

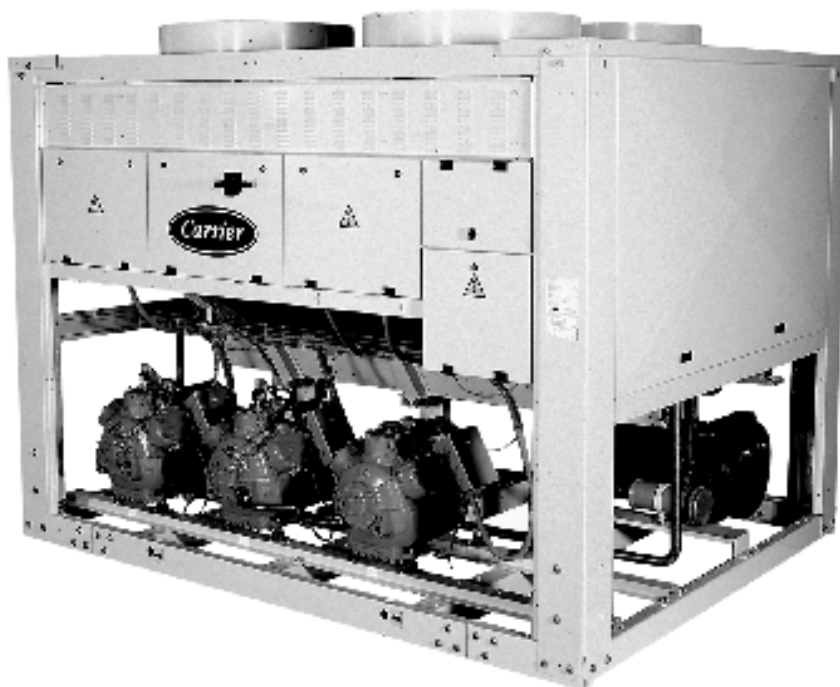


# 30GK Series PRO-DIALOG *PLUS* Control

Air-Cooled Liquid Chillers

50 Hz

PRO-DIALOG *PLUS*



Installation, operation and maintenance instructions



Quality Management System Approval

## TABLE OF CONTENTS

<b>1 - SAFETY CONSIDERATIONS</b> .....	<b>4</b>
1.1 - General .....	4
1.2 - Avoiding electrocution .....	4
<b>2 - GENERAL DESCRIPTION</b> .....	<b>5</b>
2.1 - General .....	5
2.2 - Abbreviations used .....	5
<b>3 - HARDWARE DESCRIPTION</b> .....	<b>6</b>
3.1 - General .....	6
3.2 - Electronic boards .....	6
3.2.1 - The basic board .....	6
3.2.2 - Slave boards .....	6
3.2.3 - The user interface .....	7
3.2.4 - Connections between boards .....	7
3.2.5 - Slave board addresses .....	7
3.2.6 - Power supply to the boards .....	7
3.2.7 - Light emitting diodes on boards .....	7
3.3 - The controls .....	7
3.3.1 - Electronic expansion valve (EXV) .....	7
3.3.2 - The head pressure controls .....	7
3.3.3 - The evaporator pumps .....	8
3.3.4 - The condenser pump .....	8
3.3.5 - Pressure sensors .....	8
3.3.6 - Thermistors .....	8
3.4 - User connections .....	9
<b>4 - SETTING UP PRO-DIALOG PLUS CONTROL</b> .....	<b>10</b>
4.1 - Local interface general features .....	10
4.2 - Unit start/stop control .....	11
4.2.1 - Description .....	11
4.2.2 - Stopping the unit in local mode .....	11
4.2.3 - Starting unit and selecting an operating type .....	11
4.3 - Menus .....	12
4.3.1 - Selecting a menu .....	12
4.3.2 - Selecting a menu item .....	12
4.3.3 - Modifying the value of a parameter/access to a sub-menu .....	12
4.3.4 - Expand display .....	12
4.4 - General menu structure .....	13
4.5 - Menu tree structure .....	14
4.5.1 - Description of the Information menu .....	15
4.5.2 - Description of the Temperatures menu .....	16
4.5.3 - Description of the Pressures menu .....	16
4.5.4 - Description of the Setpoints menu .....	17
4.5.5 - Description of the Inputs menu .....	18
4.5.6 - Description of the Outputs/Tests menu .....	18
4.5.7 - Description of the Configuration menu .....	20
4.5.8 - Description of the Alarms menu .....	25
4.5.9 - Description of the Alarms History menu .....	25
4.5.10 - Runtime menu description .....	26

**The cover photograph is solely for illustration, and forms no part of any offer for sale or any sale contract. The manufacturer reserves the right to change the design at any time without notice.**

<b>5 - PRO-DIALOG PLUS CONTROL OPERATION .....</b>	<b>27</b>
5.1 - Start/stop control .....	27
5.2 - Heating/cooling selection .....	27
5.3 - Evaporator water pump control .....	28
5.4 - Condenser water pump control .....	28
5.5 - Control interlock contact .....	28
5.6 - Evaporator heater control .....	28
5.7 - Control point .....	28
5.7.1 - Active setpoint .....	28
5.7.2 - Reset .....	28
5.8 - Demand limit .....	29
5.9 - Capacity control .....	29
5.10 - Determining the lead circuit .....	29
5.11 - Circuit loading sequence .....	29
5.12 - Slave compressor start-up sequence .....	30
5.13 - Controlling the EXV .....	30
5.14 - Head pressure control on air-cooled units .....	30
5.15 - Head pressure control on water-cooled units .....	30
5.16 - Active setpoint selection .....	30
5.17 - High pressure load shedding function .....	31
5.18 - Pumping down .....	31
5.19 - Master/slave assembly .....	31
5.20 - Controlling Pro-Dialog Plus units with a System Manager .....	31
5.21 - Optional heat reclaim module .....	32
<b>6 - DIAGNOSTICS - TROUBLESHOOTING .....</b>	<b>32</b>
6.1 - General .....	32
6.2 - Displaying alarms .....	32
6.3 - Resetting alarms .....	32
6.4 - Alarm codes .....	33

## 1 - SAFETY CONSIDERATIONS

### 1.1 - General

Installation, start-up and servicing of equipment can be hazardous if factors particular to the installation are not considered: operating pressures, electrical components, voltages and the installation site itself (elevated plinths, rooftops and built-up structures).

Only highly trained and qualified installation engineers and technicians, who are fully trained on the product, are authorised to install and start up this equipment.

During all servicing operations, it is important to read, understand and follow all the recommendations and instructions given in the installation and service instructions for the product, including the tags and labels affixed to the equipment, components and any parts supplied separately, and to comply with all other relevant safety regulations.

- Apply all safety codes and practices.
- Wear safety glasses and gloves.
- Use the proper tools to move heavy objects. Move units carefully and set them down gently.

### 1.2 - Avoiding electrocution

Only personnel qualified in accordance with the recommendations of the IEC (International Electrotechnical Commission) may be permitted access to electrical components. It is particularly recommended that all sources of electricity to the unit be shut off before any work is begun. Shut off the main power supply at the main circuit breaker or isolator.

#### **IMPORTANT:**

***Risk of electrocution: Even when the main power isolator or circuit breaker is off, it is still possible for certain components such as crankcase heaters and trace heaters to be energised, since they are connected to a separate power source.***

***Even when the unit is switched off, the power circuit remains energised, as long as the unit or circuit disconnect is not open. Refer to the wiring diagram for details.***

***Attach appropriate safety labels.***

***Risk of burns: Electrical currents cause components to get hot either temporarily or permanently. Handle power cables, electrical cables and conduits, terminal box covers and motor frames with very great care.***

***IMPORTANT: This equipment uses and emits electromagnetic signals. The tests carried out on this product have shown that it complies with all applicable codes regarding electromagnetic compatibility.***

***IMPORTANT : If the boards need to be handled wear anti-static gloves to avoid exposing the electronic components to a destructive voltage. Only unpack the boards from their anti-static bag when they need to be installed.***

## 2 - GENERAL DESCRIPTION

### 2.1 - General

PRO-DIALOG Plus is a system for controlling units which use reciprocating compressors\*:

- Single or dual circuit
- Air or water-cooled condensers
- Non-reversible heat pumps
- Split systems

\* At present only air-cooled models are available.

PRO-DIALOG Plus controls compressor start-up and demand limits needed to maintain the desired entering or leaving temperature setpoint for water. It automatically sets the position of the electronic expansion valve (if used) to optimise the evaporator charge. It controls operation of the fans (on air-cooled units) or water valves (on water-cooled units) to maintain the correct head pressure in each circuit.

Safety circuits are constantly monitored by PRO-DIALOG Plus to ensure safe operation of the unit. PRO-DIALOG Plus also gives access to a Quick Test program covering all inputs and outputs.

All PRO-DIALOG Plus controls can work in accordance with three independent modes:

- Local mode: the machine is controlled by commands from the user interface.
- Remote mode: the machine is controlled by remote contacts (volt-free contacts, analogue signals).
- CCN mode: the machine is controlled by commands from the Carrier Comfort Network (CCN). In this case a data communication cable is used to connect the unit to the CCN communication bus.

The operating mode must be chosen with the Operating Type selection button described in section 4.2.1.

When the PRO-DIALOG Plus system operates autonomously (Local or Remote mode) it retains all of its own control capabilities but does not offer any of the features of the CCN network.

### 2.2 - Abbreviations used

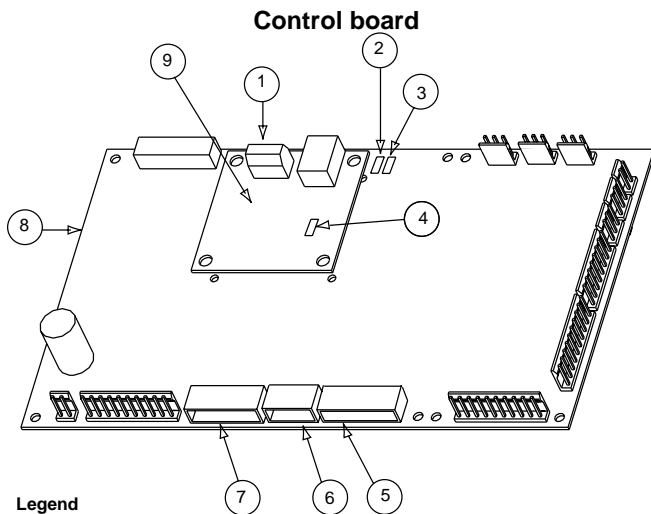
In this manual the circuits are called circuit A and circuit B. The compressors in circuit A are labelled A1, A2, A3 and A4. Those in circuit B are labelled B1, B2, B3 and B4. A1 and B1 are the lead compressors.

The following abbreviations are frequently used:

AI	- Analogue Input
AO	- Analogue Output
CCn	- Operating type: CCN
CCN	- Carrier Comfort Network. This is the Carrier communication network
DI	- Discrete Input
DO	- Discrete Output
EXV	- Electronic Expansion Device
LED	- Light Emitting Diode
LOFF	- Operating type: Local off
L-ON	- Operating type: Local operation
MASt	- Master unit operating type (master/slave assembly)
RCPM	- Reciprocating Compressor Protection Module
rEM	- Operating type: by remote control contacts
SCT	- Saturated disCharge Temperature
SIO	- Standard Input/Output - internal communication bus linking the basic board to the slave boards
SST	- Saturated Suction Temperature

### 3 - HARDWARE DESCRIPTION

#### 3.1 - General



**Legend**

- 1 CCN connector
- 2 Red LED, status of the board
- 3 Green LED, communication bus SIO
- 4 Orange LED, communication bus CCN
- 5 Remote master board customer control connection contacts
- 6 Remote master board customer control connection signal
- 7 Remote master board customer report connection contacts
- 8 Master PD4 basic board
- 9 CCN/clock board

The control system consists of at least a PD4 basic board, a user interface, a PD4-EXV slave board and, depending on the application, one or more RCPM compressor boards, 4xDO boards or 4xAI-2xAO boards and an NRCP-BASE slave board. Slave boards are connected to the basic board via an internal communication bus (SIO).

The CCN/clock board is connected and screwed to the master basic board. It permits communication with elements of the Carrier Comfort Network via the CCN bus.

The various control components are arranged in modules within the control cabinet:

- **Control module:** This comprises the basic board, the user interface, the EXV control board and option boards, as well as the customer's terminal block.
- **Start-up module:** This consists of the start-up boards, compressor protection boards, as well as the compressor circuit breakers and contactors.
- **Fan module (air-cooled unit):** Consists of one or two 4xDO boards together with the fan circuit breakers and contactors.

#### 3.2 - Electronic boards

##### 3.2.1 - The basic board

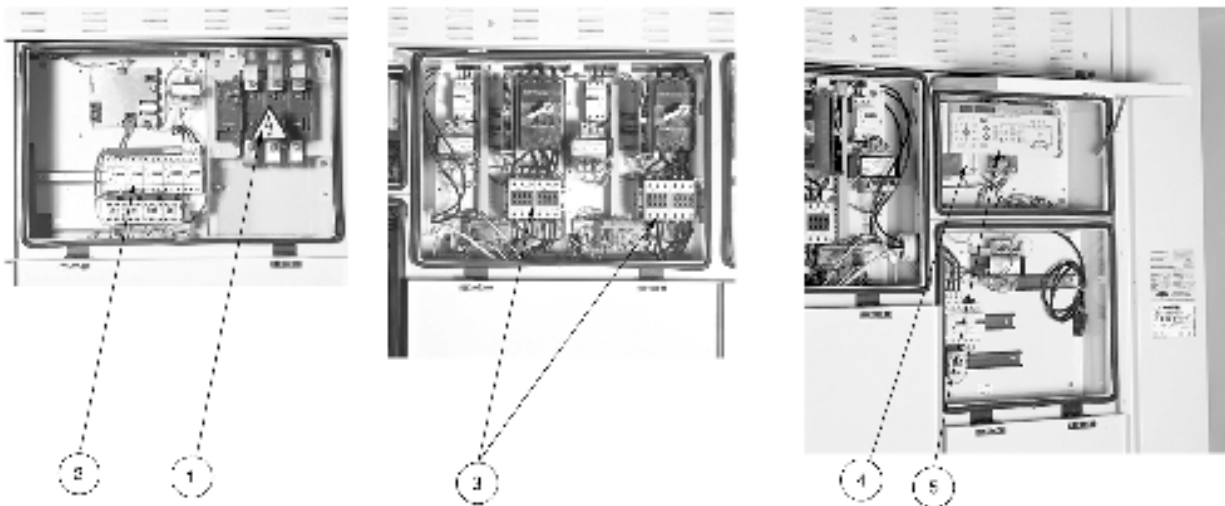
It can be used alone or in conjunction with slave boards. It holds the program that controls the machine. It continuously manages the information coming in from the various pressure and temperature sensors, and communicates with the slave boards via the SIO bus. It can also communicate with elements of the Carrier Comfort Network via the CCN bus.

*NOTE: After a power cut the unit restarts in the same operating mode as before the power cut.*

##### 3.2.2 - Slave boards

- **Compressor board RCPM:** This board is used to control a compressor. Up to eight RCPM boards can be connected to the basic board.
- **4xDO board:** This board can be used to control fan stages.
- **PD4-EXV board:** This board can control two EXV valves and two suction temperature sensors.
- **4xAI-2xAO board:** This optional board can be used to read sensors (oil pressure), or to control variable speed fans (air-cooled units) or the condenser valve (water-cooled units).
- **NRCP-BASE board:** This optional board is used to control the inputs and outputs of the heat reclaim option.

#### Control box



**Legend**

- 1 Power supply disconnect switch
- 2 Fan start-up module
- 3 Compressor start-up module
- 4 Control system
- 5 User interface

### 3.2.3 - The user interface

The user interface is in two parts:

- **The main interface:** This gives access to all of the control parameters for the unit. It consists of a 2-digit primary display block and a secondary 4-digit display block with 10 LEDs and 5 buttons.
- **The summary interface:** This gives quick access to just the main control parameters for the unit. It comprises 12 buttons and 16 LEDs, and includes a schematic diagram of the unit.

### 3.2.4 - Connections between boards

The basic board and slave boards communicate with each other over an internal three-wire RS485 communication bus (SIO bus). These three wires link all the boards in parallel.

Terminals 1, 2 and 3 on connector J9 (A, B, C are connected internally) of the basic board are connected to terminals 1, 2 and 3 of terminal J9 of the NRCP-BASE board, terminal J4 of the PD4-EXV board respectively, except for terminal J3 of the 4xDO and 4xAI-2xAO boards where terminals 2 and 3 are reversed.

Incorrect connection will render the system inoperative.

### 3.2.5 - Slave board addresses

Every slave board (except the NRCP-BASE board) has a unique address controlled by 8 DIP switches. The switch is disabled when it is in the open position (OPEN or OFF). On RCPM boards SIO address switch is labelled 'ADDR'.

**NOTE:** Any incorrect address will prevent the unit from starting. Turn off the power before amending the address of any auxiliary board.

**Board addresses**

Board	Address switch							
	8	7	6	5	4	3	2	1
PD4-EXV	0	0	0	1	1	1	0	1
4xDO Fan board # 1	0	0	1	0	0	1	1	1
4xDO Fan board # 2	0	0	1	0	1	0	1	1
4xAI-2xAO board # 1	0	0	1	0	1	1	1	1
4xAI-2xAO board # 2	0	1	1	1	1	0	0	0
RCPM # 1 (compressor A1)	1	1	0	1	0	1	0	0
RCPM # 2 (compressor A2)	1	1	0	1	1	1	1	1
RCPM # 2 (compressor A3)	1	1	0	1	1	0	0	1
RCPM # 2 (compressor A4)	1	1	1	0	0	1	0	0
RCPM # 3 (compressor B1)	1	1	1	0	1	0	1	0
RCPM # 4 (compressor B2)	1	1	1	1	0	1	0	1
RCPM # 4 (compressor B3)	1	1	1	0	1	1	1	1
RCPM # 4 (compressor B4)	1	1	1	1	0	0	1	0

### 3.2.6 - Power supply to the boards

All boards are supplied by a 24 V source, referred to earth. In the event of a power supply interrupt, the unit restarts automatically without the need for an external command. However, any faults active when the supply is interrupted are saved and may in certain cases prevent a circuit or unit from restarting.

**NOTE:** When connecting the power supply for the boards, maintain polarity.

### 3.2.7 - Light emitting diodes on boards

All boards continuously check and indicate the proper operation of their electronic circuits. A light emitting diode (LED) lights on each board when it is operating properly.

#### Red LED

- The MAIN red LED flashes at about 2 second intervals to show that the module is working properly.
- Irregular flashing or no flashing is a sign of a defective board.

#### Green LED

(item SIO on the board)

- This LED flashes continuously to show that the board is communicating correctly over its internal bus.
- If this LED is not flashing, check the wiring of the SIO bus and the address of the board (slave board only). If the basic board is not linked to any slave boards, this LED should not flash.
- If all slave boards indicate a communication fault, check the SIO bus connection on the basic board. If this connection is correct and the fault persists, replace the basic board.

#### Orange LED - CCN/clock board

- This LED flashes to show that the basic board is communicating via the CCN bus.

## 3.3 - The controls

### 3.3.1 - Electronic expansion valve (EXV)

The EXV is used to adjust the refrigerant flow to changes in the operating conditions of the machine. For this purpose, a series of calibrated orifices are machined into the wall of the refrigerant inlet port. As the refrigerant passes through these orifices, it expands and becomes a bi-phase mixture (liquid and gas).

To adjust the refrigerant flow to changes in operating conditions, a piston moves constantly up or down to vary the cross-section of the refrigerant path. This piston is driven by an electronically controlled linear stepper motor. The high degree of accuracy with which the piston is positioned ensures that the flow of refrigerant is precisely controlled.

**NOTE:** The external connector of the EXV must be cleaned and coated with silicone grease (Part No. 397 EE) to keep out condensation and prevent corrosion.

### 3.3.2 - The head pressure controls

The controller can deal with the following:

- in the case of air-cooled units, for each circuit, fan stages together with, if necessary, a variable speed fan (controlled by an optional 4xAI-2xAO board)
- in the case of water-cooled units, a water valve. This valve is controlled by an optional 4xAI-2xAO board which can deliver a 0-10 V d.c. or 4-20 mA signal, depending on the configuration.



### 3.3.3 - The evaporator pumps

The controller can regulate one or two evaporator pumps, with automatic changeover between the two pumps.

### 3.3.4 - The condenser pump

In appropriate cases the controller can regulate a condenser pump (for water-cooled units or air-cooled units with heat reclaim option). This control does not require an additional board.

### 3.3.5 - Pressure sensors

These are used to measure the following pressures in each circuit:

- Discharge gas pressure (high pressure type)
- Suction pressure (low pressure type)
- Oil pressure (option)

These electronic sensors deliver 0 to 5 V d.c. to the main board or to a 4xAI-2xAO slave board. Two sensor versions are used; one is calibrated for high pressure and the other for low pressure and oil pressure.

#### Discharge pressure sensors

These are on the high pressure side of the lead compressor in each circuit. They replace the usual discharge gas pressure gauges and can be used to control head pressure or by the high pressure load shedding option.

#### Oil pressure sensors

If installed, these sensors are used to measure the compressor oil pressure on the oil pressure discharge side. The suction pressure is subtracted from the oil pressure value to arrive at the differential oil pressure.

#### Suction pressure sensors

They are located in the low-pressure side of the unit on the lead compressor of each circuit. The suction pressure sensor reading is used to control the electronic expansion devices EXV. They permit replacement of the low-pressure switches, low-pressure gauges and possibly of the oil pressure safety switch.

### 3.3.6 - Thermistors

These all have similar characteristics.

#### Evaporator entering water temperature sensor

The evaporator entering water temperature sensor is installed in the evaporator wall in the free space at the side of the tube bundle.

#### Evaporator leaving water temperature sensor

The evaporator leaving water temperature sensor is installed in evaporator leaving water piping: The sensor bulb is directly immersed in the water.

#### Compressor suction sensor

This is located in the lead compressor of each circuit in the suction gas line situated between the motor and the cylinders above the oil pump.

#### Condenser entering and leaving water temperature sensors

These are used to control the heating capacity on heat pumps. In cooling only units they have no control function. They are installed in the common condenser entering and leaving line.

#### Heat reclaim condenser entering/leaving water temperatures

These sensors measure the entering and leaving water temperatures of heat reclaim condensers and are used on air-cooled units equipped with the heat reclaim option. If not, they may be fitted as options. In this case they only have informative character.

#### Temperature setpoint reset sensor

This is an optional 0-10 V sensor which can be installed remotely from the unit. It is used to reset the cooling and heating setpoint on the unit as a function of either the outdoor air temperature or ambient room temperature. The sensor is not supplied by Carrier, and must be configured by the User Menu.

#### Outdoor temperature sensor

Mounted on the control box. It is used for start-up, setpoint temperature reset and frost protection control.

#### Master/slave assembly temperature control

The optional water temperature sensor can be used for master/slave assembly control.



### 3.4 - User connections

The connections below are available at the customer's terminal block. Some of them can only be used in special operating modes. For further details see the sections that describe the functions (section 5) and the configurations (section 4.2.1).

**NOTE: The bridge between terminals 32, 63 and 65 on the customer's terminal block must not be removed.**

CONNECTION BLOCK				
DESCRIPTION	CONNECTOR/CHANNEL	TERMINAL	DESCRIPTION	REMARKS
Alarm relay output, circuit A	J3 / CH24	30A - 31A	Indicates alarms in circuit A	Volt-free contacts 24 V a.c. 48 V d.c. max, 20 V a.c. or V d.c., 3 A max, 80 mA min, external power supply.  Connector: 6 pin WAGO 231-306/026000 pitch 5.08.
Alarm relay output, circuit B	J3 / CH25	30B - 31B	Indicates alarms in circuit B	
User safety loop and chilled water pump interlock	J4 / CH15a	34 - 35	This contact is mounted in series with the water flow control contact. It can be used for any user safety loop that requires that the unit is shut down, if it is open. The chilled water pump operation auxiliary contact is connected between these two terminals.	24 V a.c., 20 mA  Connector: 10 pin WAGO 734-110, pitch 3.5
Remote start/stop	J4 / CH11	32 - 33	The remote start/stop command is only used if the unit is under remote operation control (rEM). See section 4.2.1.	
Remote cooling setpoint selection	J4 / CH12	65 - 66	The remote cooling setpoint selection command is only used if the unit is under remote operation control (rEM). See section 4.2.1.	
Remote heating/cooling control or remote heat reclaim control	J4 / CH13	63 - 64	The remote heating/cooling control command is only used if the unit is under remote operation control (rEM). See section 4.2.1.	
	J4 / CH13	63 - 64	The command allows selection of the second condensing setpoint or of the heat reclaim mode. It is only used if the unit is under remote operation control (rEM). See section 4.2.1.	
Demand limit command	J4 / CH14	73 - 74	This contact permits activating the unit demand limit function. See section 5.8. This contact is active, whatever the operating type.	
0-10 V d.c. setpoint reset or demand limit entry	J8 / CH10	71 - 72	This 0-10 V d.c. input is used for setpoint reset or unit demand limit. It is active, whatever the unit operating type. This 0-10 V signal can be supplied by a user command or a 0-10 V temperature sensor.	Connector: 2 pin WAGO 231-302/026000 pitch 5.08
Connection to CCN	J12	1 - 2 - 3	A RS-485 bus is used for connection to the CCN. The CCN connector is located on the CCN/clock board (inserted on the PD4 Basic Board) - Pin 1: signal + - Pin 2: ground - Pin 3: signal -	Use of a shielded cable (max. length: 1000 m) Shielding: braiding on 95% - 100% of the cable surface. Shielding connection at the two cable ends.

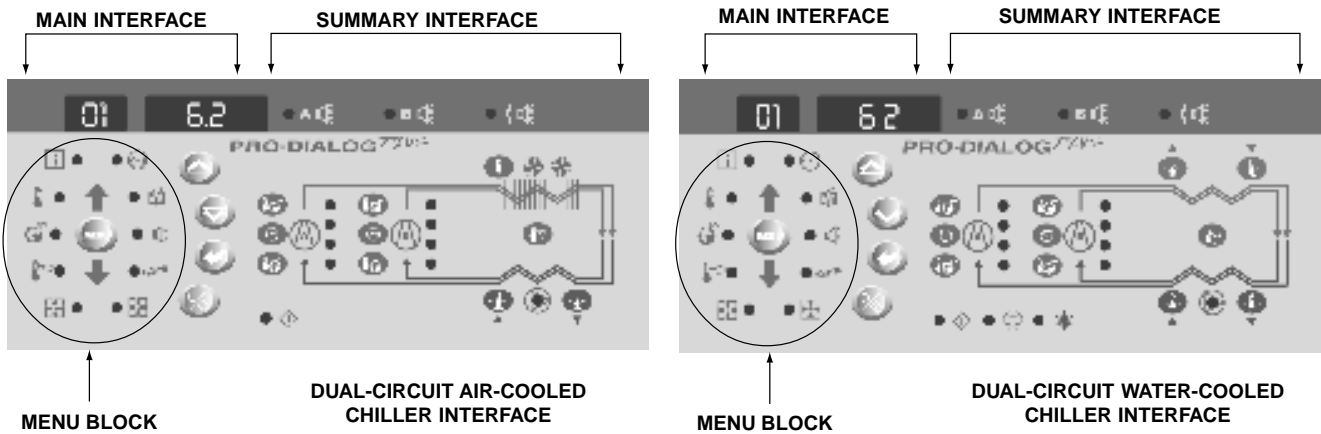
AVAILABLE TERMINALS				
Description	Connector/channel	Terminal	Description	Remarks
Condenser water flow switch input	J5/CH17		This contact is used to detect lack of condenser water flow and shuts down the unit.	24 V a.c. - 20mA
Evaporator 1 and 2 pump operation input	J5/CH18		This contact is used to detect an evaporator pump operation fault and switches over to the other evaporator pump*.	
Evaporator 1 control	J2/CH19		This contact permits control of evaporator 1 pump by the unit*.	24 V a.c. internal supply. Max. consumption - each output: 20 VA/10W - for all 3: 40 VA/20 W if all are used
Evaporator 2 control	J2/CH20		This contact permits control of evaporator 2 pump by the unit*.	
Condenser pump control	J2/CH21		This contact permits control of condenser pump by the unit*.	

#### Legend

\* Associated functions, if selected: automatic changeover, pump 1 and 2; manual or CCN selection; periodical; by default.

## 4 - SETTING UP PRO-DIALOG PLUS CONTROL

### 4.1 - Local interface general features



The local interface enables a number of operating parameters to be displayed and modified.

The interface consists of two distinct parts: the main interface (left hand section) and the summary interface (right hand section).

#### Main interface

It gives access to all PRO-DIALOG PLUS data and operating functions. It consists of:

- A two-digit display showing the number of the item selected.
- A four-digit display showing the contents of the item selected.
- LEDs and buttons for unit start/stop, menu selection, menu item selection and value adjustment.

#### MAIN INTERFACE









BUTTON NAME	DESCRIPTION
MENU	Permits the selection of a main menu. Each main menu is represented by an icon. The icon is lit if active.
Up arrow	Permits scrolling through the menu items (in the two-digit display). If the modification mode is active this button authorises increase of the value of any parameter.
Down arrow	Permits scrolling through the menu items (in the two-digit display). If the modification mode is active this button authorises decrease of the value of any parameter.
Enter	Gives access to the modification mode, validates a modification or displays expanded item description.
Start/stop	Authorises start or stop of the chiller in local mode or modification of its operating type.

#### MAIN INTERFACE MENU LEDS






LED	NAME	DESCRIPTION
	INFORMATIONS menu	Displays the general operating parameters for the unit.
	TEMPERATURES menu	Displays the unit operating temperatures.
kPa	PRESSURES menu	Displays the unit operating pressures.
	SETPOINTS menu	Displays the unit setpoints and enables them to be modified.
	INPUTS menu	Displays the status of the unit digital and analogue inputs.
	OUTPUTS/TESTS menu	Displays the status of the unit outputs and enables them to be tested.
	CONFIGURATIONS menu	Displays the unit configuration and enables it to be modified.
	ALARMS menu	Displays active alarms.
	ALARMS HISTORY menu	Displays the history of the alarms.
	OPERATING LOG menu	Displays the operating times and number of starts for the unit and the compressors.

The summary interface (right hand section) includes a mimic diagram of the unit, together with push-buttons and LEDs. It gives quick access to the main operating parameters of the unit.

#### SUMMARY INTERFACE LEDs

LED	INDICATION WHEN LIT
	<b>Green LED:</b> The unit is authorised to start or is already running
<b>A</b> 	<b>Red LED:</b> - Lit: circuit A or unit shut down by alarm - Flashing: circuit A or unit running with alarm present
<b>B</b> 	<b>Red LED:</b> - Lit: circuit B or unit shut down by alarm - Flashing: circuit B or unit running with alarm present
	<b>Red LED:</b> Water flow switch default or user safety lock open.
	<b>Green LED:</b> The evaporator pump is running.
	<b>Yellow LEDs:</b> From top to bottom - start/stop status of compressors A1, A2, A3 and A4 or B1, B2, B3 and B4. Flashing LED indicates that the circuit is in the protection or defrost mode (A or B).
	<b>Green LED:</b> The unit operates in heating mode.
	<b>Green LED:</b> The unit operates in cooling mode.

#### SUMMARY INTERFACE PUSH BUTTONS

BUTTON	DISPLAY
	Blue button: evaporator leaving or entering water temperature in °C Gray button: outdoor air temperature in °C
	Control point (setpoint + reset) in °C
	Press 1: circuit A/B discharge pressure in kPa Press 2: circuit A/B saturated condensing temperature in °C
	Press 1: circuit A/B suction pressure in kPa Press 2: circuit A/B saturated suction temperature in °C
	Press 1: compressor A1/B1 operating hours in h/10 or h/100 Press 2: compressor A2/B2 operating hours in h/10 or h/100

## 4.2 - Unit start/stop control

### 4.2.1 - Description

The unit start/stop can be controlled by one of the following methods:

- Locally on the actual unit (Local control type)
- By remote control with the aid of user contacts (remote control type)
- By CCN control with the aid of the CCN (CCN control type)

The main interface includes a Start/Stop button which can be used to stop or start the unit in the local operating type or to select the remote or CCN operating type.

The available operating types are described in the following table.

### The following operating types can be selected using the Start/Stop button:

#### OPERATING TYPES

4-DIGIT DISPLAY	DESCRIPTION
LOFF	<b>Local Off.</b> The unit is halted in local mode.
L-On	<b>Local On.</b> The unit is in local control mode and is authorised to start.
L-Sc*	<b>Local On - timer control.</b> The unit is in local control mode. It is authorised to start if the period is occupied. If the timer program for unit operation is unoccupied, the unit remains shut down until the period next becomes occupied.
CCN*	<b>CCN.</b> The unit is controlled by CCN commands.
rEM*	<b>Remote.</b> The unit is controlled by remote control contacts.
MAST*	<b>Master Unit.</b> The unit runs as a master in a two unit lead/lag arrangement. This is displayed if the unit is configured for master/slave control. See section 5.19.


#### Legend

\* Displayed if the configuration requires it.  
Section 5.1 gives a more detailed description of the commands to start/stop the unit, analysed by operating type.

### 4.2.2 - Stopping the unit in local mode

The unit can be stopped in local mode at any time by pressing the Start/Stop button.







#### TO STOP THE UNIT

BUTTON ACTION	2-DIGIT DISPLAY	4-DIGIT DISPLAY
 Press the Start/Stop button for less than 4 seconds (one short press is enough).	C	LOFF
If the button is released, the unit stops without the need for further action.	t	LOFF

### 4.2.3 - Starting unit and selecting an operating type

The unit can be started in local mode, or unit operating type can be changed at any time using the Start/Stop button. In the example that follows, the unit is stopped (LOFF) and the user wants to start the unit in local mode.

#### CHANGING THE OPERATING TYPE

BUTTON ACTION	2-DIGIT DISPLAY	4-DIGIT DISPLAY
 Continually press the operating type selection button for more than 4 seconds.	C	LOFF
 Hold down the Start/Stop button. The available operating types are displayed one by one until the button is released.		L-On L-Sc
	rEM	
Release the Start/Stop button if the operating type you want is displayed (in this example L-On). "C" flashes in the 2-digit display to show that the controller is awaiting confirmation.		L-On
 Press the Enter button to confirm the operating type selected (in this example: L-On). "t" is displayed in the 2-digit display to indicate the operating type selected. If the Enter button is not pressed soon enough, the controller will cancel the change and continue to use the previous operating type.	t	L-On

## 4.3 - Menus

### 4.3.1 - Selecting a menu









The MENU button authorises you to select a menu from the 10 main menus that are available. Each time you press this button one of the 10 LEDs lights up in turn alongside each of the icons representing a main menu. The active menu is the one against which the LED is lit. If a menu is empty then its LED is not lit. To scroll quickly through the menus, hold the MENU button down.

### 4.3.2 - Selecting a menu item

The up and down Arrow buttons let you scroll through the menu items. Menu item numbers are displayed in the two-digit display. The item number increases or decreases every time you press the up or down Arrow button. The menu items that are not in use or incompatible with the configuration are not displayed. The value or status associated with the active item is displayed in the four-digit display. To scroll quickly through the items, hold the up or down Arrow button down.

The following example shows how to access item 3 in the Pressures menu.

#### SELECTING A MENU ITEM

OPERATION	PRESS BUTTON	MENU LED	ITEM NUMBER 2-DIGIT DISPLAY
Press the MENU button until the LED marked PRESSURE lights.			0
			0
Press one of the Arrow buttons until the two-digit display shows 3 (item number 3).			1
			2
			3

### 4.3.3 - Modifying the value of a parameter/access to a sub-menu



















Press the Enter button for more than 2 seconds to enter the modification mode or to select a sub-menu. This lets you correct the value of an item or select a sub-menu with the aid of the up and down Arrow buttons (if you are authorised to overwrite the item concerned). When modification mode is activated, the LED for the main menu to which the item belongs flashes in menu block. Once the required value is obtained, press the Enter button again to validate the change or to access the sub-menu. The LED for the menu to which the item belongs then stops flashing, indicating that modification mode no longer applies.

In modification mode, the value to be modified increases or decreases in steps of 0.1 every time you press the Arrow buttons. Holding one of these buttons down increases the rate of increase or decrease.

**NOTE:** The access to a sub-menu may require entering a password. This is automatically requested. See section 4.5.7.2.

The example below shows how to modify the value of item 1 in the Setpoint menu.

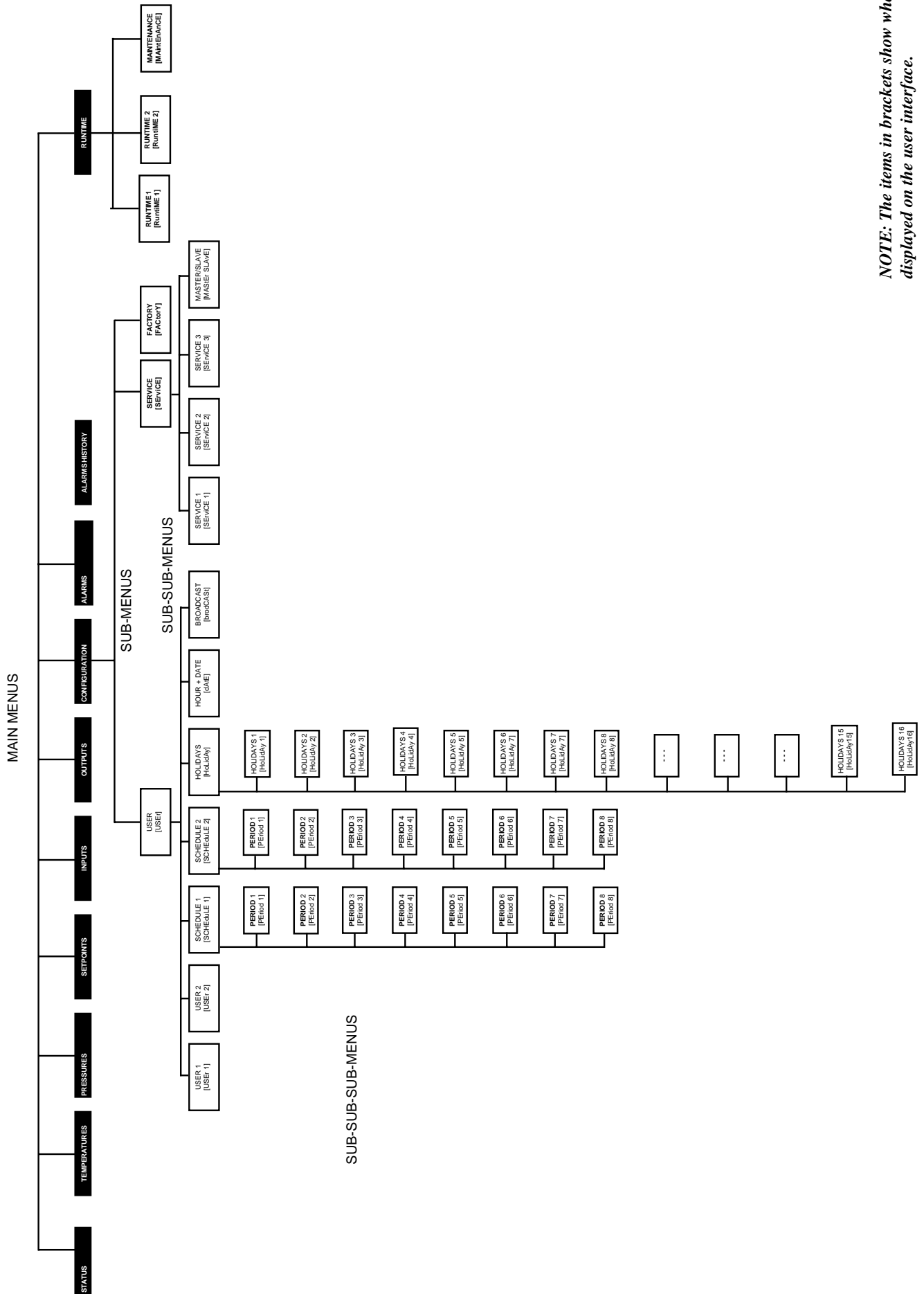
#### MODIFYING THE VALUE OF A PARAMETER

OPERATION	PRESS button	MENU LED	ITEM NUMBER 2-DIGIT DISPLAY	ITEM NUMBER 4-DIGIT DISPLAY
Hold on the MENU button until the LED for SETPOINT lights.			0	
			0	
Press one of the Arrow buttons until the two-digit display shows 1 (item number 1 - cooling setpoint 2). The value for setpoint 2 is displayed in the four-digit display (6.0°C in this example).			1	
			1	6.0
Press the Enter button for more than 2 seconds to enable the value associated with item 1 to be modified. The Setpoint menu LED flashes indicating that modification mode is active.			1	6.0
Keep pressing the Down Arrow button until the value 5.7 is displayed in the four-digit display. The Setpoint menu LED keeps flashing.			1	5.9
			1	5.8
			1	5.7
Press the Enter button again to validate the change. The new setpoint is 5.7°C. The Setpoint menu LED stops flashing, indicating that modification mode no longer applies.			1	5.7

### 4.3.4 - Expand display

Pressing the Enter button causes a 23 character text expansion to be scrolled across the four-digit display. All user menus provide an expansion of the current displayed parameters. If the expansion is complete the four-digit display reverts to item value. This function can be inhibited through the User Configuration menu.

#### 4.4 - General menu structure



**NOTE:** The items in brackets show what is displayed on the user interface.

## 4.5 - Menu tree structure

ITEM	STATUS	TEMP	PRESSURES	SETPOINTS	INPUTS	OUTPUTS	CONFIG	ALARMS	ALARMS HIST	RUNTIMES
0	Default display	Evaporator water entering temp.	Discharge pressure, circuit A	Cooling setpoint 1	Contact 1: remote on/off	Compressor status, circuit A	SUB-MENU: User Configuration [USER]	Number of active alarms/ resets	Historic alarm code 1	SUB-MENU: Runtimes 1
1	Active modes	Evaporator water leaving temp.	Suction pressure, circuit A	Cooling setpoint 2	Contact 2: remote setpoint	Compressor status, circuit B	SUB-MENU: Service Configuration [SERVICE]	Active alarm code 1**	Historic alarm code 2	SUB-MENU: Runtimes 1
2	Chiller occupied/unoccupied	Condenser water entering temperature	Oil differential pressure, compressor A1	Heating setpoint	Contact 3: remote heating/cooling	Capacity reduction status, circuits A & B	SUB-MENU: Factory Configuration [FACTORY]	Active alarm code 2**	Historic alarm code 3	SUB-MENU: Maintenance
3	Minutes left before starting	Condenser water leaving temperature	Discharge pressure, circuit B	Condensing setpoint	Contact 4: remote heat reclaim operation	Fan contactor status, circuit A	-	Active alarm code 3**	Historic alarm code 4	-
4	Cooling/heating selection	Heat reclaim water entering temperature	Suction pressure, circuit B	Heat reclaim setpoint	Demand limit selection	Fan contactor status, circuit B	-	Active alarm code 4**	Historic alarm code 5	-
5	Heat reclaim selection	Heat reclaim water leaving temperature	Oil differential pressure, compressor B1	Demand limit setpoint in %	Water flow & customer interlock control	Alarm circuit status, circuits A & B	-	Active alarm code 5**	Historic alarm code 6	-
6	Unit capacity in %	Saturated discharge temperature, circuit A	Oil differential pressure, compressor A2	Cooling mode ramp	Evaporator pump fault detection	EXV position, circuit A	-	-	Historic alarm code 7	-
7	Capacity circuit A in %	Saturated suction temperature, circuit A	Oil differential pressure, compressor A3	Heating mode ramp	Water flow control, condenser	EXV position, circuit B	-	-	Historic alarm code 8	-
8	Capacity circuit B in %	Suction temperature, compressor A1	Oil differential pressure, compressor A4	Cooling - threshold for zero reset	Control box thermostat	Variable speed fan, circuit A or cond. water valve position in %	-	-	Historic alarm code 9	-
9	Present demand limit in %	Superheat, circuit A	Oil differential pressure, compressor B2	Cooling - threshold for max. reset	External 0-10 V d.c. signal	Variable speed fan, circuit B or cond. water valve position in %	-	-	Historic alarm code 10	-
10	Present lag limit in %	Saturated discharge temperature, circuit B	Oil differential pressure, compressor B3	Cooling - max. reset value	-	Water pump 1 status	-	-	-	-
11	Setpoint in local control	Saturated suction temperature, circuit B	Oil differential pressure, compressor B4	Heating - threshold for zero reset	-	Water pump 2 status	-	-	-	-
12	Setpoint occupied/unoccupied mode	Suction temperature compressor B1	Heat reclaim pressure, circuit A	Heating - threshold for max. reset	-	Condenser pump status	-	-	-	-
13	Active setpoint	Superheat, circuit B	Heat reclaim pressure, circuit B	Heating - max. reset value	-	Evap. heater & heat reclaim cond. status	-	-	-	-
14	Control point	Outdoor temperature	-	-	-	Cond. water valve position, heat reclaim mode	-	-	-	-
15	Controlled water temperature	Water loop temp. master/slave assembly	-	-	-	Solenoid status, heat reclaim function	-	-	-	-
16	Condensing point	-	-	-	-	User test interface	-	-	-	-
17	Heat reclaim indicator, circuit A	-	-	-	-	-	-	-	-	-
18	Heat reclaim indicator, circuit B	-	-	-	-	-	-	-	-	-

**Legend**  
 \*\* Displayed if the alarm exists  
 - Not in use

**NOTE:** The items in brackets show what is displayed on the user interface.

## 4.5.1 - Description of the Information menu

### INFORMATION MENU [3]

ITEM	FORMAT	UNITS	DESCRIPTION
0			<b>Automatic display mode.</b> It cycles through the following displays:
	±nn.n	°C	<b>1: Controlled water temperature:</b> temperature of the water that the unit tries to maintain at the control point.
			<b>2: Unit operating type</b>
	LOFF	-	Local Off
	L-On	-	Local On
	L-Sc	-	Local On - based on unit clock.
	CCn	-	CCN Control.
	rEM	-	Remote Control
	MASt	-	Master unit
			<b>3: Unit status</b>
	OFF	-	Off: Unit is stopped and not authorised to start.
	rEADY	-	Ready: Unit is authorised to start
	dELAY	-	Delay: Unit is in delay at start-up. This delay is active after the unit has been switched on. The delay can be configured in the User Configuration menu.
	StOPPIng	-	Stopping: Unit is currently stopping.
	running	-	On: Unit is running or authorised to start.
	triPout	-	Fault shutdown.
	OvErridE	-	Limit: The operating conditions do not allow total unit operation.
			<b>4. Unit occupied/unoccupied status</b>
	OCUPPIEd	-	Occupied: Unit in occupied mode
	UNOCUPPIEd	-	Unoccupied: Unit in unoccupied mode
			<b>5. Heating/cooling operating mode</b>
	COOL	-	Cooling: Unit operates in cooling mode
	HEAT	-	Heating: Unit operates in heating mode
	rECLAIM	-	Cooling: Unit is in auto cooling and heat reclaim demand is active
			<b>6. Alarm mode</b>
	ALArM	-	Alarm: Unit is totally stopped because of failure.
	ALERt	-	Alert: Unit is in failure but not completely stopped.
			<b>7. Master/Slave status</b>
	MAStEr	-	Master: The master/slave control is active and the unit is the master
	SLAVe	-	Slave: The master/slave control is active and the unit is the slave
1 [1]	nn	-	<b>Active mode codes.</b> Each active mode is displayed in turn. This Item is masked when nil. Pressing the enter button when a mode code is displayed causes a character text expansion to be scrolled across the four-digit display. See the description in the following table
2 [2]	occu unoc Forc	-	This item indicates the current <b>chiller occupied/unoccupied</b> mode. Occupied Unoccupied The value is displayed in turn with 'Forc' when the unit is in CCN control and if this variable is forced through CCN.
3	nn.n	minutes	<b>Start-up delay.</b> This item indicates the minutes left before the unit can be started. This delay at start-up is always active after the unit has been switched on. The delay can be configured in the User Configuration 1 menu.
4 [2]	HEAT COOL	-	<b>Heating/cooling on selection:</b> This item is accessible in read/write, if the unit is in local control mode. It is only displayed, if the unit is in LOFF, L-On or L-Sc operating type. Displayed for heat pumps. Heating mode selection Cooling mode selection
5 [2]	YES NO	-	<b>Heat reclaim mode selection:</b> This item is accessible in read/write, if the unit is in local control mode. It is only displayed, if the unit is in LOFF, L-On or L-Sc operating type. Displayed for air-cooled or water-cooled units with a condenser water valve. Heat reclaim mode selection, use of heat reclaim condensing setpoint. Normal cooling mode selection, use of standard condensing setpoint
6	Nnn	%	<b>Total active capacity of unit.</b>
7	nnn	%	<b>Total active capacity of circuit A.</b>
8 [2]	nnn	%	<b>Total active capacity of circuit B.</b>
9 [2]	nnn Forc	%	<b>Present demand limit.</b> This is the authorised operating capacity of the unit. See section 5.8. The value is displayed in turn with 'Forc' when the unit is in CCN control and if this variable is forced through CCN.
10	nnn	%	<b>Present lag chiller demand limit.</b> Displayed when the master/slave control is selected.
11 [2]	SP-1 SP-2 AUtO	-	<b>Setpoint select in local mode.</b> This point is read/write accessible. Displayed only when the unit is LOFF, L-On or L-Sc operating type. SP-1 = cooling setpoint 1 SP-2 = cooling setpoint 2 AUtO = active setpoint depends on schedule 2 (setpoint selection schedule). See section 5.7.1 & 4.5.7.6.
12 [2]	occu unoc Forc	-	<b>Setpoint occupied mode.</b> Occupied: cooling setpoint 1 is active Unoccupied: cooling setpoint 2 is active The value shall be displayed in turn with 'Forc' when the unit is in CCN control and if this variable is forced through CCN.
13	±nn.n	°C	<b>Active setpoint.</b> This is the current cooling/heating setpoint: it refers to cooling/heating setpoint 1 or 2.
14	±nn.n Forc	°C	<b>Control point.</b> This is the setpoint used by the controller to adjust the temperature of the leaving or entering water (according to configuration). Control point = active setpoint + reset. See section 5.7 The value is displayed in turn with 'Forc' when the unit is in CCN control and if this variable is forced through CCN.
15	±nn.n	°C	<b>Controlled water temperature.</b> Water temperature that the unit tries to maintain at the control point.
16	±nn.n Forc	°C	<b>Condensing setpoint.</b> The value is displayed in turn with 'Forc' if the unit is in CCN mode and this parameter is forced by CCN.
17	n		<b>Heat reclaim function indicator, circuit A</b> (see heat reclaim section)
18	n		<b>Heat reclaim function indicator, circuit B</b> (see heat reclaim section)

#### Legend

- 1 This item is masked when nil.
- 2 This item is displayed in certain unit configurations only.
- 3 Access to this menu is read-only except for item 10 that can be forced when the unit is in Local operating type.



## DESCRIPTION OF OPERATING MODES (ITEM 1 OF THE INFORMATION MENU)

MODE #	MODE NAME	DESCRIPTION
7	Delay at start-up active	The delay at start-up operates after the unit has been switched on. If the delay has not expired, the mode is active. The delay is configured in the User1 configuration menu.
8	2nd cooling setpoint active	The second cooling setpoint is active. See section 5.7.1
9	Setpoint reset active	In this mode, the unit uses the reset function to adjust the leaving or entering water temperature setpoint. See section 5.7.2.
10	Demand limit active	In this mode, the capacity at which the unit is allowed to operate is limited. See section 5.8.
11	Ramp loading active	Ramp loading is active. In this mode, the controlled high or low water temperature value (in °C/min) in heating mode is limited to a preset value in order to prevent compressor overload. The ramp function must be configured (see User1 configuration menu). The ramp values can be modified (see setpoint menu).
12	Low entering water temperature protection in heating mode	The unit is in heating mode and the temperature of the evaporator leaving water is lower than the lesser of the two cooling setpoints. A capacity stage is removed. This mode only applies to heat pumps.
13,14	Low suction temperature protection	13 = circuit A & 14 = circuit B. Protection for evaporator suction low temperature circuit is active. In this mode, circuit capacity is not authorised to rise if the unit is in cooling mode, and saturated suction temperature in the circuit is lower by more than 13°C at the leaving chilled water and lower than the frost protection threshold.
15,16	Low discharge superheat protection	15 = circuit A & 16 = circuit B. In this mode the circuit capacity is shut down by pumpout and not allowed to restart, when the low superheat alarm conditions are satisfied. During the shutdown/start-up sequence, mode 15 or 16 is active. See descriptions for alarms 48 and 49.
17,18	High pressure protection	17 = circuit A & 18 = circuit B. The circuit is in high pressure protection mode because the HP protection threshold has been exceeded. The circuit capacity is not authorised to rise and any slave compressor can be stopped in order to prevent a high pressure break.
19,20	Not used	
21	Heat reclaim active	Circuit A or circuit B operates in heat reclaim mode and not in standard cooling mode (pumpdown phase is activated).
22	Evaporator heater active	Mode active if risk of frost exists.
23	Evaporator pump reversal active	Two evaporator water pumps installed on the unit and pump reversal is active. See section 5.3
24	Periodic evaporator pump start-up	The unit is shut down and is started every day at 14:00 hours for 2 seconds. This function must be configured in the User1 menu. See sections 5.3 and 4.5.7.3.
25	Low night-time capacity	Unit capacity is limited. The period when this mode starts, as well as the limited capacity in night-time mode are controlled in Client1 menu.
26	Unit under SM control	Unit is under control of a System Manager (FSM or CSM III).
27	Master/slave link active	Unit is connected to a secondary unit by a master slave link and either: - the unit is configured as a master and this master is operating, or - the unit is configured as a slave and this slave is operating.

### 4.5.2 - Description of the Temperatures menu

#### TEMPERATURES MENU [2]

ITEM	FORMAT	UNITS	COMMENTS
0	±nn.n	°C	Evaporator entering water temperature
1	±nn.n	°C	Evaporator leaving water temperature
2[1]	±nn.n	°C	Condenser entering water temperature
3[1]	±nn.n	°C	Condenser leaving water temperature
4[1]	±nn.n	°C	Reclaim condenser entering water temperature
5[1]	±nn.n	°C	Reclaim condenser leaving water temperature
6	±nn.n	°C	Saturated discharge temperature circuit A
7	±nn.n	°C	Saturated suction temperature circuit A
8	±nn.n	°C	Suction temperature compressor A1
9	±nn.n	°C	Superheat circuit A
10[1]	±nn.n	°C	Saturated discharge temperature circuit B
11[1]	±nn.n	°C	Saturated suction temperature circuit B
12[1]	±nn.n	°C	Suction temperature compressor B1
13[1]	±nn.n	°C	Superheat circuit B
14[1]	±nn.n	°C	Outdoor temperature
15[1]	±nn.n	°C	Water loop temperature, master/slave assembly

#### Legend

- 1 This item is displayed in certain unit configurations only
- 2 Access to this menu is read-only.

### 4.5.3 - Description of the Pressures menu

#### PRESSURES MENU [2]

ITEM	FORMAT	UNITS	COMMENTS
0	nnnn	kPa	Discharge pressure circuit A
1	nnnn	kPa	Suction pressure circuit A
2	nnnn	kPa	Differential oil pressure compressor A1
3	nnnn	kPa	Discharge pressure circuit B
4	nnnn	kPa	Suction pressure circuit B
5	nnnn	kPa	Differential oil pressure compressor B1
6[1]	nnnn	kPa	Differential oil pressure compressor A2
7[1]	nnnn	kPa	Differential oil pressure compressor A3
8[1]	nnnn	kPa	Differential oil pressure compressor A4
9[1]	nnnn	kPa	Differential oil pressure compressor B2
10[1]	nnnn	kPa	Differential oil pressure compressor B3
11[1]	nnnn	kPa	Differential oil pressure compressor B4
12[1]	nnnn	kPa	Pumpdown pressure, heat reclaim, circuit A
13[1]	nnnn	kPa	Pumpdown pressure, heat reclaim, circuit B

#### Legend

- 1 This item is displayed in certain unit configurations only.
- 2 Access to this menu is read-only

## 4.5.4 - Description of the Setpoints menu

### SETPOINTS MENU [2]

ITEM	FORMAT	UNITS	RANGE	COMMENTS
0	±nn.n	°C	See table below	This item lets you display and modify <b>Cooling setpoint 1*</b>
1	±nn.n	°C	See table below	This item lets you display and modify <b>Cooling setpoint 2*</b>
2	nnn	°C	See table below	This item lets you display and modify <b>Heating setpoint*</b> , only displayed for heat pumps.
3 [1]	nnn	°C	See table below	This item lets you display and modify the condensing setpoint*. It is used by the control to regulate the fan stages or a variable-speed fan (air-cooled units) or the condenser water valve control (water-cooled units), if the unit is not in heat reclaim mode.
4 [1]	nnn	°C	See table below	This item lets you display and modify the heat reclaim setpoint*. As item 3, this is used for condensing setpoint control.
5	nnn	%	0 to 100	<b>Capacity limit setpoint.</b> Limitation by volt-free contact. This item is used to define the maximum capacity that the unit is authorised to use, if the capacity limit contact activate the limit. See section 5.8.
6 [1]	±nn.n	°C/min	0.1 to 1.1	<b>Cooling ramp loading rate.</b> This parameter is only accessible if the ramp function is validated in the User Configuration 1 menu. This item refers to the maximum rate of temperature rise in °C in the water heat exchanger in cooling mode. When capacity loading is effectively limited by the ramp, mode 11 is active.
7 [1]	±nn.n	°C/min	0.1 to 1.1	<b>Heating ramp loading rate.</b> This parameter is only accessible if the ramp function is validated in the User Configuration 1 menu. This item refers to the maximum rate of temperature drop in °C in the water heat exchanger in heating mode. When capacity loading is effectively limited by the ramp, mode 11 is active.
8 [1]	±nn.n	[3]	See table below	<b>Zero reset threshold, cooling mode**</b>
9 [1]	±nn.n	[3]	See table below	<b>Full reset threshold, cooling mode**</b>
10 [1]	±nn.n	°C	See table below	<b>Full reset value, cooling mode**</b>
11 [1]	±nn.n	[3]	See table below	<b>Zero reset threshold, heating mode**</b>
12 [1]	±nn.n	[3]	See table below	<b>Full reset threshold, heating mode**</b>
13 [1]	±nn.n	°C	-16 to 16	<b>Full reset value, heating mode**</b>

#### Legend

1 This item is displayed in certain unit configurations only.

2 All points contained in this table can be modified.

\* Those setpoints can be used for entering or leaving water temperature control. By default the unit controls the evaporator entering fluid temperature. Leaving fluid temperature control requires a parameter modification in the Service Configuration menu.

\*\* These parameters are only accessible when reset based on OAT or delta T has been selected in the User Configuration 1 menu. See section 4.5.7.3.

SETPOINT	DESCRIPTION	CONTROL FOR LEAVING WATER	CONTROL FOR ENTERING WATER
<b>Cooling</b>	Minimum setpoint		
	- Water	3.3°C	9.3°C
	- Medium Brine	-10°C	-4°C
	- Low Brine	-20°C	-14°C
	Maximum setpoint		
<b>Heating</b>	Maximum setpoint	MCT - 4.0	MCT - 10.0

#### Note:

Three setpoint reset configuration modes can be selected in the Client1 menu:

1 Reset using an external 0-10 V d.c. signal

2 Reset using Delta T

3 Reset by external temperature sensor (air-cooled units only)

The items with zero reset or maximum reset are based on these three modes.

## 4.5.5 - Description of the Inputs menu

### INPUTS MENU [2]

ITEM	FORMAT	UNITS	COMMENTS
0	OPEn/CLoS	-	<b>Remote contact 1 status</b> This contact is used to start (contact closed) and stop (contact open) the chiller. It is only valid, if the unit is in the remote operating control (rEM) mode.
1	OPEn/CLoS	-	<b>Remote contact 2 status</b> This contact is used to select a cooling only setpoint, if the unit is in cooling mode and in the remote operating control (rEM) type. Contact open = csp1 Contact closed = csp2
2[1]	OPEn/CLoS	-	<b>Remote contact 3 status</b> This contact is used to select the heating or cooling mode, only if the unit is in the remote operating control type. Contact open: unit in cooling mode Contact closed: unit in heating mode
3[3]	OPEn/CLoS	-	<b>Remote contact 4 status</b> This contact is used to select the second condensing setpoint or the heat reclaim mode (for a heat reclaim unit), only if the unit is in the remote operating control type. Contact open = unit uses the normal condensing setpoint and is in normal mode (no heat reclaim) Contact closed = unit uses the heat reclaim setpoint and is in heat reclaim mode.
4	OPEn/CLoS	-	<b>Remote contact 5 status*</b> If this contact is closed, it permits limiting the unit demand, based on the demand limit setpoint, if the demand limit method by contact has been selected.
5	OPEn/CLoS	-	<b>Water flow and customer interlock control contact status*</b> Opening of this contact shuts the unit off or prevents its start-up and generates an alarm. It is used to control the water circulation.
6[1]	OPEn/CLoS	-	<b>Water pump operation status.</b> If the contact opens when the evaporator pump has received a command to operate, this trips a pump failure alarm.
7[1]	OPEn/CLoS	-	<b>Condenser water flow control.</b> Controls the condenser water circulation.
8[1]	OPEn/CLoS	-	<b>Control box thermostat and phase reversal interlock status*.</b> Opening of this contact shuts the unit off or prevents its start-up and generates an alarm.
9[1]	nn.n	-	<b>External 0-10 V d.c. signal.</b> This signal from an external source can be used (based on the configuration) for the reset or demand limit function of the unit.

#### Legend

- 1 This item is displayed in certain unit configurations only
  - 2 Access to this menu is read-only
  - \* Active in all operating types
- See section 3.4

## 4.5.6 - Description of the Outputs/Tests menu

### 4.5.6.1 - General

This menu displays the status of the controller outputs. Moreover, when the machine is fully stopped (LOFF) the outputs can be activated for manual or automatic tests (the access to the tests is password controlled).

### 4.5.6.2 - Menu description

#### OUTPUTS STATUS AND TESTS MENU [2] [3]

ITEM	FORMAT	UNITS	DESCRIPTION.
0		-	<b>Compressor status</b> b1 = compressor A1 b2 = compressor A2 b3 = compressor A3 b4 = compressor A4 This item permits display of the compressor status in circuit A. It also permits independent testing. In test mode the direction arrows permit successive display of 0001, 0010, 0100 and 1000, so as to in turn force authorisation of each output.
1 [1]		-	<b>Compressor status</b> b1 = compressor B1 b2 = compressor B2 b3 = compressor B3 b4 = compressor B4 This item permits display of the compressor status in circuit B. It also permits independent testing. In test mode the direction arrows permit successive display of 0001, 0010, 0100 and 1000, so as to in turn force authorisation of each output.
2 [1]	tEST	-	<b>Capacity reduction status, circuits A &amp; B</b> b1 = capacity reduction A1 b2 = capacity reduction B1 This item permits display of the capacity reduction status in circuit A. It also permits independent testing.
3 [1]	tEst	-	<b>Fan contactor status/test, circuit A</b> b1 = fan contactor assembly 1 b2 = fan contactor assembly 2 b3 = fan contactor assembly 3 b4 = fan contactor assembly 4 This item permits display of the fan stages. It also permits independent testing. In test mode the direction arrows permit successive display of 0001, 0010, 0100 and 1000, so as to in turn force authorisation of each output.

**OUTPUTS STATUS 2 AND TESTS MENU [2] [3] - cont.**

ITEM	FORMAT	UNITS	DESCRIPTION
4 [1]	tEst	-	<b>Fan contactor status/test, circuit B</b> b1 = fan contactor assembly 1 b2 = fan contactor assembly 2 b3 = fan contactor assembly 3 b4 = fan contactor assembly 4 This item permits display of the fan stages. It also permits independent testing. In test mode the direction arrows permit successive display of 0001, 0010, 0100 and 1000, so as to in turn force authorisation of each output.
5	tEst	-	<b>Alarm command status/test</b> b1 = alarm circuit A b2 = alarm circuit B In test mode the direction arrows permit successive display of 01 and 10, so as to in turn force authorisation of each alarm output.
6	tEst	%	<b>EXV position, circuit A</b> In the test mode the direction arrows permit forcing the valve to its fully open position.
7	tEst	%	<b>EXV position, circuit B</b> In the test mode the direction arrows permit forcing the valve to its fully open position.
8 [1]	tEst	%	<b>Variable speed fan, circuit A or condenser water valve position in %</b>
9 [1]	tEst	%	<b>Variable speed fan, circuit B or condenser water valve position in %</b>
10	On Stop tEst FAIL Good Forc	- - - - - -	<b>Evaporator water pump No. 1 command status.</b> Not displayed if unit does not control a pump. On: the pump operates Stop: the pump has stopped Forc: This item is only displayed if the unit is in local off mode (LOFF). Selecting this item permits energising the pump without delay and for an unlimited period. The pump continues to operate, until any key on the user interface is pressed: it is then immediately switched off. If the unit is in CCN control mode, the pump status is displayed alternately with 'Forc' if its status is forced by CCN. During the test phase, pump supply is energised for 10 seconds only. When the test has finished, the following display appears: - Fail: displayed if the test has failed, because the pump is not started - Good: displayed if the test succeeds
11	On OFF tEst FAIL Good Forc	- - - - - -	<b>Evaporator water pump No. 2 command status.</b> Not displayed if unit does not control a pump. On: the pump operates Stop: the pump has stopped Forc: This item is only displayed if the unit is in local off mode (LOFF). Selecting this item permits energising the pump without delay and for an unlimited period. The pump continues to operate, until any key on the user interface is pressed: it is then immediately switched off. If the unit is in CCN control mode, the pump status is displayed alternately with 'Forc' if its status is forced by CCN. During the test phase, pump supply is energised for 10 seconds only. When the test has finished, the following display appears: - Fail: displayed if the test has failed, because the pump is not started - Good: displayed if the test succeeds
12	On OFF tEst FAIL Good Forc	- - - - - -	<b>Condenser pump status/test</b> On: the pump operates Stop: the pump has stopped Forc: This item is only displayed if the unit is in local off mode (LOFF). Selecting this item permits energising the pump without delay and for an unlimited period. The pump continues to operate, until any key on the user interface is pressed: it is then immediately switched off. If the unit is in CCN control mode, the pump status is displayed alternately with 'Forc' if its status is forced by CCN. During the test phase, pump supply is energised for 10 seconds only. When the test has finished, the following display appears: - Fail: displayed if the test has failed, because the pump is not started - Good: displayed if the test succeeds
13[1]	nn	-	<b>Evaporator heater and heat reclaim condenser status</b> b1 = evaporator heater b2 = heat reclaim condenser heater
14[1]	tEst	%	<b>Condenser water valve position in heat reclaim mode</b>
15[1]		-	<b>Solenoid valve status/test, heat reclaim function</b> b1 = heat reclaim coil shutoff solenoid valve, circuit A b2 = heat reclaim coil drain solenoid valve, circuit A b3 = heat reclaim coil shutoff solenoid valve, circuit B b4 = heat reclaim coil drain solenoid valve, circuit B In test mode the direction arrows permit successive display of 0001, 0010, 0100 and 1000, so as to in turn force authorisation of each output.
16	YES no tEst		<b>Used only for local interface</b> Cause all diodes and blocks to light up or flash, to verify that they are operating correctly

**Legend**

- 1 This item is displayed in certain unit configurations only
- 2 A test is only possible if the units are in local off mode and if all compressors have stopped
- 3 The password is only valid for the test. 'Test' is displayed during the test, alternating with the item number

#### 4.5.6.3 - Manual tests

This function allows the user to test the outputs individually, if the machine is completely shut down (LOFF). To carry out a manual test use the arrow keys to access the output to be tested and press the Enter key (longer than 2 seconds) to activate the modification mode. The password is automatically requested, if it has not previously been verified. The Outputs/Test LED on the user interface begins to flash. Enter the desired test value and again press Enter to start the test. 'TEST' is displayed on the 4-digit display alternately with the value tested. The Outputs/Test LED stops flashing. Press the Enter key or an arrow key to stop the test.

#### 4.5.7 - Description of the Configuration menu

##### 4.5.7.1- General

This menu can be used to display and modify all configurations: Factory, Service and User. Only the User Configuration can be modified by the end-user. The Factory, Service and master/slave configurations are not described in this document. A configuration can only be modified if the unit is fully stopped (LOFF).

The menus User 1 [USER 1] and User 2 [USER 2] are password-protected. The other menus are directly accessible, except if item 12 of the User 1 menu (password for all configurations) has been validated.

##### 4.5.7.2 - Password

A password must be entered in order to access the test function or to modify a configuration. It is automatically requested, if necessary: 'EntEr PASS' is displayed on the 4-digit display and the configuration menu LED flashes, indicating that the modification mode is active. Press the arrow keys until the value '11' is displayed on the 4-digit display. Press Enter to validate this. The configuration menu LED stops flashing. If the password is correct, 'Good' is displayed. If the password is incorrect, 'PASS incorrEct' is displayed. The User password has a default value of 11.

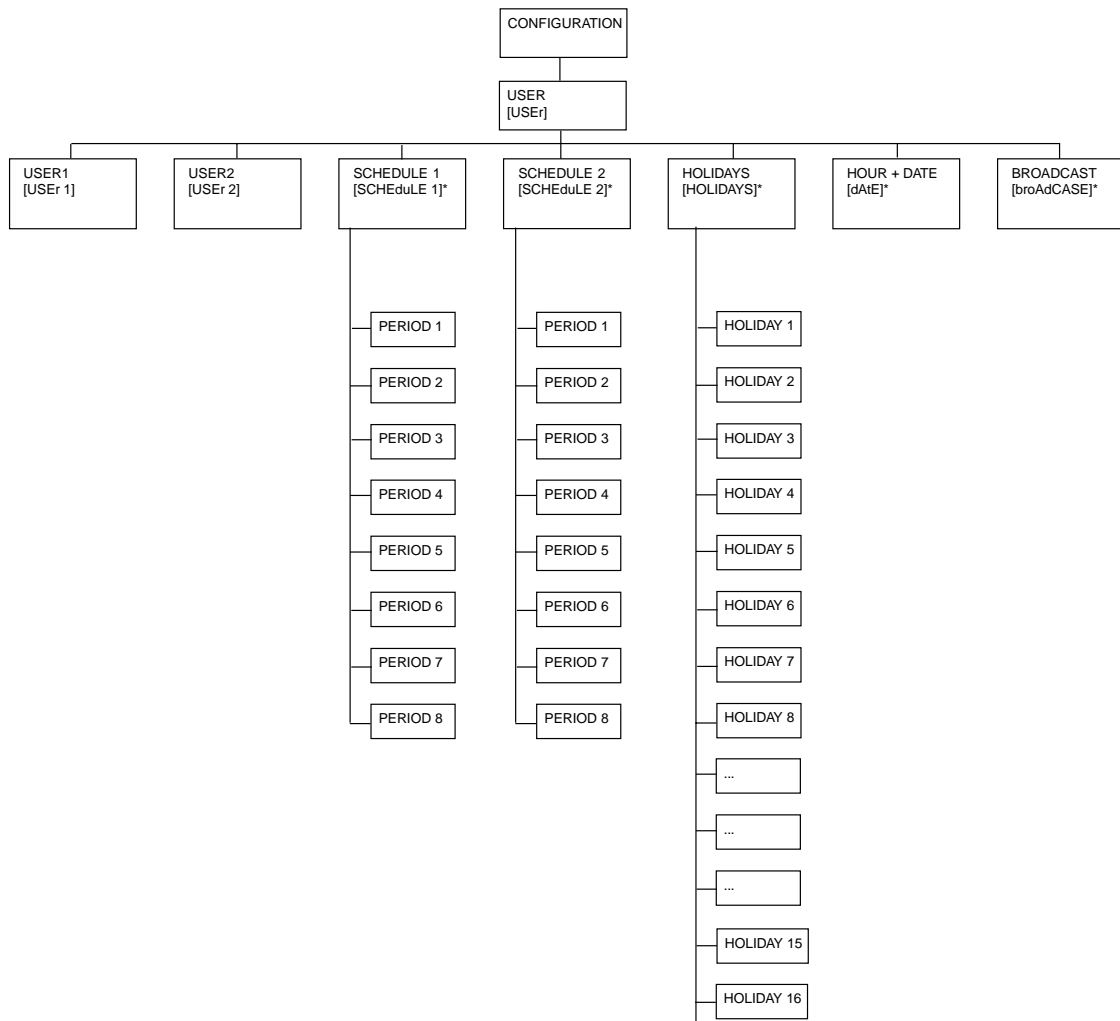
This value can be modified through the Service configuration. The password can be entered if the unit is fully stopped, otherwise 'ACCES dEniEd' (access denied) will be displayed on the 4-digit display. The controller automatically deactivates the password after 5 minutes without activity (i.e. no buttons pressed) or after powering up.

**SUB-MENU USER CONFIGURATION**

ITEM	USER 1 [USER1]	USER 2 [USER2]*	DATE [dAtE]*	SCHEDULE 1 [SchEdULe 1MEnu]*	SCHEDULE 2 [SchEdULe 2 MEnu]*	HOLIDAYS [HOLIdAy MEnu]*	BROADCAST [BrodCAST]*
0	Return to previous menu	Return to previous menu*	Return to previous menu	Return to previous menu	Return to previous menu	Return to previous menu	Return to previous menu
1	Circuit selection	Periodic pump start-up*	Hour*	SUB-MENU: Period 1 [PErloD 1]	SUB-MENU: Period 1 [PErloD 1]	SUB-MENU: Holidays 1 [HOLIdAy 1]	Broadcast acknowledger selection
2	Circuit capacity increase sequence	Night mode - start hour*	Day of the week*	SUB-MENU: Period 2 [PErloD 2]	SUB-MENU: Period 2 [PErloD 2]	SUB-MENU: Holidays 2 [HOLIdAy 2]	Broadcast activation
3	Ramp selection*	Night mode - end hour*	Day and month*	SUB-MENU: Period 3 [PErloD 3]	SUB-MENU: Period 3 [PErloD 3]	SUB-MENU: Holidays 3 [HOLIdAy 3]	Outdoor temperature broadcast bus
4	Start-up delay*	Night mode - demand limit in %	Year*	SUB-MENU: Period 4 [PErloD 4]	SUB-MENU: Period 4 [PErloD 4]	SUB-MENU: Holidays 4 [HOLIdAy 4]	Outdoor temperature broadcast element
5	Water pump selection	Number clock 1*	-	SUB-MENU: Period 5 [PErloD 5]	SUB-MENU: Period 5 [PErloD 5]	SUB-MENU: Holidays 5 [HOLIdAy 5]	Start month daylight saving time
6	Water pump changover delay*	Number clock 2*	-	SUB-MENU: Period 6 [PErloD 6]	SUB-MENU: Period 6 [PErloD 6]	SUB-MENU: Holidays 6 [HOLIdAy 6]	Start day daylight saving time
7	Automatic reset selection*	CCN address *	-	SUB-MENU: Period 7 [PErloD 7]	SUB-MENU: Period 7 [PErloD 7]	SUB-MENU: Holidays 7 [HOLIdAy 7]	Start hour daylight saving time
8	Demand limit selection	CCN bus*	-	SUB-MENU: Period 8 [PErloD 8]	SUB-MENU: Period 8 [PErloD 8]	SUB-MENU: Holidays 8 [HOLIdAy 8]	Minutes to add
9	Voltage corresponding to 100% of demand limit	-	-	-	-	SUB-MENU: Holidays 9 [HOLIdAy 9]	End month daylight saving time
10	Voltage corresponding to 0% of demand limit	-	-	-	-	SUB-MENU: Holidays 10 [HOLIdAy 10]	End day daylight saving time
11	Extended display selection	-	-	-	-	SUB-MENU: Holidays 11 [HOLIdAy 11]	End hour daylight saving time
12	Password for all user configurations	-	-	-	-	SUB-MENU: Holidays 12 [HOLIdAy 12]	Minutes to subtract
13	Software version number	-	-	-	-	SUB-MENU: Holidays 13 [HOLIdAy 13]	-
14	-	-	-	-	-	SUB-MENU: Holidays 14 [HOLIdAy 14]	-
15	-	-	-	-	-	SUB-MENU: Holidays 15 [HOLIdAy 15]	-
16	-	-	-	-	-	SUB-MENU: Holidays 16 [HOLIdAy 16]	-

**Legend:**

\*: only displayed if configuration requires.



**SUB-MENU PERIOD CONFIGURATION\***

Item	PERIOD 1 to 8 [PERIOD X MENU]*
0	Return to previous menu
1	Start of occupied period
2	End of occupied period
3	Selection Monday
4	Selection Tuesday
5	Selection Wednesday
6	Selection Thursday
7	Selection Friday
8	Selection Saturday
9	Selection Sunday
10	Selection holidays

**SUB-MENU HOLIDAY CONFIGURATION\***

Item	HOLIDAYS 1 to 16 [HOLIDAY X MENU]*
0	Return to previous menu
1	Start month holidays
3	Start day holidays
4	Number of days, holidays

**Legend**

\*: only displayed if configuration requires.

**NOTE:** The items in brackets show what is displayed on the user interface.

### 4.5.7.3 - Description of the User 1 Configuration sub-menu

#### USER 1 CONFIGURATION SUB-MENU [2]

ITEM	FORMAT	UNITS	DEFAULT	COMMENTS
0	USER MEnu	-	-	When selected this item authorises return to the previous menu.
1 [1]	0/1/2	-	0	<b>Lead circuit selection</b> 0 = automatic based on the number of start-ups and the operating hours of each circuit 1 = lead circuit A 2 = lead circuit B
2 [1]	0/1	-	0	<b>Circuit capacity increase sequence</b> 0 = equal charge for both circuits 1 = priority charge on one circuit
3 [1]	YES/no	-	no	<b>Ramp loading select.</b> For units with more than one compressor per circuit. Yes = ramp enabled No = ramp disabled This configuration enables the ramp to be activated for heating or cooling (depending on configuration): the maximum rate (in °C/min) of temperature drop or rise for the heat exchanger water (leaving or entering, upon configuration). Ramp setting value can be configured in the Setpoint menu.
4	1 to 15	min	1	<b>Delay at start-up.</b> This value is reinitialised after power-up or when both circuits are halted by local, remote or CCN command. No compressor will be started up until this pause has expired. However, the evaporator pump command will be activated immediately. The safety lockout loop will not be checked until the pause has expired.
5	0/1/2/3/4	-	0	<b>Pump sequence select</b> 0 = no pump 1 = one pump only 2 = two pumps with auto rotation 3 = pump #1 manual select 4 = pump #2 manual select If the auto sequence is selected, the pump change-over occurs when the rotation delay is elapsed. If the manual sequence is selected then, the selected pump is used in priority. Change-over occurs if one pump fails.
6 [1]	24 to 3000	hours	48	<b>Pump changeover delay.</b> Displayed if auto pump sequence is selected. This parameter is used for pump auto-rotation: the control tries to limit the pump run time difference to the pump changeover delay value. Change-over between pumps occurs when this difference becomes greater than the configured pump changeover delay.
7	0/1/2/3	-	0	<b>Automatic heating/cooling changeover selection.</b> Permits activation of automatic reset type 0 = none 1 = 0-10 V d.c. reference voltage 2 = temperature difference 3 = outdoor temperature
8	0/1/2	-	0	<b>Demand limit selection</b> 0 = demand limit not selected 1 = demand limit by contact 2 = demand limit by external signal 0-10 V d.c.
9 [1]	0 to 10	Volts	0	<b>Voltage corresponding to 100% of the demand limit</b>
10 [1]	0 to 10	Volts	0	<b>Voltage corresponding to 0% of the demand limit</b>
11	«YES/no»	-	yes	<b>Extended menu select</b> Yes = menu description available No = menu description not available This item authorises activating or inhibiting the menu item expanded display.
12	«YES/no»	-	no	<b>Password for all User Configurations</b> Yes = password required for all User Configurations (Date, Time Schedule, Broadcast) No = password require for User menu only When this item is validated, the User Password will be required for all configurations accessible by the User.
13	nn.n	-	-	<b>Software version number</b> This item shows the number of the software version used by this controller. Access is read only.

#### Legend

- 1 This item shall be masked when not used.
- 2 Access to menu is read/write.



#### 4.5.7.4 - Description of the User 2 Configuration sub-menu

##### USER 1 CONFIGURATION SUB-MENU

ITEM	FORMAT	UNITS	DEFAULT	COMMENTS
0	USER 2 Menu			When selected this item authorises return to the previous menu.
1[1]	YES/no	-	no	<b>Periodic pump quick-start of the water pump(s)</b> Yes = the pump is started periodically when the unit is manually stopped. No = periodic pump start is disabled When the unit is manually stopped (e.g. during the winter season) the pump is started each day at 14.00 hours for 2 seconds. If two pumps are available, pump #1 is started on odd days and pump #2 on even days.
2 [1]	n <sub>1</sub> n <sub>2</sub> n <sub>3</sub> n <sub>4</sub> 00:00 to 23:59	-	00:00	<b>Night control mode - start time*</b> Authorises entering the time of day at which the night control mode starts. During this period the fan runs at low speed (to reduce fan noise) if permitted by operating conditions, and unit capacity is limited to the maximum night values.
3 [1]	n <sub>1</sub> n <sub>2</sub> n <sub>3</sub> n <sub>4</sub> 00:00 to 23:59	-	00:00	<b>Night control mode - end time*</b> Authorises entering the time of day at which the night control mode ends.
4 [1]	0 to 100	%	-	<b>Night mode demand limit value.</b> Authorises configuration of the maximum capacity authorised during the night mode.
5 [1]	0 or 65 to 99	-	0	<b>Schedule 1 clock number</b> (for unit on/off schedule, see section 4.5.7.6). 0 = schedule in local operating mode 65 to 99 = schedule in CCN operating mode
6 [1]	0 or 65 to 99	-	0	<b>Schedule 2 clock number</b> (schedule for setpoint selection, see section 4.5.7.6). 0 = schedule in local operating mode 65 to 99 = schedule in CCN operating mode
7 [1]	1 to 239	-	1	<b>CCN element address.</b> No two network elements can have the same element number and bus number at the same time.
8 [1]	0 to 239	-	0	<b>CCN bus number.</b> No two network elements can have the same element number and bus number at the same time.

##### Legend

\* n<sub>1</sub>n<sub>2</sub>: hours (00 to 23). The first time the Enter button is continuously pressed, the first two characters in the 4-digit display flash so that hours can be adjusted.  
n<sub>3</sub>n<sub>4</sub>: minutes (00 to 59). Continuous pressing of the Enter key again causes the last two characters to flash so that minutes can be adjusted.

#### 4.5.7.5 - Description of Date and Time configuration sub-menu

##### DATE & TIME CONFIGURATION SUB-MENU

ITEM	FORMAT	COMMENTS
0	dAtE MEnu	When selected this item authorises return to the previous menu.
1	n <sub>1</sub> n <sub>2</sub> n <sub>3</sub> n <sub>4</sub> 00:00 to 23:59	<b>Current time</b> setting. n <sub>1</sub> n <sub>2</sub> : hours (00 to 23). The first time the Enter button is continuously pressed, the first two characters in the 4-digit display flash so that hours can be adjusted. n <sub>3</sub> n <sub>4</sub> : minutes (00 to 59). Continuous pressing of the Enter key again causes the last two characters to flash and minutes can be adjusted.
2	«Mo» «tU» «uE» «tH» «Fr» «SA» «Su»	<b>Current day of week</b> setting. Monday Tuesday Wednesday Thursday Friday Saturday Sunday
3	n <sub>1</sub> n <sub>2</sub> n <sub>3</sub> n <sub>4</sub> 01:01 to 31:12	<b>Current day and month</b> setting. n <sub>1</sub> n <sub>2</sub> :day (01 to 31). The first time the Enter button is continuously pressed, the first two characters in the 4-digit display flash so that day can be adjusted. n <sub>3</sub> n <sub>4</sub> :month (01 to 12). Continuous pressing of the Enter key again causes the last two characters to flash so that month can be adjusted.
4	nnnn	<b>Current year</b> setting.

#### 4.5.7.6 - Description of the Time Schedules sub-menus

The control provides two timer programs: time schedule 1 and time schedule 2.

The first timer program (schedule #1) provides a means to automatically switch the unit from an occupied mode to an unoccupied mode: the unit is started during occupied periods.

The second timer program (schedule #2) provides a means to automatically switch (when auto mode is selected) the active setpoint from an occupied setpoint to an unoccupied setpoint. Cooling or heating setpoint 1 is used during occupied periods. Cooling setpoint 2 is used during unoccupied periods. For additional information on setpoint activation see section 5.7.1.

Each schedule consists of eight time periods set by the operator. These time periods can be flagged to be in effect or not in effect on each day of the week plus a holiday period (see section 4.5.7.7 on public holidays). The day begins at 00.00 hours and ends at 24.00 hours.

Program is in unoccupied mode unless a schedule time period is in effect. If two periods overlap and are both active on the same day, the occupied mode takes priority over the unoccupied period.

Each of the eight periods can be displayed and changed with the aid of a sub-sub-menu. The table below shows how to access the period configuration. Method is the same for the time schedule #1 or the time schedule #2.

**PERIOD X CONFIGURATION SUB-MENUS (X = 1 to 8)**

ITEM #	FORMAT	COMMENTS
0	Period X Menu	Indicates the period (X) you are going to configure. When selected this item authorises a return to the main menu.
1	n <sub>1</sub> n <sub>2</sub> n <sub>3</sub> n <sub>4</sub> 00:00 to 24:00	<b>Occupied period - Start time*</b> . Authorises entering the time of day at which the occupied period starts.
2	n <sub>1</sub> n <sub>2</sub> n <sub>3</sub> n <sub>4</sub> 00:00 to 24:00	<b>Occupied period - End time*</b> . Authorises entering the time of day at which the occupied period ends.
3	Mo- 0 or Mo- 1	1 = the period is in effect on <b>Monday</b> . 0 = period not in effect on Monday
4	tu- 0 or tu- 1	1 = the period is in effect on <b>Tuesday</b> . 0 = period not in effect on Tuesday.
5	UE-0 or UE- 1	1 = the period is in effect on <b>Wednesday</b> .  0 = period not in effect on Wednesday.
6	tH- 0 or tH- 1	1 = the period is in effect on <b>Thursday</b> . 0 = period not in effect on Thursday.
7	Fr-0 or Fr- 1	1 = the period is in effect on <b>Friday</b> . 0 = period not in effect on Friday.
8	SA- 0 or SA- 1	1 = the period is in effect on <b>Saturday</b> . 0 = period not in effect on Saturday.
9	Su- 0 or Su- 1	1 = the period is in effect on <b>Sunday</b> . 0 = period not in effect on Sunday.
10	Ho- 0 or Ho- 1	1 = the period is in effect on <b>public holidays</b> . 0 = period not in effect on public holidays.



**Legend**

\* n<sub>1</sub>n<sub>2</sub>: hours (00 to 24). The first time the Enter button is continuously pressed, the first two characters in the 4-digit display flash so that hours can be adjusted.  
n<sub>3</sub>n<sub>4</sub>: minutes (00 to 59). Continuous pressing of the Enter key again causes the last two characters to flash so that minutes can be adjusted.

**Typical timer program:**

Time	MON	TUE	WES	THU	FRI	SAT	SUN	HOL
0	P1							
1	P1							
2	P1							
3								
4								
5								
6								
7	P2	P2	P3	P4	P4	P5		
8	P2	P2	P3	P4	P4	P5		
9	P2	P2	P3	P4	P4	P5		
10	P2	P2	P3	P4	P4	P5		
11	P2	P2	P3	P4	P4	P5		
12	P2	P2	P3	P4	P4			
13	P2	P2	P3	P4	P4			
14	P2	P2	P3	P4	P4			
15	P2	P2	P3	P4	P4			
16	P2	P2	P3	P4	P4			
17	P2	P2	P3					
18			P3					
19			P3					
20			P3					P6
21								
22								
23								
24								

MON : Monday  
TUE : Tuesday  
WED : Wednesday  
THU : Thursday  
FRI : Friday  
SAT : Saturday  
SUN : Sunday  
HOL : Public holidays

 Occupied  
 Unoccupied

	Starts at	Ends at	Active on
<b>P1:</b> period 1,	0h00,	3h00,	Monday
<b>P2:</b> period 2,	7h00,	18h00,	Monday and Tuesday
<b>P3:</b> period 3,	7h00,	21h00,	Wednesday
<b>P4:</b> period 4,	7h00,	17h00,	Thursday and Friday
<b>P5:</b> period 5,	7h00,	12h00,	Saturday
<b>P6:</b> period 6,	20h00,	21h00,	Public holidays
<b>P7:</b> period 7,	Not used in this example		
<b>P8:</b> period 8,	Not used in this example		

**4.5.7.7 - Description of the Holidays sub-menus**

This function is used to define 16 public holiday periods. Each period is defined with the aid of three parameters: the month, starting day and duration of the public holiday period. During these public holidays the controller will be in occupied or unoccupied mode, depending on the programmed periods validated for public holidays (see section 4.5.7.8).

Each of these public holiday periods can be displayed and changed with the aid of a sub-menu.

**ATTENTION: The broadcast function must be activated to utilize the holiday schedule, even if the unit is running in stand-alone mode (not connected to CCN). See section 4.5.7.6.**

**HOLIDAY PERIOD X CONFIGURATION SUB-MENUS (X = 1 to 16)**

ITEM #	FORMAT	COMMENTS
0	HoLidAy X Sub-menu	When selected this item authorises a return to the configuration menu.
1	0 to 12	<b>Start month of public holiday period</b> 0 = period not in use 1 = January, 2 = February, etc.
2	0 to 31	<b>Start day of public holiday period.</b> 0 period not in use.
3	0 to 99 days	<b>Duration of the public holiday period in days.</b>

**NOTE: Typical programming for public holidays:**

- A public holiday period lasting 1 day on 20th May, for instance, is configured as follows: start month = 5, start day = 20, duration = 1
- A public holiday period lasting 2 day on 25th May, for instance, is configured as follows: start month = 5, start day = 25, duration = 2

**4.5.7.8 - Description of the Broadcast sub-menu**

The controller provides a broadcast configuration menu which you can use to configure the unit to be the CCN's broadcaster, responsible for transmitting the time, outdoor temperature, and holiday flags to all system elements.

This menu also authorises setting the date to begin and end daylight saving time. There should be **only one** broadcaster in a CCN, so this table should not be configured if any other system element is acting as broadcaster.

**ATTENTION: If the unit operates in standalone mode (not CCN connected) this menu must be used if the holiday function is used, or to correct for daylight saving time.**

## BROADCAST CONFIGURATION SUB-MENU

ITEM #	FORMAT	COMMENTS
0	broAdCAST MEnu	When selected this item authorises a return to the main menu.
1	YES/no	Determines whether or not the unit is a <b>broadcast acknowledger</b> when the unit is connected on a CCN network. There must be only <b>one broadcast acknowledger</b> in a CCN.  <b>Warning:</b> if the unit operates in standalone mode (not CCN connected) this choice must be set to Yes if the holiday function is used (see section 4.5.7.8) or if you want to configure the daylight saving time function.
2	YES/no	This item authorises <b>enabling or disabling the Broadcast function</b> . When it is set to Yes, the control will make a periodic broadcast on the CCN. When it is set to No, the control is not the broadcaster and there is no need to configure the other choice in this table. There must be only <b>one broadcaster</b> in a CCN and this item should not be configured if any other system element is acting as broadcaster.  <b>Warning:</b> if the unit operates in standalone (not CCN connected) this choice must be set to Yes if the holiday function is used (see section 4.5.7.8) or if you want to configure the daylight saving time function.
3	nnn 0 to 239	<b>OAT Broadcaster bus number:</b> it is the bus number of the system that has the outside air temperature sensor connected to it. Used for CCN network function only.
4	nnn 0 to 239	<b>OAT Broadcaster element number:</b> it is the element number of the system element that has the outside air temperature sensor connected to it. Used for CCN network function only.
5	nn 1 to 12	<b>Daylight saving start month.</b> In this mode you enter the month in which the broadcaster will adjust its time for the start of daylight saving time.
6	nn 1 to 31	<b>Daylight saving start day.</b> In this mode you enter the day on which the broadcaster will adjust its time for the start of daylight saving time.
7	n <sub>1</sub> n <sub>2</sub> n <sub>3</sub> n <sub>4</sub> 00:00 to 24:00	<b>Authorises entering the hours and minutes for saving start.</b> In this mode you enter the time of day when the broadcaster will adjust its time for the start of daylight saving time.  n <sub>1</sub> n <sub>2</sub> : hours (00 to 24). The first time the Enter button is continuously pressed, the first two characters in the 4-digit display flash so that hours can be adjusted. n <sub>3</sub> n <sub>4</sub> : minutes (00 to 59). Continuous pressing of the Enter key again causes the last two characters to flash so that minutes can be adjusted.
8	nnnn 1 to 1440 minutes	<b>Daylight saving start minutes to add:</b> number of minutes by which the broadcaster will adjust its time for the start of daylight saving time.
9	nn 1 to 12	<b>Daylight saving stop month.</b> In this mode you enter the month in which the broadcaster will adjust its time for the end of daylight saving time.
10	nn 1 to 31	<b>Daylight saving stop day.</b> In this mode you enter the day on which the broadcaster will adjust its time for the end of daylight saving time.
11	n <sub>1</sub> n <sub>2</sub> n <sub>3</sub> n <sub>4</sub> 00:00 to 24:00	<b>Authorises entering the hours and minutes for saving stop.</b> In this mode you enter the time of day when the broadcaster will adjust its time for the end of daylight saving time.
12	nnnn 1 to 1440 minutes	<b>Daylight saving start minutes to subtract:</b> number of minutes by which the broadcaster will adjust its time for the end of daylight saving time.

n<sub>1</sub>n<sub>2</sub>: hours (00 to 24). The first time the Enter button is continuously pressed, the first two characters in the 4-digit display flash so that hours can be adjusted.  
n<sub>3</sub>n<sub>4</sub>: minutes (00 to 59). Continuous pressing of the Enter key again causes the last two characters to flash so that minutes can be adjusted.

### 4.5.8 - Description of the Alarms menu

This menu is used to display and reset up to 5 active alarms. It also permits alarm reset. If no alarm is active this menu is not accessible. See section 6 for a complete description of the alarm codes and alarm reset.

#### ALARMS MENU

ITEM #	FORMAT	DESCRIPTION
0 [1]	X ALArM rESEt ALArM	X alarms are active Reset of alarms is requested  To reset all active alarms, continuously press the Enter key. 'rESEt ALArM' is then displayed. Press the select key again: all alarms are reset.
1 [1]	nn	Current alarm code 1*
2 [1]	nn	Current alarm code 2*
3 [1]	nn	Current alarm code 3*
4 [1]	nn	Current alarm code 4*
5 [1]	nn	Current alarm code 5*

#### Legend

- 1 This item is masked when nil  
\* Pressing the Enter key when alarm code is displayed causes the following message to be scrolled:  
"time of alarm" "date of alarm" "full CCN alarm message"  
- "time of alarm": hh-mm  
- "date": dd-mm  
- "full CCN alarm message": up to 64 characters

### 4.5.9 - Description of the Alarms History menu

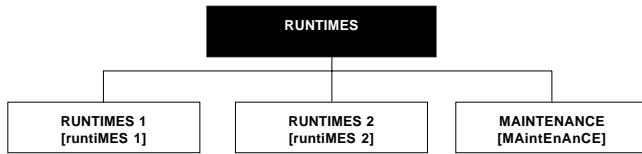
#### ALARMS HISTORY MENU

ITEM #	FORMAT	COMMENTS
1 [1]	nn	Alarm history code 1*
2 [1]	nn	Alarm history code 2*
3 [1]	nn	Alarm history code 3*
4 [1]	nn	Alarm history code 4*
5 [1]	nn	Alarm history code 5*
6 [1]	nn	Alarm history code 6*
7 [1]	nn	Alarm history code 7*
8 [1]	nn	Alarm history code 8*
9 [1]	nn	Alarm history code 9*
10 [1]	nn	Alarm history code 10*

#### Legend

- 1 This item is masked when nil  
\* Pressing the Enter key when alarm code is displayed causes the following message to be scrolled:  
"time of alarm" "date of alarm" "full CCN alarm message"  
- "time of alarm": hh-mm  
- "date": dd-mm  
- "full CCN alarm message": up to 64 characters

#### 4.5.10 - Runtime menu description



**NOTE:** The items in brackets show what is displayed on the user interface.

##### 4.5.10.1 - Description of the Runtimes 1 menu

###### RUNTIMES MENU [1]

ITEM #	FORMAT	UNIT	COMMENTS
0	-	-	When selected this item authorises return to the previous menu
1	nnnn   M 10   M100	hrs/10 or 100	Unit operating hours*
2	nnnn   M 10   M100	hrs/10 or 100	Compressor A1 operating hours*
3 [1]	nnnn   M 10   M100	hrs/10 or 100	Compressor A2 operating hours*
4 [1]	nnnn   M 10   M100	hrs/10 or 100	Compressor A3 operating hours*
5 [1]	nnnn   M 10   M100	hrs/10 or 100	Compressor A4 operating hours*
6 [1]	nnnn   M 10   M100	hrs/10 or 100	Compressor B1 operating hours*
7 [1]	nnnn   M 10   M100	hrs/10 or 100	Compressor B2 operating hours*
8 [1]	nnnn   M 10   M100	hrs/10 or 100	Compressor B3 operating hours*
9 [1]	nnnn   M 10   M100	hrs/10 or 100	Compressor B4 operating hours*
10	nnnn   M 10   M100	-/10 or 100	Machine starts*
11	nnnn   M 10   M100	-/10 or 100	Compressor A1 starts*
12 [1]	nnnn   M 10   M100	-/10 or 100	Compressor A2 starts*
13 [1]	nnnn   M 10   M100	-/10 or 100	Compressor A3 starts*
14 [1]	nnnn   M 10   M100	-/10 or 100	Compressor A4 starts*
15 [1]	nnnn   M 10   M100	-/10 or 100	Compressor B1 starts*
16 [1]	nnnn   M 10   M100	-/10 or 100	Compressor B2 starts*
17 [1]	nnnn   M 10   M100	-/10 or 100	Compressor B3 starts*
18 [1]	nnnn   M 10   M100	-/10 or 100	Compressor B4 starts*

###### NOTES

1 This item is masked when not used

\* Certain values are divided by 10 or by 100, so that number of hours or start-ups of less than 10 are displayed as 0.

When the value is divided by 10 or by 100 it is displayed in turn with "M 10" or "M100".

#### 4.5.10.2 - Description of the Runtimes 2 menu

###### RUNTIMES MENU [2]

ITEM #	FORMAT	UNIT	COMMENTS
0	-	-	When selected this item authorises return to the previous menu
1	nnnn   M 10   M100	hrs/10 or 100	Pump #1 operating hours*
2	nnnn   M 10   M100	hrs/10 or 100	Pump #2 operating hours*
3 [1]	nnnn   M 10   M100	hrs/10 or 100	Condenser pump operating hours
4 [1]	nnnn	-	Number of start-ups for the compressor with the highest number during the last hour
5	nnnn	-	Average number of compressor start-ups/hour for the last 24 hours

##### 4.5.10.3 - Maintenance menu description

To be active, the maintenance function must be preset in the Service configuration.

###### ITEM # FORMAT DESCRIPTION

ITEM #	FORMAT	DESCRIPTION
0	MAintEnAnCE MMenu	When selected this item authorises return to the previous menu.
1 [1]		Accessible with the Service password.
2 [1]		For future use
3 [1]		For future use
4 [1]	ALErt	Water loop rate to low
5 [1]	nnn/ALErt	Next primary pump maintenance operation in nnn days. 'ALErt' is displayed, when the delay before maintenance has elapsed.
6 [1]	nnn/ALErt	Next secondary pump maintenance operation in nnn days. 'ALErt' is displayed, when the delay before maintenance has elapsed.
7 [1]	nnn/ALErt	Next water filter maintenance operation in nnn days. 'ALErt' is displayed, when the delay before maintenance has elapsed.

###### Legend

1 This item is masked when not used.

## 5 - PRO-DIALOG PLUS CONTROL OPERATION

### 5.1 - Start/stop control

The table below summarises the unit control type and stop or go status with regard to the following parameters.

- **Operating type:** this is selected using the start/stop button on the front of the user interface.
- **Remote start/stop contacts:** these contacts are used when the unit is in remote operating type (rEM). See sections 3.6.2 and 3.6.3.
- **CHIL\_S\_S:** this network command relates to the chiller start/stop when the unit is in CCN control (CCn). Variable forced to disable: the unit is halted. Variable forced to Enable: the unit runs in accordance with schedule 1.

- **Start/Stop schedule:** occupied or unoccupied status of the unit as determined by the chiller start/stop program (Schedule #1). Used when the unit is equipped with an optional CCN/clock board, otherwise the chiller occupied mode is forced to occupied all the time.
- **Master control type.** This parameter is used when the unit is the master unit in a two chiller lead/lag arrangement. The master control type determines whether the unit is to be controlled locally, remotely or through CCN (this parameter is a Service configuration).
- **CCN emergency shutdown:** if this CCN command is activated, it shuts the unit down whatever the active operating type.
- **General alarm:** the unit is totally stopped due to failure.

ACTIVE OPERATING TYPE							STATUS OF PARAMETERS					CONTROL TYPE	UNIT MODE
LOFF	L-ON	L-SC	rEM	CCN	MASt	CHIL_S_S	REMOTE START/STOP CONTACT	MASTER CONTROL TYPE	START/STOP SCHEDULE MODE	CCN EMERGENCY SHUTDOWN	GENERAL ALARM		
-	-	-	-	-	-	-	-	-	-	Enable	-	-	Off
-	-	-	-	-	-	-	-	-	-	-	Yes	-	Off
Active	-	-	-	-	-	-	-	-	-	-	-	Local	Off
-	-	Active	-	-	-	-	-	-	Unoccupied	-	-	Local	Off
-	-	-	Active	-	-	-	Off	-	-	-	-	Remote	Off
-	-	-	Active	-	-	-	-	-	Unoccupied	-	-	Remote	Off
-	-	-	-	Active	-	Disable	-	-	-	-	-	CCN	Off
-	-	-	-	Active	-	-	-	-	Unoccupied	-	-	CCN	Off
-	-	-	-	-	Active	-	-	Local	Unoccupied	-	-	Local	Off
-	-	-	-	-	Active	-	Off	Remote	-	-	-	Remote	Off
-	-	-	-	-	Active	-	-	Remote	Unoccupied	-	-	Remote	Off
-	-	-	-	-	Active	Disable	-	CCN	-	-	-	CCN	Off
-	-	-	-	-	Active	-	-	CCN	Unoccupied	-	-	CCN	Off
-	Active	-	-	-	-	-	-	-	-	Disable	No	Local	On
-	-	Active	-	-	-	-	-	-	Occupied	Disable	No	Local	On
-	-	-	Active	-	-	-	On	-	Occupied	Disable	No	Remote	On
-	-	-	-	Active	-	Enable	-	-	Occupied	Disable	No	CCN	On
-	-	-	-	-	Active	-	-	Local	Occupied	Disable	No	Local	On
-	-	-	-	-	Active	-	On	Remote	Occupied	Disable	No	Remote	On
-	-	-	-	-	Active	Enable	-	CCN	Occupied	Disable	No	CCN	On

### 5.2 - Heating/cooling selection

On heat pumps, heating/cooling selection can be controlled differently depending on the active operating type:

- Locally on the unit, using operating types L-C1, L-C2, LC1r and LC2r (for cooling) and L-H (for heating).
- Remotely using the heat/cool selection volt-free contact when the unit is in Remote operating type (rEM).
- Via a CCN command when the unit is in CCN operating type (CCn).

The current heat/cool operating mode on the unit is indicated by item 4 in the Information menu and by the heat/cool LEDs on the summary interface.

PARAMETER STATUS					
ON/OFF STATUS	CONTROL TYPE	HEATING/COOLING SELECTION IN LOCAL MODE	REMOTE HEATING/COOLING CONTACTS	HC_SEL	OPERATING MODE
Off	-	-	-	-	Cooling
On	Local	Cooling	-	-	Cooling
On	Local	Heating	-	-	Heating
On	Remote	-	Cooling mode	-	Cooling
On	Remote	-	Heating mode	-	Heating
On	CCN	-	-	Cooling	Cooling
On	CCN	-	-	Heating	Heating

### 5.3 - Evaporator water pump control

The unit can control one or two evaporator water pumps. The evaporator water pump is turned on when this option is configured (see User configuration) and when the unit is in one of the on modes described above or in delay mode. Since the minimum value for the delay at start-up is 1 minute (configurable between 1 and 15 minutes), the pump will run for at least one minute before the first compressor starts.

The pump is kept running for 20 seconds after the unit goes to stop mode. The pump keeps working when the unit switches from heating to cooling mode or vice-versa. It is turned off if the unit is shut down due to an alarm unless the fault is a frost protection error.

The pump can be started in particular operating conditions when the evaporator heater is active. See section 5.19 for the particular evaporator pump control for the follower unit (master/slave assembly). If two pumps are controlled and the reversing function has been selected (see User 1 configuration), the control tries to limit the pump run time delta to the configured pump change-over delay. If this delay has elapsed, the pump reversing function is activated, when the unit is running. During the reversing function both pumps run together for two seconds. If a pump has failed and a secondary pump is available, the unit is stopped and started again with this pump.

The control provides a means to automatically start the pump each day at 14.00 hours for 2 seconds when the unit is off. If the unit is fitted with two pumps, the first pump is started on odd days and the second pump is started on even days. Starting the pump periodically for a few seconds increases the life-time of the pump bearings and the tightness of the pump seal.

**NOTE: If this function is used, there should not be any chilled water pump interlock between terminals 34 and 35 (see section 3.4).**

### 5.4 - Condenser water pump control

Only available on water-cooled units and air-cooled units with heat reclaim.

The condenser pump can be controlled by two modes, depending on the configuration (only accessible by Carrier Service).

- 1 - Control based on unit start/stop control. In this case it is controlled in the same way as the evaporator pump.
- 2 - Control based on compressor status. In this case the pump is activated at the same time as the first compressor. It only switches off when no compressor is activated.

### 5.5 - Control interlock contact

This contact can control the status of the water loop. Its function is to prevent unit start-up, if it is open and if the start-up delay has passed. Furthermore, this contact must remain closed when the unit is not in local off, remote or CCN control mode. Opening this contact for more than 8 seconds while the unit is operating, will cause immediate shut-down of the faulty unit.

### 5.6 - Evaporator heater control

The evaporator heater can be activated to protect an evaporator that may be damaged by ice, if the unit is shut down for a long period at low outdoor air temperature. If the heater is not sufficient to increase the water temperature, the evaporator pump can be started.

**NOTE: The evaporator heater control parameters may be modified using the Service Configuration menu.**

### 5.7 - Control point

Control point represents the leaving water temperature that the unit must produce.

- In cooling mode: control point = active setpoint + reset
- In heating mode: control point = active setpoint - reset

#### 5.7.1 - Active setpoint

Two setpoints can be selected as active in cooling mode. Usually, the second setpoint is used for unoccupied periods or for ice storage (medium or low brine unit). A single setpoint is available in heating mode.

Depending on the current operating mode, the active setpoint can be selected with the operating type selector button, or with the user's volt-free contacts, or with network commands (see section 3.4).

#### 5.7.2 - Reset

Reset means that the active setpoint is modified so that less machine capacity is required (in cooling mode, the setpoint is increased, in heating mode it is decreased). This modification is in general a reaction to a drop in the load. For the Pro-Dialog Plus control system, the source of the reset can be configured in the User 1 configuration: it can be based on an external 0-10 V signal, provided either by the outdoor temperature (that gives a measure of the load trends for the building) or by the return water temperature (delta T that gives an average building load). In response to a drop in the outdoor temperature or to a drop in delta T, the cooling setpoint is normally reset upwards in order to optimise unit performance:

In both cases the reset parameters, i.e. slope, source and maximum value, are configurable in the Setpoints menu (see section 4.5.4). Reset is a linear function based on three parameters.

- A reference at which reset is zero (outdoor temperature or delta T - no reset value).
- A reference at which reset is maximum (outdoor temperature or delta T - full reset value).
- The maximum reset value.



## 5.8 - Demand limit

Generally, demand limit is used by an energy management system in order to restrict the unit electricity consumption.

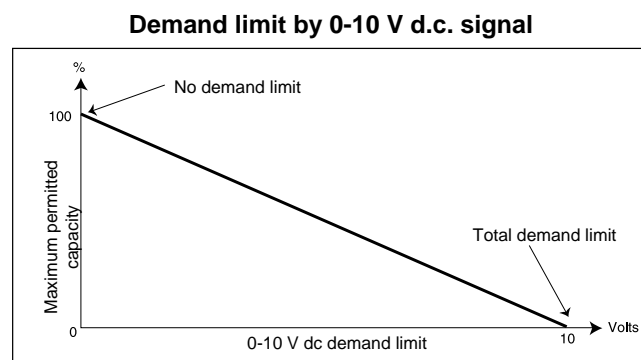
The PRO-DIALOG Plus control system for 30GX & 30HX provides two methods of demand limit:

- By reference to a limiting signal from a user-controlled volt-free contact: the capacity of the unit cannot exceed the demand limit setpoint (which can be modified in the Setpoints menu) when the limit contact is closed.
- By reference to an external 0-10 V d.c. signal: the capacity of the unit cannot exceed the demand limit imposed by this external signal. It is a linear function and its parameters are configurable in the User1 menu (voltages at 0% limitation and 100% of limitation). This function is not available if Reset by reference to an external 0-10 V d.c. signal has already been selected.

Whatever the method used, demand limit is active in all operating types: Local, Remote or CCN. However, in Local operating type, demand limit can be disabled with keypad commands (see section 4.3.3) and in CCN operating type, demand limit can be controlled directly with the aid of CCN commands.

**NOTE: A limitation value of 100% means that the unit may call upon the full array of its capacity stages.**

Here is an example of demand limit by an external 0-10 V d.c. signal. This example assumes that the limitation parameters are such that at 0 volt the authorised capacity shall be maximum capacity, and at 10 volts the authorised capacity shall be zero (this is the default configuration).



## 5.9 - Capacity control

This function activates the compressors and capacity unloaders to keep the entering or leaving water temperature at its setpoint. The **precision** with which this is achieved depends on **the capacity of the water loop, the flow rate, the load, and the number of stages available on the unit.**

The control system continuously takes account of the temperature error with respect to the setpoint, as well as the rate of change in this error and the difference between entering and leaving water temperatures, in order to determine the optimum moment at which to add or withdraw a capacity stage.

**NOTE: If the same compressor undergoes too many starts (per hour) this automatically brings about reduction of compressor starts, which makes leaving water temperature control less precise.**

## 5.10 - Determining the lead circuit

This function commands the start/stop sequence of the two refrigerant circuits called A and B. The circuit authorised to start first is the lead circuit. Three methods can be configured by the user in the Configuration menu:

- **Auto mode:** the control system determines the lead circuit so as to equalise the number of starts on each circuit (value weighted by the operating times of each circuit). Thus, the circuit with the least number of starts is always given precedence to start. The lead circuit is stopped last. This function is only available in two-circuit units.

**NOTE: If one circuit has more unloaders than the other, this circuit is always the lead circuit, independent of the configuration and the operating hours of the two circuits.**

- **Circuit A as leader:** Circuit A is always the lead circuit. It is the first to start and the last to stop.
- **Circuit B as leader:** Circuit B is always the lead circuit. It is the first to start and the last to stop. This choice is only available in two-circuit units.

## 5.11 - Circuit loading sequence

Two circuit loading sequences are available. The choice of sequence can be configured by the user in the Configuration menu (see section 4.5.7.3). This function is only available in two-circuit units.

- **Balanced circuit loading:** If this sequence is selected, the control system tries to keep the capacity of circuits A and B equal as the total load on the unit increases or decreases.
- **Loading with priority given to one circuit:** If this sequence is selected, the control system loads the lead circuit completely before the second circuit starts up. When there is a demand limit, the second circuit is unloaded first.

**NOTE: If the unit is air-cooled and if the saturated condensing temperature of one of the two circuits is lower than 0°C at the start-up of one circuit, the priority capacity loading sequence of the circuits is used by the control, independent of the configuration.**



## 5.12 - Slave compressor start-up sequence

Lag compressors are started and stopped in a sequence designed to equalise their number of start-ups (value weighted by their operating time).

## 5.13 - Controlling the EXV

EXVs, if used, control the flow of refrigerant in the evaporator. They are controlled in order to maintain a constant level of superheat at the thermistor for the lead compressor inlet gas (located between the compressor motor and the cylinders).

A thermistor and a pressure sensor, in the lead compressor of each circuit, are used to measure this superheat. The thermistor measures the temperature of the superheated gas entering the cylinders. The pressure sensor measures the suction gas pressure. The controller converts this value into a saturated temperature. The difference between the superheated gas temperature and the saturated temperature is the superheat. The control system sets the position of the EXV to hold this superheat at the setpoint configured for the unit.

Since the EXVs are driven by the controller their positions are always known. During start-up of a circuit its EXV is fully closed to ensure pump down. After pump down, the system continuously controls and monitors the valve position. Similarly, on shutdown of a circuit the EXV is closed again to ensure pumping down.

EXVs are also used to restrict suction temperature, making it possible to start the unit at higher water and suction temperatures without overloading the compressors. This procedure controls what is known as Maximum Operating Pressure (MOP).

## 5.14 - Head pressure control on air-cooled units

There are two methods, configurable only by Carrier Service, for controlling the condenser fans:

- **Controlling condensation by reference to a setpoint (default):** The saturated head pressure is controlled by reference to a fixed setpoint (user-definable in the Setpoints menu). This temperature is maintained by cycling fans on and off, as well as by varying the speed of a fan in appropriate cases.
- **Controlling condensation by reference to the position of the EXV:** The saturated head pressure is controlled by reference to the position of the EXV and the superheat, by cycling fans on and off as well as by varying the speed of a fan in appropriate cases. The control system seeks to keep the EXVs as wide open as possible whilst maintaining the correct level of superheat with the fans. When the second condensing setpoint is selected (reclaim setting), the control system will automatically revert to controlling by reference to a setpoint even if control by reference to the EXV has been selected. The original configuration is reinitialised when the first condensing setpoint is re-selected.

### NOTE

*Certain units can have up to 8 fan stages, of which one per circuit is a variable-speed fan, depending on their configuration and wiring.*

## 5.15 - Head pressure control on water-cooled units

There are two configurable methods for controlling the condenser water valves (optional):

- **Controlling head pressure by reference to a setpoint:** Saturated head pressure is controlled by reference to a user-definable fixed setpoint. This temperature is maintained by using the valves to control the flow of water in each condenser circuit.
- **Controlling head pressure by reference to the position of the EXV:** Saturated head pressure is controlled by reference to the position of the EXV and the superheat, by adjusting the flow of water in each condenser circuit. The valve control system seeks to keep the EXVs as wide open as possible whilst maintaining the correct level of superheat. When the second head pressure setpoint is selected (reclaim setting), the control system will automatically revert to controlling by reference to a setpoint even if control by reference to the EXV has been selected. The original configuration is reinitialised when the first head pressure setpoint is re-selected.

## 5.16 - Active setpoint selection

Two setpoints can be selected as active in cooling mode, and one setpoint in heating mode. Usually, the second cooling setpoint is used for unoccupied periods or for ice storage (brine unit). Depending on the current operating mode, the active setpoint can be selected either by choosing the item in the Information menu, or with the user volt-free contacts, or with network commands, or by the setpoint time schedule program (Schedule 2).

The following tables show a summary of the possible selections as a function of the control types (local, remote or network), and the parameters below:

- **Local setpoint selection:** item No. 11 of the Information Menu permits selection of the active setpoint, if the unit is in the local operating type.
- **Heating/cooling operating mode.**
- **Control contacts:** status of the remote heating and cooling control contact. This contact is only active, if the unit is under remote operating control. See section 3.6.6.
- **Schedule 2 program status:** schedule program for setpoint selection. See section 4.3.11.6.

## LOCAL OPERATING MODE

PARAMETER STATUS			
HEATING/ COOLING OPERATING MODE	LOCAL SETPOINT SELECTION	SCHEDULE 2 PROGRAM STATUS	ACTIVE SETPOINT
cooling	sp 1	-	cooling setpoint 1
cooling	sp2	-	cooling setpoint 2
heating	-	-	heating setpoint
holidays	auto	occupied	cooling setpoint 1
holidays	auto	unoccupied	cooling setpoint 2

## REMOTE OPERATING MODE

PARAMETER STATUS			
HEATING/ COOLING OPERATING MODE	CONTROL CONTACT	SCHEDULE 2 PROGRAM STATUS	ACTIVE SETPOINT
heating	-	-	heating setpoint
cooling	sp 1	-	cooling setpoint 1
cooling	sp2	-	cooling setpoint 2
-	holidays	occupied	cooling setpoint 1
-	holidays	unoccupied	cooling setpoint 2

## CCN OPERATING MODE

PARAMETER STATUS		
HEATING/COOLING OPERATING MODE	SCHEDULE 2 PROGRAM STATUS	ACTIVE SETPOINT
cooling	occupied	cooling setpoint 1
cooling	unoccupied	cooling setpoint 2
heating	-	heating setpoint

### 5.17 - High pressure load shedding function

This function does not require an additional board. It prevents high pressure a break on a circuit by the following means:

- Preventing any capacity increase on the circuit once the high pressure value has reached an initial threshold.
- Shedding one or more capacity stages once a second protection threshold has been reached.

In the event of capacity stages being shed, no capacity increase will be authorised on the circuit concerned for a period of 5 minutes.

### 5.18 - Pumping down

When the lead compressor in each circuit is started or stopped, that circuit goes through a pumping down cycle to purge the evaporator and suction line of refrigerant. The maximum duration of this cycle is 3 minutes.

### 5.19 - Master/slave assembly

Two PRO-DIALOG Plus units can be linked to produce a master/slave assembly. The two machines are interconnected over the CCN bus. All parameters required for the master/slave function must be configured through the Service configuration menu.

Master/slave operation requires the connection of a temperature probe at the common manifold on each machine, if the heat exchanger leaving water temperature is controlled.

The master/slave assembly can operate with constant or variable flow. In the case of variable flow each machine must control its own water pump and automatically shut down the pump, if the cooling capacity is zero. For constant flow operation the pumps for each unit are continuously operating, if the system is operating. The master unit can control a common pump that will be activated, when the system is started. In this case the slave unit pump is not used.

All control commands to the master/slave assembly (start/stop, setpoint, heating/cooling operation, load shedding, etc.) are handled by the unit which is configured as the master, and must therefore only be applied to the master unit. They will be transmitted automatically to the slave unit. The master unit can be controlled locally, remotely or by CCN commands. Therefore to start up the assembly, simply validate the Master operating type (MASt) on the master unit. If the Master has been configured for remote control then use the remote volt-free contacts for unit start/stop. The slave unit must stay in CCN operating type continuously. To stop the master/slave assembly, select Local Off (LOFF) on the master unit or use the remote volt-free contacts if the unit has been configured for remote control.

One of the functions of the master unit (depending on its configuration) may be the designation, whether the master or slave is to be the lead machine or the follower. The roles of lead machine and follower will be reversed when the difference in running hours between the two units exceeds a configurable value, ensuring that the running times of the two units are automatically equalised. The changeover between lead machine and follower may take place when the assembly is started up, or even whilst running. The running time balancing function is not active if it has not been configured: in this case the lead machine is always the master unit.

The lead machine will always be started first. When the lead machine is at its full available capacity, start-up delay (configurable) is initialised on the follower. When this delay has expired, and if the error on the control point is greater than 1.7°C, the follower unit is authorised to start and the pump is activated. The follower will automatically use the master unit active setpoint. The lead machine will be held at its full available capacity for as long as the active capacity on the follower is not zero. When the follower unit receives a command to stop, its evaporator water pump is turned off with 20 seconds delay.

In the event of a communication fault between the two units, each shall return to an autonomous operating mode until the fault is cleared. If the master unit is halted due to an alarm, the slave unit is authorised to start without prior conditions.

### 5.20 - Controlling Pro-Dialog Plus units with a System Manager

Up to eight PRO-DIALOG Plus units (or System Manager compatible units) can be controlled by one control module of the FSM or CSM III type which can handle multi-tasking of control functions such as starting units in sequence.

## 5.21 - Optional heat reclaim module

### Change-over procedure from cooling mode to heat reclaim mode:

- Start-up of the condenser pump
- Verification of the condenser flow switch control contact. If this remains open after one minute of condenser pump operation, the circuit remains in cooling mode and alarm 79 for circuit A (alarm 80 for circuit B) will be activated.
- As soon as the saturated condensing temperature reaches 30°C, the pumpdown sequence is activated.
- Pumpdown: closing of the cooling mode coil shutoff valve. Opening of the drain valve, closing of the EXV valve.
- When the pumpdown pressure reaches the end of the pumpdown threshold, the pumpdown valve is closed and the heat reclaim function is effective.

## 6 - DIAGNOSTICS - TROUBLESHOOTING

### 6.1 - General

The PRO-DIALOG Plus control system has many fault tracing aid functions. The local interface and its various menus give access to all unit operating conditions. The test function makes it possible to run a quick test of all devices on the unit. If an operating fault is detected, an alarm is activated and an alarm code is stored in the Alarm menu.

### 6.2 - Displaying alarms

The alarm LEDs on the summary interface (see section 4.1) give a quick display of the status of each circuit and the unit as a whole.

- A flashing LED shows that the circuit is operating but there is an alarm.
- A steady LED shows that the circuit has been shut down due to a fault.

The Alarm menu on the main interface displays up to 5 fault codes that are active on the unit.









### 6.3 - Resetting alarms

When the cause of the alarm has been corrected the alarm can be reset, depending on the type, either automatically on return to normal, or manually when action has been taken on the unit. Alarms can be reset even if the unit is running.

This means that an alarm can be reset without stopping the machine. In the event of a power supply interrupt, the unit restarts automatically without the need for an external command. However, any faults active when the supply is interrupted are saved and may in certain cases prevent a circuit or a unit from restarting.

A manual reset must be run from the main interface using the following procedure:

#### RESET OF ACTIVE ALARMS

OPERATION	ITEM NUMBER 2-DIGIT DISPLAY	ITEM VALUE 4-DIGIT DISPLAY	PRESS BUTTON	MENU LED
Hold down the MENU button until the LED for alarms lights. The 4-digit display shows the number of active alarms (2 in this example).	0 0	2 ALArM	 	 
Press the Enter button until "rESEt ALARm" is shown in the 4-digit display.	0	rESEt ALARm		
Press the Enter button again to validate the reset. "Good" is displayed for 2 seconds then, "2 ALArM" and then, "no ALArM".	0	Good then, 2 AL then, no ALArM		

## 6.4 - Alarm codes

The following list gives a complete description of each alarm code and its possible cause.

ALARM CODE DESCRIPTIONS						
Code	Alarm name	Description	Action	Pumpdown	Reset type	Probable cause
1	Evaporator leaving water thermistor fault	Thermistor outside range	Unit shut down	Yes	Auto	Thermistor or wiring fault or bad connection
2	Evaporator entering water thermistor fault	Ditto	Unit shut down	Yes	Auto	Ditto
3	Condenser leaving water thermistor fault	Ditto	Heating mode: Unit shut down, if control on leaving water. Cooling mode: no action	Yes	Auto	Ditto
4	Condenser entering water thermistor fault	Ditto	Heating mode: Unit shut down, if control on entering water. Cooling mode: no action	-	Auto	Ditto
5	Heat reclaim entering water thermistor fault	Ditto	Unit with heat reclaim option: heat reclaim mode shut down, unit changes over to standard cooling mode. If not: no action	-	Auto	Ditto
6	Heat reclaim leaving water thermistor fault	Ditto	None	-	Auto	Ditto
7	Outdoor temperature sensor fault	Ditto	Reset: normal setpoint used. Limitation or reset deactivated.	-	Auto, if temp. measured by sensor returns to normal	Thermistor faulty
8	CHWS (master/slave) fluid thermistor fault	Ditto	Deactivated	-	Ditto	Thermistor faulty
9	Suction thermistor fault, compressor A1	Ditto	Circuit A shut down	Yes	Auto	Ditto
10	Suction thermistor fault, compressor B1	Ditto	Circuit B shut down	Yes	Auto	Ditto
11	External 0-10 V dc signal fault	Reset signal outside range	Reset: normal setpoint used Limitation or reset deactivated	No	Auto	Signal incorrect, wiring error
12	Discharge pressure sensor fault, circuit A	Voltage transmitted by incorrect sensor	Circuit A shut down	Yes	Auto	Sensor fault or wiring error
13	Discharge pressure sensor fault, circuit B	Ditto	Circuit B shut down	Yes	Auto	Ditto
14	Suction pressure sensor fault, circuit A	Ditto	Circuit A shut down	No	Auto	Ditto
15	Suction pressure sensor fault, circuit B	Ditto	Circuit B shut down	No	Auto	Ditto
16	Oil pressure sensor fault, compressor A1	Ditto	Circuit A shut down	No	Auto	Ditto
17	Oil pressure sensor fault, compressor B1	Ditto	Circuit B shut down	No	Auto	Ditto
18	Oil pressure sensor fault, compressor A2	Ditto	Compressor A2 shut down	-	Auto	Ditto
19	Oil pressure sensor fault, compressor B2	Ditto	Compressor B2 shut down	-	Auto	Ditto
20	Oil pressure sensor fault, compressor A3	Ditto	Compressor A3 shut down	-	Auto	Ditto
21	Oil pressure sensor fault, compressor B3	Ditto	Compressor B3 shut down	-	Auto	Ditto
22	Oil pressure sensor fault, compressor A4	Ditto	Compressor A4 shut down	-	Auto	Ditto
23	Oil pressure sensor fault, compressor B4	Ditto	Compressor B4 shut down	-	Auto	Ditto
24	Pumpdown pressure sensor fault, circuit A	Ditto	If circuit is in heat reclaim mode, it goes to cooling mode. If not, no action	-	Auto, if press. measured by sensor returns to normal	Ditto
25	Pumpdown pressure sensor fault, circuit B	Ditto	Ditto	-	Ditto	Ditto
26	Loss of communication with compressor board A1	Communication with the compressor board is lost	Circuit A shut down	No	Auto	Wiring fault, faulty module, incorrect module address
27	Loss of communication with compressor board A2	Ditto	Compressor A2 shut down	No	Auto	Ditto
28	Loss of communication with compressor board A3	Ditto	Compressor A3 shut down	No	Auto	Ditto
29	Loss of communication with compressor board A4	Ditto	Compressor A4 shut down	No	Auto	Ditto
30	Loss of communication with compressor board B1	Ditto	Circuit B shut down	No	Auto	Ditto
31	Loss of communication with compressor board B2	Ditto	Compressor B2 shut down	No	Auto	Ditto
32	Loss of communication with compressor board B3	Ditto	Compressor B3 shut down	-	Auto	Ditto
33	Loss of communication with compressor board B4	Ditto	Compressor B4 shut down	-	Auto	Ditto
34	Loss of communication with EXV board	Ditto	Unit shut down	No	Auto	Wiring bus faulty, incorrect address or board faulty
35	Loss of communication with NRCP board	The board does not respond	Unit shut down, if heat reclaim mode is selected	No	Auto, if board is again detected	NRCP board faulty
36	Loss of communication with fan board 1	Ditto	Unit shut down, if the number of fan stages per circuit is less than 3. If not, circuit A shut down	No	Auto	Wiring bus faulty, incorrect address or board faulty
37	Loss of communication with fan board 2	Ditto	Circuit B shut down	No	Auto	Ditto
38	Loss of communication with 4xAI - 2xAO board 1	Ditto	Unit shut down or no action	No	Auto	Ditto, depending on configuration
39	Loss of communication with 4xAI - 2xAO board 2	Ditto	Compressors or circuit shut down	No	Auto	Ditto, depending on configuration
40	Pumpdown fault, circuit A	End of pumpdown conditions not satisfied	Circuit A shut down	No	Manual	EXV or sensor faulty
41	Pumpdown fault, circuit B	Ditto	Circuit B shut down	No	Manual	Ditto
42	Evaporator frost protection	Unit operating: units shut down if temp. < defrost threshold. Unit shut down: if temp < threshold and evaporator heater on for more than 10 mins.	Unit shut down	No	Auto first time, then manual	Low water flow or thermistor defective
43	Low evaporator water flow rate.		Unit shut down	No	Manual	Water pump faulty
44	Low suction temperature, circuit A	Circuit operating: saturated suction temp. < defrost threshold and < leaving water -16°C for more than 10 mins.	Circuit A shut down	No	Manual	Low charge, filter dirty or thermistor faulty
45	Low suction temperature, circuit B	Ditto	Circuit B shut down	No	Manual	Ditto
46	High suction overheat, circuit A	EXV fully open	Circuit A shut down	Yes	Manual	Ditto
47	High suction overheat, circuit B	Ditto	Circuit B shut down	Yes	Manual	Ditto
48	Low suction overheat, circuit A	EXV in min. position, and circuit superheat below superheat setpoint -5.5 K, saturated suction temp. above MOP for 5 mins.	Circuit A shut down	Yes	Manual	EXV or thermistor or transducer defective

**ALARM CODE DESCRIPTIONS**

Code	Alarm name	Description	Action	Pumpdown	Reset type	Probable cause
49	Low suction overheat, circuit B		Circuit B shut down	Yes	Manual	Ditto
50	Low oil pressure, compressor A1	Oil pressure < min. threshold	Circuit A shut down	No	Manual	Compressor, crankcase heater, pressure sensor or EXV faulty, refrigerant charge too high, low oil charge
51	Low oil pressure, compressor B1	Ditto	Circuit B shut down	No	Manual	Ditto
52	Low oil pressure, compressor A2	Ditto	Compressor A2 shut down		Manual	Ditto
53	Low oil pressure, compressor B2	Ditto	Compressor B2 shut down		Manual	Ditto
54	Low oil pressure, compressor A3	Ditto	Compressor A3 shut down		Manual	Ditto
55	Low oil pressure, compressor B3	Ditto	Compressor B3 shut down		Manual	Ditto
56	Low oil pressure, compressor A4	Ditto	Compressor A4 shut down		Manual	Ditto
57	Low oil pressure, compressor B4	Ditto	Compressor B4 shut down		Manual	Ditto
58	Evaporator water flow control fault	1. Interlock not closed before end of start-up delay 2. Pump shut down for 2 mins and water flow contact closed	Unit shut down. Pump shut down	No	Manual	Evaporator water flow fault
59	Low pressure fault, circuit A	Circuit operating, and suction pressure below permitted threshold for more than 3 mins.	Circuit A shut down	No	Auto first time, then manual*	Low refrigerant charge, EXV faulty or filter dirty
60	Low pressure fault, circuit B	Ditto	Circuit B shut down	No	Ditto	Ditto
61	Repeated high pressure load sheds, circuit A	More than 6 successive capacity load sheds in the circuit due to exceeded high pressure	None	No	Auto	Transducer faulty, condenser ent. air temp., evaporator ent. water temp. too high, cond. blocked or fan flow rate too low
62	Repeated high pressure load sheds, circuit B	Ditto	Ditto		Ditto	Ditto
63	High pressure switch not reset or reverse compressor rotation, circuit A	The high pressure switch has not been reset after a high pressure cut-out, or the lead compressor does not work	Circuit A shut down	No	Manual	The high pressure switch has not been reset, poor electrical connection of lead compr.
64	High pressure switch not reset or reverse compressor rotation, circuit B	Ditto	Circuit B shut down	No	Manual	Ditto
65	Control box thermostat fault	Sensor overheat	Unit shut down		Manual	Control box poorly ventilated
66	Loss of communication with System Manager	Units controlled by SM, and communication with the module over 2 mins. faulty	Unit operates in autonomous mode		Auto	CCN network fault
67	Loss of communication with the master or slave	Master/slave connection interrupted between the two units for more than 2 mins.	Unit operates in autonomous mode		Auto	CCN network fault
68	Master/slave configuration error	Poor master/slave configuration	Master/slave control not allowed		Auto/manual in case of heating/cooling fault	Master/slave configuration fault
69	Initial factory configuration necessary	All factory parameters are at zero	Unit prevented from starting		Auto	No factory configuration
70	Poor factory configuration. 1. Compr. A3 configured and A2 absent 2. Compr. A4 configured and A2 or A3 absent 3. No lead compr. in circuit B 4. Compr. B3 configured and B2 absent 5. Compr. B4 configured and B2 or B3 absent 6. Difference of compressors in circ. A and B too high 7. Fan configured for a water-cooled condenser 8. No fans configured 9. Heat reclaim option configured, and heat reclaim sensors not configured	Poor factory configuration	Ditto		Ditto	Factory configuration error
71	CCN/Clock Board fault	The CCN/Clock Board is no longer detected	Unit shut down	No	Auto, if the board is again detected	CCN/Clock Board faulty
72	Emergency stop	An emergency stop command has been transmitted by the CCN network.	Unit shut down	No	CCN	CCN network command
73	Pump No. 1 fault	Evaporator water pump operating contact open, when the pump has received a command to operate.	Unit shut down	No	Manual	Pump overheat or poor pump connection
74	Pump No. 2 fault	Ditto	Unit shut down	No	Manual	Ditto
75	Condenser anti-freeze protection, circuit A	Saturated temperature is under the frost cut-out point	Unit shut down. Condenser pump started, if unit is shut down	No	Auto	Discharge pressure transducer faulty, refrigerant leak, or low cond. water temp.
76	Condenser anti-freeze protection, circuit B	Ditto	Ditto	No	Auto	Ditto
77	Lack of water flow, condenser	Water flow switch (water-cooled units) not closed for 1 min.	Unit shut down	No	Manual	Condenser pump, low water flow, water flow switch
78	Condenser water flow fault, heat reclaim mode	Ditto	Units stays in cooling mode	No	Manual	Ditto
79	Heat reclaim mode fault, circuit A	More than two consecutive pumpdown sequences not successful	Circuit A stays in cooling mode	No	Manual	Leak or heat reclaim or drain solenoid shut-off valve fault
80	Heat reclaim mode fault, circuit B	Ditto	Circuit B stays in cooling mode	No	Manual	Ditto
81	High pressure fault, circuit A	Circuit operating and discharge pressure exceeds the high pressure cut-out point	Unit shut down	No	Manual, the high pressure command must be reset manually by the button on the HP pressure switch	Fan circuit fault, air or condenser temperature too high
82	High pressure fault, circuit B	Ditto	Ditto	No	Ditto	Ditto
83	Maintenance alert 1. Charge too low 2. Water loop too low 3. Air filter maintenance delay elapsed 4. Pump 1 maintenance delay elapsed 5. Pump 2 maintenance delay elapsed 6. Water filter maintenance delay elapsed	A maintenance alert is active	None		Manual	

## 6.4.1 - Compressor faults

### 6.4.1.1 - General

Each compressor is protected against multiple faults by two digital inputs located on the control board. If one of these inputs opens, it causes an immediate shutdown on the compressor without any action from the basic board.

### 6.4.1.2 - Compressor protection devices

On PRO-DIALOG Plus units, compressors are individually protected by the following devices connected to the digital inputs on the compressor control board:

### DGT (only for units with low-temperature option):

The discharge gas thermostat detects and protects the compressor against abnormally high discharge temperatures.

### Starter Guard:

This board patented by Carrier (also called AM board) monitors both the compressor regime and the status of its crankcase heaters which ensure correct lubrication when the compressor starts.

ALARM CODE DESCRIPTIONS					
Code	Alarm name	Action	Pumpdown	Reset type	Probable cause
101	DGT fault, compressor A1	Circuit A shut down	No	Manual	Hot gas thermostat contact open
102	Starter Guard fault compressor A1	Circuit A shut down	No	Ditto	Crankcase heater fault and open motor current fault detection board contact
201	DGT fault, compressor A2	Compressor A2 shut down		Ditto	Hot gas thermostat contact open
202	Starter Guard fault compressor A 2	Compressor A2 shut down		Ditto	Crankcase heater fault and open motor current fault detection board contact
301	DGT fault, compressor A3	Compressor A3 shut down		Ditto	Hot gas thermostat contact open
302	Starter Guard fault compressor A 3	Compressor A3 shut down		Ditto	Crankcase heater fault and open motor current fault detection board contact
401	DGT fault, compressor A4	Compressor A4 shut down		Ditto	Hot gas thermostat contact open
402	Starter Guard fault compressor A 4	Compressor A4 shut down		Ditto	Crankcase heater fault and open motor current fault detection board contact
501	DGT fault, compressor B1	Circuit B shut down	No	Ditto	Hot gas thermostat contact open
502	Starter Guard fault compressor B1	Circuit B shut down	No	Ditto	Crankcase heater fault and open motor current fault detection board contact
601	DGT fault, compressor B2	Compressor B2 shut down		Ditto	Hot gas thermostat contact open
602	Starter Guard fault compressor B 2	Compressor B2 shut down		Ditto	Crankcase heater fault and open motor current fault detection board contact
701	DGT fault, compressor B3	Compressor B3 shut down		Ditto	Hot gas thermostat contact open
702	Starter Guard fault compressor B3	Compressor B3 shut down		Ditto	Crankcase heater fault and open motor current fault detection board contact
801	DGT fault, compressor B4	Compressor B4 shut down		Ditto	Hot gas thermostat contact open
802	Starter Guard fault compressor B4	Compressor B4 shut down		Ditto	Crankcase heater fault and open motor current fault detection board contact



Order No. 13040-76, 05.2000. Supersedes order No.: New  
Manufacturer reserves the right to change any product specifications without notice.



Environmental Management System Approval

Manufactured by: Carrier S.A., Montluel, France.  
Printed in the Netherlands on totally chlorine-free paper.