message is indicated.
Skilled engineers are required.

AL14, AL15, AL34 - probe not operating
The relevant probe is broken or not connected. Check the wiring and functional capacity of the probe.
If AL14 is present, the devices programmed with the P5 parameter are forced to start up, and the inverter of device no.1/valve, if enabled, is forced to 10 volts. The remaining devices can be switched on according to the value measured by probe 1. If AL15 is present all the devices connected to circuit 2 are forced to switch on and the fan inverter is forced to 10 volts.
If AL34 is present, the compensation (if enabled) does not operate. These alarms can only be reset manually, and so they do not reset until the user presses the alarm button on the pCO terminal in order to clear the alarms.

AL17 - flow regulator
Alarm message AL17 indicates water flow alarm.

AL33 - selected refrigerator number incorrect
If the sum of the number of refrigerators of the primary and secondary circuit exceeds the number of outputs actually available, alarm AL33 is generated.

PSt, PSC, PSS, Psn - password
These four codes listed refer to the Passwords of the Maintenance, Clock, Setpoint and Programming branches respectively.
For each of the sections listed, the number to be set in order to have access to the subsequent parameters is:
- xxx (Maintenance, Clock, Setpoint);
- xxx (Programming).

Main display: Menu
After pressing the Menu button the probe ELWT reading is displayed on the left side of the display, whereas on the right side of the display the probe CTWR reading is displayed. If one of two probes has not been selected (P1=0 and/or P24=0), the symbol "----" appears instead of the reading. The LED located on the left of each display lights up beside the unit of measurement (ºC , ºF) corresponding to the type of probe selected.

Initial Lamp-Test
Whenever the pCO is powered up, the display lights up all its LEDs and shows the figures "8.8.8. 8.8.8." for a few seconds. After the Lamp-Test the probe readings are displayed and only the LEDs required for the operation are lit. During this procedure it is possible to check whether all the LEDs are operating.

Setting of negative parameters
Many parameters that can be set from the terminal may have negative values. When these parameters are included between "-99" and "-10" it is impossible to set the decimal value. Therefore the whole value without decimal is always accepted. From the control monitor, on the other hand, it is also possible to set the decimal value.
For this reason, when selecting from the control monitor negative parameters with values between -99 and -10, it is necessary to set *only* values with 0 as the decimal part.

Installation of the Default Values

automatic installation: in the software a control is implemented that carries out automatic installation of the default values when the initial programme startup is carried out or when the EPROM is substituted for another different version (check the version and date indicated on the EPROM label);

manual installation: if the user wants to reprogramme the unit*, he must put it into the OFF status*. Afterwards *he must press simultaneously the MENU+PROG buttons* until the letters "rST 0" appear. By pressing ▲ or ▼**,** the symbol "8.8.8. 8.8.8." is displayed and all the LEDs stay lit for a few seconds and in the meantime the software installs the default values.

6 CONNECTIONS

For an exhaustive description of the hardware and of the installation procedure please refer to the Microtech II “Installation and Usage manual", available on request.

6.1 Hardware architecture

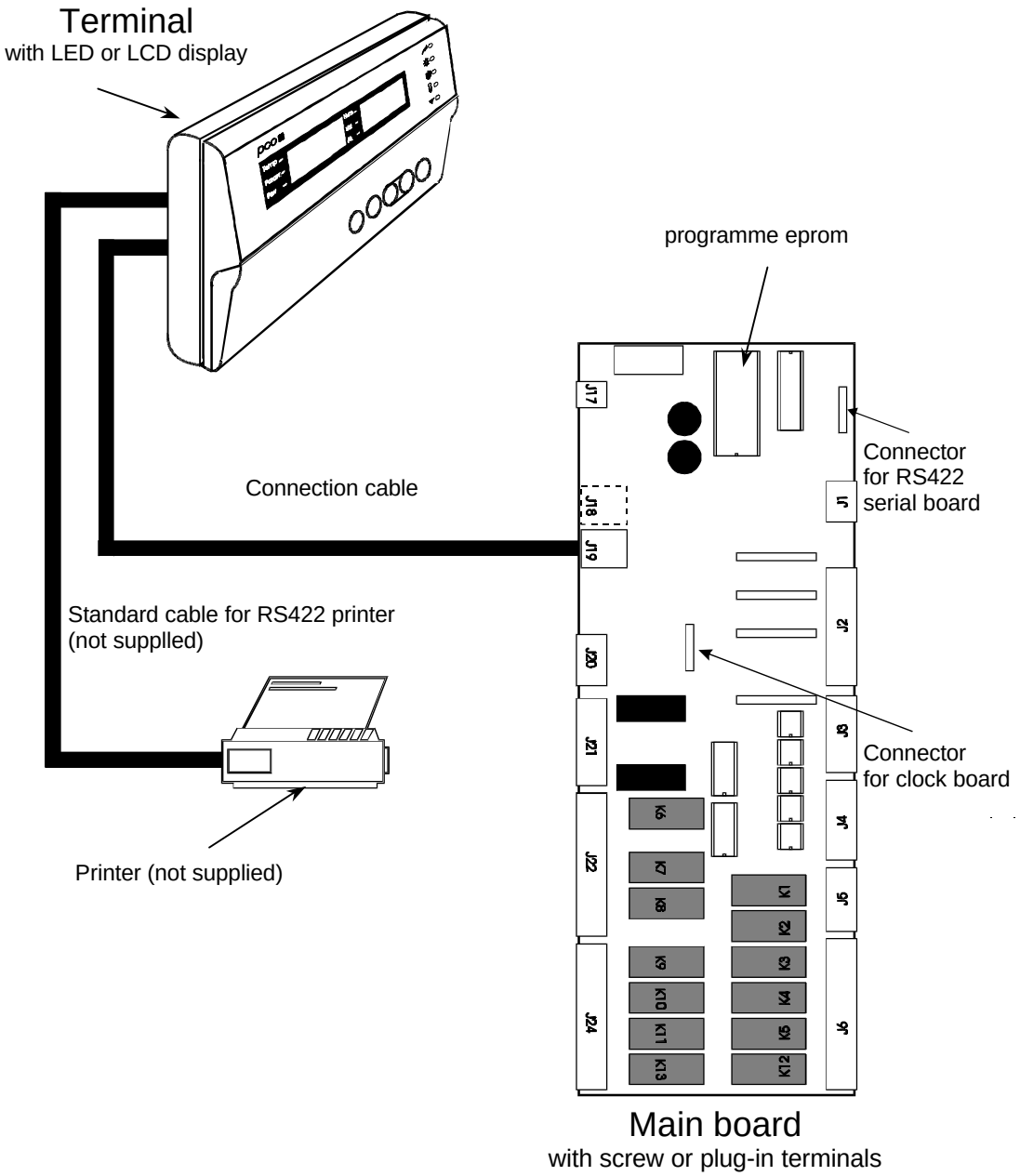


Figure 17

The hardware architecture is defined as follows:
1. A TERMINAL with display, keyboard and LEDs. **The connection of the terminal to the main board is not necessary for the controller operation; it can be used for the initial programming of the basic parameters.**
2. A MAIN BOARD with the set of terminals necessary for connection to controlled devices.
3. Connection cable between terminal unit and main board.
4. Connection cable between terminal unit and serial printer (to be provided by the customer).
5. Serial printer (to be provided by the customer).

6.2 Main board - Layout

Below is a description of the sequencer main board with reference to the basic layout.

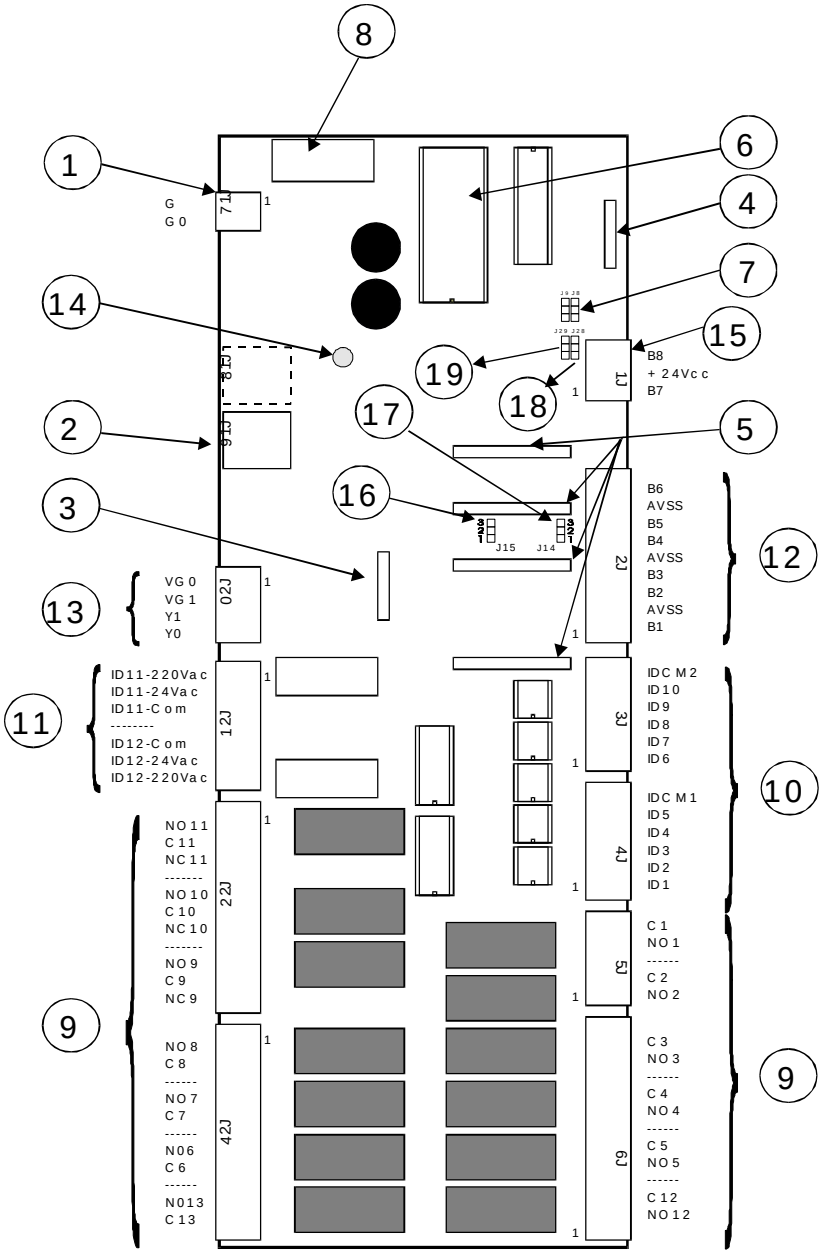


Figure 18

The main board is the basic core of the controller ; inside it 3 different parts can be identified:

- the microprocessor and memories that control the unit
- the terminal boards that permit interface with the refrigerators controlled to be set up
- the connectors that permit interface with the remote terminal, the real-time clock board, and the local and monitoring network to be set up.

Figure 18 references, page 22

1. Power supply connector 24V~50-60 Hz 15VA or 24V ⎓ 10W (see note on page 28)
2. Telephone-type connector for connection to the user terminal (MMI-Man Machine Interface)
3. Real-time clock board (optional)
4. RS422/RS485 optoinsulated board (optional) for connection to a monitoring remote assistance serial line
5. Pin strip for analogue-input adapter boards that may be set up, upon request only
6. EPROM containing application programme
7. Jumpers to select the local network communication modes

J8 in position 1-2 allows connection of the board to a terminal and, possibly, to the control monitor; in position 2-3 only connection to the local network is enabled

J9 in position 1-2 enables control monitor to be able to reset the board, in position 2-3 makes board independent of reset action of control monitor

The interface boards purchased from McQuay have both jumpers in position 1-2

Caution: this EPROM does not support "local network" control

8. Fuse 230 V~, 2A delayed
9. Digital outputs (switchable power 2300VA, 10A/230V~):

NO(n): Output contact normally open (n)

NC(n): Output contact normally closed (n)

C(n): Common contact for output contact (n)

10. Digital inputs (24V~, 10mA)

ID(n): Digital inputs 1÷10

IDCM1: Common reference for digital inputs 1÷5

IDCM2: Common reference for digital inputs 6÷10

11. Digital inputs (230V~, 10mA)

ID11, ID12: Digital inputs 11 and 12

ID11R, ID12R: common reference for the digital inputs ID11 and ID12 respectively

12. Analogue inputs

B(n): Analogue input 1÷8

AVSS: Common reference of analogue inputs B(n)

13. Analogue outputs 0÷10 V ⎓

Y(n): Analogue outputs 1 and 2

VG1: External power supply for analogue outputs (24V~ or 24V ⎓)

VG0: Reference for power supply and signal of analogue outputs Y0 and Y1

14. Mains ON LED

15. Analogue inputs

B(n): analogue inputs 7 and 8

+24 Vcc: Power supply for external active probes 24V ⎓ (ɳ) current

16. Jumper J15 selecting analogue input B6 in 0÷1 V ⎓ or 4÷20 mA (1-2=4÷20 mA, 2-3=0÷1 V ⎓)
17. Jumper J14 selecting analogue input B5 in 0÷1 V ⎓ or 4÷20 mA (1-2=4÷20 mA, 2-3=0÷1 V ⎓)
18. Jumper J28 selecting analogue input B7 in 0÷1 V ⎓ or 4÷20 mA (1-2=4÷20 mA, 2-3=0÷1 V ⎓)
19. Jumper J29 selecting analogue input B8 in 0÷1 V ⎓ or 4÷20 mA (1-2=4÷20 mA, 2-3=0÷1 V ⎓)

7 MEANING OF INPUTS AND OUTPUTS

Power supply

CONNECTOR	SIGNALS	DESCRIPTION
J17 – 1	G	Power supply + 24 V⎓ 10 W or 24V~50/60 Hz 15 VA (see note on page 28)
J17 – 2	G0	Power supply reference
J1 – 2	+24	Power supply for external active probes 24 V⎓ (max. power that can be supplied: 80mA

Connection with terminal

CONNECTOR	SIGNALS	DESCRIPTION
J19	Terminal	6-way telephone cable connection with terminal

Analogue inputs

CONNECTOR	SIGNALS	DESCRIPTION
J2 – 1	B1	Probe ELWT (only when probe is NTC passive type)
J2 – 2	AVSS	Common analogue inputs
J2 – 3	B2	Probe CTWR (only when probe is NTC passive type)
J2 – 4	B3	OAT Probe
J2 – 5	AVSS	Common analogue inputs
J2 – 6	B4	Remote on/off (optional)
J2 – 7	B5	Not used
J2 – 8	AVSS	Common analogue inputs
J2 – 9	B6	Not used
J1	B7	External setpoint reset
J1	B8	Load limiter

Digital inputs

CONNECTOR	SIGNALS	DESCRIPTION
J4 – 1	ID1	Refrigerator 1 alarm
J4 – 2	ID2	Refrigerator 2 alarm
J4 – 3	ID3	Refrigerator 3 alarm
J4 – 4	ID4	Refrigerator 4 alarm
J4 – 5	ID5	Refrigerator 5 alarm
J4 – 6	IDCM1	Digital common inputs ID1-ID5
J3 – 1	ID6	Refrigerator 6 alarm
J3 – 2	ID7	Refrigerator 7 alarm
J3 – 3	ID8	Refrigerator 8 alarm
J3 – 4	ID9	Refrigerator 9 alarm
J3 – 5	ID10	Refrigerator 10 alarm
J3 – 6	IDCM2	Digital common inputs ID6-ID10
J21 –1	ID11-230Vac	Common digital input ID11 at 230 V~ or 24 V~
J21 – 2	ID11-24Vac	Fan inverter lock – 24 V~ digital input
J21 – 3	ID11 - Com	Fan inverter lock – 230 V~ digital input
J21 – 4		Not connected
J21 – 5	ID12 - Com	Common digital input ID12 at 230 V~ or 24 V~
J21 – 6	ID12-24 Vac	Digital input flow regulator at 24 V~
J21 – 7	ID12-230 Vac	Digital input flow regulator at 230 V~

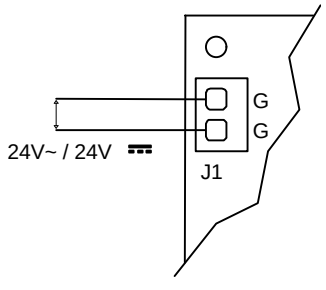
Digital outputs

CONNECTOR	SIGNALS	DESCRIPTION
J22 – 1	NO11	General alarms - contact normally open
J22 – 2	C11	Common general alarms
J22 – 3	NC11	General alarms - contact normally closed
J22 – 4		Not connected
J22 – 5	NO10	Refrigerator 10 - contact normally open
J22 – 6	C10	Common device 10
J22 – 7	NC10	Refrigerator 10 - contact normally closed
J22 – 8		Not connected
J22 – 9	NO9	Refrigerator 9 - contact normally open
J22 – 10	C9	Common device 9
J22 – 11	NC9	Refrigerator 9 - contact normally closed
J24 – 1	NO8	Refrigerator 8 - contact normally open
J24 – 2	C8	Common refrigerator 8
J24 – 3		Not connected
J24 – 4	NO7	Refrigerator 7 - contact normally open
J24 – 5	C7	Common refrigerator 7

J24 – 6		Not connected
J24 – 7	NO6	Refrigerator 6 - contact normally open
J24 – 8	C6	Common refrigerator open
J24 – 9		Not connected
J24 – 10	NO13	Not connected
J24 – 11	C13	Not connected
J6 – 1	NO12	Refrigerator 11 - contact normally open
J6 – 2	C12	Common refrigerator 11
J6 – 3		Not connected
J6 – 4	NO5	Refrigerator 5 - contact normally open
J6 – 5	C5	Common refrigerator 5
J6 – 6		Not connected
J6 – 7	NO4	Refrigerator 4 - contact normally open
J6 – 8	C4	Common refrigerator 4
J6 – 9		Not connected
J6 – 10	NO3	Refrigerator 3 - contact normally open
J6 – 11	C3	Common refrigerator 3
J5 – 1	NO2	Refrigerator 2 - contact normally open
J5 – 2	C2	Common refrigerator 2
J5 – 3		Not connected
J5 – 4	NO1	Refrigerator 1 - contact normally open
J5 – 5	C1	Common refrigerator 1

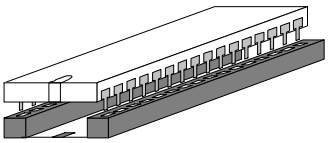
Analogue ouputs 0-10 Vdc

CONNECTOR	SIGNALS	DESCRIPTION
J20 – 1	VG0	Reference signal Y0
J20 – 2	VG1	Reference signal Y1
J20 – 3	Y1	Inverter
J20 – 4	Y0	Inverter



Installation of EPROMs

Before connecting / disconnecting the EPROM, shut down power to Microtech II board. For correct operation of the system, the EPROM must be connected to the appropriate socket on the **main board**, ensuring that **the "notch" on the surface of the EPROM matches one marked on the socket**.
Connect the EPROM to the corresponding main board socket, checking that all the pins are correctly inserted into their slots.



When removing the EPROM be careful not to touch the SMD components mounted on the board in the space inside the socket.

Figure 27 EPROM position

IMPORTANT: Electrical damage that occurs on the electronic components is usually due to **electrostatic discharges** caused by the operator. The utmost care is therefore needed when using this kind of component, and particularly:

- before handling any electronic component or card, touching an earth contact (not touching the materials is not enough, since a discharge of 10000 V, a voltage very easily reached with static electricity, produces an arc of about 1 cm);
- as far as possible, materials should be left inside their original packaging. If it is necessary to remove the main board from a pack, transfer the product to an antistatic pack without touching the rear of the board with your hand;
- as far as possible avoid using plastic bags, polystyrene or non-antistatic sponges;
- take only one EPROM at a time out of the original antistatic packs;
- avoid touching the pins of the EPROM with your hands.

8 CONNECTION OF OPTIONAL BOARDS

8.1 Serial printer

It is possible to use the serial printer only if the terminal with the following code is available:
PC0T00SL60 6-digit LED terminal.
This terminal is equipped with a 9-pole male float connector (connector **A**, Figure 28), on to which to connect the printer by means of a **printer serial cable** of 9-pole (pC0 side) - 25-pole (printer side).
The printer must be fitted with communication serial port **RS232**. The printer must be programmed with the following data:
- 1200 bauds; - no parity; - 8 data bits; - 1 or 2 stop bits.

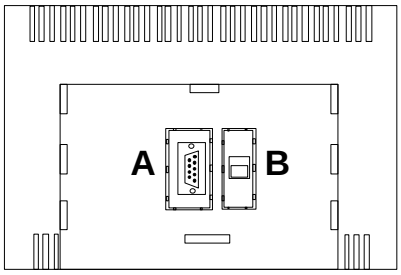
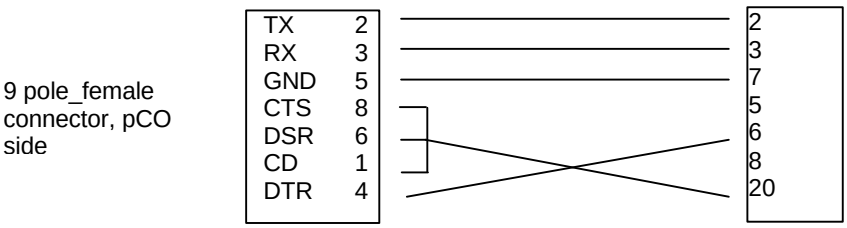


Figure 28. Rear view of pCO terminal

Type of printer serial cable



8.2 Clock board

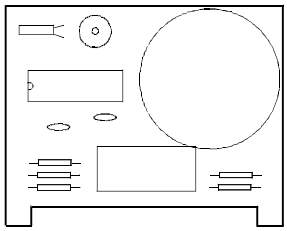


Figure 29. Clock board

This figure shows the real time clock board, code **CLK0000000,** which allows current date and time to be displayed.
In the event that time bands are to be used (in programmes that control them), this board is essential.
When there is no power supply to the pC0, the rechargable lithium battery (45 mA/h; 12 h maximum charge time), keeps the check board operational for over one month.

9 APPENDIX A: TROUBLESHOOTING

Unit does not start (mains ON LED on main board is off, LCD is off, other LEDs are off).
Check:
a) that there is mains voltage;
   that downstream of the 230V~ - 240V~ power voltage transformer there are 24V~;
b) that 24V~ power connector has been correctly plugged in;
c) that protection fuse is intact (Figure 18);
d) that telephone connection cable between terminal (if present) and main board has been correctly connected.

At start-up one of the following conditions occur:
   alarm LED ON;
   no messages or random messages on the LCD;
   buzzer ON.
Check:
a) that EPROM has been connected with correct polarity (see **Fig. 27**);
b) that, while connecting EPROM, the pins have not been bent;
c) that microprocessor chip has not been tampered with: if so, call Technical Assistance.

Eprom failure alarm
a) Contact Technical Assistance

User terminal is locked (does not respond to button being pressed)
Check:
a) that terminal has not been disconnected and then connected to main board without waiting for 2-3 seconds. If so, stop and restart MicroTech II with terminal connected;
b) that EPROM has been correctly installed.

Notes:

CAREL

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