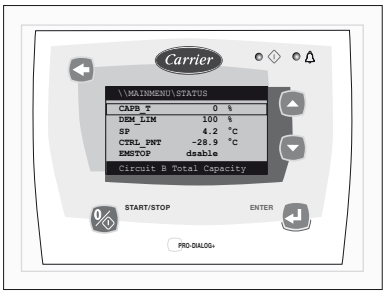
Carrier

61AF

Pro-Dialog+ Control

PRO-DIALOG +

AQUASNAP™



Operating instructions

LLOYD'S REGISTER QUALITY ASSURANCE
ISO9001 · ISO14001

Quality and Environment Management Systems Approval

Contents

1 - SAFETY CONSIDERATIONS 3
1.1 - General 3
1.2 - Avoid electrocution 3

2 - GENERAL DESCRIPTION 3
2.1 - General 3
2.2 - Abbreviations used 3

3 - HARDWARE DESCRIPTION 3
3.1 - General 3
3.2 - Electrical supply to boards 4
3.3 - Light emitting diodes on boards 4
3.4 - The sensors 4
3.5 - The controls 4
3.6 - Connections at the user terminal block 4

4. SETTING UP PRO-DIALOG+ CONTROL 6
4.1 - General features 6
4.2 - Default screen characteristics 6
4.3 - Password screens 6
4.4 - Menu screen characteristics 6
4.5 - Data screen or configurable parameter characteristics 6
4.6 - Parameter modification 7
4.7 - Operating mode screen 7
4.8 - Menu tree structure 8
4.9 - Detailed menu description 9

5 - PRO-DIALOG PLUS CONTROL OPERATION 15
5.1 - Start/stop control 15
5.2 - Heat exchanger water pump control 15
5.3 - Control interlock contact 15
5.4 - Heat exchanger frost protection 15
5.5 - Control point 15
5.6 - Capacity limitation 16
5.7 - Capacity control 16
5.8 - Defrost function 16
5.9 - Additional electric heater stage control 17
5.10 - Control of a boiler 17
5.11 - Eco function 17
5.12 - Master/slave assembly 17

6 - DIAGNOSTICS - TROUBLESHOOTING 18
6.1 - General 18
6.2 - Displaying alarms 18
6.3 - Resetting alarms 18
6.4 - Alarm codes 19

1 - SAFETY CONSIDERATIONS

1.1 - General

Installation, start-up and servicing of equipment can be hazardous if certain factors particular to the installation are not considered: operating pressures, presence of electrical components and voltages and the installation site (elevated plinths and built-up up structures). Only properly qualified installation engineers and highly qualified installers and technicians, fully trained for the product, are authorised to install and start-up the equipment safely. During all servicing operations all instructions and recommendations which appear in the installation and service instructions for the product, as well as on tags and labels fixed to the equipment and components and accompanying parts supplied separately, must be read, understood and followed.

- Apply all standard 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 - Avoid electrocution

Only personnel qualified in accordance with IEC (International Electrotechnical Commission) recommendations 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: This equipment conforms to all applicable codes regarding electromagnetic compatibility.

2 - GENERAL DESCRIPTION

2.1 - General

Pro-Dialog is an electronic control system to regulate units of the following types: 61AF

These units have only one refrigerant circuit.

The Pro-Dialog control regulates:

- compressor start-up to control the water loop
- the fans to optimise operation of each refrigerant circuit
- the defrost cycles to ensure the operation of the refrigerant circuit.

As standard Pro-Dialog offers three on/off commands:

- Local - on/off command using the keyboard
- Remote - wired on/off command using volt-free contacts
- Network - Carrier Comfort Network (CCN) on/off command.

The command type is selected in advance by keyboard.

2.2 - Abbreviations used

In this manual, the compressors are labelled A1 and A2.

The following abbreviations are used frequently:

CCN	Carrier Comfort Network
LED	Light Emitting Diode
LEN	Internal communication bus linking the main board to the slave boards
SCT	Saturated condensing temperature
SST	Saturated suction temperature
EXV	Electronic expansion valve
PD-AUX	Auxiliary input/output board

3 - HARDWARE DESCRIPTION

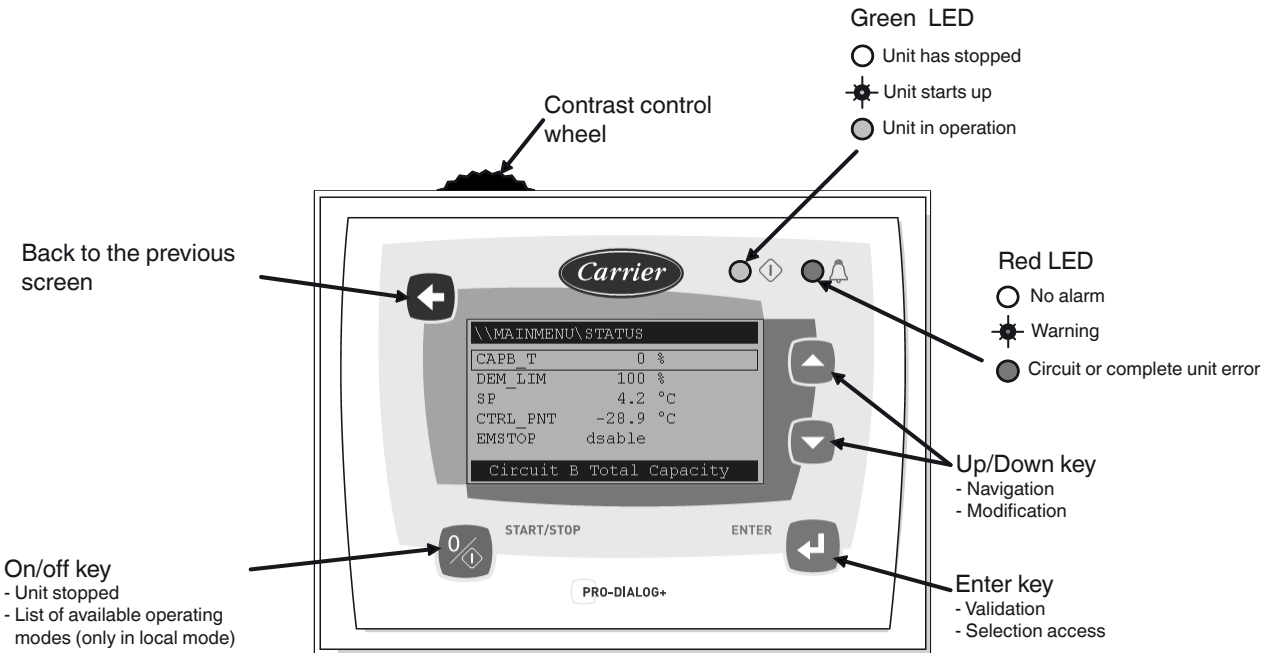
3.1 - General

The control system consists of an NRCP2-BASE board (that can control up to two compressors), a PD-AUX board (that allows control of the different electric heater stages), an EXV board (that ensures the control of the EXV function) and a user interface. Certain options may require a number of additional PD-AUX boards.

All boards communicate via an internal LEN bus. The NRCP2-BASE board contains the complete control program for the machine, and continuously manages the recovery of the values of the various temperature and pressure sensors.

The user interface includes an alphanumeric eight-line display, two LEDs with five navigation keys as well as a contrast control wheel.

Figure 1 - Control board



3.2 - Electrical supply to boards

All boards are supplied from a common 24 V a.c. supply 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.

CAUTION: Maintain the correct polarity of the power supply connection of the boards, to ensure that they are not damaged.

3.3 - 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.

- The red LED that flashes for a two-second period - one second on, one second off - indicates correct operation. A different rate indicates a board or a software failure.
- The green LED flashes continuously on all boards to show that the board is communicating correctly over its internal bus. If the LED is not flashing, this indicates a LEN bus wiring problem.
- The orange LED of the master board flashes during any communication via the CCN bus.

3.4 - The sensors

Pressure sensors
Two types of electronic sensors are used:

- low pressure: suction pressure and pump entering pressure (optional),
- high pressure: discharge pressure and economiser pressure.

Thermistors
The heat exchanger water sensors are installed in the entering and leaving side. The outdoor temperature sensor is mounted under a metal plate. An additional sensor placed on an air heat exchanger pipe ensures defrost operation.

3.5 - The controls

Water circulation pump
The controller regulates the heat exchanger water pumps.

Heaters
They protect the heat exchanger (and the piping for units without pump) against frost, if the unit has stopped and is energised.

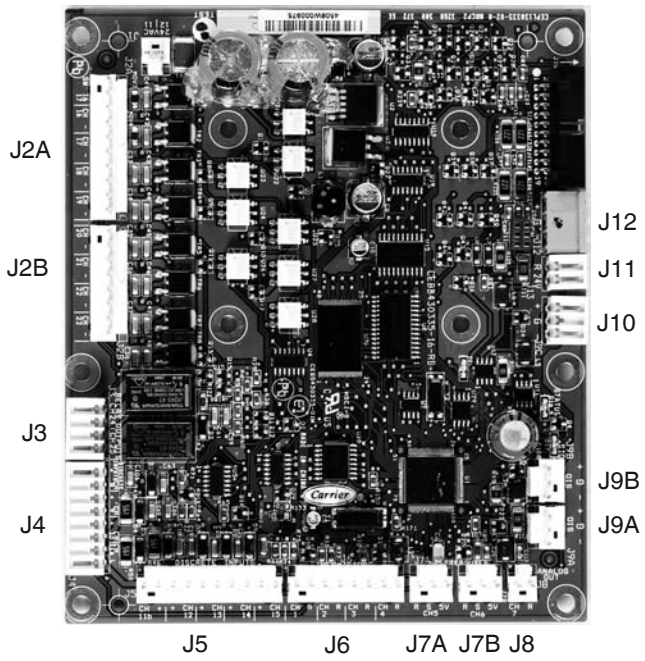
Boiler
This output authorises start/stop of a boiler.

3.6 - Connections at the user terminal block

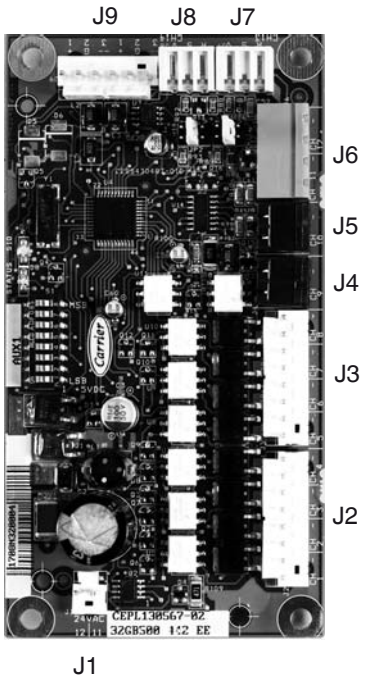
3.6.1 - General description

The contacts below are available at the user terminal block on the NRCP2-BASE boards. Some contacts can only be used if the unit operates in remote operating type (Remote).

NRCP2-BASE control board



Optional PD-AUX board



NRCP2-BASE board connections

Connector/channel	Type	Terminal	Description
CH 08/J4	DI	32-33	Remote on/off switch
CH 09/J4	DI		Customer safety loop input (0 = fault, 1 = OK)
CH 10/J4	DI	73-74	Capacity limitation selection
CH 12/J5	DI		Setpoint selection
CH 13/J5	DI		Power detection input (micro-cut protection)
CH 20/J2B	DO		Reversible four-way valves
CH 21/J2B	DO		Water heater command
XXXX/J12	Series		RJ-45 series connection - Pin 1: signal + - Pin 2: ground - Pin 3: signal -

3.6.2 - Volt-free on/off contact

If the unit works in the remote operating mode (Remote) the operation of the on/off contact is as follows:

Without multiplexing

	Off	On heating
On/off contact	Open	Closed

With multiplexing

	Off	On heating	On auto
On/off contact	Open	Closed	Open

3.6.3 - Volt-free setpoint selection contact

	Heating	
	hsp 1	hsp 2
Set point selection contact	Open	Closed

3.6.4 - Volt-free capacity limitation selection contact

	100%	Limit
Capacity limitation	Open	Closed

4. SETTING UP PRO-DIALOG+ CONTROL

4.1 - General features

The interface includes different screens that are listed below:

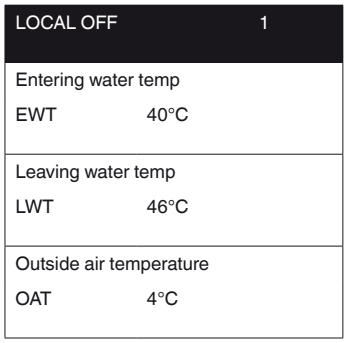
- Default screens with direct display of the main parameters,
- Menu screens for navigation,
- Data/configuration screens listing the parameters by type,
- Operating mode selection screen,
- Password entry screen,
- Parameter modification screen.

NOTE: If the interface is not used for a long period, it will go black. The control is always active, the operating mode remains unchanged. The interface screen is re-animated, when the user presses a key. Pressing the key once illuminates the screen, pressing the key a second time leads to a screen that is related to the context and the key symbol.

4.2 - Default screen characteristics

There are four default screens. Each screen shows:

- The unit status, its screen number,
- Three displayed parameters.



On the left the unit status, on the right the screen number

Description of the first parameter

Abbreviation and value with unit of measurement of the first parameter

Description of the second parameter

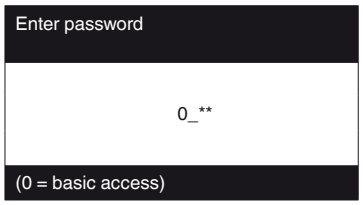
Abbreviation and value with unit of measurement of the second parameter

Description of the third parameter

Abbreviation and value with unit of measurement of the third parameter

Pressing the Up or Down key changes one default screen to another default screen. The screen number is updated.

4.3 - Password screens

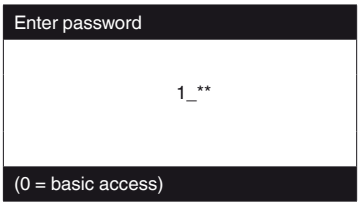


Description of the password entry screen

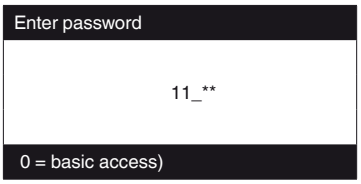
Password value

Description

The password is entered digit by digit. The cursor is shown at the current digit that flashes. The arrow keys modify the digit value. The digit modification is validated with the Enter key and the cursor is moved to the next digit.



The first digit is 1, the cursor is positioned on the second digit

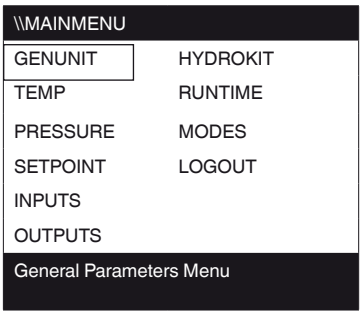


Pressing the Enter key at a digit without value validates the overall selection of the password. The screen is refreshed by the menu list, and the items displayed depend on the level of the activated password.

The entry of an incorrect password keeps the password entry screen.

Password selection 0 (zero) can simply be made by pressing the Enter key twice in succession.

4.4 - Menu screen characteristics



Current path in the menu structure

Selection cursor to the left of the first column

Menu list

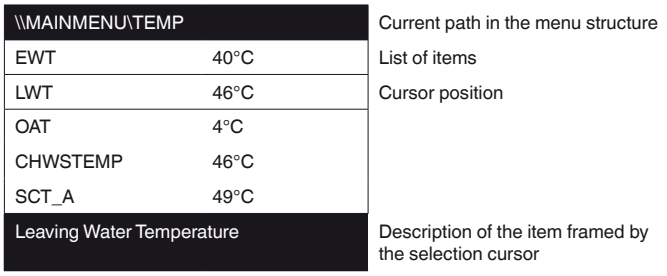
Description of the menu framed by the selection cursor

Each menu item defines the access to categorised data. The Up and Down arrows position the cursor at the current item. The Enter key activates the display of the selected sub-menu.

The item LOGOUT permits exiting from the menu screen and protects access by a user password. The “Previous” key permits exiting from the current screen without deactivating the password-protected access.

4.5 - Data screen or configurable parameter characteristics

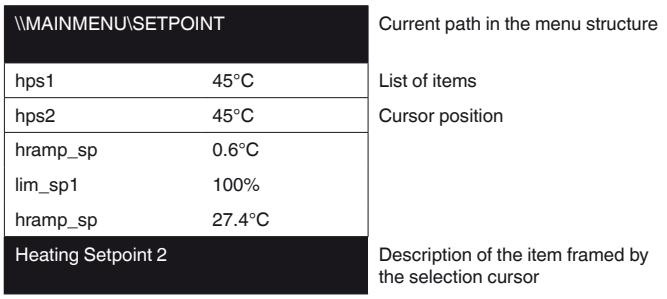
The data screens display information parameters such as temperatures or pressures. The configuration screens display unit control parameters such as the water temperature setpoints.



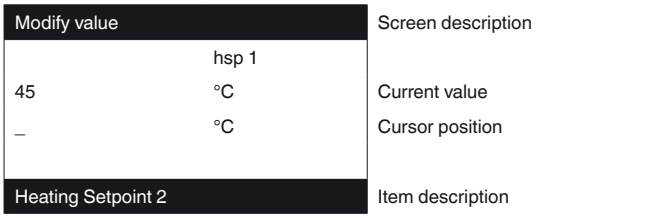
The Up and Down arrow keys position the cursor on the current menu item. The Enter key activates the parameter modification (if possible). Any non-pertinent modification attempt is blocked by a refusal screen.

4.6 - Parameter modification

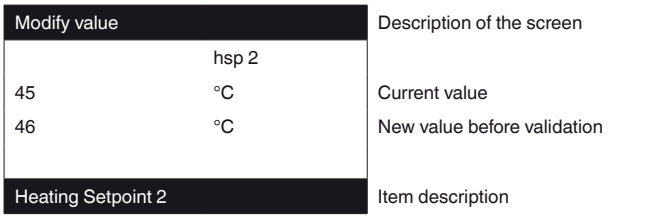
A configuration parameter can be modified by positioning the cursor and then pressing the Enter key.



The following screen allows modification of a parameter.



The Up and Down arrow keys permit the selection of the first digit. Pressing the Up key successively scrolls up to the following symbols:
0, 1, 2, 3, 4, 5, 6, 7, 8, 9, ., -.
The Down key follows the reverse order of the Up key in scrolling down the digit list above. Each digit is validated with the Enter key.
The - sign is only accessible for the first selected character.

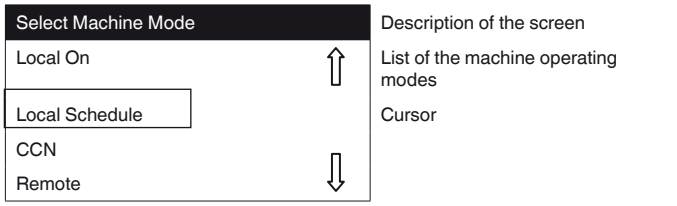


The value is validated with the Enter key. At any time the return key cancels the current modification.

ATTENTION: If the user exits from the current data screen, the value is saved. A saving confirmation is displayed. The Enter key validates the parameter modification(s). The Return to the Previous Screen key cancels the current modification(s).

4.7 - Operating mode screen

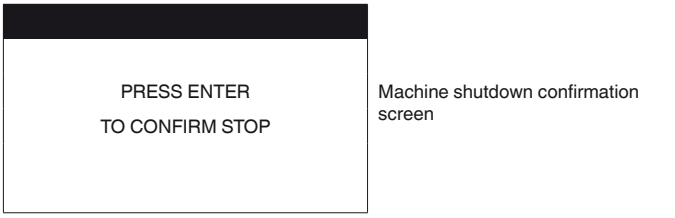
The unit is in Local Off mode, pressing the on/off (0/1) key once activates the display of the operating mode screen.



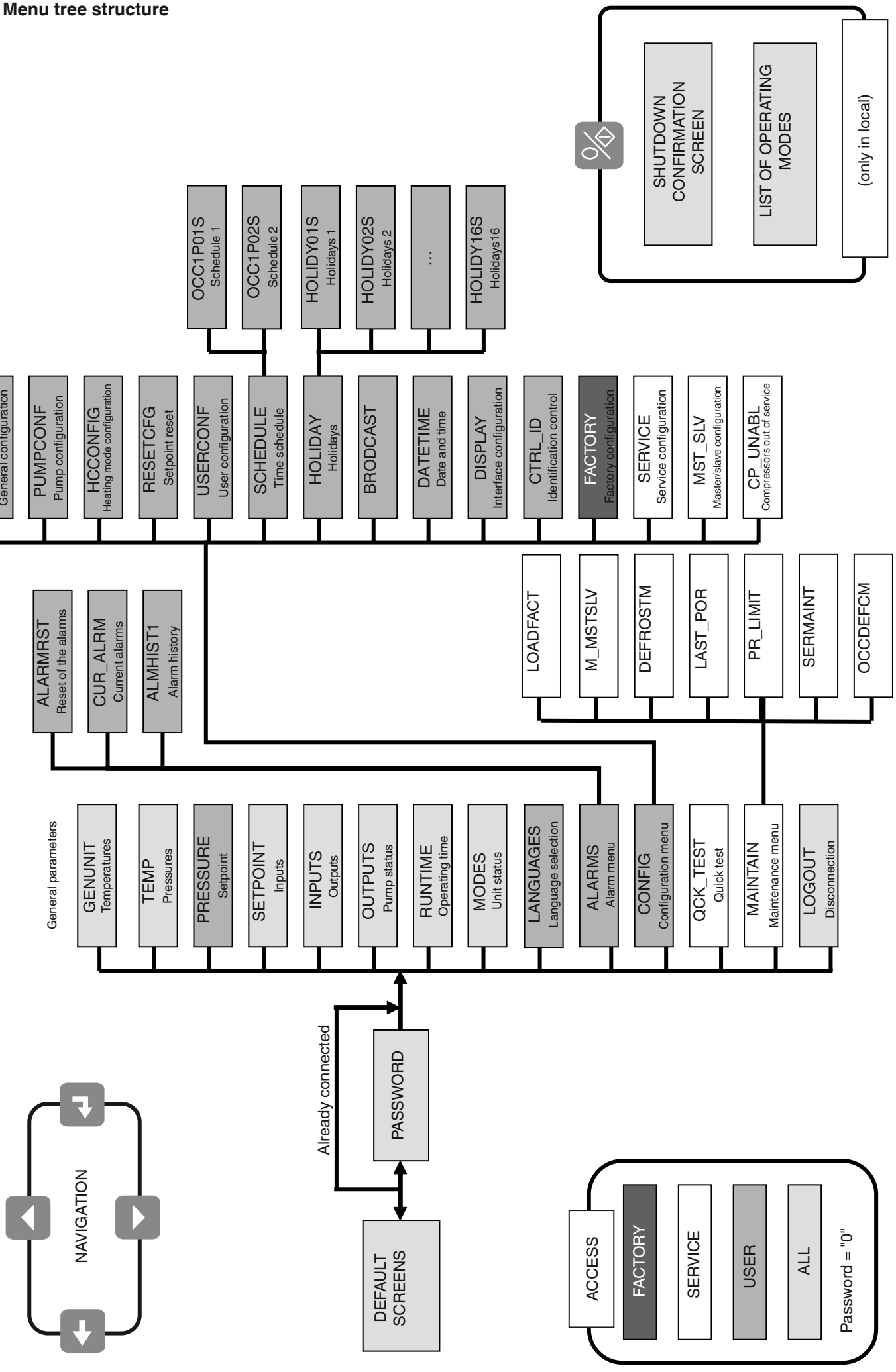
The Up and Down keys position the cursor on the selected operating mode. Four modes are immediately displayed on the screen. To access operating modes that are not visible, please use the Up and Down keys.

When the operating mode has been selected, the new operating mode can be validated with the Enter key.

When the unit is in an operating mode and the On/off key is pressed, the unit will stop. A confirmation screen protects the unit against inadvertent shutdowns.



4.8 - Menu tree structure



4.9 - Detailed menu description

ATTENTION: Depending on the unit characteristics, certain menu items are not used.

4.9.1 - GENUNIT menu

NAME	FORMAT	UNIT	NOTE	DESCRIPTION
CTRL_TYP	0/1/2	-	1	Control mode type
STATUS	0-9	-	2	Operating status
min_left	0-15	min		Start-up delay
LSP_SEL	0/1/2	-	11	Setpoint selection via the interface
SP_SEL	0/1/2	-	10	Setpoint selection via the CCN network
SP_OCC	Yes/No	-		Occupancy setpoint
CHIL_S_S	Enable/Disable	-	3	Unit start/stop via the CCN network
CHIL_OCC	Yes/No	-	4	Unit time schedule via the CCN network
CAP_T	nnn	%		Total unit capacity
DEM_LIM	nnn	%	7	Demand limit value
SP	±nnn.n	°C		Current setpoint
CTRL_PNT	±nnn.n	°C	8	Control point
EMSTOP	Enable/Disable	-	9	CCN emergency stop

NOTE	DESCRIPTION
1	0 = Local, 1 = CCN, 2 = Remote
2	The STATUS point can have the following values: Off > STATUS = 0 — Ready > STATUS = 5 Running > STATUS = 1 — Override > STATUS = 6 Stopping > STATUS = 2 — Defrost > STATUS = 7 Delay > STATUS = 3 — Run Test > STATUS = 8 Tripout > STATUS = 4 — Test > STATUS = 9
3	Permits starting/stopping the machine, in CCN mode only. The override value is displayed, but only used, if the unit is in CCN mode.
4	Indicates if the unit is in occupied mode or not. In CCN mode the value can be forced and used instead of actual occupancy status,.
7	Demand limit active. This point can be forced in CCN mode and this override value will have priority over the other limit values (external or limit control).
8	Control point. This point can be forced in CCN mode and this override value will have priority over the value calculated by the control.
9	Always active if the unit is not in CCN mode.
10	Setpoint selection. This point can be forced in CCN mode and this override value will have priority over the setpoint selection in Remote mode.
11	0 = Auto, 1 = Spt1, 2 = Spt2

4.9.2 - TEMP menu

NAME	FORMAT	UNIT	DESCRIPTION
EWT	±nnn.n	°C	Heat exchanger entering water temperature
LWT	±nnn.n	°C	Heat exchanger leaving water temperature
OAT	±nnn.n	°C	Outside air temperature
CHWSTEMP	±nnn.n	°C	Common master/slave temperature
SCT_A	±nnn.n	°C	Saturated condensing temperature
SST_A	±nnn.n	°C	Saturated suction temperature
SUCT_T	±nnn.n	°C	Suction gas temperature
ECO_SST	±nnn.n	°C	Saturated suction temperature at the EXV Eco
ECO_SUCT	±nnn.n	°C	Suction gas temperature at the EXV Eco
DEFRT_A	±nnn.n	°C	Defrost temperature
DEFRT_2	±nnn.n	°C	Defrost temperature of the second heat exchanger

4.9.3 - PRESSURE menu

NAME	FORMAT	UNIT	DESCRIPTION
DP_A	±nnn.n	kPa	Discharge pressure
SP_A	±nnn.n	kPa	Main suction pressure
ECO_SP_A	±nnn.n	kPa	Suction pressure EXV Eco
W_P_IN	±nnn.n	kPa	Entering water pressure

4.9.4 - SETPOINT menu

NAME	FORMAT	VALUE	UNIT	DESCRIPTION
hsp1	26.7 to 66	38.0	°C	Heating setpoint 1
hsp2	26.7 to 66	38.0	°C	Heating setpoint 2
hramp_sp	0.2 to 2.0	0.60	^C	Ramp loading
lim_sp1	0 to 100	100	%	Limit setpoint

4.9.5 - INPUTS menu

NAME	FORMAT	UNIT	DESCRIPTION
ONOFF_SW	Open/Close	-	Remote start/stop contact
SETP_SW	Open/Close	-	Remote setpoint contact
LIM_SW1	Open/Close	-	Remote capacity limitation contact
FLOW_SW	Open/Close	-	Water flow rate/customer safety loop contact
leak_v	nn.n	Volt	Leak detector value
Lock_sw2	Open/Close	-	Customer safety loop contact

4.9.6 - OUTPUTS menu

NAME	FORMAT	UNIT	DESCRIPTION
CP_A1	On/Off	-	Compressor output A1
CP_A2	On/Off	-	Compressor output A2
FAN_A1	0 to 2	-	Fan speed A1
FAN_A2	0 to 2	-	Fan speed A2
EXV_A	nnn	%	Main EXV position
EXV_ECO	nnn	%	EXV Eco position
EV_VALV1	On/Off	-	Shut-off valve compressor A1/EXV Eco
EV_VALV2	On/Off	-	Shut-off valve compressor A2/EXV Eco
RV_A	On/Off	-	Four-way valves
EXC_HEAT	On/Off	-	Heat exchanger heater
BOILER	On/Off	-	Boiler command
EHS_STEP	n	-	Electric heater stage
PUMP_1	On/Off	-	Output pump 1
ALARM	On/Off	-	Alarm relay
RUNNING	On/Off	-	Unit on relay

4.9.7 - RUNTIME menu

NAME	FORMAT	UNIT	DESCRIPTION
HR_MACH	nnnnn	hours	Number of unit operating hours
st_mach	nnnnn	-	Number of unit start-ups
HR_CP_A1	nnnnn	hours	Number of operating hours compressor A1
st_cp_a1	nnnnn	-	Number of start-ups compressor A1
HR_CP_A2	nnnnn	hours	Number of operating hours compressor A2
st_cp_a2	nnnnn	-	Number of start-ups compressor A2
hr_fana1l	nnnnn	hours	Number of low-speed operating hours fan A1
hr_fana1h	nnnnn	hours	Number of high-speed operating hours fan A1
hr_fana2l	nnnnn	hours	Number of low-speed operating hours fan A2
hr_fana2h	nnnnn	hours	Number of high-speed operating hours fan A2
hr_pump	nnnnn	hours	Number of pump operating hours

4.9.8 - MODES menu

NAME	FORMAT	UNIT	DESCRIPTION
m_limit	Yes/No	-	Capacity limitation active
m_ramp	Yes/No	-	Ramp loading active
m_cooler	Yes/No	-	Heat exchanger heater active
m_SM	Yes/No	-	Aquasmart active
m_leadla	Yes/No	-	Master/slave active
m_night	Yes/No	-	Low-noise level night mode active
m_heater	Yes/No	-	Electric heater stages active
m_boiler	Yes/No	-	Boiler active
m_defr_a	Yes/No	-	Defrost active
m_sst_a	Yes/No	-	Low suction temperature
m_dgt_a	Yes/No	-	High discharge gas temperature
m_hp_a	Yes/No	-	High pressure
m_sh_a	Yes/No	-	High pressure

4.9.9 - ALARMS menu

NAME	DESCRIPTION
ALARMRST	Alarm reset
CUR_ALRM	Current alarms
ALMHIST1	Alarm history

4.9.10 - CONFIG menu

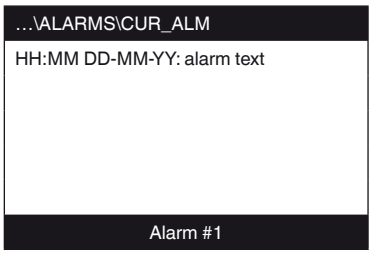
NAME	DESCRIPTION
GEN_CONF	General configuration menu
PUMPCONF	Pump configuration menu
HC_CONFIG	Heating mode configuration menu
RESETCFG	Reset configuration menu
USERCONFIG	User configuration menu
SCHEDULE	Time schedule
HOLIDAY	Holiday calendar
BRODCAST	Summer time/winter time control
DATETIME	Time adjustment
DISPLAY	Parameter display
CTRL_ID	Control identification

4.9.11 - ALARMRST menu

NAME	FORMAT	UNIT	DESCRIPTION
RST_ALM	Yes/No	-	Alarm reset
ALM	Normal	-	Alarm status
alarm_1c	nnnnn	-	Current alarm 1
alarm_2c	nnnnn	-	Current alarm 2
alarm_3c	nnnnn	-	Current alarm 3
alarm_4c	nnnnn	-	Current alarm 4
alarm_5c	nnnnn	-	Current alarm 5
alarm_1	nnnnn	-	Current JBus alarm 1
alarm_2	nnnnn	-	Current JBus alarm 2
alarm_3	nnnnn	-	Current JBus alarm 3
alarm_4	nnnnn	-	Current JBus alarm 4
alarm_5	nnnnn	-	Current JBus alarm 5

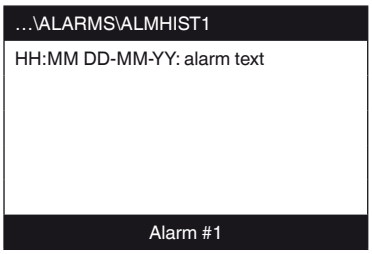
4.9.12 - CUR_ALRM menu

This menu lists up to ten a active alarms. For each alarm the display shows the time and date the alarm was generated as well as the alarm description. Each screen shows one alarm.



4.9.13 - ALMHIST1 menu

This menu lists up to twenty alarms that have occurred at the unit. For each alarm the display shows the time and date the alarm was generated as well as the alarm description. Each screen shows one alarm.



4.9.14 - SCHEDULE menu

NAME	DESCRIPTION
OCC1P01S	Unit on/off time schedule
OCC1P02S	Unit setpoint selection time schedule

4.9.15 - HOLIDAY menu

NAME	DESCRIPTION
HOLDY_01	Holiday period 1
HOLDY_02	Holiday period 2
HOLDY_03	Holiday period 3
HOLDY_04	Holiday period 4
HOLDY_05	Holiday period 5
HOLDY_06	Holiday period 6
HOLDY_07	Holiday period 7
HOLDY_08	Holiday period 8
HOLDY_09	Holiday period 9
HOLDY_10	Holiday period 10
HOLDY_11	Holiday period 11
HOLDY_12	Holiday period 12
HOLDY_13	Holiday period 13
HOLDY_14	Holiday period 14
HOLDY_15	Holiday period 15
HOLDY_16	Holiday period 16

4.9.16 - BRODCAST menu

NAME	FORMAT	DEFAULT	UNIT	DESCRIPTION
ccnbroad	0/1/2	2	-	Activates the broadcast 0 = deactivated, 1= broadast during holidays at the network, 2 = broadcast during holidays, machine only
oatbusnm	0 to 239	0	-	Broadcast of the outside temperature Bus number of the machine with the outside temperature
oatlocad	0 to 239	0	-	Element number of the machine with the outside temperature
dayl_sel	Disable/Enable	Disable	-	Activation summer time, winter time
Summer time				
startmon	1 to 12	3	-	Month
startdow	1 to 7	7	-	Day of the week (1 = Monday)
startwom	1 to 5	5	-	Week of the month
Winter time				
stopmon	1 to 12	10	-	Month
stoptdow	1 to 7	7	-	Day of the week (1 = Monday)
stopwom	1 to 5	5	-	Week of the month

4.9.17 - GENCONF menu

NAME	FORMAT	DEFAULT	UNIT	DESCRIPTION
ramp_sel	Yes/No	No	-	Ramp loading sequence
off_on_d	1 to 15	1	min	Start-up delay
nh_start	00:00 to 24:00	00:00	-	Night mode start hour
nh_end	00:00 to 24:00	00:00	-	Night mode stop hour
bas_menu	0 to 3	0	-	Basic menu configuration 0 = total access 1 = access to the alarm menu by password 2 = access to the setpoint menu by password 3 = combination of 1 and 2
synoptic	Yes/No	No	-	Synoptic diagram display

4.9.18 - PUMPCONF menu

NAME	FORMAT	DEFAULT	UNIT	DESCRIPTION
pump_seq	Yes/No	No	-	Heat exchanger pump availability
pump_per	Yes/No	No	-	Pump seizure protection
pump_sby	Yes/No	No	-	Pump shutdown when the unit is in standby
pump_loc	Yes/No	Yes	-	Flow rate verification when the pump has shut down

4.9.19 - HCCONFIG menu

NAME	FORMAT	DEFAULT	UNIT	DESCRIPTION
hr_sel	0 to 3	0	-	Heating reset selection 1 = outside temp., 0 = none, 2 = delta T
heat_th	-20 to 0	-15	°C	Outside temperature threshold heating mode
boil_th	-15 to 15	-10	°C	Outside temperature threshold for the boiler
ehs_th	-5 to 21	5	°C	Outside temperature threshold for electric heater stages
ehs_back	Yes/No	No	-	One backup electric heater stage
ehs_pull	0 to 60	0	minutes	Delay before start-up of the first electric heater stage
ehs_defr	Yes/No	No	-	Quick electric heat stages for defrost

4.9.20 - RESETCFG menu

NAME	FORMAT	DEFAULT	UNIT	DESCRIPTION
oathr_non	-10 to 51.7	-10	°C	Outside temperature for no reset
oathr_fu	-10 to 51.7	-10	°C	Outside temperature for maximum reset
dt_hr_non	-17.8 to -3.9	-17.8	^C	Delta T for no reset
dt_hr_fu	-17.8 to -3.9	-17.8	^C	Delta T for maximum reset
v_hr_non	-17.8 to -6.7	-17.8	^C	Current value for no reset
v_hr_fu	-17.8 to -6.7	-17.8	^C	Current value for maximum reset
hr_deg	-34.4 to 1.1	-17.8	^C	Heating mode reset value

4.9.21 - USERCONF menu

NAME	FORMAT	DEFAULT	UNIT	DESCRIPTION
language	0 to 5	0	-	Language selection English = 0, Spanish = 1, French = 2, German = 3, Italian = 4, Translation = 5
use_pass	1 to 9999	11	-	User password

4.9.22 - DATETIME menu

NAME	FORMAT	DEFAULT	UNIT	DESCRIPTION
hour	0 to 24		hours	Hour
minutes	0 to 59		minutes	Minutes
dow	1 to 7		-	Day of the week
tom_hol	No/Yes	No	-	Holiday tomorrow?
tod_hol	No/Yes	No	-	Holiday today?
dlig_off	No/Yes		-	Winter time change-over active?
dlig_on	No/Yes		-	Summer time change-over active?
d_of_m	1 to 31		-	Day of the month
month	1 to 12		-	Month
year	0 to 99		-	Year

4.9.23 - CTRL_ID menu

NAME	FORMAT	DEFAULT	UNIT	DESCRIPTION
elemt_nb	1 to 239	1	-	Element number
bus_nb	0 to 239	0	-	Bus number
baudrate	9600 to 38400	9600	-	Communication speed
		61 AF Pro-Dialog+		Description
		CSA-SR-20H430NN		Software version
		-		Serial number

4.9.24 - OCC1PSX menu

The control provides two timer programs:
The first timer program (No. 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 (No. 2) provides a means to automatically switch the active setpoint from an occupied setpoint to an unoccupied setpoint, if the Auto mode has been selected.

Setpoint 1 is used during occupied periods, setpoint 2 during unoccupied periods.

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. The day begins at 00.00 hours and ends at 23.59 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 following table shows how to access the period configuration. Method is the same for the time schedule 1 or the time schedule 2.

Time schedule type:

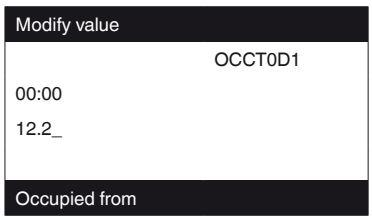
Time	MON	TUE	WES	THU	FRI	SAT	SUN	HOL
0	P1							
1	P1							
2	P1							
3								
4								
5								
6								
7	P2	P2	P3	P4	P4	P5		
8	P2	P2	P3	P4	P4	P5		
9	P2	P2	P3	P4	P4	P5		
10	P2	P2	P3	P4	P4	P5		
11	P2	P2	P3	P4	P4	P5		
12	P2	P2	P3	P4	P4			
13	P2	P2	P3	P4	P4			
14	P2	P2	P3	P4	P4			
15	P2	P2	P3	P4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

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

Occupied
Unoccupied

	Starts at	Stops at	Active on
P1: period 1,	0h00,	3h00,	Monday
P2: period 2,	7h00,	18h00,	Monday + Tuesday
P3: period 3,	7h00,	21h00,	Wednesday
P4: period 4,	7h00,	17h00,	Thursday + Friday
P5: period 5,	7h00,	12h00,	Saturday
P6: period 6,	20h00,	21h00,	Holidays
P7: period 7,	Not used in this example		
P8: period 8,	Not used in this example		

Configuration menu for occupied and unoccupied periods				
NAME	**FORMAT**	**DEFAULT**	**UNIT**	**DESCRIPTION**
OVR_EXT	0-4	0	hours	Occupied schedule override
DOW1	0/1	11111111	-	Period 1 day of the week MTWTFSSH Monday Tuesday Wednesday Thursday Friday Saturday Sunday Holiday
OCCTOD1	0:00-24:00	00:00	-	Occupied from
UNOCTOD1	0:00-24:00	24:00:00	-	Occupied until
DOW2	0/1	0	-	Period 2 days of the week MTWTFSSH Monday Tuesday Wednesday Thursday Friday Saturday Sunday Holiday
OCCTOD2	0:00-24:00	00:00	-	Occupied from
UNOCTOD2	0:00-24:00	00:00	-	Occupied until
DOW3	0/1	0	-	Period 3 days of the week MTWTFSSH Monday Tuesday Wednesday Thursday Friday Saturday Sunday Holiday
OCCTOD3	0:00-24:00	00:00	-	Occupied from
UNOCTOD3	0:00-24:00	00:00	-	Occupied until
DOW4	0/1	0	-	Period 4 days of the week MTWTFSSH Monday Tuesday Wednesday Thursday Friday Saturday Sunday Holiday
OCCTOD4	0:00-24:00	00:00	-	Occupied from
UNOCTOD4	0:00-24:00	00:00	-	Occupied until
DOW5	0/1	0	-	Period 5 days of the week MTWTFSSH Monday Tuesday Wednesday Thursday Friday Saturday Sunday Holiday
OCCTOD5	0:00-24:00	00:00	-	Occupied from
UNOCTOD5	0:00-24:00	00:00	-	Occupied until
DOW6	0/1	0	-	Period 6 days of the week MTWTFSSH Monday Tuesday Wednesday Thursday Friday Saturday Sunday Holiday
OCCTOD6	0:00-24:00	00:00	-	Occupied from
UNOCTOD6	0:00-24:00	00:00	-	Occupied until
DOW7	0/1	0	-	Period 7 days of the week MTWTFSSH Monday Tuesday Wednesday Thursday Friday Saturday Sunday Holiday
OCCTOD7	0:00-24:00	00:00	-	Occupied from
UNOCTOD7	0:00-24:00	00:00	-	Occupied until
DOW8	0/1	0	-	Period 8 days of the week MTWTFSSH Monday Tuesday Wednesday Thursday Friday Saturday Sunday Holiday
OCCTOD8	0:00-24:00	00:00	-	Occupied from
UNOCTOD8	0:00-24:00	00:00	-	Occupied until



4.9.25 - HOLIDY0XS menu

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.

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 utilise the holiday schedule, even if the unit is running in stand-alone mode (not connected to CCN).

NAME	FORMAT	DEFAULT	UNIT	DESCRIPTION
HOL_MON	0-12	0	-	Holiday month
HOL_DAY	0-31	0	-	Holiday day
HOL_LEN	0-99	0	-	Holiday duration

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.
  LOFF: local off, L-C: local on, L-SC: local schedule, REM: remote, CCN: network, MAST: Master
- **Remote start/stop contacts:** these contacts are used when the unit is in remote operating type (Remote). See sections 3.6.2 and 3.6.3.
- **CHIL_S_S:** this network command relates to the unit start/stop when the unit is in network mode (CCN).
- **Command set to Stop:** the unit is halted.
- **Command set to Start:** the unit runs in accordance with schedule 1.
- **Start/Stop schedule:** occupied or unoccupied status of the unit as determined by the unit start/stop program (Schedule 1).
- **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-C	L-SC	REM	CCN	MAST	CHIL_S_S	Remote start/ stop contact	Master control type	Start-Stop time schedule	CCN emergency shutdown	General alarm		
-	-	-	-	-	-	-	-	-	-	Active	-	-	Off
-	-	-	-	-	-	-	-	-	-	-	oui	-	Off
-	-	-	-	Active	-	Off	-	-	-	-	-	CCN	Off
-	-	-	-	Active	-	-	-	-	Unoccupied	-	-	CCN	Off
-	-	-	-	-	Active	Off	-	CCN	-	-	-	CCN	Off
-	-	-	-	-	Active	-	-	CCN	Unoccupied	-	-	CCN	Off
-	-	-	-	Active	-	On	-	-	Occupied	Disabled	No	CCN	On
-	-	-	-	-	Active	On	-	CCN	Occupied	Disabled	No	CCN	On
Active	-	-	-	-	-	-	-	-	-	-	-	Local	Off
-	-	Active	-	-	-	-	-	-	Unoccupied	-	-	Local	Off
-	-	-	-	-	Active	-	-	Local	Unoccupied	-	-	Local	Off
-	Active	-	-	-	-	-	-	-	-	Disabled	No	Local	On
-	-	Active	-	-	-	-	-	-	Occupied	Disabled	No	Local	On
-	-	-	-	-	Active	-	-	Local	Occupied	Disabled	No	Local	On
-	-	-	Active	-	-	-	Open	-	-	-	-	Remote	Off
-	-	-	Active	-	-	-	-	-	Unoccupied	-	-	Remote	Off
-	-	-	-	-	Active	-	Open	Remote	-	-	-	Remote	Off
-	-	-	-	-	Active	-	-	Remote	Unoccupied	-	-	Remote	Off
-	-	-	Active	-	-	-	Closed	-	Occupied	Disabled	No	Remote	On
-	-	-	-	-	Active	-	Closed	Remote	Occupied	Disabled	No	Remote	On

5.2 - Heat exchanger water pump control

Master/slave control is not active, or it is active and unit is the master unit:
In the On, Stopping or Delay modes and if the unit is stopped the pump is started up and continues to operate for 20 seconds after the compressor has stopped. It is stopped if the boiler is active, but could be started up due to the capacity limitation function.

Master/slave function is active and unit is the slave unit:
The pump is started up, when the unit is started up and if the demand limit is above 1%. Otherwise the pump will be stopped 30 seconds after the last compressor has stopped, except if the configuration parameter "lag_pump" has been configured to turn the pump even if it has been set to stop. In this case the pump will run continuously.

A periodical quick pump start-up has been configured:
The water pump is started up each day at 14.00 hours for two seconds.

5.3 - Control interlock contact

This contact checks the status of a loop (water flow switch and customer safety loop, see chapter 3.6). It prevents the unit from starting if it is open when the delay at start-up has expired. This open contact leads to an alarm shutdown, if the unit is running.

5.4 - Heat exchanger frost protection

The heater for the heat exchanger and the water pump (for units with a pump) can be energised to protect the heat exchanger, if it may be damaged by frost, when the unit is shut down for a long time at low outdoor temperature.

NOTE: Heat exchanger heater control parameters can be modified, using the Service configuration.

5.5 - Control point

The control point represents the water temperature that the unit must produce. The heat exchanger entering water temperature is controlled by default, but the heat exchanger leaving water temperature can also be controlled (requires a Service configuration modification).

Control point = active setpoint + reset

5.5.1 - Active setpoint

Two setpoints can be selected for the heating mode. Usually, the second setpoint is used for unoccupied periods.

Depending on the current operating type, the active setpoint can be selected:

- by choosing the item in the GENUNIT menu,
- via the user's volt-free contacts,
- via network commands
- via the setpoint timer program (schedule 2).

The following tables summarise the possible selections depending on the control types (local, remote or network) and the following parameters:

- Setpoint select in local control: item LSP_SEL in the GENUNIT menu permits selection of the active setpoint, if the unit is in local operating type.
- Operating mode.
- Setpoint selection contacts: setpoint selection contact status.
- Schedule 2 status: schedule for setpoint selection.

LOCAL OPERATING MODE

PARAMETER STATUS			
Operating mode	**Local setpoint selection**	**Time schedule 2 status**	**Active setpoint**
Heating	sp1	-	Heating setpoint 1
Heating	sp 2	-	Heating setpoint 2
Heating	auto	occupied	Heating setpoint 1
Heating	auto	unoccupied	Heating setpoint 2

REMOTE OPERATING MODE

PARAMETER STATUS		
Operating mode	**Setpoint selection contact**	**Active setpoint**
Heating	sp 1 (open)	Heating setpoint 1
Heating	sp 2 (closed)	Heating setpoint 2

5.5.2 - Reset

Reset means that the active setpoint is modified so that less machine capacity is required. The setpoint is decreased.

This modification is in general a reaction to a drop in the load. For the Pro-Dialog control system, the source of the reset can be configured in the HCCONFIG table.

This reset can be based on:

- either the outside temperature:
  - this gives a measure of the load trends for the building
  - if the outside temperature decreases, the setpoint will again increase.
- or the return water temperature:
  - this is the heat exchanger delta T and gives an average building load
  - if the temperature difference is reduced, the setpoint will decrease.

In both cases the reset parameters, i.e. slope, source and maximum value, are configurable in the RESETCFG menu.

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.

5.6 - Capacity limitation

Capacity limitation is used to restrict the unit power consumption. The Pro-Dialog control system allows limitation of the unit capacity, using user-controlled volt-free contacts.

Capacity limitation can result in a demand limit, a capacity loss or a limit demand in the night mode.

The unit capacity can never exceed the limitation setpoint activated by these contacts. The limitation setpoints can be modified in the SETPOINT menu.

5.7 - Capacity control

This function adjusts the number of active compressors to keep the heat exchanger 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.

If the same compressor undergoes too many starts (per hour) or runs below one minute each time it is started this automatically brings about reduction of compressor starts, which makes leaving water temperature control less precise.

In addition, the high pressure, low pressure or defrost unloading functions can also affect the temperature control accuracy. Compressors are started and stopped in a sequence designed to equalise the number of start-ups (value weighted by their operating time).

5.8 - Defrost function

Defrost is activated to reduce frost build-up on the air heat exchanger. During the defrost cycle the fans of that circuit are stopped, and the four-way refrigerant valve is reversed, forcing the circuit to cooling mode. The fan can temporarily be restarted during the defrost cycle. The defrost cycle is fully automatic and does not require any setting.

5.9 - Additional electric heater stage control

As an option, the heat pump units can control up to four additional electric heating stages.

The electric heating stages are activated to complement the heating capacity when the following conditions are satisfied:
- The unit uses 100% of the available heating capacity, or the unit is limited in its operation by a protection mode (low suction temperature, hot gas or defrost sequence in progress protection), and in all cases cannot satisfy the heating load.
- The outdoor temperature is below a configured threshold (see HCCONFIG configuration).
- Unit capacity limitation is not active.

The user may configure the last available electric heating stages as a safety stage. In this case, the safety stage is only activated in addition to the other stages if there is a machine fault, preventing the use of the heating capacity. The other electric heating stages will continue to operate as described above.

5.10 - Control of a boiler

The unit can control the start-up of a boiler. When the boiler is operating, the unit water pump is stopped. A heat pump unit and a boiler cannot operate together.

In this case the boiler output is activated in the following conditions:
- A fault prevents the use of the heat pump capacity.
- The unit works at a very low outside temperature, making the heat pump capacity insufficient. The outside air temperature threshold for use of the boiler is fixed at -10°C, but this value can be adjusted in the HCCONFIG menu.

NOTE: The control of the electric heating stages or of a boiler is not authorised for slave units.

5.11 - Eco function

The 61AF units include an Eco function. This function is based on the circulating refrigerant flow and allows maintaining the superheat setpoint. The function is not available during defrost and during the first minute of operation.

The objective of this function is to obtain higher performances and improved efficiency.

5.12 - Master/slave assembly

Two Pro-Dialog+ 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. It is not required, if the entering 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 mode 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 (Master) 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 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.

ATTENTION: For heat pumps operating in master/slave mode and using an NRCP2 board or equipped with electric heater stages control must be on the entering water temperature.

6 - DIAGNOSTICS - TROUBLESHOOTING

6.1 - General

The Pro-Dialog+ control system has many fault tracing aid functions. The local interface and its various menus give access to all unit operating conditions. If an operating fault is detected, an alarm is activated and an alarm code is stored in the Alarms menu, sub-menus CUR_ALRM and ALARMRST.

6.2 - Displaying alarms

The alarm LED on the interface (see chapter 4.1) allows the quick display of the unit status.

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

The ALARMRST menu on the main interface displays up to five 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 via the ALARMRST menu, item RST_ALM. Depending on the configuration in the GENCONF menu, access to the item may be protected by a password.

6.4 - Alarm codes

Alarm No.	Alarm code	Alarm description	Reset type	Probable cause	Action taken by the control
Thermistor faults					
1	th-01	Sensor fault, fluid entering water heat exchanger	Automatic when the temperature measured by the sensor returns to normal	Defective thermistor	Unit is shut down
2	th-02	Sensor fault, fluid leaving water heat exchanger	Automatic when the temperature measured by the sensor returns to normal	Defective thermistor	Unit is shut down
3	th-03	Defrost sensor fault	Automatic when the temperature measured by the sensor returns to normal	Defective thermistor	Unit is shut down
4	th-04	Defrost sensor fault, second coil	Automatic when the temperature measured by the sensor returns to normal	Defective thermistor	Unit is shut down
5	th-10	Outside temperature sensor fault	Automatic when the temperature measured by the sensor returns to normal	Defective thermistor	Unit is shut down
6	th-11	CHWS fluid sensor fault (master/slave)	Automatic when the temperature measured by the sensor returns to normal	Defective thermistor	The master/slave mode is stopped
7	th-12	Suction sensor fault	Automatic when the temperature measured by the sensor returns to normal	Defective thermistor	Unit is shut down
8	th-24	Economiser sensor fault	Automatic when the temperature measured by the sensor returns to normal	Defective thermistor	The economiser function is stopped
Pressure transducer faults					
9	Pr-01	Discharge pressure transducer fault	Automatic when the voltage transmitted by the sensor returns to normal	Defective transducer or installation fault	Unit is shut down
10	Pr-04	Suction pressure transducer fault	Automatic when the voltage transmitted by the sensor returns to normal	Defective transducer or installation fault	Unit is shut down
11	Pr-13	Economiser pressure transducer fault	Automatic when the voltage transmitted by the sensor returns to normal	Defective transducer or installation fault	None
12	Pr-24	Water pump pressure transducer fault	Automatic when the voltage transmitted by the sensor returns to normal	Defective transducer or installation fault	Unit is shut down
Communication fault					
13	Co-E1	Communication loss with the EXV board	Automatic when communication is re-established	Installation bus fault or defective slave board	Unit is shut down
14	Co-O1	Communication loss with PD-AUX board No.1	Automatic when communication is re-established	Installation bus fault or defective slave board	Unit with optional water pressure sensors, unit is shut down.
15	Co-O2	Communication loss with PD-AUX board No. 2	Automatic when communication is re-established	Installation bus fault or defective slave board	None
16	A1-01	CP A1 fault: Kriwan electrical protection open	Manual	Compressor overheating	Compressor is shut down
17	A2-01	CP A2 fault: Kriwan electrical protection open	Manual	Compressor overheating	Compressor is shut down
Process faults					
18	P-01	Water heat exchanger frost protection.	Automatic if the same alarm has not tripped during the last 24 hours, otherwise manual.	Water flow rate too low or defective thermistor	Unit is shut down
19	P-05	Low suction temperature.	Automatic when the temperature returns to normal, and if this alarm has not appeared during the last 24 hours, otherwise manual.	Pressure sensor defective, EXV blocked or low refrigerant charge	Unit is shut down
20	P-08	High superheat	Automatic when the temperature returns to normal, and if this alarm has not appeared during the last 24 hours, otherwise manual.	Pressure sensor defective, EXV blocked or low refrigerant charge	Unit is shut down
21	P-11	Low superheat	Automatic when the temperature returns to normal, and if this alarm has not appeared during the last 24 hours, otherwise manual.	Pressure sensor defective, EXV blocked or low refrigerant charge	Unit is shut down
22	P-14	Water flow control and customer interlock fault	Automatic if the unit is in manual shut-down status, otherwise manual.	Heat exchanger pump defect or water flow switch fault	Unit is shut down
23	P-16	Compressor A1 not started or no pressure increase registered	Manual	Connection problem	Compressor is shut down
24	P-17	Compressor A2 not started or no pressure increase registered	Manual	Connection problem	Compressor is shut down
25	P-29	Communication loss with the System Manager	Automatic when communication is re-established	CCN installation bus defective	Unit goes into autonomous mode
26	P-30	Communicaiton loss between master and slave	Automatic when communication is re-established	CCN installation bus defective	Unit goes into autonomous mode
27	P-31	CCN emergency stop	Manual	Network command	Unit is shut down
28	P-32	Fault water pump 1	Manual	Pump overheating or poor pump connection	Unit is completely stopped if there is no emergency pump
29	P-37	Repeated high pressure unloading	Automatic	Transducer defective or fan circuit fault	None
30	P-40	Repeated low suction temperature unloading	Manual	Pressure sensor defective or refrigerant charge too low	Unit is shut down
31	P-43	Heat exchanger temperature too low, less than 8°C, prevents unit start-up	Automatic when the temperature detected returns to normal	Operating compressor protection out of range or pressure sensor fault	The unit cannot start
32	P-50	Refrigerant leak	Automatic when the concentration returns to a lower value than the normal threshold	Refrigerant leak or volatile components present in the machine atmosphere	None
33	P-63	High pressure fault	Manual	Fan fault	Unit is shut down
34	P-97	Reversed entering/leaving water sensors	Manual	Sensor defective, sensors reversed	Unit is shut down
35	MC-nn	Master chiller configuration error	Automatic when the master configuration returns to normal or when the unit is no longer in master/slave mode	Master/slave configuration error	Master/slave mode is stopped
36	FC-nO	No factory configuration	Automatic if the configuration is entered	Unit size has not been configured	Unit is shut down

6.4 - Alarm codes (continued)

Alarm No.	Alarm code	Alarm description	Reset type	Probable cause	Action taken by the control
Process faults (continued)					
37	FC-nn	Illegal factory configuration number	Manual	The unit size has been configured with the wrong value	Unit is shut down
38	Sr-nn	Maintenance alert	Manual	Maintenance has been carried out on one of the critical components	None
39	P-28	Customer safety lock	Automatic	The customer safety input has been activated	Unit is shut down

Carrier
Order No. 16112-76, 10.2010. Supersedes order No.: 16112-76, 07.2010.
Manufacturer reserves the right to change any product specification without notice.
Manufactured by: Carrier SCS, Montluel, France.
Printed in the Netherlands.