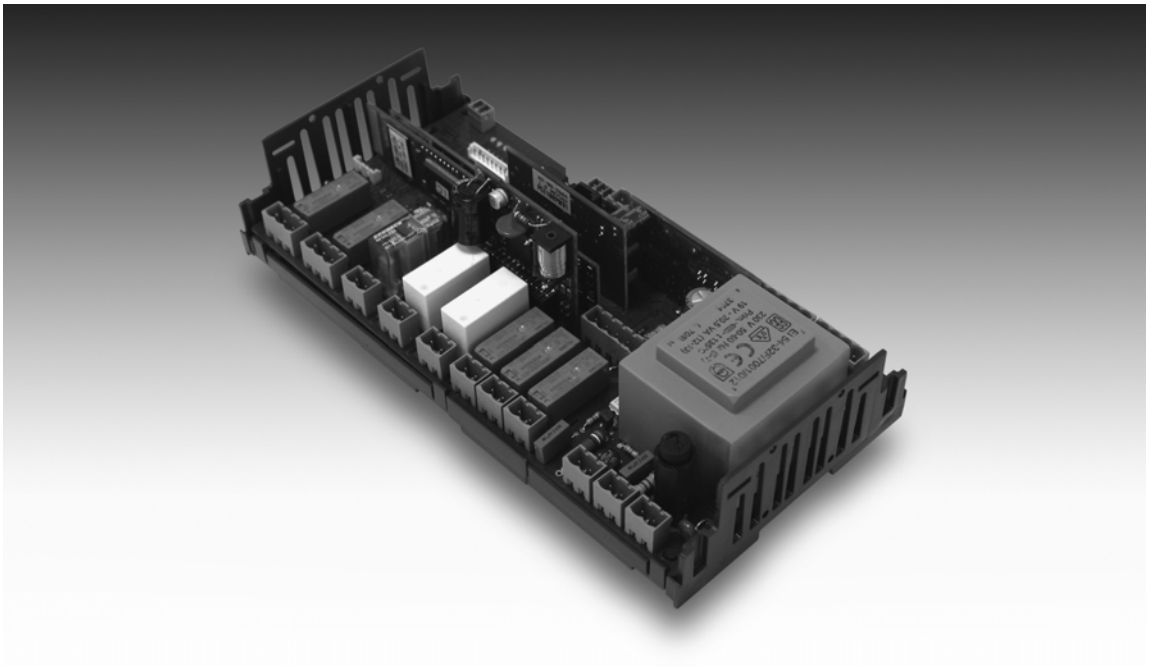


User manual

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

CAREL

Technology & Evolution

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

We wish to save you time and money!
We can assure you that the thorough reading of this manual will guarantee correct installation and safe use of the product described.

IMPORTANT WARNINGS

BEFORE INSTALLING OR HANDLING THE DEVICE PLEASE CAREFULLY READ AND FOLLOW THE INSTRUCTIONS DESCRIBED IN THIS MANUAL.

This device has been manufactured to operate risk-free for its specific purpose, as long as:
it is installed, operated and maintained according to the instructions contained in this manual;
the environmental conditions and the voltage of the power supply correspond to those specified.
All other uses and modifications made to the device that are not authorised by the manufacturer are considered incorrect.
Liability for injury or damage caused by the incorrect use of the device lies exclusively with the user.
Please note that this unit contains powered electrical devices and therefore all service and maintenance operations must be performed by specialist and qualified personnel who are aware of the necessary precautions.
Disconnect the machine from the mains power supply before accessing any internal parts.

INFORMATION FOR USERS ON THE CORRECT HANDLING OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

In reference to European Union directive 2002/96/EC issued on 27 January 2003 and the related national legislation, please note that:

1. WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
2. The public or private waste collection systems defined by local legislation must be used. In addition, the equipment can be returned to the distributor at the end of its working life when buying new equipment.
3. The equipment may contain hazardous substances: the improper use or incorrect disposal of such may have negative effects on human health and on the environment;
4. The symbol (crossed-out wheeled bin) shown on the product or on the packaging and on the instruction sheet indicates that the equipment has been introduced onto the market after 13 August 2005 and that it must be disposed of separately;
5. In the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

CONTENTS

1. User interface

The MasterCase2 uses the PGD0 display and the series of standard PST terminals as the user interface.
This terminals, as well as being the same used by other Carel instruments (consequently allowing a reduction in product codes), offer various solutions:

- PGD0 terminal with 6 buttons;
- PST small terminal with 3 digits and 3 buttons;
- simple remote display with 3 digits.

Important: The use of the PGD terminal excludes the use of any PST terminals.
If the PST terminal is left connected, the display is not updated, remaining on the last value displayed.
Each button is backlit by a LED to signal the status of the unit (outputs active, alarms, etc...).
The terminals are not required for the operation of the MasterCase2, but rather are used to program the controller.
The terminals can be connected "live", that is, when the instrument is on, without creating problems in operation.

1.1 Functions of the Buttons and LEDs on the PST small terminal

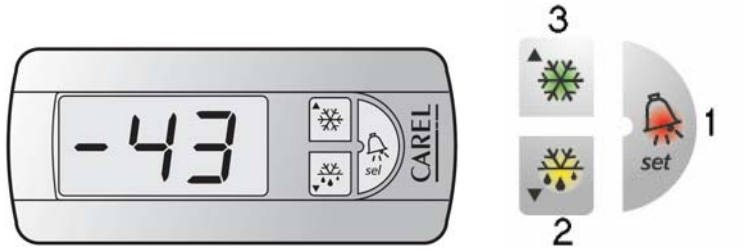


Fig. 1

Button	Function	Description
	UP	<u>Normal operation</u> • Pressed for more than one second activates or deactivates the light relay; • Pressed together with SET displays the value of the third probe (S3); • Pressed together with DOWN for 5 seconds activates or deactivates the continuous cycle function. <u>Parameter programming</u> • Moves from one parameter to the previous; • Increases the value of the selected parameter; • Pressed together with SET returns to the menu list. <u>LED</u> • Steady: controller on;
	DOWN	<u>Normal operation</u> • Pressed for 5 seconds starts a local manual defrost, if the conditions allow; • Pressed for 5 seconds together with SET starts a network manual defrost, if the conditions allow; • Pressed together with UP for 5 seconds activates or deactivates the continuous cycle function; • Pressed together with SET displays the value read by the defrost probe (S2); <u>Parameter programming</u> • Moves from one parameter to the next; • Decreased the value of the selected parameter. <u>LED</u> • Steady: defrost active
	SET	<u>Normal operation</u> • Silences the audible alarm (buzzer) and deactivates the alarm relay, if active; • Pressed for 5 seconds together with DOWN starts a network manual defrost, if the conditions allow; • Pressed for 5 seconds displays the control set point; • Pressed for more than 6 seconds. When no alarms are active, accesses the type F parameters; entering the password PP (22) accesses all the parameters, divided into groups, that can be selected and modified. • Pressed together with UP displays the value read by the third probe (S3); • Pressed together with DOWN displays the value read by the defrost probe (S2); <u>Parameter programming</u> • Displays the value of the selected parameter or exits programming mode; • Pressed together with UP returns to the menu list. <u>LED</u> • Steady: alarm active.

1.2 Functions of the Buttons and LEDs on the PGD0 terminal

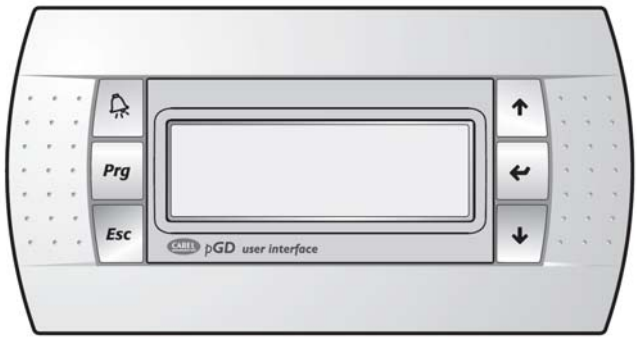


Fig. 2

1.2.1 Terminal buttons

Button	Function	Description
	ALARM	• Displays any alarms present and deactivates the alarm relay, if active. • The LED flashing indicates a previous alarm that has been reset. Pressing the button momentarily displays the alarm and switches off the LED.
	PRG	Normal operation • Accesses the programming menu screens.
	ESC	Normal operation • Returns to the main screen. Parameter programming • Returns to the programming menu.
	UP	Normal operation • Scrolls the previous screens in the same branch when the cursor is in the top left; • Increases the value of a setting field when the cursor is in the field; for a selection field, on the other hand, pressing the arrow button displays the previous option • Pressed together with DOWN for 5 seconds activates or deactivates the continuous cycle function. Parameter programming • Increases the value of the parameter displayed.
	ENTER	Normal operation • Moves the cursor between the "home" position (top left) and the setting or selection fields; • Pressed in the main screen displays the value read by the main probes, press ESC to display the main screen; Parameter programming • Saves the value of the set parameter to memory after the cursor has been moved out of the field.
	DOWN	Normal operation • Scrolls the next screens in the same branch when the cursor is in the top left; • Decreases the value of a setting field when the cursor is in the field; for a selection field, on the other hand, pressing the arrow button displays the next option • Pressed together with UP for 5 seconds activates or deactivates the continuous cycle function. Parameter programming • Decreases the value of the parameter displayed.

2. Setting the parameters

The parameters have been grouped into two families:

- **frequent** parameters (indicated by type **F** in the parameter tables)
- configuration parameters (indicated by type **C**), with access protected by a password to prevent unwanted tampering.

The parameters can be programmed as follows:

- from the keypad
- via LAN (download parameters from master to the connected slaves)
- via an RS485 serial connection, if the optional card is fitted.

To set the parameters from the keypad, the procedure varies depending on whether the PGD0 or PST display is used.

2.1 Accessing the parameters from the PGD0 display

2.1.1 Accessing the type "F" parameters

- press the Prg button;
- press the ↵ button until selecting the password entry field in the "Parameters" section;
- press the ↵ button again without entering the password;
- select the desired menu item by pressing ↑ and ↓ and then ↵.
- scroll using ↑ and ↓ until displaying the desired parameter.

2.1.2 Accessing the type "C" parameters

- press the Prg button;
- press the ↵ button until selecting the password entry field in the "Parameters" section;
- press the ↑ and ↓ buttons until displaying 22 (password to access the type "C" parameters);
- confirm by pressing ↵;
- select the desired menu item by pressing ↑ and ↓ and then ↵;
- scroll using ↑ and ↓ until displaying the desired parameter.

2.1.3 Modifying the parameters

After having displayed the first parameter, either type C or type F, proceed as follows:

- scroll using ↑ and ↓ until displaying the parameter to be modified;
- press ↵ to enter the mode for modifying the associated value, if there is more than one parameter on the screen, press the ↵ button until reaching the desired parameter;
- modify the value using ↑ and/or ↓;
- press ↵ to confirm and save the value;
- if there is more than one parameter on the screen, press the ↵ button until cursor flashes in the top left corner of the screen;
- repeat all the operations under "modifying the parameters" to change the values of any other parameters.

2.1.4 Exiting the programming procedure

- Press the Esc button until returning to the main screen.

2.2 Accessing the parameters from the PST display

2.2.1 Accessing the type "F" parameters

- press the  button for more than 5 seconds;
- the display shows parameter "*PP*" (Password **Parameters**);
- press the  button;
- confirm by pressing  , without entering the password;
- the display shows the selection menu;
- select the desired menu item by pressing  and  and then  ;
- press the  button to enter the item
- press the  or  button until displaying the parameter to be modified.

2.2.2 Accessing the type "C" parameters

- press the  button for more than 5 seconds;
- the display shows parameter "*PP*" (Password **Parameters**);
- press the  button;
- press the  or  button until displaying 22 (password to access the type "C" parameters);
- confirm by pressing  .
- the display shows the selection menu;
- select the desired menu item by pressing  and  and then  ;
- press the  button to enter the item
- press the  or  button until displaying the parameter to be modified.

2.2.3 Modifying the parameters

After having displayed the first parameter, either type C or type F, proceed as follows:

- press  or  until reaching the parameter to be modified;
- press  to display the corresponding value;
- modify the value using  and/or  ;
- press  to confirm and save the value and return to the display of the parameter code;
- repeat all the operations under "modifying the parameters" to change the values of any other parameters.

2.2.4 Exiting the programming procedure

- Press  +  tighter to return to the menu list;
- Alternatively, press  for more than 5 seconds to return to the temperature display.

3. Digital input configuration

3.1 General operating principle

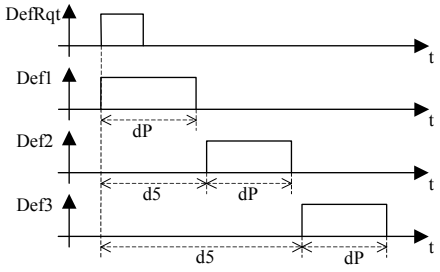
The *MasterCase2* series instruments feature three digital inputs that can be configured using parameters A1, A2, A3 (hereinafter A1 to A3) respectively, associated with inputs DI1 to D13. In addition, a further parameter, "A8", is used to manage a digital input called the "virtual" input, as it is not physically present on the instrument, but rather associated with the status of digital input DI1 on the Master in a pLAN (master-slave configuration).

Parameters used

- "A1", configuration of digital input 1
- "A2", configuration of digital input 2
- "A3", configuration of digital input 3
- "A8", virtual input configuration

The following describes the operation for each value of A1 to A3 / A8:

- *A1 to A3 / A8= 0: digital input disabled*
  The corresponding digital input is not used and ignores the closing/opening of any contacts connected to it.
- *A1 to A3 / A8= 1: input associated with an immediate external alarm*
  The digital input can be connected to an external alarm that requires immediate activation (for example, high pressure alarm, etc...). The alarm is generated when the contact is opened, and causes the display of the code "IA", the activation of the buzzer and the total shutdown of the controller and all the related outputs. When the alarm condition is no longer present, the unit returns to normal temperature control operation.
- *A1 to A3/A8= 2: input associated with a delayed external alarm*
  The operating mode is the same as for value 1 above, in this case however the alarm signal can be delayed by a time, in minutes, equal to the value set for the parameter "A7".
- *A1 to A3/A8= 3: input associated with a defrost enabling signal*
  This setting is used to enable/disable the defrost function. When the contact is open the defrost is inhibited, when the contact is closed the defrost is enabled. If the contact is closed, but there is no defrost request, the defrost is obviously not performed. If the contact is closed and a defrost is in progress, when the digital input is opened the current defrost is stopped, terminating any dripping and post-dripping phases, and the successive defrosts are inhibited, until the next time the digital contact is closed. Possible applications: this function is useful, for example, in the case of multiplexed showcases with hot gas defrost. In these systems, the defrosts are performed in "islands", and therefore, at any one time, some islands are enabled to defrost, and others are disabled. Another use of the function is to prevent defrosts on the units accessible to the public during opening times.
- *A1 to A3/A8= 4: input associated with an immediate defrost from external contact*
  When the corresponding digital input is closed, a defrost is started, according to the criteria set for the type "d" parameters. Possible applications: this function is useful when defrosts need to be performed on a series of utilities coordinated by an external timer. To avoid simultaneous defrosts, the parameter "d5" can be used to delay the start of the defrost on each unit. Another use of the function is to prevent defrosts on the units accessible to the public during opening times.



Key

DefRqt	Defrost call
Def1	Defrost on unit 1
Def2	Defrost on unit 2
Def3	Defrost on unit n°3
d5	Defrost start delay from controller power on or on from digital input
dP	Maximum defrost time

Fig. 3

- *A1 to A3/A8= 5: door switch*
  This function is used to manage the door switch on a cold room. When the contact (door) is opened, the control functions and the fans are stopped and the light output is activated. When the contact closes the unit starts again in the previous operating mode, delaying any temperature alarms for a number of hours equal to the value of the parameter "d8". If the door, and consequently the contact, remain open for a time greater than "d8", the display shows the alarm code "dr" and the controller returns to the operating mode it was in prior to the opening of the door. Specifically:
  1. if the controller was in Duty Setting mode, it returns to Duty Setting;
  2. if the controller was in continuous cycle mode, it returns to continuous cycle mode, and the maximum duration of the continuous cycle is not affected by the time the door was open;
  3. if the controller was in defrost mode, it remains in defrost mode;

  When the controller is restarted, the set safety times are observed (see type "c" parameters).
- *A1 to A3/A8= 6: remote ON/OFF*
  By setting the input for this function the controller can be switched on/off using an external contact. Switching off is not equivalent to disconnecting power, but rather is a "logical Off", that is, the controller goes into "standby", ignoring all the digital inputs and outputs, the defrost requests, continuous cycle and Duty Setting. The controller however still continues to display the temperature, alternating with the message "Off" on the PST display, or the message "UNIT OFF" on the PGD display.
  1. Contact closed= controller ON; 2. Contact open= controller OFF.
- *A1 to A3 /A8= 7: curtain switch*
  The digital input set to this value is used to activate/deactivate the "light" relay output when the corresponding contact is opened/closed. In addition, if the parameter "Stn" is set to 1, the set point will be varied by the value of the parameter "r4".
- *A1 to A3/A8= 8: "duty cycle setting" operation*
  The opening of the contact associated with the digital input set with this value will switch the controller to "duty setting" operation
- *A1 to A3/A8= 9: door switch with control ON*
  The behaviour of the controller when the digital input set to this value is opened is the same as for the "door switch" (An = 5) with the difference that in this case the outputs remain active (ON). This configuration can be used in cases where the door is opened and closed frequently, for short periods (frozen food display cabinets, etc...).

4. Analogue input configuration

4.1 General operating principle

The MasterCase2 controller has 7 analogue inputs, 3 of which can be configured using parameters /S1, /S2, /S3.
Each input can be associated with the type of probe connected and an offset for the reading.

Parameters used

- "/B1", configuration of the type of probe /S6 (not managed in the 1st version of the software)
- "/B2", configuration of the type of probe /S7 (not managed in the 1st version of the software)
- "/B3", configuration of the type of probe /S4
- "/B4", configuration of the type of probe /S5
- "/B5", configuration of the type of probe /S1
- "/B6", configuration of the type of probe /S2
- "/B7", configuration of the type of probe /S3
- "/S1", configuration of the function of probe S1
- "/S2", configuration of the function of probe S2
- "/S3", configuration of the function of probe S3
- "/C", calibration of probe B5
- "/d", calibration of probe B6
- "/8", calibration of probe B7
- "PUO", calibration of the superheated gas temperature probe (suction probe)
- "PAO", calibration of the saturated evaporation temperature probe
- "/4", defines a virtual probe between the room probe and the third probe

4.2 Types of probes

The MasterCase2 controller correctly manages different types of probes, using parameters "/B1 to /B7":

- NTC
- 0-5V
- PT1000
- 4-20mA

All the probes connected cannot be configured in all modes; see the list of parameters for more detailed information.

4.3 Calibration and offset

Each input can be assigned a value that is added to (positive value) or subtracted from (negative value) the temperature measured by the probe. For example, to decrease the temperature by 2.3 degrees, set -2.3. The offset can be set from –9.9 to +9.9 with precision to the tenth of a degree. For the probes relating to the management of the electronic valve, the offset may vary from -9.9 to 19.9 with precision to the tenth of a degree (parameters "PUO" and "PAO").

4.4 Control probes

The configuration of the control probes can be customised using parameters "S1", "S2" and "S3", assigning a different association between the room probe, defrost probe and third probe and the physical inputs B4, B5 and B6; the default configuration associates the physical inputs as follows:

- B4 = room probe (S1)
- B5 = defrost probe (S2)
- B6 = third probe (S3)

The manual often uses the term S1 to indicate the room probe, S2 the defrost probe and S3 the third probe; this is valid naturally only for the default configuration of the board.

4.5 Virtual probe

The parameter "/4" defines a non-existent probe used for the normal control functions This parameter determines the weighted average used to calculate the reference control probe value based on the reading of the room probe and the third probe.
The formula is the following:

virtual probe $= \frac{(100-("/4"))xS1+("/4")xS3}{100}$; where S1=room probe and S3=third probe

If "/4" is set to 0, the virtual probe coincides with the room probe; if set to 100, the virtual probe coincides with the third probe. If control is based on the virtual probe (value of parameter "/4" between 0 and 100), the breakage of one of the two probes automatically moves control to the other probe.

5. Digital output configuration

5.1 General operating principle

The *MasterCase2* series instruments have eight digital outputs that can be configured using parameters o1, o2, o3, o4, o5, o6, o7, o8 (hereinafter o1 to o8) associated respectively with the outputs from DO1 to DO8.
Multiple outputs can be configured with the same function, thus acting as "repeats".

Parameters used

- "o1", configuration of digital output 1
- "o2", configuration of digital output 2
- "o3", configuration of digital output 3
- "o4", configuration of digital output 4
- "o5", configuration of digital output 5
- "o6", configuration of digital output 6
- "o7", configuration of digital output 7
- "o8", configuration of digital output 8

The following describes the operation corresponding to each value of o1 to o8:

0 = "REGULATION", control
1 = "FAN", fans
2 = "DEFROST EVAP 1", defrost evaporator 1
3 = "DEFROST EVAP 2", defrost evaporator 2
4 = "LIGHT/NIGHT BLIND", light, curtain outputs
5 = "TRIM HEATER", heaters
6 = "ALARM", alarm signals
7 = "ON/OFF SOLENOID", solenoid
8 = "NET COMPRESSOR", network compressor
9 = "NONE", output not used

6. Other settings

6.1 H parameters

Parameters used

- "H0", supervisor serial address
- "H3", enable ON/OFF function from terminal
- "H4", enable ON/OFF function from supervisor
- "Sn", number of slave units in the LAN

As regards the parameters "H0" and "Sn", see further on in the manual under the chapter "Network functions".

Parameter "H3", if set to 1, enables a screen on the PGD terminal used to switch the unit on/off.
Parameter "H4", if set to 1, enables the unit to be switched on and off from the supervisor.
Important: the two functions, despite being able to act at the same time, are not independent. If the unit is switched off from the terminal, it cannot then be switched back on from the supervisor and vice-versa. In practice, the two functions must be considered as being in "series".

7. Temperature control

7.1 General operating principle

Parameters used

- "/4", control probe
- "St", set point
- "rd", differential (hysteresis)
- "r1", minimum set point
- "r2", maximum set point

Control is performed as follows:

temperature "/4" > "St" + "rd" ⇨ control ON
temperature "/4" ≤ "St" ⇨ control OFF

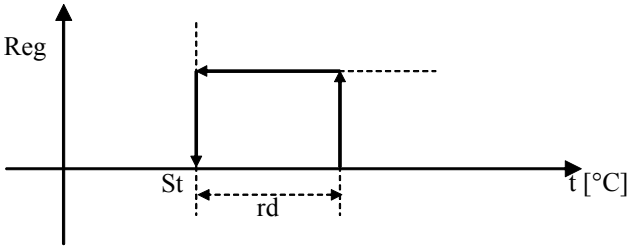


Fig. 4

Key

Reg	Control status
t	Time
St	Set point
rd	Differential

7.2 Safety parameters and control activation times

Parameters used

- "c0", control start delay when switching the instrument on
- "c1", minimum time between two consecutive starts
- "c2", minimum off time
- "c3", minimum on time
- "c8", control start delay from when the valve opens

7.2.1 Control start delay when switching the instrument on ("c0")

This parameter is used to delay, by a set time in minutes, the activation of the control functions from when the instrument is switched on.

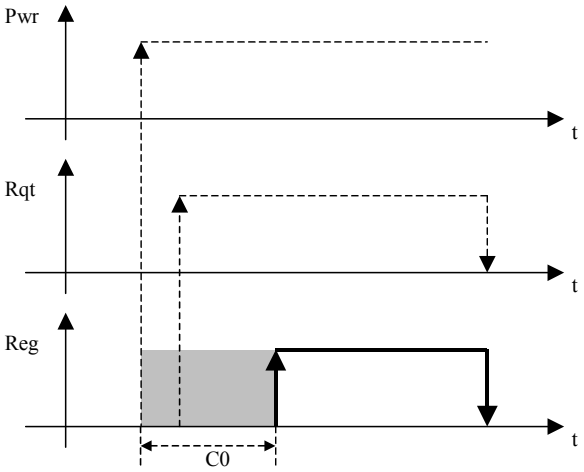


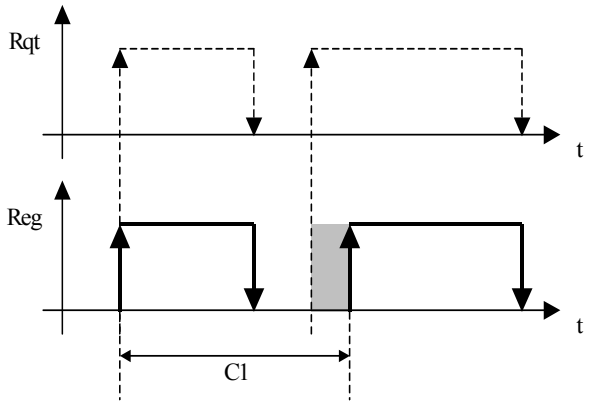
Fig. 5

Key

Pwr	Enable control (Sys ON)
Rqt	Control request
Reg	Control status
t	Time
c0	Control start delay when switching the instrument on

7.2.2 Minimum time between two consecutive starts ("c1")

Sets the minimum time that must elapse between two activations of the controller, irrespective of the temperature and the set point.
This parameter can be set so as to limit the number of starts per hour. For example, if the maximum number of starts per hour allowed is 10, simply set c1=6 to ensure that this limit is observed.

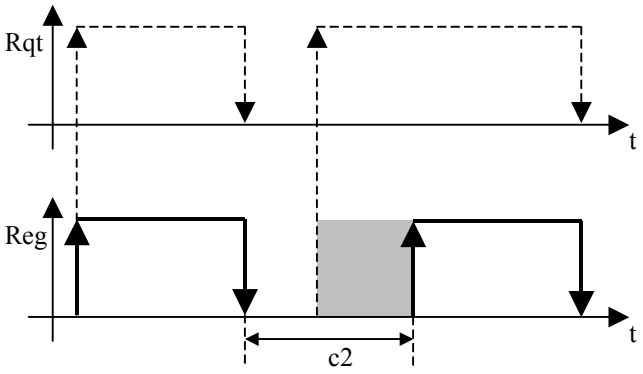


Key
Rqt Control request
Reg Control status
t Time
c1 Minimum time between two consecutive starts

Fig. 6

7.2.3 Minimum off time ("c2")

Sets the minimum controller off time in minutes (compressor output).
The compressor output is not reactivated until the minimum time selected (c2) has elapsed since the last deactivation.
This parameter is useful for ensuring the balancing of the pressure after shutdown, in the case, for example, of systems with hermetic and capillary compressors.

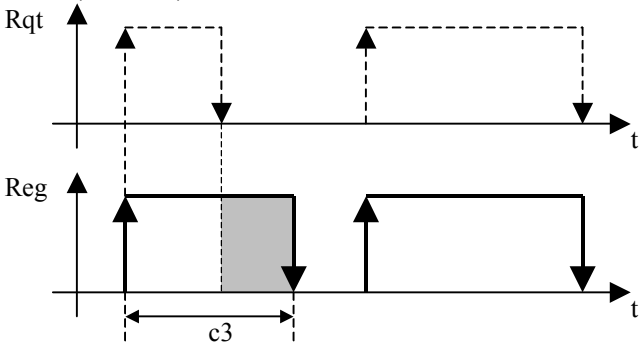


Key
Rqt Control request
Reg Control status
t Time
c2 Minimum off time

Fig. 7

7.2.4 Minimum on time ("c3")

Sets the minimum control on time.
The compressor output is not deactivated unless it has been activated for at least the time set.



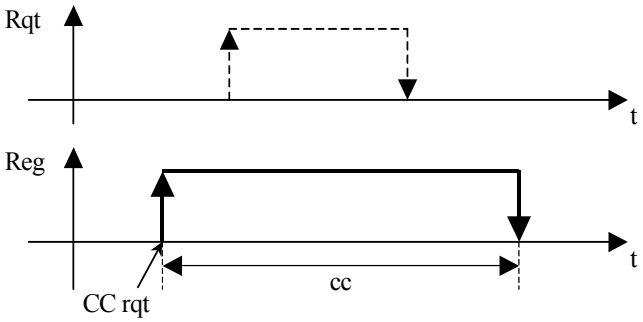
Key
Rqt Control request
Reg Control status
t Time
c3 Minimum on time

Fig. 8

7.3 Continuous cycle function

Parameters used

- "cc", continuous cycle duration
- "c6", low temperature alarm bypass time after continuous cycle
- "AL", low temperature alarm (deviation from the set point)
- "St", set point



Key	
Rqt	Control request
Reg	Control status
t	Time
CC rqt	Instant of continuous cycle procedure activation request
cc	Continuous cycle duration

Fig. 9

The continuous cycle function forces operation for the time "cc", for the purpose of lowering the temperature, even below the set point.
This function is started manually by pressing the "UP" and "DOWN" buttons on the user interface for more than five seconds, both on the PST terminal and on the PGD terminal; clearly the function cannot be activated using the PST display only (as there are no buttons).
If cc=0, the continuous cycle is disabled, the controller exits the continuous cycle procedure when the time set for the parameter "cc" has elapsed, or alternatively when reaching the minimum temperature threshold set using the parameter "AL".

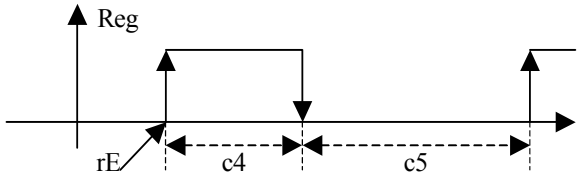
$$T_{LIMIT} = \text{"St"-"AL"}$$

At the end of continuous cycle operation, the low temperature alarm "L0" is disabled for the duration, in hours, indicated by parameter "c6".

7.4 "Duty cycle setting" function (safety control)

Parameters used

- "c4", Safety control (ON time)
- "c5", Safety control (OFF time)



Key	
Reg	Control status
t	Time
rE	Control probe broken or not connected alarm
c4	Safety control (ON time)
c5	Safety control (OFF time)

Fig. 10

This function is used to keep the utility operating even when there is a control probe fault (alarm "rE"). Specifically, this function is used to decide the control on time (c4) and off time (c5).If the alarm "rE" is reset, control restarts normally again without requiring the intervention of the maintenance personnel.

7.5 Temperature monitoring

Parameters used

- "r5", enable maximum and minimum temperature recording
- "rt", time elapsed since starting to monitor the maximum and minimum temperature
- "rH", maximum temperature recorded in the interval "rt"
- "rL", minimum temperature recorded in the interval "rt"

Enables temperature monitoring, recording the maximum ("rH") and minimum ("rL") temperature reached in the interval "rt" (max 999h).
The monitoring function starts when "r5" is set to 1.
To stop temperature monitoring, set "r5" to 0. After 999 hours, the max and min temperatures are no longer recorded, as the maximum monitoring time allowed by the instrument has been reached. Reset "r5" to start the monitoring again.

8. Night-time operation

8.1 General operating principle

Parameters used

- "A1" to "A3" = 7; input associated with the curtain switch
- "r6", night-time control with third probe (S3)
- "r4", deviation from the set point
- "Stn", select night-time set point mode
- "St", set point
- "hSn", night-time set point start hour
- "mSn", night-time set point start minutes
- "hSd", night-time set point end hour
- "msd", night-time set point end minutes

MasterCase2 offers the possibility to manage two different control set points, during the day and at night.

Parameter Stn can be used to configure the controller for the automatic changeover of the set point.
The following values are possible:

"Stn" = 0, no night-time set point.
No digital input programmed as the curtain switch (A*x* ≠ 7) ⇨ no action.
Digital input programmed as the curtain switch (A*x* = 7) ⇨ when the status of the corresponding digital input changes, **only** the light output will be activated (action sent across the local network from the Master to the Slaves). No change in the set point.

"Stn" = 1, set point variation from digital input.
No digital input programmed as the curtain switch (A*x* ≠ 7) ⇨ no action.
Digital input programmed as the curtain switch (A*x* = 7) ⇨ when the status of the corresponding digital input changes, the following will occur:

- activation of the light output (action sent across the local network from the Master to the Slaves);
- variation of the set point, according to parameter "r4";
- switching of the control reference to the third probe (S3), according to parameter "r6".

"Stn" = 2, variation from RTC.
If the controller is fitted with the RTC option, operation can switch from the daytime to the night-time set point and vice-versa by setting two time bands (see parameters "hSm", "mSn", "hSn", hSd" and the figure below). The actions performed will be the same as described in the previous point ("Stn"=1 and A*x*=7).
If a digital input has been programmed as the curtain switch (A*x* = 7), the change in status will **only** activate or deactivate the light output.

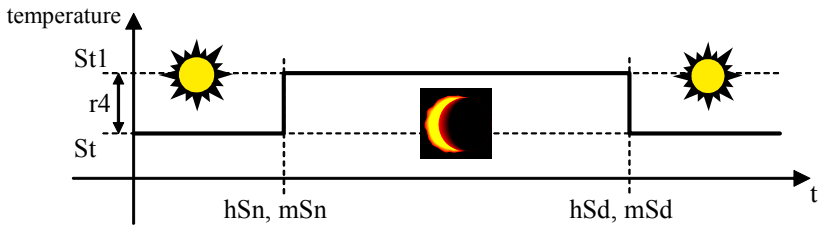


Fig. 11

9. Fans

9.1 General operating principle

The operation of the fans can be divided into four phases:

1. Normal operation
2. Defrost
3. Dripping
4. Post-dripping

9.2 Normal operation

Parameters used

- "F0", fan operating mode
- "F1", fan off time
- "F2", fan operation based on the control status
- "A0", temperature alarm return and fan activation differential

During normal operation the fans can be managed by the "fan controller", which manages them according to the temperature measured by the end defrost probe (S2) where "F1" =0, or alternatively can be always on, and stop when the controller is switched off, based on the settings of parameters "F2", where "F0"=0.

"F0"=0, "F2"=0

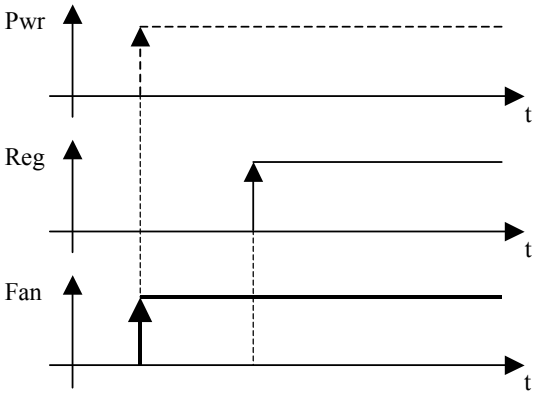


Fig. 12

"F0"=0, "F2"=1

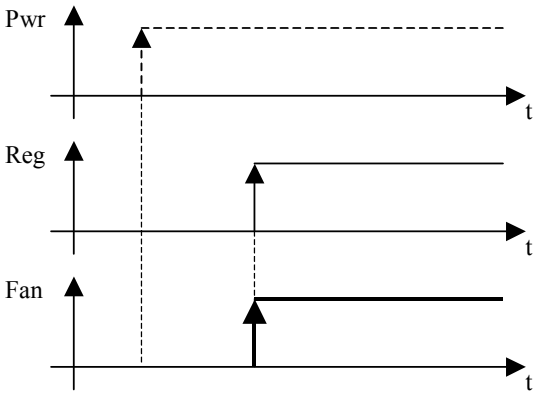


Fig. 13

"F0"=1

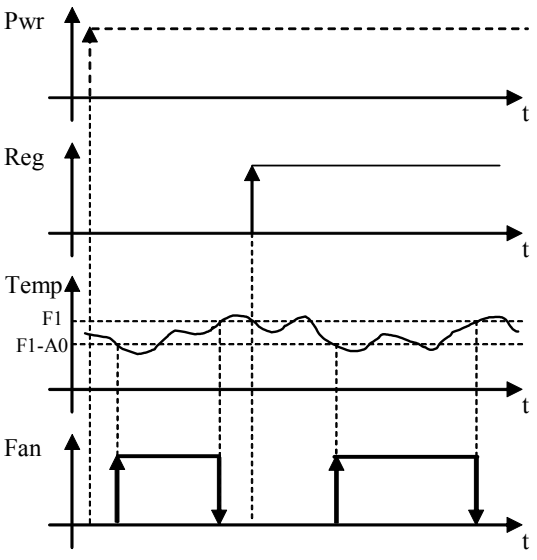


Fig. 14

Key

Pwr	Enable control (Sys ON)
Reg	Control status
Fan	Status of the fans
Temp	Temperature
F1	Fan off time
A0	Temperature alarm return and fan activation differential

9.3 Defrost, dripping, post-dripping

Parameters used

- "F3", fan management during defrost
- "Fd", fan off time during post-dripping
- "dd", dripping time

During defrost, the fans can be configured to operate in different modes, based on the value of parameter "F3":

- F3=0, fans on during defrost. During the *dripping wait* (in the case of master-slave network defrost) and *dripping* times (if set by the parameter "dd") the fans are always off.
- F3=1, fans always off in all phases, defrost and dripping wait.
- F3=2, fans always on, even during the dripping phase ("dd"). This is useful in the applications where the fans must always be on, yet a "pause"/dripping time is required after defrosting. During the *dripping wait* (in the case of master-slave network defrost) and *dripping* times (if set by the parameter "dd") the fans are always on.

F0=0, F3=0, Fd ≠ 0

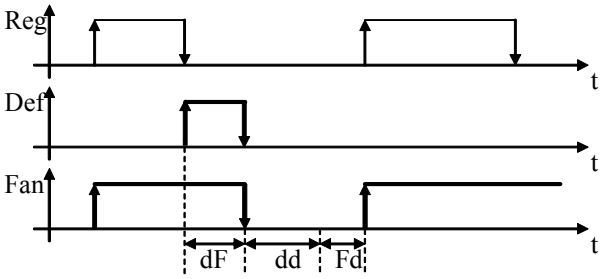


Fig. 15

F0=0, F3=1, Fd ≠ 0

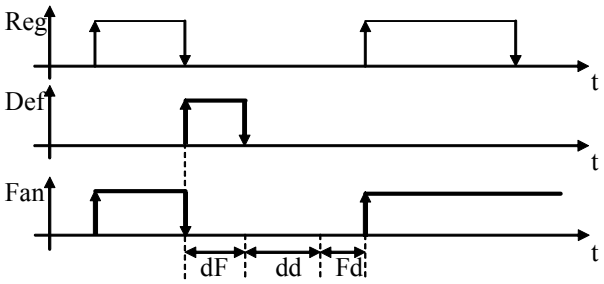


Fig. 16

F0=0, F3=2, Fd ≠ 0

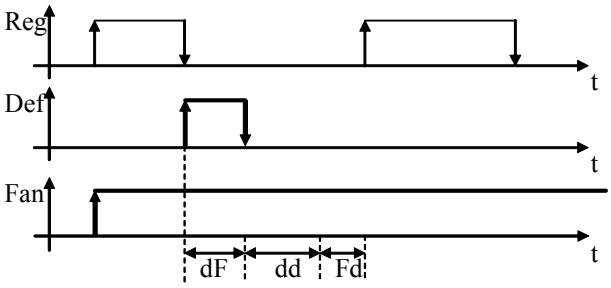


Fig. 17

Key	
Reg	Control status
Fan	Status of the fans
t	Time
dF	Defrost operation
dd	Dripping wait time
Fd	Post-dripping time

10. Defrost

10.1 General operating principle

Parameters used

- All the type "d" parameters
- "/10", select end defrost probe
- "/9", end defrost also with third probe (S3)
- "r3", enable alarm "Ed" (defrost ended by timeout)

The defrost function has the task of removing any frost or ice on the evaporator, optimising energy consumption and maximising performance.
MasterCase2 offers different types of programmable defrosts:

- cyclical defrost;
- defrost from Real Time Clock;
- defrost at instrument start-up.

There are also different types of forced defrosts:

- manual defrost from LAN;
- manual local defrost;
- defrost from digital input.

The following types of defrost are available (these can be selected using parameter "d0"):

- heater, end by temperature or after a maximum safety time (timeout)
- hot gas, end by temperature or after a maximum safety time (timeout)
- heater, end by time
- hot gas, end by time

If parameter "r3"=1, when the defrost procedure ends after having reached the maximum time ("d0" = 0 or 1), the "Ed" alarm is signalled to indicate a possible problem.
N.B.: All the defrosts, except for the local manual defrosts, are transferred from the master to the slaves over the pLAN network.

10.2 Structure of the defrost function

The defrost procedure features three phases:

- "Actual" defrost
- Dripping wait
- Post-dripping

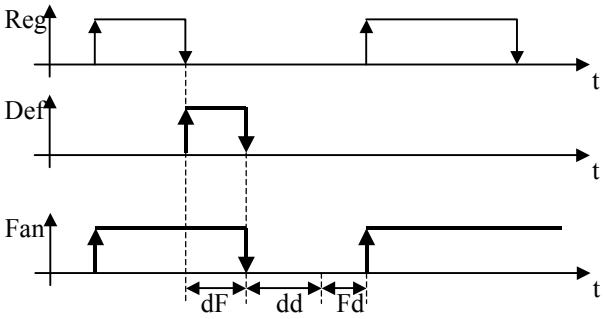


Fig. 18

Key

Reg	Control status
Def	Status of the defrost output
dF	Defrost operation (actual defrost)
dd	Dripping wait time
Fd	Post-dripping time

10.3 "Actual" defrost

Parameters used

- "d0", type of defrost
- "/10", select end defrost probe
- "/9", end defrost also with third probe (S3)
- "dP", maximum defrost duration
- "dt", maximum defrost temperature

The "actual" defrost phase is the main phase of the defrost procedure; only during this phase is the heater output or hot gas injection solenoid valve activated.
The duration of this phase depends on the configuration of parameter "d0", which indicates whether the end of the actual defrost procedure depends only on the maximum defrost time "dP", or also on the temperature indicated as the end defrost temperature "dt", according to the value read by the probe indicated by parameter "/10" and the configuration of parameter "/9".

d0=0/2

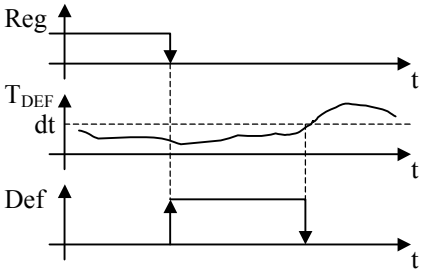


Fig. 19

d0=1/3

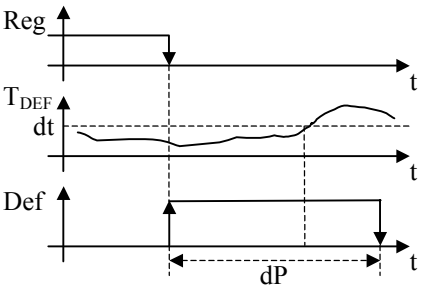


Fig. 20

Key

Reg	Control status
Def	Status of the defrost output
T_{DEF}	End defrost probe temperature
dP	Maximum defrost duration
dt	Maximum defrost temperature

10.4 Dripping and post-dripping times

Parameters used

- "F3", fan management during defrost
- "dd", dripping time
- "Fd", fan off time during post-dripping

This phase allows the water created due to the heat from the electric heaters to drip, choosing whether the fans should be on at the same time.
The dripping phase lasts the time indicated by parameter "dd"; during the dripping phase, the fans operate based on the setting of parameter "F3". For further details on the dripping and post-dripping phases, see the section on the fans.

10.5 Cyclical defrost

MasterCase2 offers the possibility to configure "cyclical" defrosts, that is, defrosts that are repeated cyclically over time. Parameter "dI" manages this type of defrost, with the procedure being repeated after the number of hours set with this parameter. The time is restarted whenever a defrost is completed (even non-cyclical ones).
If "dI" is equal to 0 ("dI" = 0), cyclical defrosts are disabled.
In a LAN, the activation of a cyclical defrost on the master also activates a defrost on the connected Slaves (network defrost).

10.6 Defrost on start-up

This functions activates a defrost when the instrument is switched on, based on the setting of parameter "d4".
This function can be useful when, due to frequent power failures and the consequent resetting of the defrost timer (see parameter "dI"), the number of planned defrosts may be reduced and therefore be insufficient. In multi-utility systems, to avoid the simultaneous defrosting of all the units when power returns, set parameter "d5", corresponding to the defrost delay, to different values.

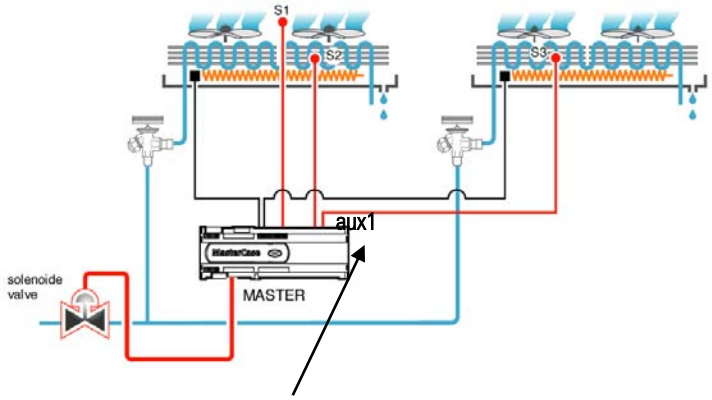
10.7 Network defrost

With each programmed or forced defrost, except for the local manual defrosts, the Master unit transfers the defrost call to all the Slave units; the various instruments in the pLAN network can be programmed to also wait for the end defrost signal from the network.
This setting depends on parameter "d2":

- "d2" = 0 ➔ the instrument completes the defrost without waiting for the end signal (stand-alone instrument);
- "d2" = 1 ➔ the instrument waits, at the end of the defrost, for the end signal, which is usually sent by the master in a LAN of multiplexed cabinets; the end signal arrives when all the units in the network have completed the actual defrost phase.

10.8 Management of the second evaporator

The MasterCase2 controller can manage a second defrost output that is independent from the main one and associated with the value read by the third probe (S3). Consequently, this can be used to control a defrost heater on the second evaporator, with the management of the second evaporator bypassing the end defrost configuration with two probes (parameter "/9").
To enable the function, configure one of the outputs (parameters "o1" to "o8") as the second evaporator output.



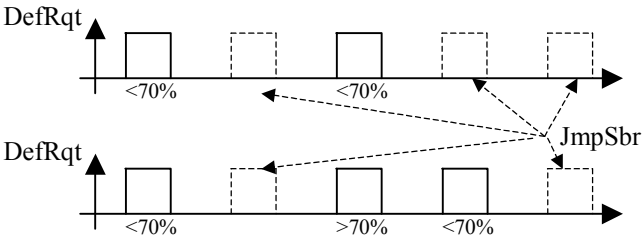
Two independent defrost outputs
Fig. 21

10.9 Skip defrost

This parameter (parameter "d7") enables the algorithm by which, based on the actual time elapsed during the last defrost, the following defrost is performed or skipped.
The following rules are considered:

- the maximum number of consecutive defrosts that can be skipped is 3, that is, after the third defrost skipped, the following one is always performed;
- after switching the instrument on, the first 7 defrosts are always performed;
- the number of events to be skipped is increased by a maximum of 1 at a time;
- the manual defrosts (started on the user interface) or by digital input are always performed and counted;
- the function can only be used with the defrosts that end by temperature.

This function is based on a very simple but very effective principle. If the defrost lasts less than or equal to 70% of the time set for the parameter "dP" (maximum defrost time), the next defrost envisaged will be skipped. When the following defrost is performed, the check is repeated, and if the outcome is the same then the following two defrosts envisaged are skipped, and so on according to the criteria described above (maximum 3 successive defrosts skipped).
As soon as the defrost time exceeds 70% of the time "dP", the following defrost will be performed and the function will start again.



Key
DefRqt Defrost call
JmpSbr Defrosts skipped

Fig. 22

This function should be used with the programming of the defrosts equally distributed over the day (e.g. cyclical defrosts, parameter "dI").

10.10 HI alarm bypass after defrost

During the defrost phase, and in the period immediately following the defrost, the control probe reading may reach temperature values that are not allowed in normal operation, yet may be allowable in these transition phases; consequently, the unnecessary high temperature alarm "HI" signal can be disabled for the time indicated by parameter "d8". If the alarm condition continues more than the time indicated by "d8", the alarm will be activated.

10.11 Priority of defrost over safety times and the activation of the controller

Parameter "d9" can be used to assign the priority between the defrost call and the controller safety parameters.

- "d9" = 0 ⇨ the protection times are observed;
- "d9" = 1 ⇨ the defrost has higher priority and the times set with the "C" parameters are ignored.

10.12 Management of the user interface during defrost

Configuration only available for the PST terminal.
Parameter "d6" can be used to set what is displayed during the defrost phase:

- "d6" = 0 ⇨ the temperature is displayed, alternating with the defrost in progress signal "dF";
- "d6" = 1 ⇨ the last temperature measured before the start of the defrost procedure is displayed;
- "d6" = 2 ⇨ the defrost in progress signal "dF" only is displayed.

Naturally, if any alarms are active, the display selected will alternate with the alarm signal.

11. Electronic valve

11.1 General operation

MasterCase2 can manage the operation of an electronic expansion valve with stepper motor (Carel E2V) or a PWM On/Off valve.
This allows the possibility to directly control the injection of refrigerant into the evaporator, with lower and more stable superheat values, higher evaporation temperatures and consequently greater humidity and a more constant temperature, guaranteeing better product conservation and quality.

Parameters used

- All type "P" parameters

11.2 Configuration of the system parameters

Select the type of valve ("P1")

The MasterCase2 controller can control two different types of valve. Parameter P1 is used to set the model installed.

- "P1" = 0, "PWM", PWM valve;
- "P1" = 1, "STEPPER", Valve with stepper motor;
- "P1" = 2, "NONE", Valve not installed.

Note: *Whenever this parameter is modified, the control will need to be switched off and on again, so as to load the internal values associated with the type of valve chosen.*

Refrigerant ("PH")

Parameter "PH" sets the type of refrigerant used on the unit. This setting is required for the calculation of the saturated evaporation temperature. For refrigerants with glide, the dew point is used.

Superheat set point ("P3")

Parameter "P3" indicates the superheat control set point.

Dead band ("P2")

Parameter "P2" indicates the dead band, that is, the semi-interval of temperatures (±) around the superheat set point in which there are no control actions.
For example, a value of 1°C for this parameter with a set point of 5°C means that the superheat can vary between 4°C and 6°C without the controller attempting to modify it. Obviously, if the superheat value is outside of this interval, the controller would immediately be activated.

Proportional gain, Integral time, Derivative time

The proportional (parameter "P4"), integral (parameter "P5") and derivative (parameter "P6") constants are the main control parameters. These define the superheat PID control algorithm. Refer to classic PID control theory for a more detailed description of their meaning.
Note: The proportional constant – Kp – defines the gain not only for the PID control but also for all the active protection functions (LOW SHeat protection, LOP protection, MOP protection, HiTcond protection).

LOW SuperHeat

Low subcooling threshold.
Parameter "P7" defines the activation threshold for the low superheat protection function. Below this value another control function is activated, in *addition* to the PID, with programmable constant (parameter "P8").
When this threshold is crossed, the timer (parameter "P9") starts for the low superheat alarm, if activated.

MOP

High suction pressure threshold (Maximum Operating Pressure) indicated in saturated °C.
Parameter "PM1" defines the high pressure protection activation threshold. Above this value, integral control starts, using a constant that can be set (parameter "PM2") so as to maintain the saturated suction temperature below the set value.
Note: The MOP protection tends to CLOSE the expansion valve. This means that if the reason why a high pressure situation occurred is temporary (compressor start, sudden variation in the refrigerant charge, modulation of the cooling capacity, etc.) the refrigerant superheat temperature on the suction side may be low or drop quickly. In these cases, the MOP protection and the superheat control act together, and there are no limits to either. If, on the other hand, the high pressure has been reached at the same time as particularly high or normal superheat values (for example the unit was started with very high temperatures of the product being cooled), the unlimited and extended action of the MOP may involve a refrigerant suction temperature that is excessive for the correct operation of the compressor. For this reason, a limit has been introduced to the maximum superheat temperature, described below (high suction temperature threshold).

MOP delay at start

This is the delay time for the activation of the MOP protection function whenever the control is activated (both when the unit is started and whenever deviating from the set point). It can be set using parameter "PM3". This allows regular restarts before activating the MOP function.

High suction temperature threshold

Parameter "PM4" sets the maximum temperature (thermometric) allowed for the gas leaving the evaporator.
This parameter therefore limits the action of the MOP protection so that, when reached, the corrective action of the protection function is stopped, until the refrigerant temperature returns below the set value.

Type and range of the saturation temperature probe

Parameter "PSt" selects the mode used to read the suction temperature; when PSt = 0 the saturation temperature is read by the pressure probe (the operating limits can be set by the parameters "PEL" and "PEH") and then converted to a temperature. When PSt = 1, the temperature is read directly by the connected probe.
Parameters "PUO" and "PAO" can be used to define an offset on the temperature read by the two probes.

12. HACCP

12.1 General operation

This function allows advanced control of the operating temperature and the recording of any faults due to power failures or increases in the operating temperature for various reasons (faults, severe operating conditions, user errors, etc...).
This function can only be activated on the controllers with the RTC option fitted.

Parameters used

- "Ad", "tr", temperature alarm delay and HACCP alarm delay
- "AH", high temperature alarm (deviation from the set point)
- "tA", type of HACCP alarm
- "tSH", "tSM", "tSd", "tSm", HACCP alarm start hour, minutes and date
- "tEH", "tEM", "tEd", "tEm", HACCP alarm end hour, minutes and date
- "to", delete the saved data

Alarms generated

- "HF"
- "HA"

12.2 HA alarm

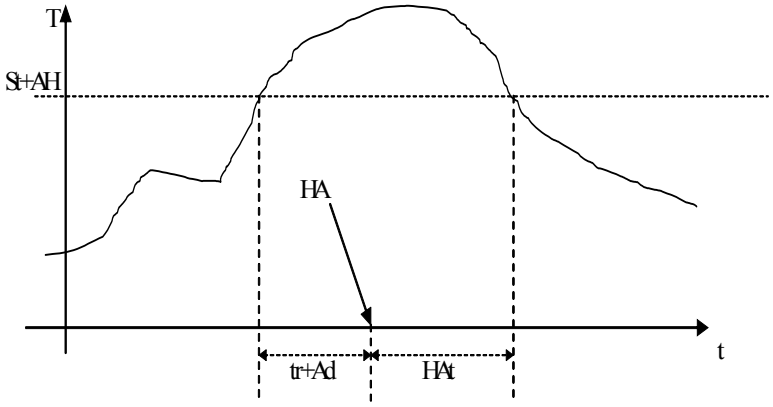


Fig. 23

Key	
T	Temperature control probe
t	Time
St	Set point
AH	High temperature alarm (deviation from the set point)
tr	HACCP alarm delay
To	Temperature alarm delay
HA	HA alarm (HACCP)
HAt	HA alarm duration

If, during operation, the temperature measured is greater than the threshold represented by the sum of the parameters "AH" (high temperature alarm threshold) and "St" (set point), for a time greater than the sum of the parameter "tr" (specific for the HACCP alarms) and the parameter "Ad" (temperature alarm delay), the alarm HA is activated.
When the event occurs the following data are saved:

- hour, minutes and day, month, year the alarm condition started;
- type of alarm;
- maximum temperature reached after the activation of the alarm;
- hour, minutes and day, month, year the alarm condition ended.

12.3 HF alarm

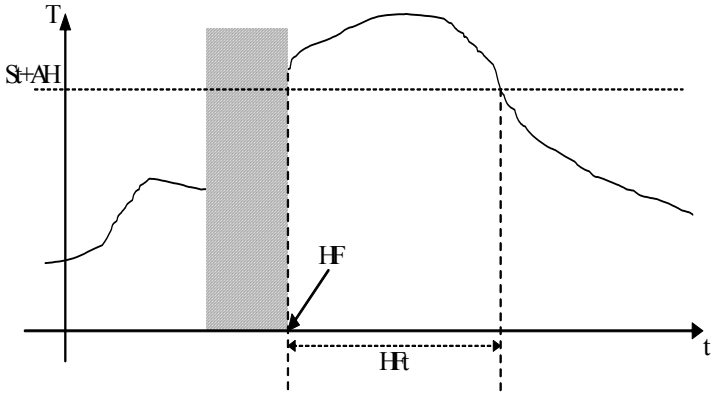


Fig. 24

Key	
T	Temperature control probe
t	Time
St	Set point
AH	High temperature alarm (deviation from the set point)
tr	HACCP alarm delay
To	Temperature alarm delay
HF	HF alarm (HACCP)
HFt	HF alarm duration

This is activated after a power failure if, when power returns, the temperature is higher than the threshold represented by "AH" + "St". The following data are saved:

- hour, minutes and day, month, year the power failure ended;
- type of alarm;
- maximum temperature reached after the activation of the alarm;
- hour, minutes and day, month, year the alarm condition ended.

13. Network functions

13.1 Local network operation (pLAN)

The MasterCase2 controllers can be connected together to form a pLAN (**p**CO **L**ocal **A**rea **N**etwork) in master-slave configuration. The main purpose of the pLAN is to provide communication and synchronisation in operation between a series of instruments (maximum six: one Master and five Slaves) operating on a multi-evaporator utility, for example a multiplexed cabinet. The configuration of the instruments can be modified by simply setting the network address.
This configuration is used to synchronise and coordinate the defrosts, send the status of the digital inputs and display any alarms active relating to the Slaves on the Master.

13.2 pLAN network configuration

13.2.1 Parameters used

- "Sn", Number of slave units (only on the master)
- "Sj", Select the unit in the pLAN connected to the display (only on the PGD terminal)

On the Master unit, the number of units connected in the LAN can be configured using parameter "Sn".
The Master function will be automatically taken by the controller configured with address 1 in the pLAN network. All the other units act as slaves.
Parameter "Sj" can be used to change the unit in the network displayed on the terminal; the function for selecting the unit in the network displayed on the terminal is only available with the PGD terminal.

```
+--------------------+
|Switch to         Sj|
|unit                |
|SLAVE1              |
|Current Unit:MASTER |
+--------------------+
```

13.2.2 Setting the address of the PGD0 terminal

The address of the terminal can only be set after having supplied power to the terminal via the RJ12 telephone connector. The default address of the terminal is 32.

To enter configuration mode, press the DOWN  UP  and ENTER  buttons at the same time for at least 5 seconds; the following screen will be displayed, with the cursor flashing in the top left corner:

```
Display address
setting.........:nn

I/O Board address:xx
```

• To change the address of the terminal (display address setting) press ENTER  . The cursor will move to the address field (nn).

• Use the DOWN  and UP  buttons to select the desired value, and confirm by pressing ENTER  . If the value selected is different from the one saved previously, the following screen will be displayed, and the new value will be saved to the permanent memory on the display.

```
Display address
changed
```

If the field nn is set to 0, the terminal will communicate with the controller using the "point-to-point" protocol (not pLAN) and the "I/O Board address: xx" field is no longer displayed, being without meaning.

13.2.3 Setting the address of the boards in the pLAN

The pLAN address is set using a standard PGD0 terminal, as follows:
• Disconnect the board from the power supply;
• Prepare a PGD0 terminal with the address set to 0;
• Connect the terminal to the controller;
• Disconnect any pLAN connections to other controllers from the MasterCase2;

• Power the controller by pressing the UP  and ALARM  buttons at the same time;
• After a few seconds the following screen will be displayed:

```
PLAN ADRESS: 0
UP:      INCREASE
DOWN:  DECREASE
ENTER: SAVE & EXIT
```

• To change the address, simply use the UP  and DOWN  buttons and then press ENTER  to confirm.

13.3 Downloading the parameters

All the instruments in the MasterCase2 series have the possibility of transferring the parameter settings from the master to the slaves across the pLAN local network. This operation is used to save time in programming the instruments that are used in the same LAN and that would have similar settings.
During the transfer phase, all the parameters are downloaded from the master to the slaves, except for those that involve the individual controller (clock setting, defrost times, etc.…). The following list summarises the parameters that are transferred via pLAN from the Master to the Slaves; for a more detailed description of each individual parameter, see the table of parameters.

/10	c0	dM	PEL
/4	c1	dP	PH
/7	c2	dPM	PL1
/9	c3	dt	PL2
/B1	c4	F0	PM1
/B2	c5	F1	PM2
/B3	c6	F2	PM3
/B4	c8	F3	PM4
/B5	cc	Fd	PPE
/B6	CP1	H3	Pst
/B7	d0	H4	r1
/S1	d2	P1	r2
/S2	d3	P2	r3
/S3	d4	P3	r4
/SL1	d5	P4	r5
/t	d6	P5	r6
A0	d7	P6	rd
A7	d8	P7	St
Ad	d9	P8	tr
AH	dd	P9	
AL	dI	PEH	

13.4 Failed download signal

When the parameter download procedure starts, a screen is displayed indicating the results of the download.
For each slave unit present in the network, the message "No" is displayed if there has been a communication error (download failed), while if the download is successful, the message "Ok" is displayed.

```
+--------------------+
|Download Result     |
|                    |
|Sl1:Ok Sl3:Ok Sl5:- |
|Sl2:No Sl4:-        |
+--------------------+
```

13.5 Network defrost in multiplexed systems

One of the functions that mostly requires synchronisation is defrost management. The master controls the defrosts on all the slaves connected. The master waits for all the units to have ended the defrost before signalling the end of the defrost on the entire network. The slaves that have ended the defrost wait for the end defrost signal from the master before starting the dripping phase. Once having received the end defrost signal, the controllers switch to the dripping phase. The defrost on each single unit and the network defrost in any case end after the maximum defrost time, set by parameter ("dP", default 30 min.).
The network defrost, as well as being run cyclically at a programmable interval using parameter "dI", can be started:

- From the PGD0 terminal by pressing ENTER and DOWN together for more than 5 seconds;
- From the PST terminal by pressing the SET  and  buttons together for more than 5 seconds

  N.B.: Pressing the DOWN button on PGD0 or the  button on the PST for more than 5 seconds starts the local defrost on the unit.
- At pre-set times, if the RTC option is fitted on the Master unit.

13.6 Remote alarm signals

The unit configured as the master in a LAN can signal remote alarms present on the slave units, if enabled by setting the corresponding configuration parameter (parameter Ar = 1). All the masters are enabled to receive the alarm signals from the slaves by default.
As the terminal or display is not essential for the operation of the unit, and indeed in a LAN the slave can operate perfectly without this user interface, this function is particularly useful for "centralising" the alarm management functions on the master.
If the master detects an alarm on a slave unit (probe error, high or low temperature error, etc....), the display shows the corresponding alarm signal. The following codes denote an alarm on the slave units:

1. Alarm on slave unit 1 = n1
2. Alarm on slave unit 2 = n2
3. Alarm on slave unit 3 = n3
4. Alarm on slave unit 4 = n4
5. Alarm on slave unit 5 = n5

The alarm relay on the master is activated when the remote alarm signal remote is received.

13.7 Supervisory network

The MasterCase2 controllers can be connected to a supervisor, allowing remote control of the entire installation.

Parameters used

- "H0", supervisor serial address

To configure the supervisory network, simply set parameter "H0" accordingly.

The unit can be interfaced to a local or remote supervisory/telemaintenance system.
The accessories available for the MasterCase2 board include an optional RS485 or Ethernet serial communication adapter, supplied separately.

The variables available to supervisor are shown in the following table. See the list of parameters for an extended description:

Ref.	Idx	T	Flow
Digital variables			
MP1	1	D	RW
MP2	2	D	RW
MP3	3	D	RW
MP4	4	D	RW
MP5	5	D	RW
MP6	6	D	RW
MP7	7	D	RW
MP8	8	D	RW
MP	9	D	RW
On/Off	10	D	RW
Rtc Present	11	D	R
r3	12	D	RW
r5	13	D	RW
r6	14	D	RW
F0	15	D	RW
F2	16	D	RW
Fd	17	D	RW
d4	18	D	RW
Ar	19	D	RW
d7	20	D	RW
d9	21	D	RW
/9	23	D	RW
H3	25	D	RW
Comp	26	D	R
Light	27	D	R
Def	28	D	R
Fan	29	D	R
Def2	30	D	R
Alarm	31	D	R
Thea	32	D	R
NetComp	33	D	R
On/Off	34	D	R
HI	40	D	R
LO	41	D	R
Ed	43	D	R
Ed1	44	D	R
Id	45	D	R
dA	46	D	R
IA	47	D	R
HA	48	D	R
HF	49	D	R
E1	50	D	R
E2	51	D	R
E3	52	D	R

Ref.	Idx	T	Flow
rE	53	D	R
LO1	54	D	R
N1	55	D	R
N2	56	D	R
N3	57	D	R
N4	58	D	R
N5	59	D	R
Res HACCP	60	D	RW
PSt	61	D	RW
No haccp alr	62	D	R
MOP	63	D	R
dr	64	D	R
tC	65	D	R
MA	66	D	R
U1	67	D	R
U2	68	D	R
U3	69	D	R
U4	70	D	R
U5	71	D	R
LOP	72	D	R
LSh	73	D	R
HSh	74	D	R
Integer Variables			
Ad	1	I	RW
A1	2	I	RW
A2	3	I	RW
A3	4	I	RW
A4	5	I	RW
A7	6	I	RW
A8	7	I	RW
H0	8	I	RW
/10	9	I	RW
Sn	12	I	RW
Stn	13	I	RW
hSn	14	I	RW
hSd	15	I	RW
F3	16	I	RW
d2	17	I	RW
c0	18	I	RW
c1	19	I	RW
c2	20	I	RW
c3	21	I	RW
c4	22	I	RW
c5	23	I	RW
c6	24	I	RW

Ref.	Idx	T	Flow
c8	25	I	RW
cc	26	I	RW
d0	27	I	RW
d5	29	I	RW
d8	30	I	RW
dd	31	I	RW
dI	32	I	RW
dP	33	I	RW
dM	34	I	RW
dPM	35	I	RW
/t	36	I	RW
/4	37	I	RW
/7	38	I	RW
/S1	39	I	RW
/S2	40	I	RW
/S3	41	I	RW
d1	42	I	RW
d2	43	I	RW
d3	44	I	RW
d4	45	I	RW
d5	46	I	RW
d6	47	I	RW
d7	48	I	RW
d8	49	I	RW
h1	50	I	RW
h2	51	I	RW
h3	52	I	RW
h4	53	I	RW
h5	54	I	RW
h6	55	I	RW
h7	56	I	RW
h8	57	I	RW
m1	58	I	RW
m2	59	I	RW
m3	60	I	RW
m4	61	I	RW
m5	62	I	RW
m6	63	I	RW
m7	64	I	RW
m8	65	I	RW
PH	66	I	RW
tr	70	I	RW
tA	71	I	R
tSH	72	I	R
tSM	73	I	R

Ref.	Idx	T	Flow
tSD	74	I	R
tSm	75	I	R
tSy	76	I	R
tEH	77	I	R
tEM	78	I	R
tED	79	I	R
tEm	80	I	R
tEy	81	I	R
/B1	82	I	RW
/B2	83	I	RW
/B3	84	I	RW
/B4	85	I	RW
/B5	86	I	RW
/B6	87	I	RW
/B7	88	I	RW
P9	90	I	RW
th	100	I	R
t	101	I	R
tn	102	I	R
tm	103	I	R
ty	104	I	R
td	105	I	R
PF	116	I	R
Power Rqt	117	I	R
d6	118	I	RW
rt	119	I	R
mSn	120	I	RW
mSd	121	I	RW
P1	122	I	RW
CP1	123	I	R
PM3	124	I	R
Analogue Variables			
AH	1	A	RW
AL	2	A	RW
A0	3	A	RW
St	4	A	RW
rd	5	A	RW
r1	6	A	RW
r2	7	A	RW
r4	8	A	RW
SL1	9	A	RW
F1	10	A	RW
dt	11	A	RW
/8	12	A	RW

Ref.	Idx	T	Flow
/C	13	A	RW
/d	14	A	RW
P2	15	A	RW
P3	16	A	RW
P4	17	A	RW
P5	18	A	RW
P6	19	A	RW
P7	20	A	RW
P8	21	A	RW
PM1	22	A	RW
PM2	23	A	RW
PM4	24	A	RW
Po1	25	A	R
Po4	26	A	R
PL	27	A	R
Po3	28	A	R
Po2	29	A	R
Air off prb	30	A	R
Defrost prb	31	A	R
Air on prb	32	A	R
Virtual Prb	33	A	R
/10 prb	34	A	R
tt	40	A	R
rH	60	A	R
rL	61	A	R
PPE	62	A	RW
PEL	63	A	RW
PEH	64	A	RW
PUO	65	A	RW
PAO	66	A	RW
PL1	67	A	RW
PL2	68	A	RW

14. Alarms

14.1 Summary table

Ref.	Screen description	Meaning	Relay alarm and buzzer
rE	Control probe broken or not connected	Control probe/probes broken or not connected	Active
E1	Air Off probe broken or not connected	(S1) Room probe broken or not connected	Relay only
E2	Defrost probe broken or not connected	(S2) Defrost probe broken or not connected	Relay only
E3	Air on probe broken or not connected	(S3) Third probe broken or disconnected	Relay only
E0		Communication error with the PST terminal (only on PST display)	Not active
IA	Immediate external alarm	Immediate external alarm	Active
dA	Delayed external alarm	Delayed external alarm	Active
LO	Low temperature alarm	Low temperature alarm	Active
HI	High temperature alarm	High temperature alarm	Active
HA	HACCP alarm	HA alarm (HACCP)	Relay only
HF	HACCP alarm	HF alarm (HACCP)	Relay only
Ed	Defrost ended by timeout	Defrost ended by timeout	Relay only
Ed1	Driver probes out of range	Driver control probes broken or not connected	Active
LSh	Low SuperHeat alarm	Low superheat	Active
dF	dF	Defrost in progress (only on PST display)	Not active
tC	RTC invalid	RTC error	Active (only on units with RTC)
MA	Lost communication with master	Lost communication with the master	Active (only on the slaves)
u1	Lost communication with slave 1	Lost communication with slave unit 1	Active (only on the master unit)
u2	Lost communication with slave 2	Lost communication with slave unit 2	Active (only on the master unit)
u3	Lost communication with slave 3	Lost communication with slave unit 3	Active (only on the master unit)
u4	Lost communication with slave 4	Lost communication with slave unit 4	Active (only on the master unit)
u5	Lost communication with slave 5	Lost communication with slave unit 5	Active (only on the master unit)
n1	Alarm on slave 1	Alarm on slave unit 1	Active (only on the master unit)
n2	Alarm on slave 2	Alarm on slave unit 2	Active (only on the master unit)
n3	Alarm on slave 3	Alarm on slave unit 3	Active (only on the master unit)
n4	Alarm on slave 4	Alarm on slave unit 4	Active (only on the master unit)
n5	Alarm on slave 5	Alarm on slave unit 5	Active (only on the master unit)
Id	Duty cycle setting from digital input	Duty cycle setting alarm from digital input	Active
dr	Timeout door open	Door open alarm	Relay only

14.2 Notes and descriptions

MasterCase2 offers the possibility to signal any faults both using the alarm LED on the terminal and the buzzer (PST terminal only), as well as, in the case of serious alarms, by activating a relay with changeover contacts for the remote alarm signal; each alarm signal is sent to the supervisor, allowing real time monitoring even from a remote location.

The alarms can be divided into groups:

- Alarms relating to the probes
- Alarms relating to the electronic valve
- Temperature alarms
- HACCP alarms
- Alarms relating to communication between the units
- Alarms relating to the digital inputs
- Other signals

14.2.1 Alarms relating to the probes

Check the parameters: "/4", "/S1…/S3", "/B1…/B7", "PSt", "PEL", "PEH".

rE

Control probe error:

- probes not working: the probe signal is interrupted or short-circuited;
- probes not compatible with the instrument.

If control is based on the virtual probe (value of parameter "/4" between 0 and 100), this error will be generated only when both the probes are broken. In fact, the breakage of just one of the two probes automatically moves control to the other probe.

E1

Room probe error:

- probe not working: the probe signal is interrupted or short-circuited;
- probe not compatible with the instrument.

E2

Evaporator probe error:

- probe not working: the probe signal is interrupted or short-circuited;
- probe not compatible with the instrument.

E3

Third probe error:

- probe not working: the probe signal is interrupted or short-circuited;
- probe not compatible with the instrument.

E0

Communication error with the PST terminal.

This error may arise if there is no communication between the controller and the terminal, even if power to the latter is supplied by the controller.

Ed1

Superheat probes out of range.

The valve is controlled by reading the superheat, which in turn is the difference between the value measured by the evaporator probe (either pressure or temperature, depending on parameter "PSt") and the suction temperature probe. If these probes are faulty or out-of-range, the controller is no longer able to manage the valve, and control is terminated, signalling the presence of a serious alarm:

- check the electrical connections;
- check the condition of the probes.

14.2.2 Alarms relating to the electronic valve

Check the parameters: "P1", "PH", "P7", "P9", "PM1", "PM4".

LSh

Low superheat. When the threshold set by parameter "P7" is exceeded, a delay set for parameter "P9" starts, after which this alarm is generated:

- check the mechanical condition of the valve;
- check that the readings and the positions of the probes are correct.

14.2.3 Temperature alarms

Check the parameters: "AL", "AH", "Ad", "St" and "A0".

LO

Low temperature alarm.

The control probe has detected a temperature lower than the set point by a value greater than parameter "AL":

- check the correct operation of the temperature probes.

The alarm is reset automatically when the temperature returns within the set limits (see parameters "AL" and "A0").

HI

High temperature alarm.

The control probe has detected a temperature higher than the set point by a value greater than parameter "AH":

- check the correct operation of the temperature probes.

The alarm is reset automatically when the temperature returns within the set limits (see parameters "AH" and "A0").

14.2.4 HACCP alarms

Check the parameters: "St", "Ad", "AH", all the type "t" parameters.
See the HACCP section in the manual.

HA

HACCP alarm, type HA.
A high temperature alarm has occurred according to the settings of parameters "tr", "Ad", "AH", "St":

- check the HACCP parameters;
- check the temperature and the correct operation of the temperature probes.

HF

HACCP alarm, type HF.
A high temperature alarm has occurred according to the settings of parameters "tr", "AH", "St".
A power failure has occurred for more than one minute and when power returned the temperature was higher than the value set for "AH" + "St":

- check the HACCP parameters;
- check the temperature and the correct operation of the temperature probes.

14.2.5 Alarms relating to communication between the units

Check the parameters: "Sn", setting the unit address in the LAN.
See the "Network functions" section in the manual.

MA (on slave)

Loss of communication with the master on the slave:

- check the LAN electrical connections.

These network signals (both on the master and on the slaves) are reset automatically as soon as communication is re-established between the master and the slaves.

"u1 to u5" (on master)

Loss of communication with slave 1 to 5:

- check the LAN electrical connections.

These network signals (both on the master and on the slaves) are reset automatically as soon as communication is re-established between the master and the slaves.

14.2.6 Alarms relating to the digital inputs

Check the parameters: "A1 to .A3", "A8" and "A7".

IA

Immediate alarm from digital input:

- check the status of the digital input and the value of the corresponding parameter "A1 to .A3" / "A8".

dA

Delayed alarm from digital input:

- check the status of the digital input and the value of the corresponding parameters "A1 to A3" / "A8" and "A7".

Id

This is an immediate external alarm (see the description of alarm "IA"), with the difference that the controller will activate the "duty cycle setting" function (see explanation of parameters "c4" and "c5"):

- check the status of the digital input and the value of the corresponding parameter "A1 to A3" / "A8".

14.2.7 Other signals

Check the parameters: "r3", "dP", "d0", "d8", "d6", "Ar", "th", "t'", "tn", "tM", "tY" and "td".

Ed

The last defrost ended as the maximum time (parameter "dP") exceeded, before reaching the end defrost temperature ("dt"). The signal is active only if parameter "r3"= 1. The signal **remains on until a defrost is completed correctly as programmed and that ends at the set temperature:**

- check parameters "r3", "d0", "dt" and "dP";
- check the efficiency of the defrost devices;
- check the positioning of the end defrost probe.

dr

The digital input configured as the "door switch" ("A1 to A3", "A8" = 5) has remained open for a time greater than the time set for parameter "d8":

- check that the door is actually closed;
- check the status of the contact connected to the input on the instrument.

dF

Defrost running:

- this is not an alarm signal, but rather an indication that the controller is running a defrost;
- it is only displayed if parameter d6= 0, or d6= 2.

"n1 to n5" (on master)

Local alarm on slave 1 to 5:

- check the status of the slave with the alarm and check the alarm code on the slave.

tC

Clock error (RTC) on the unit fitted with the RTC:

- set the time and the minutes on the user interface or via supervisor;
- if the error persists, check and/or replace the clock card.

15. List of parameters

15.1 (Prb) Probe parameters

Ref.	Screen description	Type	Access Level	Description	UOM	Range	Default
/4	Virtual probe configuration	RW	C	Defines a virtual probe between the room probe and the third probe. 0 = The value of the virtual probe is the same as the room probe 1 to 99 = The value of the virtual probe is between the room probe and the third probe 100 = The value of the virtual probe is the same as the third probe	-	0 to 100	0
/7	Remote display type	RW	C	Select the remote display 0 = SMALL KEYPAD, PST small with three buttons 1 = READ-ONLY, PST small display only	-	0 to 1	0
/8	S3 probe calibration	RW	C	Calibration of probe S3	°C	-9.9 to 9.9	0
/9	End defrost with air on probe	RW	C	Select end defrost mode also with third probe (S3). The defrost ends: 0 = DISABLED, when the temperature of the probe selected by /10 is greater than the end defrost temperature "dt" 1 = ENABLED, when both the temperature of the probe selected by /10 and the temperature of the third probe are greater than the end defrost temperature "dt"	-	0 to 1	0
/10	End defrost probe	RW	F	Select the probe used to end the defrost procedure 0 = VIRTUAL 1 = AIR OFF PROBE (room probe) 2 = DEFROST PROBE	-	0 to 2	2
/C	S1 probe calibration	RW	C	Calibration of probe S1	°C	-9.9 to 9.9	0
/d	S2 probe calibration	RW	C	Calibration of probe S2	°C	-9.9 to 9.9	0
/t	User interface management	RW	C	Select the probe displayed on the main screen 0 = NOT PRESENT, no probe 1 = AIR OFF PROBE (room probe) 2 = DEFROST PROBE 3 = AIR ON PROBE (third probe) 4 = REGULATION PROBE (virtual probe)	-	0 to 4	4
/S1	S1 probe configuration mode	RW	C	Configuration of the function of probe S1 0 = NOT PRESENT 1 = AIR OFF PROBE (room probe) 2 = DEFROST PROBE 3 = AIR ON PROBE (third probe)	-	0 to 3	1
/S2	S2 probe configuration mode	RW	C	Configuration of the function of probe S2 0 = NOT PRESENT 1 = AIR OFF PROBE (room probe) 2 = DEFROST PROBE 3 = AIR ON PROBE (third probe)	-	0 to 3	2
/S3	S3 probe configuration mode	RW	C	Configuration of the function of probe S3 0 = NOT PRESENT 1 = AIR OFF PROBE (room probe) 2 = DEFROST PROBE 3 = AIR ON PROBE (third probe)	-	0 to 3	3
/B1	S6 probe type	RW	C	Select the type of probe S6 0 = NTC 1 = 0-5Vdc 2 = PT1000 3 = 4-20mA **For future applications. Currently not managed**	-	0 to 3	0
/B2	S7 probe type	RW	C	Select the type of probe S7 0 = NTC 1 = 0-5Vdc 2 = PT1000 3 = 4-20mA **For future applications. Currently not managed**	-	0 to 3	0
/B3	S4 probe type	RW	C	Select the type of probe S4 0 = NTC 1 = 0-5Vdc 2 = PT1000	-	0 to 2	0

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
/B4	S5 probe type	RW	C	Select the type of probe S5 0 = NTC 1 = 0-5Vdc 2 = PT1000	-	0 to 2	0
/B5	S1 probe type	RW	C	Select the type of probe S1 0 = NTC 1 = 0-5Vdc 2 = PT1000	-	0 to 2	0
/B6	S2 probe type	RW	C	Select the type of probe S2 0 = NTC 1 = 0-5Vdc 2 = PT1000	-	0 to 2	0
/B7	S3 probe type	RW	C	Select the type of probe S3 0 = NTC 1 = 0-5Vdc 2 = PT1000	-	0 to 2	0

15.2 (rEG) Control parameters

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
r1	Minimum set point value	RW	C	Minimum set point value allowed by the user	°C	-50.0 to r2	-50.0
r2	Maximum set point value	RW	C	Maximum set point value allowed by the user	°C	r1 to 90.0	90.0
r3	Alarm for defrost end timeout	RW	C	Enable "Ed" alarm (defrost ended by timeout) 0 = DISABLED 1 = ENABLED	-	0 to 1	0
r4	Automatic variat. to night-time setpoint	RW	C	Night-time set point (deviation from the set point)	°C	-20.0 to 20.0	3.0
r5	Min and max temp. monitoring enabling	RW	C	Enable maximum and minimum temperature recording 0 = DISABLED 1 = ENABLED	-	0 to 1	0
r6	Night-time regulation with air on probe	RW	C	Night-time control with third probe (S3) 0 = DISABLED, night-time control on virtual probe 1 = ENABLED, night-time control on third probe (S3)	-	0 to 1	0
rd	Regulation differential	RW	F	Value of the differential (hysteresis) used for temperature control.	°C	0.1 to 20.0	2.0
rH	Max temperature stored	R	C	Maximum temperature recorded in the interval "rt"	°C	-	-
rL	Min temperature stored	R	C	Minimum temperature recorded in the interval "rt"	°C	-	-
rt	Temperature storing interval	R	C	Time elapsed since starting to monitor the maximum and minimum temperature	hours	0 to 999	0

15.3 (cMP) Safety time and control activation parameters

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
c0	Regulation starting delay	RW	C	Control start delay from power up	min	0 to 15	0
c1	Minimum time beetween two start of the same comp	RW	C	Minimum time between two consecutive starts	min	0 to 15	0
c2	Minimum comp OFF time	RW	C	Minimum off time	min	0 to 15	0
c3	Minimum comp ON time	RW	C	Minimum on time	min	0 to 15	0
c4	Relay safety Time ON on error	RW	C	Safety control ("Duty cycle setting" function) ON time	min	0 to 100	0
c5	Relay safety Time OFF on error	RW	C	Safety control ("Duty cycle setting" function) OFF time Displayed if C4≠0	min	0 to 100	0
c6	Low temperature alarm exclusion after cc	RW	C	Low temperature alarm bypass time after continuous cycle	hours	0 to 15	2
c8	Delay start regulation after valve open	RW	C	Control start delay from when the valve opens	s	0 to 120	5
cc	Continuous cycle duration	RW	C	Continuous cycle duration	hours	0 to 15	4

15.4 (dEF) Defrost management parameters

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
d0	Defrost type	RW	C	Type of defrost: 0 = ELECTRIC; END BY TEMPERATURE, OTHERWISE BY TIME 1 = HOTGAS; END BY TEMPERATURE, OTHERWISE BY TIME 2 = ELECTRIC; END BY TIME 3 = HOTGAS; END BY TIME	-	0 to 3	0
d2	LAN defrost command type	RW	C	Type of control for LAN defrost 0 = START ONLY 1 = START AND STOP	-	0 to 1	1
d4	Defrost at startup	RW	C	Defrost when switching controller on 0 = DISABLED 1 = ENABLED	-	0 to 1	0
d5	Defrost delay from digital input	RW	C	Defrost start delay from controller power on or on from digital input	min	0 to 180	0
d6	Display control during defrost	RW	C	Display management during defrost 0 = TEMP+DF, display the temperature alternating with the symbol "dF" 1 = FIXED TEMPERATURE, hold on last temperature displayed; 2 = dF, display the message "dF"(PST only).	-	0 to 2	0
d7	Enable skip defrost	RW	C	Enable "skip defrost" function 0 = DISABLED 1 = ENABLED	-	0 to 1	0
d8	High temperature alarm exclusion after defrost/door	RW	F	High temperature alarm bypass time after defrosting and/or door open	min	0 to 600	60
d9	Defrost priority on the compressor protection	RW	C	Priority of defrost over protection times	-	0 to 1	0
dd	Dripping time after defrost	RW	F	Dripping time	min	0 to 15	2
dI	Interval between two defrost	RW	F	Interval between two consecutive defrosts	hours	0 to 192	8
dP	Maximum duration of a defrost	RW	F	Maximum defrost time	min	0 to 180	30
dt	Defrost end temperature	RW	F	End defrost temperature	°C	-50.0 to 30.0	4.0

15.5 (ALr) Alarm parameters

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
A0	Fan and alarm differential	RW	C	Temperature alarm return and fan activation differential (see parameters F1, AH and AL)	°C	0.1 to 20.0	2.0
A1...3	Digital input 1...3 configuration	RW	C	Configuration of digital inputs 1 to 3 **(see note 1)** 0 = None 1 = Remote alarm 2 = Remote delayed alarm 3 = Enable defrost 4 = Start ext defrost (immediate defrost from external contact) 5 = Door switch 6 = Remote on/off 7 = Blind switch (curtain switch) 8 = Start duty setting 9 = Door switch regul.on, (door switch with control ON)	-	0 to 9	0
A7	Detection delay time for delayed alarm input	RW	C	Alarm delay from digital input (A1 to 3 = 2)	min	0 to 180	180
A8	Virtual digital input configuration	RW	C	Virtual digital input configuration (see parameters A1...3)	-	0 to 9	0
Ad	Temperature alarm delay	RW	C	Temperature alarm delay	min	0 to 180	120
AH	High temperature alarm	RW	F	High temperature alarm (deviation from the set point)	°C	0 to 20.0	0.0
AL	Low temperature alarm	RW	F	Low temperature alarm (deviation from the set point)	°C	0 to 20.0	0.0
Ar	Slave remote alarm signal enabling on master	RW	C	Enable the master to signal the slave alarms (only on the master)	-	0 to 1	1

15.6 (FAn) Evaporator fan management parameters

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
F0	Fan management	RW	C	Fan management 0 = ALWAYS ON (except in cases F2, F3, Fd) 1 = THERMOSTAT CONTROLLED, fans controlled based on absolute set point F1	-	0 to 1	0
F1	Fan start-up absolute setpoint	RW	F	Fan off time	°C	-40.0 to 50.0	5.0
F2	Fans off with compressor off	RW	C	Fans off when control off 0 = DISABLED 1 = ENABLED Active only if F0= 0	-	0 to 1	1
F3	Fans manage during defrost	RW	C	Fan management during defrost 0 = FANS ON, OFF IN dd, fans on, off during dripping ("dd") 1 = FANS ALWAYS OFF 2 = FANS ALWAYS ON, fans on even during the dripping phase ("dd")	-	0 to 2	1
Fd	After dripping fan stopping	RW	F	Fan off time during post-dripping	min	0 to 15	1

15.7 (CnF) Configuration parameters

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
H0	Serial address (Supervisor)	RW	C	Supervisor serial address	-	0 to 199	1
H3	Enable On/Off from keyboard	RW	C	Enable ON/OFF from terminal	-	0 to 1	1
H4	Enable On/Off from supervisor	RW	C	Enable ON/OFF from supervisor	-	0 to 1	0
o1…8	Digital Output 1...8 configuration	RW	C	Configuration of digital outputs 1 to 8 0 = REGULATION (control) 1 = FAN 2 = DEFROST EVAP 1 3 = DEFROST EVAP 2 4 = LIGHT/NIGHT BLIND (light, curtain output) 5 = TRIM HEATER 6 = ALARM 7 = ON/OFF SOLENOID 8 = NET COMPRESSOR 9 = NONE	-	0 to 9	-
Sn	Number of slaves	RW	C	Number of slaves (only on the master) 0 = LAN not present	-	0 to 5	0

15.8 (SEt) Set point parameters

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
St	Temperature setpoint	RW	F	Set point	°C	r1 to r2	-20.0
Stn	Select night setpoint type	RW	C	Select night-time set point mode 0 = NONE 1 = FROM DIGITAL INPUT (See A1 to 3=7) 2 = FROM RTC	-	0 to 2	0
hSn	Night setpoint starts at	RW	C	Night-time set point start hour	hours	0 to 23	0
mSn	Night setpoint starts at	RW	C	Night-time set point start minutes	min	0 to 59	0
hSd	Night setpoint stops at	RW	C	Night-time set point end hour	hours	0 to 23	0
hSd	Night setpoint stops at	RW	C	Night-time set point end minutes	min	0 to 59	0

15.9 (HcP) HACCP parameters

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
tr	HACCP alarm delay	RW	F	HACCP alarm delay 3 = HACCP disabled	min	0 to 180	0
tA	Haccp alarm type	R	F	Type of HACCP alarm 4 = no alarm 5 = HA alarm 6 = HF alarm	-	0 to 2	0
tSH	Haccp alarm start	R	F	HACCP alarm start hours	-	-	-
tSM	Haccp alarm start	R	F	HACCP alarm start minutes	-	-	-
tSd	Haccp alarm start	R	F	HACCP alarm start day	-	-	-
tSm	Haccp alarm start	R	F	HACCP alarm start month	-	-	-
tSY	Haccp alarm start	R	F	HACCP alarm start year	-	-	-
tt	Max temperature during haccp alarm	R	F	Maximum temperature reached during the most recent HACCP alarm	°C	-50.0 to 90.0	-50.0
tEH	Haccp alarm end at	R	F	HACCP alarm end hours	-	-	-
tEM	Haccp alarm end at	R	F	HACCP alarm end minutes	-	-	-
tEd	Haccp alarm end at	R	F	HACCP alarm end day	-	-	-
tEm	Haccp alarm end at	R	F	HACCP alarm end month	-	-	-
tEY	Haccp alarm end at	R	F	HACCP alarm end year	-	-	-
to	Reset haccp history	RW	F	Delete the data saved	-	0 to 1	0

15.10 (rtc) RTC parameters (Real Time Clock)

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
th	Hour	RW	F	Current hours	-	0 to 23	-
t'	Hour	RW	F	Current minutes	-	0 to 59	-
tn	Date	R	F	Current weekday	-	-	-
tM	Date	RW	F	Current month	-	0 to 12	-
tY	Date	RW	F	Current year	-	0 to 9	-
td	Date	RW	F	Current day	-	0 to 31	-
d1	1^ defrost time	RW	C	Weekday of 1st defrost 0 = ***, no setting 1 = MONDAY 2 = TUESDAY 3 = WEDNESDAY 4 = THURSDAY 5 = FRIDAY 6 = SATURDAY 7 = SUNDAY 8 = MONDAY TO FRIDAY 9 = WEEK-END 10 = ALL DAYS	-	0 to 10	0
h1	1^ defrost time	RW	C	Hours of 1st defrost	hours	0 to 23	0
M1	1^ defrost time	RW	C	Minutes of 1st defrost	min	0 to 59	0
d2	2^ defrost time	RW	C	Weekday of 2nd defrost **(see parameter d1)**	-	0 to 10	0
h2	2^ defrost time	RW	C	Hours of 2nd defrost	hours	0 to 23	0
m2	2^ defrost time	RW	C	Minutes of 2nd defrost	min	0 to 59	0
d3	3^ defrost time	RW	C	Weekday of 3rd defrost **(see parameter d1)**	-	0 to 10	0
h3	3^ defrost time	RW	C	Hours of 3rd defrost	hours	0 to 23	0
m3	3^ defrost time	RW	C	Minutes of 3rd defrost	min	0 to 59	0
d4	4^ defrost time	RW	C	Weekday of 4th defrost **(see parameter d1)**	-	0 to 10	0
h4	4^ defrost time	RW	C	Hours of 4th defrost	hours	0 to 23	0
m4	4^ defrost time	RW	C	Minutes of 4th defrost	min	0 to 59	0
d5	5^ defrost time	RW	C	Weekday of 5th defrost **(see parameter d1)**	-	0 to 10	0
h5	5^ defrost time	RW	C	Hours of 5th defrost	hours	0 to 23	0
m5	5^ defrost time	RW	C	Minutes of 5th defrost	min	0 to 59	0
d6	6^ defrost time	RW	C	Weekday of 6th defrost **(see parameter d1)**	-	0 to 10	0
h6	6^ defrost time	RW	C	Hours of 6th defrost	hours	0 to 23	0
m6	6^ defrost time	RW	C	Minutes of 6th defrost	min	0 to 59	0

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
d7	7^ defrost time	RW	C	Weekday of 7th defrost **(see parameter d1)**	-	0 to 10	0
h7	7^ defrost time	RW	C	Hours of 7th defrost	hours	0 to 23	0
m7	7^ defrost time	RW	C	Minutes of 7th defrost	min	0 to 59	0
d8	8^ defrost time	RW	C	Weekday of 8th defrost **(see parameter d1)**	-	0 to 10	0
h8	8^ defrost time	RW	C	Hours of 8th defrost	hours	0 to 23	0
m8	8^ defrost time	RW	C	Minutes of 8th defrost	min	0 to 59	0

15.11 (EEv) Valve parameters

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
P1	EEV Type	RW	C	Type of valve 7 = PWM, valve with PWM control 8 = STEPPER, valve with step control 9 = NOT PRESENT	-	0 to 2	0
PH	Refrigerant Type	RW	C	Type of refrigerant: 0 = R22 1 = R134a 2 = R404a 3 = R407c 4 = R410a 5 = R507 6 = R290 7 = R600 8 = R600a 9 = R717 10 = R744	-	0 to 10	2
PPE	PWM period	RW	C	Period of the PWM signal	s	3.0 to 10.0	6.0
CP1	Start-up EEV opening	RW	C	Initial valve position	%	0 to 100	80
P2	SuperHeat Dead zone	RW	C	Dead band	°C	0 to 9.9	0
P3	SuperHeat Set	RW	C	Superheat set point	°C	0 to 50.0	12.0
P4	PID Proportional factor	RW	C	PID proportional gain	-	0 to 99.9	10.0
P5	PID Integral factor	RW	C	PID integral time	S	0 to 250	100
P6	PID Derivative factor	RW	C	PID derivative time	s	0 to 99.9	0.0
P7	Low SuperHeat threshold	RW	C	Low superheat threshold	°C	-10.0 to P3	5.0
P8	Low SuperHeat Integral time	RW	C	Low superheat integral time	s	0 to 25.0	15.0
P9	Alarms delay Low SuperHeat	RW	C	Low superheat alarm delay time	s	0 to 9999	0
PM1	MOP protection Threshold	RW	C	MOP threshold (saturated evaporation temperature)	°C	-50.0 to 70.0	60.0
PM2	MOP protection Integral time	RW	C	Integral time during the MOP (valve closing)	s	0 to 25.0	10.0
PM3	MOP protection Start-up delay	RW	C	MOP function activation delay	s	0 to 250	120
PM4	Suction temp. high limit	RW	C	Maximum superheated gas temperature	°C	0 to 999.9	80.0
PSt	Evaporation satured temperature from	RW	C	Evaporation temperature read by 0 = PRESSURE, if the evaporation pressure probe is used 1 = TEMPERATURE, if the evaporation temperature probe is used	-	0 to 1	1
PEL	Evaporation pressure probe Min value	RW	C	Minimum value of the evaporator probe. Available only if PSt=0	bar	-1.0 to 40.0	-1.0
PEH	Evaporation pressure probe Max value	RW	C	Maximum value of the evaporator probe. Available only if PSt=0	bar	-1.0 to 90.0	9.3
PUO	Suction temp. Offset	RW	C	Temperature offset of the suction probe	°C	-9.9 to 19.9	0
PAO	Satured temp. Offset	RW	C	Temperature offset of the saturation probe	°C	-9.9 to 19.9	0

15.12 Outputs (PGD only)

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
o1…8	Digital Output 1...8 configuration	RW	C	Configuration of digital outputs 1 to 8 0 = REGULATION (control) 1 = FAN 2 = DEFROST EVAP 1 3 = DEFROST EVAP 2 4 = LIGHT/NIGHT BLIND (light, curtain output) 5 = TRIM HEATER 6 = ALARM 7 = ON/OFF SOLENOID 8 = NET COMPRESSOR 9 = NONE The same parameters are available as parameters o1 to o8 on the PST display, in the CnF menu (configuration).	-	0 to 9	-

15.13 Service (PGD only)

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
MP	Manual procedure Enable:	RW	C	Enable the manual procedure	-	0 to 1	0
MP 1..8	Regulation Fan Defrost evap 1 Defrost evap 2 Light/night blind Trim heater Alarm On/off solenoid Net compressor	RW	C	Manually enable and disable the outputs	-	0 to 1	0

15.14 Initialisation (PGD only)

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
-	Press ENTER to install default parameter	RW	C	Press ENTER to activate the default value installation procedure Use with caution.	-		
	Carel SpA Cod. FLSTDmMC2O Ver.:x.x xx/xx/xx	R	C	Version, code and release date of the application.			
	Boot:xx.xx xx/xx/xx	R	C	MasterCase2 boot firmware version	-		
	Bios:xx.xx xx/xx/xx	R	C	MasterCase2 bios firmware version	-		

15.15 Unit ON/OFF (PGD only)

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
-	Press ENTER to switch the unit status	RW	C	Change the unit status. Available only if H3=1	-		

15.16 Network (PGD only)

Ref.	Screen description	Type	Access level	Description	UOM	Range	Default
Sj	Switch to unit	RW	C	Switch the terminal to another unit in the LAN. Only the available units are displayed: 10 = MASTER 11 = SLAVE 1 12 = SLAVE 2 13 = SLAVE 3 14 = SLAVE 4 15 = SLAVE 5 This function is not featured on the PST terminal.	-	0 to 5	Unit current
Sn	Number of slaves	RW	C	Number of slaves (only on the master) 0 = LAN not present	-	0 to 5	0

Note 1

Value of A1 to A3/A8	Meaning	Operation
0	Input not active	No function associated
1	Immediate external alarm	Contact open = alarm active
2	Delayed external alarm	Contact open = alarm active with delay set by parameter "A7".
3	Enable defrost	Contact open = defrost not enabled Contact closed = defrost enabled
4	Immediate activation of the defrost	Contact closed = start immediate defrost.
5	Door switch	Contact open = door open. When the door is opened the controller and the fans stop. If the door remains open for a time greater than the value set for parameter "d8", the controller and the fans start again and an error is signalled ("dr").
6	Remote ON/OFF	Contact closed = unit ON (on); Contact open = unit OFF (unit in standby).
7	Curtain switch	Contact closed = night curtain closed. See parameters "Stn", "r4" and "r6".
8	"Duty cycle setting" from external contact	Contact closed = activation of the "duty cycle setting" (see parameters "c4" and "c5"). Contact open = deactivation, return to normal control.
9	Door switch with control ON	As for function 5, but the controller remains active.

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