XTRACONNECT 2

NA 10.139 B

06 - 2011

Module électronique de régulation et de signalisation à microprocesseurs pour refroidisseurs de liquide et pompe à chaleur

Microchip and LCD display electronic regulation and signaling electronic module for liquid coolers and heat pumps

Elektronisches Regel- und Anzeigemodul mit Mikroprozessor und LCD-Anzeige für Flüssigkeitskühler und Wärmepumpe

Módulo electrónico de regulación y señalización a microprocesador y visualizador LCD para enfriadores de líquido y bomba de calor

Installation
Fonctionnement
Mise en service
Maintenance

Montage-
Betriebs-und
Wartungs-
Anweisung

Installation
Operation
Commissioning
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Instalación
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CIAT

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1 IMPORTANT RECOMMENDATIONS

Your unit is equipped with a microprocessor-controlled electronic circuit board. To ensure the correct operation of your machine, you must follow the rules listed below.

1.1 Electrical power supply

• Remote control: 230 V AC/50 Hz.

If the machine's remote control is powered separately (transformer not supplied), provide the following:

1 - A power supply line running directly from a distribution point (this line must be used only to supply power to the machine's remote control).

2 - This power supply line must be at least 1 metre away from all power lines (400 V).

1.2 Specifications of the XTRACONNECT 2 board

Board power input: 35 Watts.

Maximum allowable voltage and current per input/output:

253 V AC -3.15 A.

The board is powered by an onboard screw-on three-pin connector.

The terminals are identified as follows:

1 - Live,

2 - Neutral,

3 - Earth.

Board fuse specifications:

Schurter UMT 250 V AC/3.15 A. Time lag: 10 × 3. Product code: 34031 0171.

Environmental conditions:

- In storage: –40/+80°C, 5/85% humidity without condensation.
- In use: –20/+70°C, 5/85% humidity without condensation.

Degree of pollution: 3.

1.3 Warning

Read the instructions in the manual before attempting to service the product.

Before attempting to service the board, disconnect its power source and make sure that no voltage is present.

To prevent the risk of electric shock, access to the board should be impossible while it is energised.

Certain parts of the board (USB and Ethernet connectors) may be hot. Based on the ambient temperature, they could cause burns. As a result, avoid touching these connectors while they are connected.

Important:

If the date and time are lost following a power failure, replace the battery (type: Cr 2032).

There is a risk of explosion if the battery is replaced by an incorrect type.

Dispose of used batteries in accordance with local regulations.

1.4 Earthing

The unit must be earthed (good earth quality in compliance with French standard NF C 15-100).

1.5 Connection of sensors

Keep connection cables away from power lines (400 V) or a remote control line (230 V). In the case of distances of over 6 m, use a shielded cable connected to the earth on the unit.

Maximum distance: 25 m.

1.6 Connection of the communication buses and of the remote console

• Connection cable specifications:

- Flexible cable for EIA – RS 485 connection
- Two shielded wires.
- Capacitance between cables and shield: 120 pF/m.
- Resistance: 56 Ω/km.

• Connection of the shield:

- Connect the shield on the BMS or micro-computer end to earth.
- Ensure bonding all the way to the last unit

(the shield on the communication cable must be connected between each unit).

- Do not connect the shield to the earth connection on the units.
- The wires exiting the shield must be as short as possible (2 cm) on each unit.

• Cable routing:

- The cable must be at least 30 cm away from all 230 V or 400 V cables along its entire length.
- If a 230 V or 400 V cable must be crossed with a computer cable, they must cross each other at a right angle.

1.7 Connection of the on/off inputs

• Distances of less than 30 metres:

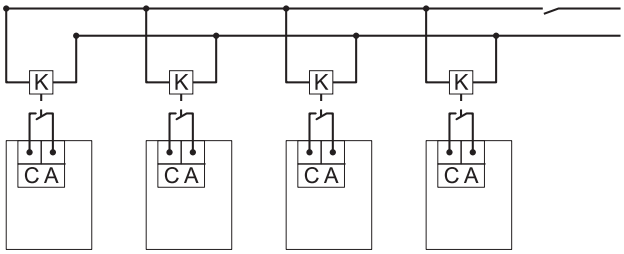
- Use a shielded cable. Keep the cable at least 30 cm away from all lines that could generate interference. Connect the shield to the earth on the unit. If several shielded cables are used, connect each shield separately (if the risk of interference persists, install a relay for each input).

• Distances of greater than 30 metres:

- Install a relay for each input near the electronic circuit board

(cable cross-section: 0.5 mm2)

• Example connection diagram:



K: Auxiliary relay (fit near the electronic circuit board)
CA: Automatic operation control (on each machine)

2 GENERAL

This microprocessor-based electronic control module with display for liquid chillers is supplied as standard on water chillers equipped with screw compressors with two or three refrigeration circuits.

Depending on the configuration, the board provides the following functions:

- Control of chilled water or hot water temperatures.
- Continuous monitoring of operating parameters.
- Diagnostics and fault storage.
- Setpoint drift based on the outdoor temperature (in heating and cooling modes).
- Communication with the console (remote or local) and the expansion boards (fault reporting, communication via modem for BMS and control console).

2.1 Description

The Xtraconnect 2 control module consists of:

- **Machines with 2 and 3 circuits on module 1:**
  - 1 common control and display console with CONNECT 2 fitted on unit.
  - 1 motherboard with hardware common with the tropicalised CONNECT 2 board with the Xtraconnect 2 software.
  - 1 tropicalised expansion board (ADD 3) with its rotary switch set to 1.
- **Machines with 3 circuits on module 2:**
  - 1 tropicalised expansion board (ADD 3) with its rotary switch set to 2.
  - 1 tropicalised expansion board (ADD 1) with its rotary switch set to 3.
- **Analogue inputs:**
  - Acquire signals measured by temperature sensors.
  - Acquire signals measured by pressure by sensors.
  - Acquire faults from the surrounding electromechanical components.
- **Actions:**
  - Compares the setpoint and the water temperature to calculate which stages are to be turned on or off.
- **Outputs:**
  - Control stage control.
  - Pump control.
  - General fault.

➢ Consoles

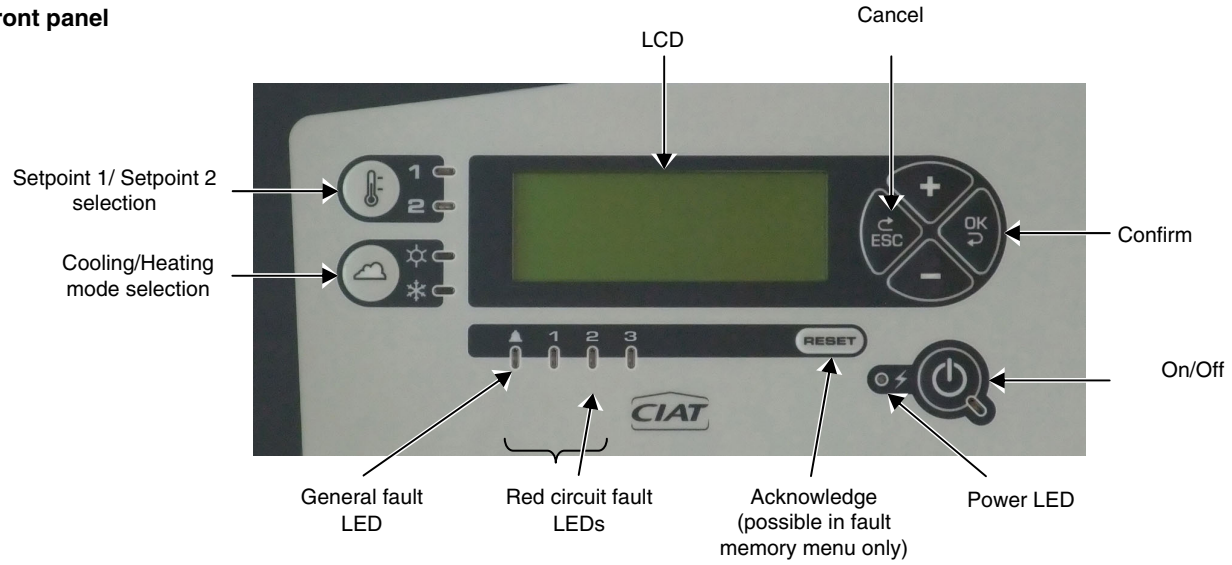
- Local console:
  - The controls on the local console are enabled regardless of the value of P103.
  - All faults can be reset from the FAULT MEMORY menu.
- **Remote control console:**
  - Reading of values.
  - The controls are enabled if P103 is set to 'remote'.

  In this case, the following parameters are modifiable:
  - On/Off.
  - Cooling/Heating.
  - All the adjustment parameters accessible via the authorised access level.
  - All locked parameters accessible via the authorised access level (except the first nine).
  - Faults cannot be reset.
  - Test mode inaccessible.
- **BMS, control console, etc:**
  - All are available in read mode.
  - All are available in write mode, except for P1 to P99 and (P100; P103; P104; P105).
  - Parameters P1 to P99 are editable.
  - If P99 is unlocked on the machine console.
  - Faults cannot be reset remotely.

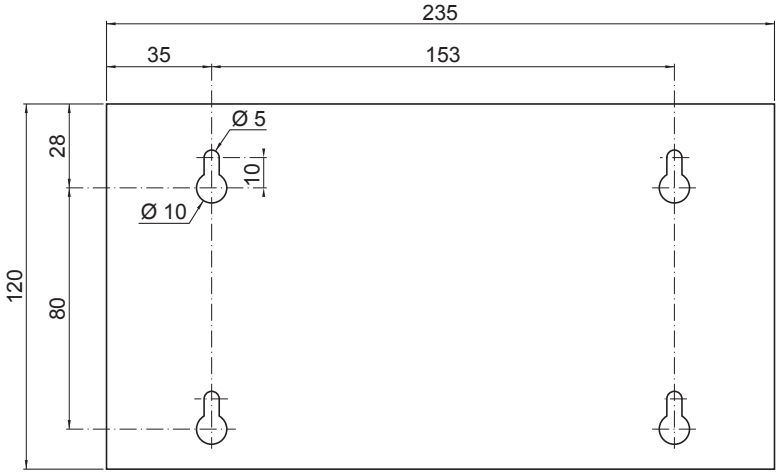
NOTE: All the registers are viewable regardless of the value of P103 (see communication protocol).

- To be able to write parameters, P103 must be set to 'remote'.
- To be able to switch between heating and cooling, P199 must be set to 'cooling/heating' via the console.
- To be able to switch between setpoints 1 and 2, P120 must be set to '2' via the console.

➢ **Front panel**



➢ **Mounting dimensions (in mm) of remote control console**



➢ Locking the console

Note: available only on the local console located on the unit.
The console is set by default to 'unlocked'.
The lock state is saved in the event of a mains power failure.
If locking mode is enabled while modifying a parameter, any changes entered are not saved and the parameter reverts to its initial setting.
To lock the console, simultaneously press and hold **+** and **–** for 5 seconds (possible in any menu on the console).
The following message appears for 5 seconds then the display returns to unit status mode (test mode is disabled):

```
L O C K E D
D I S P L A Y   P A N E L
```

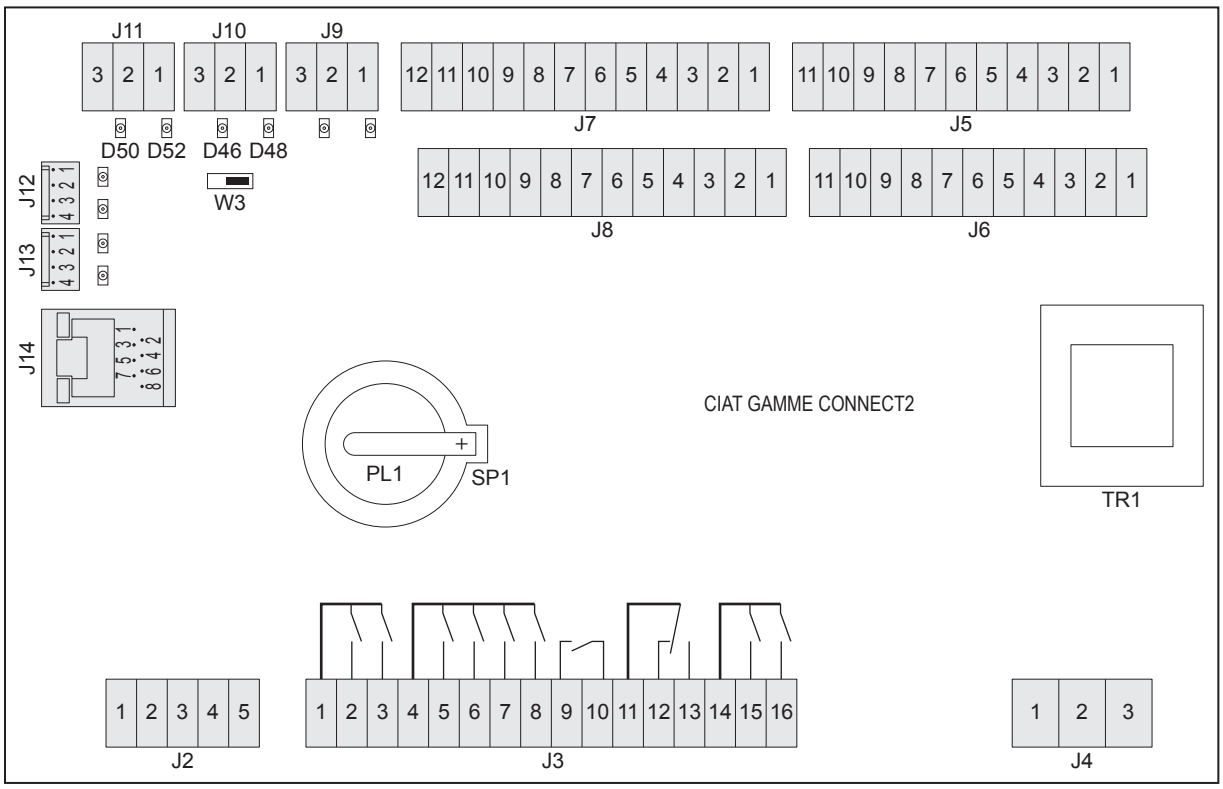
It is now possible to make any changes via the local console. Any attempts to enter changes will cause the following message to appear for 3 seconds.

```
L O C K E D
D I S P L A Y   P A N E L
```

The console is unlocked in the same manner, i.e. by pressing and holding **+** and **–** for 5 seconds. Doing so causes the following message to appear for 3 seconds:

```
U N L O C K E D
D I S P L A Y   P A N E L
```

2.2 Description of the motherboard



SWITCH W3
End-of-line resistance for two-wire RS485 link. The switch must be set to the left for the last unit on the loop and to the right for the others.

TERMINAL BLOCK J2 (analogue outputs)
1-2: 0-10 V output for circuit 1 fan speed control (**+** on terminal 1).
3-4: 0-10 V output for circuit 2 fan speed control (**+** on terminal 3).
4-5: 0-10 V output for common fan speed control (**+** on terminal 5).

TERMINAL BLOCK J3 (on/off inputs)
1: Circuit fault output common.
2: Circuit 1 fault output.
3: Circuit 2 fault output.
4: Common, inverter compressor 1 contactor and heater control.
5: Evaporator defrost heater control.
6: Pipe heat trace cable control.
7: Hydraulic module heater control.
8: Compressor 1 intake valve or inverter compressor 1 contactor control.
9: Compressor 2 intake valve or inverter compressor 2 contactor phase.
10: Compressor 2 intake valve or inverter compressor 2 contactor control.
11: Fault output common.
12: NC contact for fault output.
13: NO contact for fault output.
14: Common for pumps.
15: Pump 1 control.
16: Pump 2 control.

TERMINAL BLOCK J4 (power supply)
1: 230 V board power supply - Line.
2: 230 V board power supply - Neutral.
3: Earth.

TERMINAL BLOCK J5 (on/off inputs)
1-2: Compressor 1 protection fault (inverter).
2-3: Compressor 2 protection fault (inverter).
4-5: Circuit 1 manual reset HP fault (compressor 1 operation).
5-6: Circuit 2 manual reset HP fault (compressor 2 operation).
7-8: Phase controller fault.
8-9: Water flow fault.
10-11: Pump 1 fault.

TERMINAL BLOCK J6 (on/off inputs)
1-3: Pump 2 fault.
2-3: Automatic machine operation control.
4-6: Setpoint 1/setpoint 2.
5-6: Automatic pump operation control.
7-9: Compressor 1 load shedding control.
8-9: Compressor 2 load shedding control.
10-11: Customer fault control (outdoor).

TERMINAL BLOCK J7 (analogue inputs)
1-2: 10 K outdoor temperature sensor.
2-3: 10 K evaporator water inlet temperature sensor.
4-5: 10 K evaporator water outlet temperature sensor.
5-6: 10 K hydraulic module ambient temperature sensor.
7: **+**24 V power supply for pressure sensors.
8: 0-10 V input for heat exchanger 1 water inlet sensor.
9: 0-10 V input for heat exchanger 1 water outlet sensor.
10: Common for pressure sensors.
11: **+** 4-20 mA remote setpoint.
12: **–** 4-20 mA remote setpoint.

TERMINAL BLOCK J8 (analogue inputs)
1-2: Condenser water inlet temperature sensor.
2-3: 10 K condenser water outlet temperature sensor.
4-5: 10 K circuit 1 suction temperature sensor.
5-6: 50 K circuit 1 discharge temperature sensor.
7-8: 50 K circuit 2 discharge temperature sensor.
9: +5 V power supply for pressure sensor.
10: 0-5 V input for circuit 1 HP sensor.
11: 0-5 V input for circuit 1 LP sensor.
12: Common for pressure sensors.

TERMINAL BLOCK J9
Link for chiller or MULTICONNECT.

TERMINAL BLOCK J10
Remote control console, relay board link - AEROCONNECT.

TERMINAL BLOCK J11
BMS link.

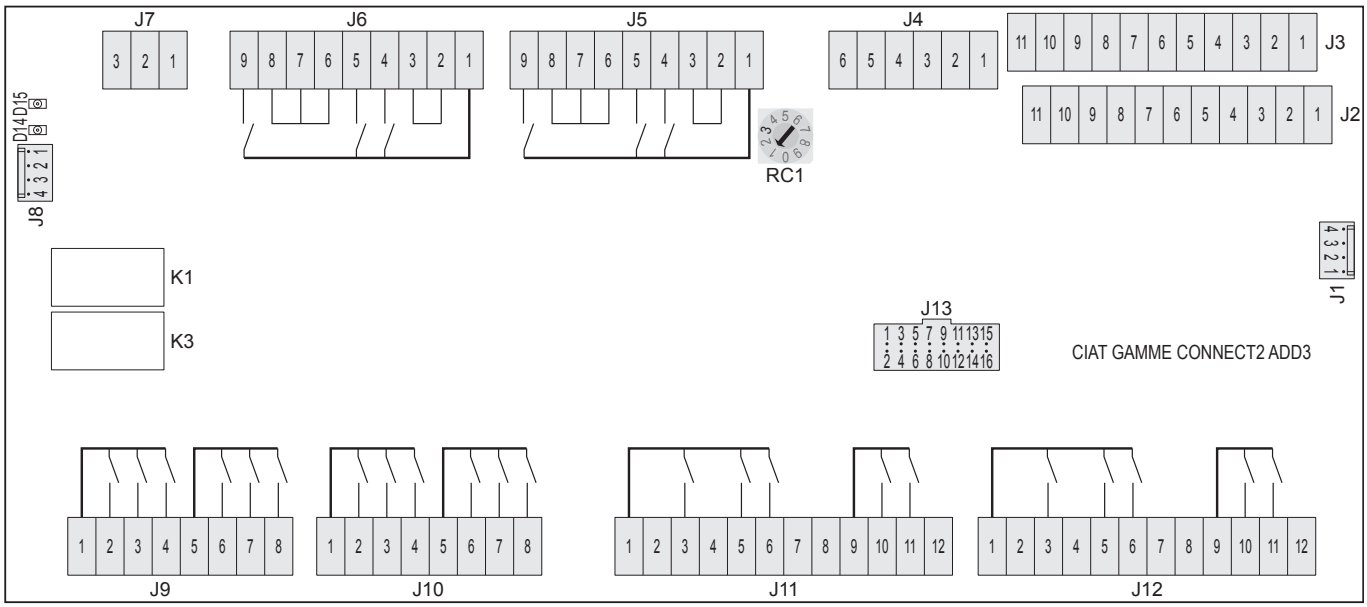
TERMINAL BLOCK J12
Local console link.

TERMINAL BLOCK J13
Link for additional boards.

TERMINAL BLOCK J14
Ethernet link for PC.

Characteristics of the on/off inputs: 24 V – 15 mA.
Characteristics of the On/Off outputs: 250 V - 2 A max.

2.3 Description of expansion board 3 (ADD3) on a 2-circuit machine and with the rotary switch set to '1'



TERMINAL BLOCK J1 (Molex)
Mother board connection.

TERMINAL BLOCK J2 (analogue inputs)
1: **+**5 V power supply for pressure sensor.
2: 0-5 V input for circuit 2 HP sensor.
3: 0-5 V input for circuit 2 LP sensor.
4: Common for pressure sensors.
5-6: 4-20 mA input (0 on terminal 5). Available.
7-8: 10 K circuit 2 suction temperature sensor.
8-9: 10 K circuit 1 liquid temperature sensor.
10-11: 10 K circuit 2 liquid temperature sensor.

TERMINAL BLOCK J3 (on/off inputs)
1-2: Emergency stop control (split system machine or machine with dry cooler)
2-3: Heating/cooling or total recovery control.
4-5: Fan fault.
6-8: Circuit 1 expansion valve fault.
7-8: Circuit 2 expansion valve fault.
8-9: Energy load shedding control.
10-11: 10 K master/slave manifold water outlet temperature sensor.

TERMINAL BLOCK J4 (analogue outputs)
1-2: Pump 1 speed control (**+** on terminal 1).
2-3: Pump 2 speed control (**+** on terminal 2) or control of three-way valve on water-to-water unit
4-5: Compressor 1 speed control (**+** on terminal 4).
5-6: Compressor 2 speed control (**+** on terminal 6).

TERMINAL BLOCK J5 (on/off inputs)
1: 230 V phase input common to the terminal outputs (24 V for inverter compressor).
2: 230 V neutral input, common for redistribution on the terminal block.
3: Neutral, compressor 1 protection.
4: Compressor 1 protection reset output (compressor 1 reset for inverter 1).
5: Output to circuit 1 high-pressure switch (compressor 1 on/off, no inverter faults)
6: Circuit 1 high-pressure switch feedback.
7: Compressor 1 winding 1 start output.
8: Not used.
9: Compressor 1 winding 2 start output (start compressor 1 for inverter).

TERMINAL BLOCK J6 (on/off inputs)
1: 230 V phase input common to the terminal outputs (24 V for inverter compressor).
2: 230 V neutral input, common for redistribution on the terminal block.
3: Neutral, compressor 2 protection.
4: Compressor 2 protection reset output (compressor 2 reset for inverter).
5: Output to circuit 2 high-pressure switch (compressor 2 on/off, no inverter faults)
6: Circuit 2 high-pressure switch feedback.
7: Compressor 2 winding 1 start output.
8: Not used.
9: Compressor 2 winding 2 start output (compressor 2 start for inverter).

TERMINAL BLOCK J7
Serial port for Module 2 (3-circuit machine).
1: Terminal A.
2: Terminal B.
3: Shield.

TERMINAL BLOCK J8 (Molex)
Serial port for the expansion boards.

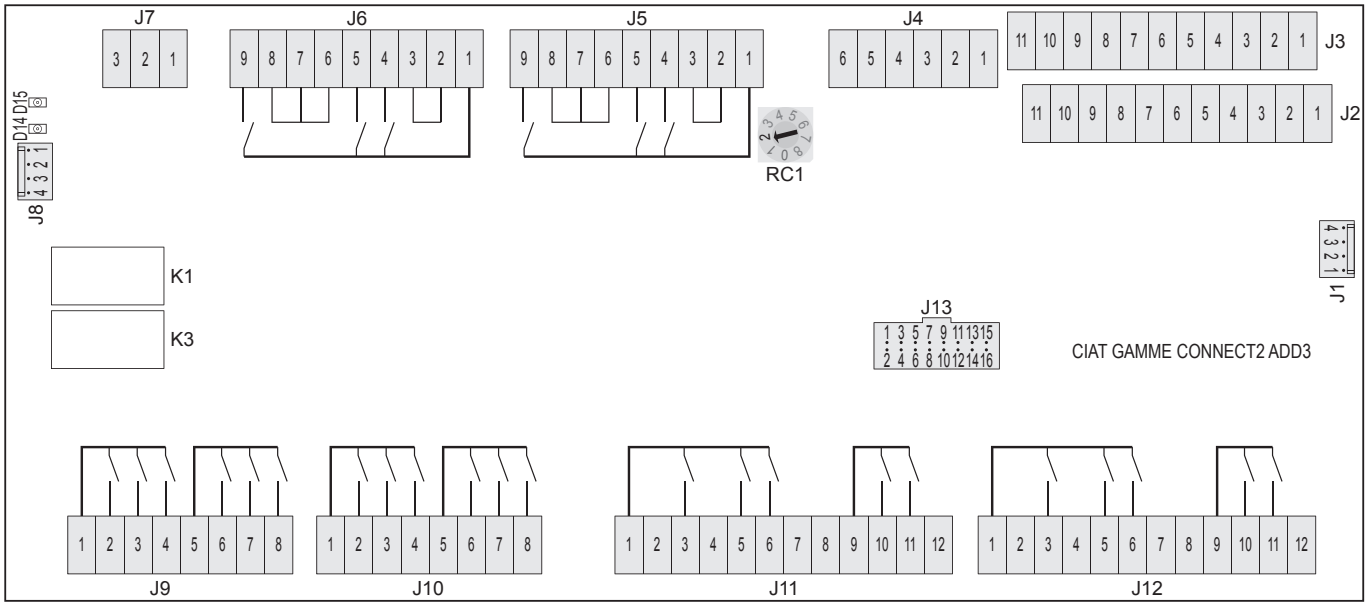
TERMINAL BLOCK J9 (on/off outputs)
1: Phase input common to terminals 2, 3 and 4.
2: Circuit 1 fan 1 output.
3: Circuit 1 fan 2 output.
4: Circuit 1 fan 3 output.
5 Phase input common to terminals 6, 7 and 8.
6: Circuit 1 fan 4 output.
7: Circuit 1 fan 5 output.
8: Circuit 1 fan 6 output.

TERMINAL BLOCK J10 (on/off inputs)
1: Phase input common to terminals 2, 3 and 4.
2: Circuit 2 fan 1 output.
3: Circuit 2 fan 2 output.
4: Circuit 2 fan 3 output.
5 Phase input common to terminals 6, 7 and 8.
6: Circuit 2 fan 4 output.
7: Circuit 2 fan 5 output.
8: Circuit 2 fan 6 output.

TERMINAL BLOCK J11 (on/off outputs)
1 Phase input common to terminals 3-5-6.
2: Neutral input common to the terminal outputs.
3: 25% valve output, compressor 1.
4: 25% valve and intake valve neutral.
5: Compressor 1 intake valve output.
6: Compressor 1 exhaust valve output.
7: Compressor 1 liquid valve and exhaust valve neutral.
8: Neutral input for terminal 12.
9: Phase input common to terminals 10-11.
10: Compressor 1 intake valve output.
11: Compressor 1 ÉCOCIAT valve output.
12: ÉCOCIAT Valve neutral output.

TERMINAL BLOCK J12 (on/off outputs)
1 Phase input common to terminals 3-5-6.
2: Neutral input common to the terminal outputs.
3: 25% valve output, compressor 2.
4: 25% valve and intake valve neutral.
5: Compressor 2 intake valve output.
6: Compressor 2 exhaust valve output.
7: Compressor 2 liquid valve and exhaust valve neutral.
8: Neutral input for terminal 12.
9: Phase input common to terminals 10-11.
10: Compressor 2 intake valve output.
11: Compressor 2 ÉCOCIAT valve output.
12: ÉCOCIAT valve neutral output.

2.4 Description of expansion board 3 (ADD3) on a 3-circuit machine. Module 2, rotary switch set to '2'



TERMINAL BLOCK J1 (Molex)
Port available for expansion boards

TERMINAL BLOCK J2 (analogue inputs)
1: +5 V power supply for pressure sensor.
2: 0-5 V input for circuit 3 HP sensor.
3: 0-5 V input for circuit 3 LP sensor.
4: Common for pressure sensors.
5-6: Available.
7-8: 10 K circuit 3 suction temperature sensor.
8-9: 10 K circuit 3 liquid temperature sensor.
10-11: 50 K circuit 3 discharge temperature sensor.

TERMINAL BLOCK J3 (on/off inputs)
1-2: Water flow fault.
2-3: Circuit 3 manual reset HP fault (compressor 3 operation).
4-5: Compressor 3 protection fault (inverter compressor 3 fault)
6-8: Circuit 3 expansion valve fault.
7-8: Circuit 3 fan fault.
9-10: Phase controller fault.
10-11: 10 K circuit 3 exchanger water outlet temperature sensor (2 modules).

TERMINAL BLOCK J4 (analogue outputs)
1-2: Pump 3 speed control (**+** on terminal 1)
2-3: Circuit 3 fan speed control (**+** on terminal 2)
4-5: Compressor 3 speed control (**+** on terminal 4)
5-6: Not used.

TERMINAL BLOCK J5 (on/off inputs)
1: 230 V phase input common to the terminal outputs (24 V for inverter compressor).
2: 230 V neutral input, common for redistribution on the terminal block.
3: Neutral, compressor 3 protection.
4: Compressor 3 protection reset output (compressor 3 reset for inverter 3).
5: Output to circuit 3 high-pressure switch (compressor 3 on/off, no inverter faults).
6: Circuit 3 high-pressure switch feedback.
7: Compressor 3 winding 1 start output.
8: Available.
9: Compressor 3 winding 2 start output (compressor 3 start for inverter).

TERMINAL BLOCK J6 (on/off outputs)
1: 230 V phase input common to the terminal outputs (24 V for inverter compressor).
2: 230 V neutral input, common for redistribution on the terminal block.
3: Available.
4: Available.
5: Available.
6: Available.
7: Available.
8: Available.
9: Available.

TERMINAL BLOCK J7
Serial port for Module 1 (3-circuit machine).
1: Terminal A.
2: Terminal B.
3: Shield.

TERMINAL BLOCK J8 (Molex)
Serial port for the expansion boards.

TERMINAL BLOCK J9 (on/off outputs)
1: Phase input common to terminals 2, 3 and 4.
2: Circuit 3 fan 1 output.
3: Circuit 3 fan 2 output.
4 :Circuit 3 fan 3 output.
5: Phase input common to terminals 6, 7 and 8.
6: Circuit 3 fan 4 output.
7: Circuit 3 fan 5 output.
8: Circuit 3 fan 6 output.

TERMINAL BLOCK J10 (on/off inputs)
1: Phase input common to terminals 2, 3 and 4.
2: Circuit 3 fault output.
3: Available.
4: Available.
5: Phase input common to terminals 6, 7 and 8.
6: Evaporator defrost heater output.
7: Desuperheater heater output.
8: Available.

TERMINAL BLOCK J11 (on/off inputs)
1: Phase input common to terminals 3, 5 and 6.
2: Neutral input common to the terminal outputs.
3: 25% valve output, compressor 3.
4: 25% valve and intake valve neutral.
5: Compressor 3 intake valve output.
6: Compressor 3 exhaust valve output.
7: Compressor 3 liquid valve and exhaust valve neutral.
8: Neutral input for terminal 12.
9: Phase input common to terminals 10-11.
10: Compressor 3 intake valve output.
11: Compressor 3 ÉCOCIAT valve output.
12: ÉCOCIAT valve neutral output.

TERMINAL BLOCK J12 (on/off outputs)
1: Phase input common to terminals 3, 5 and 6.
2: Neutral input common to the terminal outputs.
3: Available.
4: Available.
5: Available.
6: Available.
7: Available.
8: Neutral input for terminal 12.
9: Phase input common to terminals 10-11.
10: Available.
11: Available.
12: Available.

2.5 Description of expansion board 1 on a 3-circuit machine. Module 2, rotary switch set to '3'

TERMINAL BLOCK J1
Flash Memory connector.

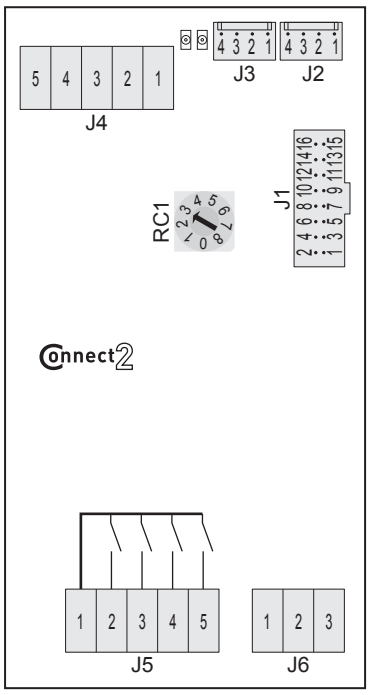
TERMINAL BLOCK J2
Link with motherboard or another expansion board.

TERMINAL BLOCK J3
Link with another expansion board.

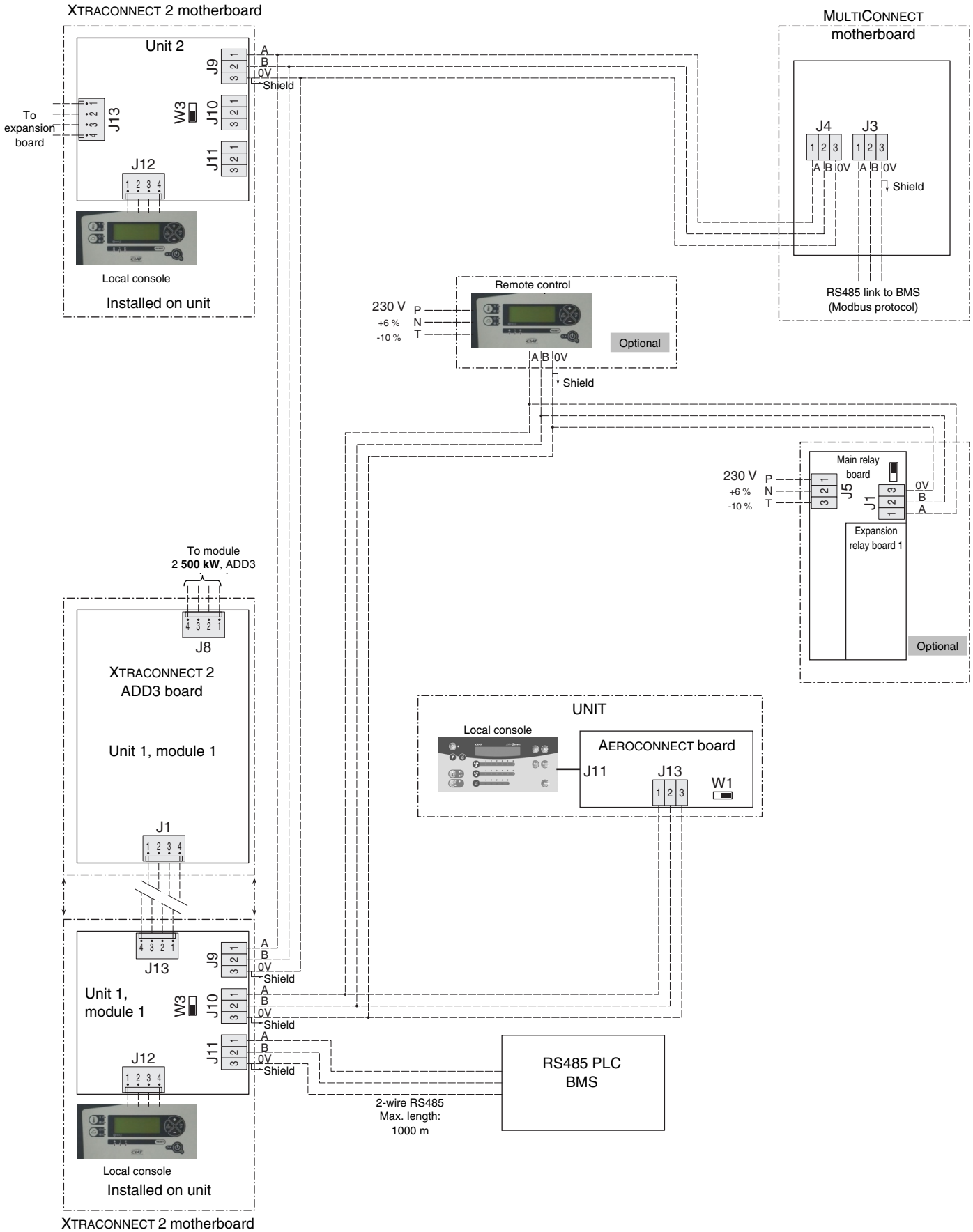
TERMINAL BLOCK J4 (on/off inputs)
1-2: Circuit 3 load shedding input.
2-3: Available.
4-5: Available.

TERMINAL BLOCK J5 (on/off inputs)
1: Common to all outputs: Compressor 3 intake valve phase.
2 Available: Compressor 3 intake valve control.
3: Available.
4: Available.
5: Available.

TERMINAL BLOCK J6 (analogue inputs)
1-2: 10 K manifold water outlet temperature sensor, 3-circuit machine (2 modules).
2-3: Available.



2.6 Connection via RS485 serial port for BMS or control console and Multiconnect with 500 kW module



For connection to a CMS, refer to document 3991049.

Identification of Modbus connection terminals :
1: A or **+**.
2: B or **–**.
3: Earth (shield).

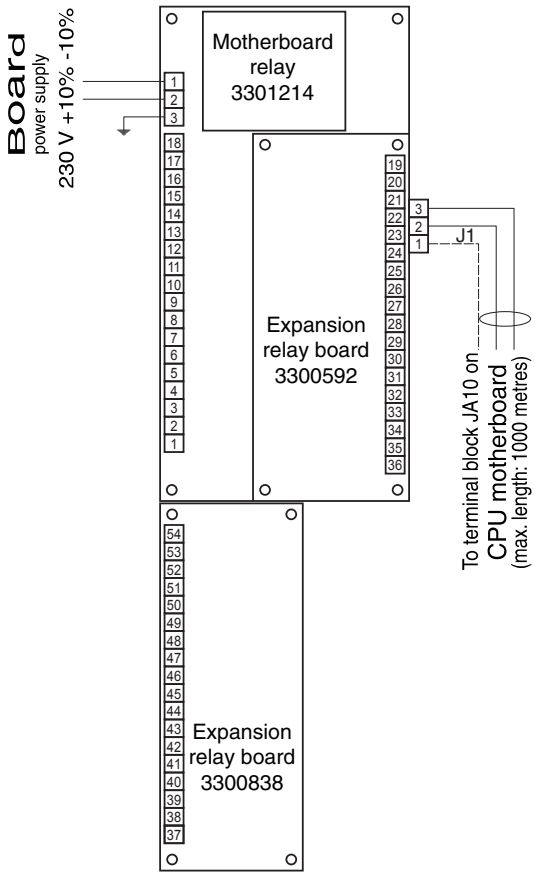
2.7 RELAY BOARD

The dry contacts on the optional relay board make it possible to remotely view the states of the stages that are activated and all the fault states on the unit.
- A 230 V ±10% power supply must be provided for the relay board.
- Connect terminal block J1 (1-2) on each relay board to terminal block J10 on the motherboard.

- The board has a relay fault which will activate in the event of incorrect wiring.

Terminal block layout:

Motherboard:	1-2	Water flow rate fault.
	3-4	Frost protection fault (water)
	5-6	Pump 1 fault.
	7-8	Pump 2 fault.
	9-10	Fan fault.
	11-12	Emergency stop fault.
	13-14	HP1 fault.
	15-16	LP1 fault.
	17-18	Compressor 1 protection fault.
Expansion board 1:	19-20	Compressor 1 operation.
	21-22	Circuit 1 discharge temperature fault.
	23-24	Compressor 1 minimum desuperheat fault.
	25-26	Compressor 1 lubrication fault.
	27-28	HP2 fault.
	29-30	LP2 fault.
	31-32	Compressor 2 protection fault.
	33-34	Compressor 2 operation.
	35-36	Circuit 2 discharge temperature fault.
Expansion board 2:	37-38	Compressor 2 minimum desuperheat fault.
	39-40	Compressor 2 lubrication fault.
	41-42	HP3 fault.
	43-44	LP3 fault.
		Compressor 3 protection fault.
	47-48	Compressor 3 operation.
	49-50	Circuit 3 discharge temperature fault.
	51-52	Compressor 3 minimum superheat fault.
	53-54	Compressor 3 lubrication fault.



3 ACCESS LEVELS

Xtraconnect 2 features three parameter access levels:
- Level 1: Users.
- Level 2: Technicians/Maintenance.
- Level 3: CIAT Technicians (full access)

3.1 Selecting an authorised access level

Authorised access levels are selected in menu 14 (ACC. LEVEL SELECT.). The following screen appears:

```
C O N T R O L E R   A T   L E V E L   x
1 4 - 1   L E V E L   2   A C C E S S
1 4 - 2   L E V E L   3   A C C E S S
```

- Level 3 provides automatic access to all levels (CIAT technicians).
- Level 2 provides access to levels 1 and 2 only (Technicians/Maintenance and CIAT technicians).
- Level 1 provides access to level 1 only (all users).

3.2 Accessing the various access levels

3.2.1 Restricting access to level 1 only

- Access level 2 is the default access level.
- If you are in a higher level and you want to restrict access to level 1 only, simultaneously hold down the **ESC** and **OK** buttons for 10 seconds.
- No password is needed to access level 1. The setpoint adjustment range is **+**or **–**5 K lower than in the higher access levels.
- The restriction messages remain displayed in access level 1. Operating messages in optimised mode are visible only in access level 2 and up.
- Restriction of access to level 1 only is stored in memory in the event of a mains power failure.

3.2.2 Access to level 2:

A numeric code must be entered to access level 2:
- The following menu for entering this code appears when level 2 is selected.

```
L E V E L   2
A C C E S S   C O D E
* * * *
```

- Using the **+** and **–** buttons, replace this first symbol (*) by the first character in the code and press **OK**. Do the same for the second, third and fourth symbols. When the last character is entered and **OK** is pressed, the following menu appears:

```
  L E V E L   2
N E W   C O D E
  * * * *
```

- To select a new access code, proceed as described above. When the last character is entered and **OK** is pressed, the screen displays the menu below followed by the main menu.

```
  L E V E L   2
N E W   C O D E   S A V E D
```

- If you do not want to change the level 2 access code, press **ESC** to exit the new access code menu and go back to the main menu.
- If you have changed your access code but have forgotten it, you can reset it to the original code by entering the LEVEL 2 ACCESS CODE menu and simultaneously holding down the **+** and **RESET** buttons for 10 seconds.

3.2.3 Access to level 3

A non-modifiable numeric code must be entered to access level 3:
- The following menu for entering this code appears when LEVEL 3 is selected.

```
  L E V E L   3
  A C C E S S   C O D E
  * * * *
```

- Using the **+** and **–** buttons, replace this first symbol (*) by the first character in the code and press **OK**. Do the same for the second, third and fourth symbols. When the last character is entered and **OK** is pressed, the main menu appears.

3.2.4 Restricting access from level 3 to level 2

To restrict access from level 3 to level 2 only, go to the following menu

```
1 4 - 1   L E V E L   2   A C C E S S
```

Press **Enter**. The following menu appears :

```
  L E V E L   2   A C C E S S
  O N L Y
  Y E S / N O
```

To restrict the controller to access level 2, select 'Yes' and press **OK,**.

3.2.5 Displaying the access codes on the controller after incorrectly entering the access codes:

- The digits in the access codes are replaced by the *symbol. When the **+** or **–** button is pressed, this symbol is replaced by the digit **0**. The digits in the code can then be selected using the **+** and **–** buttons.
The ***** symbol appears when the digit is confirmed by pressing **OK**.

- The following message appears for 5 seconds if the access code is not entered correctly.

```
  W R O N G   C O D E
```

- When an access level is changed, the following message is displayed for 5 seconds.

```
A C C E S S   L E V E L   x
```

3.3 Configuring access levels on the controller

- All three access levels on all the boards are accessible for a total of 20 hours of 'on' time after the controller is first turned on. During this period any defective boards may be removed and their replacement boards configured and checked to ensure correct operation of machine.
This time period will be automatically cancelled if a user switches to level 1 or level 2 before it ends.
When the time period ends, level 2 will be authorised unless the person commissioning the system chooses to restrict access by the end user to level 1.
- If access level 3 is authorised in order to adjust the machine parameters and, for indeterminate reasons, it is left accessible to all users, only level 2 access will be possible after a period of 4 hours.
- Commissioning of the machine can be prohibited simply by setting parameter P99 to 'No' in level 2.
Only those with the level 2 access code may re-enable commissioning of the machine.

3.4 Management of the numeric codes for accessing levels 2 and 3

- Access to level 3 is direct for anyone with a PC running the program needed to communicate with Xtraconnect 2 and who connects to the board.
- Level 2 and level 3 access codes may be obtained only from *CIAT Service* technicians. Please contact your local **CIAT Service** office.

3.5 Classification of the menus and their functions

➢ **Level 1:**

● **Menu:** Setpoint, Unit status, Measured values, Adjustment parameters, Reading parameters, Fault memory, Programming, Communication and Access level selection.
● **Function:** all functions accessible via the console: On/Off, Reset (via the fault memory menu), Heating/Cooling selection, Setpoint 1/2 selection.

➢ **Level 2:**

● **Menu:** all level 1 menus + test mode and master/slave mode.

➢ **Level 3:**

● **Menu:** all level 2 menus and machine parameters.
IMPORTANT: all the controller parameters are available via the reading parameters menu in read-only mode regardless of the access level (even level 1). The list of parameters starts at P1 and ends at P811.

4 LIST OF PARAMETERS

Access level: **1** = Access to **USER** parameters (level 1 parameters only)
2 = Access to viewable and editable parameters (levels 1 and 2). The numeric code is EDITABLE.
3 = Access to CIAT **TECHNICIAN** parameters (levels 1, 2 and 3). The numeric code is uneditable.

Access level	No.	Description	Setting	Default	Display conditions
			MACHINE CONFIGURATION		
3	1	Refrigerant type	R134a	R134a	
3	2	Unit type	1: Water-to-water; 2: Air-to-water	2	
3	3	Number of circuits	2 - 3	2	
3	8	Unit size	Condenserless 1800 - 2150 - 2500 - 2800 - 3050 - 3500 - 3600 - 3900 - 4200 - 4500 - 4800	1200	If P1 = R134a, P2 = 2 and P3 = 2
			Condenserless 4850 - 5400 - 6000 - 6600	4850	If P1 = R134a, P2 = 2 and P3 = 3
			1800 - 2150 - 2500 - 2800 - 3050 - 3500 - 3600 - 3900 - 4200 - 4500 - 4800	1800	If P2 = 1 and P3 = 2
3	9	Compressor start-up	Star-Delta - Part Winding	Star-Delta	
3	15	Measurement of electrical quantities	No - Yes	No	
3	16	Primary CT rating (module 1)	0 to 1000 A	**500 A** if P2 = 1 and P8 = 1800 to 2800 or P2 = 2, and P8 = 1800 to 2500 **750 A** if P2 = 2, P3 = 2 and P8 = 2800 to 3900 or if P3 = 3 and P8 = 4850, 5400 **1000 A** if P2 = 1 and P8 = 3050 to 4800 or P2 = 2, P3 = 2 and P8 = 4200 to 4800 or if P3 = 3 and P8 = 6000, 6600	If P15 = Yes
3	17	Secondary CT rating (module 1)	1 or 5 A	5	If P15 = Yes
3	18	Primary CT rating (module 2)	0 to 1000 A	500 A	If P15 = Yes and P3 = 3
3	19	Secondary CT rating (module 2)	1 or 5 A	5	If P15 = Yes and P3 = 3
			OPTION		
2	21	Variable speed drive	1 - Without 2 - With acoustic optimisation 3 - With energy optimisation	Without	If P2 = 2 and P8 ≠ condenserless Value 3 accessible only if P42 ≠ No
2	24	Hydraulic module	No - Yes	No	If P2 = 2 and P08 ≠ condenserless
2	25	Number of pumps delivered by CIAT	1-2	0	Visible if P24 = Yes
2	26	0-10 V configurable output	Not used – 3-way valve – Variable speed pump 2	Not used	Three-way valve, visible if P2 = Water-to-water

Access level	No.	Description	Setting	Default	Display conditions
			OPTION (CONTINUED)		
2	28	Master/slave control of two machines	Yes/No	No	
2	29	Total recovery	Yes/No	No	If P2 = 2
Breakdown					
3	30	High pressure, HP1 sensor	10 to 50 bar (resolution: 0.1)	34	
3	31	Low pressure, HP1 sensor	–1 to 10 bar (resolution: 0.1)	–0.5	
3	32	High pressure, HP2 sensor	10 to 50 bar (resolution: 0.1)	34	If P3 = 2
3	33	Low pressure, HP2 sensor	–1 to 10 bar (resolution: 0.1)	–0.5	If P3 = 2
3	34	HP3 sensor high value	10 to 50 bar (resolution: 0.1)	34	If P3 = 3
3	35	HP3 sensor low value	–1 to 10 bar (resolution: 0.1)	–0.5	If P3 = 3
3	36	High pressure, LP1 sensor	10 to 50 bar (resolution: 0.1)	17.3	
3	37	Low pressure, LP1 sensor	–1 to 10 bar (resolution: 0.1)	0	
3	38	High pressure, LP2 sensor	10 to 50 bar (resolution: 0.1)	17.3	If P3 = 2
3	39	Low pressure, LP2 sensor	–1 to 10 bar (resolution: 0.1)	0	If P3 = 2
3	40	LP3 sensor high value	10 to 50 bar (resolution: 0.1)	17.3	If P3 = 3
3	41	LP3 sensor low value	–1 to 10 bar (resolution: 0.1)	0	If P3 = 3
3	42	Electronic expansion valve	Yes/No	No	
3	43	Superheat protection	Yes/No	No	
3	44	Minimum superheat temperature	0 to 5 K (resolution: 0.1)	0.5 K	If P43 = Yes
3	45	Maximum superheat temperature	10 to 20 K (resolution: 0.1)	15.0 K	If P43 = Yes
3	48	Valve opening temperature	80 to +6°C (resolution 0.5)	110°C	
3	49	Intake closing differential	5 to +6°C (resolution 0.5)	10°C	
3	51	Discharge temperature limit	60 to +6°C (resolution 1)	115	
3	52	Water line frost protection limit	–25 to +6°C (resolution 0.1)	2	
3	54	HP fault threshold	15 to 45 bar (resolution: 0.1)	18 b	
3	55	LP fault threshold	0.1 to 5 bar (resolution: 0.1)	0.3 b	
3	56	Minimum discharge superheat temperature	0 to 30 seconds (resolution: 1)	10°C	
3	57	HPS cut-out HP value	15 to 30 bar (resolution: 0.1)	15.8 b	
3	61	Liquid valve opening time	0 to 180 seconds (resolution: 1)	0	
3	62	Liquid valve closing time	0 to 180 seconds (resolution: 1)	0	
3	70	Control LP limit differential.	0 to 10 K (resolution: 0.5)	8	
2	99	Parameter locking	No - Yes	No	
			Customer Configuration		
2	100	Language	F-GB-D-SP-I	F	
2	101	Date	DAy/MOnth/YEar		
2	102	Time	HOurs/MInutes		
1	103	Control mode	Local - remote (BMS)	Local	
2	108	Pump 2 control.	Fct (Control) - Fct (On/Off) if P2 = 1	Fct (on/off)	If P24 = No
2	116	AEROCONNECT link	Yes - No	No	
1	117	Power input limit	No - At all times - Yes via on/off input - Yes via bus	No	If P15 = Yes
1	118.1	Maximum power threshold	100 to 1000 kW	600	If P15 = Yes
1	118.2	Difference from max. power	5 to 100 kW	50	If P15 = Yes
Setpoint management					
1	119	Operating mode	1 - Cooling 2 - Heating 3 - Cooling/heating via console 4 - Cooling/heating via on/off input 5 - Automatic cooling/heating based on outdoor temperature	Cooling	
1	120	Number of setpoints	1 - 2 via console - 2 via on/off input 3 Setpoint managed by 4-20 mA signal	1	
1	121	Cooling setpoint 1	P52 + 3 K at 30°C (resolution: 0.1)	7 if P141≠ 1 9 if P141 = 1	P119 ≠ 2 and P120≠ 4

Access level	No.	Description	Setting	Default	Display conditions
***Management of setpoints** (continued)*					
1	122	Cooling setpoint 2	P52 + 1 K at 30°C (resolution: 0.1)	7	If P119 ≠ 2, P120 = 2 or 3
1	123	Heating setpoint 1	20 to +6°C (resolution 0.1)	40	P119 ≠ 1 and P120 ≠ 4
1	124	Heating setpoint 2	20 to +6°C (resolution 0.1)	35	P119 ≠ 1, P120 = 2 or 3
1	125.1	Low setpoint (4-20 mA) during COOLING:	P52 + 3 K at 30°C	P52 + 3	Displayed if P120 = 3 and cooling mode activated
1	125.2	Low setpoint (4-20 mA) during HEATING	10 to 60°C	20	Displayed if P120 = 3 and heating mode activated
1	126.1	High setpoint (4-20 mA) in COOLING mode:	P125.1 + or – 5 K at 30°C with minimum value of P52 + 3	20	Displayed if P120 = 3 and cooling mode activated
1	126.2	High setpoint (4-20 mA) in HEATING mode:	P125.2 + or – 5 K at 60°C with minimum value of 10°C	40	Displayed if P120 = 3 and heating mode activated
1	127	Cooling setpoint adjustment = f (Tout)	No - Yes	No	P119 ≠ Heating
1	128	Drift start	–20 to 55°C (resolution: 1)	25	If P127 = Yes
1	129	Drift end	P128 + 5K to 60°C (resolution: 1)	35	If P127 = Yes
1	130	Maximum setpoint at end of drift	P52 + 3K to 30°C (resolution: 0.1)	15	If P127 = Yes
1	131	Heating setpoint adjustment = f (Tout)	No - Yes	No	P119 ≠ Cooling
1	132	Drift start	–20 to 55°C (resolution: 1)	15	If P131 = Yes
1	133	Drift end	–25 to P132 –5K (resolution: 1)	5	If P131 = Yes
1	134	Maximum setpoint at end of drift	The highest setpoint if P120 ≠ 1 or Setpoint if P120 = 1 to 60°C (resolution: 0.1)	P123	If P131 = Yes
Control					
2	141	Control mode	1-Return 2-Water supply	1	If P119 ≠ 2 and if P120 ≠ 1 and P120 ≠ 4
2	142	Water loop winter protection	No - Yes	No	
2	143	Compressor stage differential	0.5 to 5 K (resolution: 0.5)	1	If P141 = 1
2	144	Interstage differential	0.5 to 5 K (resolution: 0.5)	2	If P141 = 1
Supply with compensation by return					
2	145	P coefficient	0.3 to 2 (resolution: 0.1)	1	If P141 = 2
2	146	I coefficient	0 to 1 (resolution: 0.1)	0	If P141 = 2
2	147	D coefficient	0 to 1 (resolution: 0.1)	0	If P141 = 2
2	148	T coefficient	1 to 240 seconds (resolution: 1)	15	If P141 = 2
2	149	Additional exhaust coefficient	0 to 60 seconds (resolution 1)	5	
2	150	Compensation factor	0.1 to 1 (resolution: 0.1)	0.5	
2	151	Compensation time	5 to P148 - 2 (resolution: 1)	8	
***For storage control (**Cristopia)*					
3	154	Storage	Yes/No	No	If P119 ≠ 2 and P120 ≠ 1 and P120 ≠ 4
3	155	Control ΔT	0.5 to 10°C (resolution: 0.5)	5	If P154 = Yes
Load limit defrosting					
2	170	Time between circuits (at start-up)	0 to 60 min. (10 s steps)	5 if P141≠1 0 if P141=1	
2	175	Load shedding via on/off input	Automatic/Selective	Auto	
Fan management					
2	181	HP control setpoint	7 to 13 bar (resolution: 0.5) if P1 = R134a	7 bar If P21 = 1 8 bar if P21 = 3 6.8 if P21 = 3	Visible if P2 = Air-to-water
2	182	Outdoor air temperature, forced HP	10 to +6°C (resolution 1)	25 if P21 = 0 or 1. 30 if P21 = 2.	Visible if P2 = Air-to-water and P29 = No

Access level	No.	Description	Setting	Default	Display conditions
			Fan management (continued)		
2	185	Circuit 1 stage differential	2 to 6 bar	3.5 if P21 = 1, 2 3.8 if P21 = 3	If P2 = 2
2	186	Circuit 1 interstage differential	0.5 to 3 bar	0.5	If P2 = 2
2	187	Circuit 2 stage differential	2 to 6 bar	3.5	If P2 = 2
2	188	Circuit 2 interstage differential	0.5 to 3 bar	0.5	If P2 = 2
2	189	Circuit 3 stage differential	2 to 6 bar	3.5	If P2 = 2 and P3 = 3
2	190	Circuit 3 interstage differential	0.5 to 3 bar	0.5	If P2 = 2 and P3 = 3
			High pressure control		
3	193	Shifting of HP setpoint during total recovery	2 to 11 bar (resolution: 0.5)	4.5	If P29 = Yes
3	196	Normal condensing control return ΔP	0.1 to 1 bar (resolution: 0.1)	0.5	Visible if P2 = 2
2	197	Value at 0 V	10 to 25°C if P26 = 3-way valve	25°C	Visible if P2 = Water-to-water and P26 ≠ not used
2	198	Value at 10 V	25 to 40°C if P26 = 3-way valve	35°C	Visible if P2 = Water-to-water and P26 ≠ not used
Limits					
3	220	Outdoor temperature, unit winter protection	2 to +6°C (resolution 1)	2	If P24 = Yes or P142 = Yes
3	221	Hydraulic module heater cut-in temperature (ambient)	–10 to 20°C (resolution: 1)	+2	If P24 = Yes
3	222	Outdoor temp. differential, unit winter protection	1 to 10 K (resolution: 1)	2	If P24 = Yes or P142 = Yes
3	225	Min. outdoor air temper. in HEATING mode	–25 to 5°C (resolution: 1)	DISABLED	If P2 = Water-to-water and P119 ≠ Cooling only
3	225.1	Max. outdoor air temp. in COOLING mode	35 to +6°C (resolution 1)	DISABLED	If P2 = Water-to-water and Air-to-water and P119 ≠ Heating only
3	225.2	Max. outdoor air temp. in HEATING mode	–5 to 25°C (resolution: 1)	DISABLED	If P2 = Water-to-water and P119 ≠ Cooling only
3	225.3	Mini. outdoor air temp. in COOLING mode	–20 to 25°C (resolution: 1)	DISABLED	If P2 = Water-to-water and Air-to-water and P119 ≠ Heating only
2	227	Compressor 1 operation authorisation	No - Yes	Yes	
2	228	Compressor 2 operation authorisation	No - Yes	Yes	
2	229	Compressor 3 operation authorisation	No - Yes	Yes	If P3 = 3
Operation					
1	250	LED test			
1	251	Control setpoint			If P141 ≠ 5 and ≠ 6
1	252	Outdoor air temperature			
1	253	Evaporator water inlet temperature			
1	254.1	Evaporator water outlet temperature (M1)			
1	254.2	Evaporator water outlet temperature (M2)			If P3 = 3
1	257	Condenser hot water inlet temperature			If P2 = 1
1	258	Condenser hot water outlet temperature			If P2 = 1
1	261.1	Manifold water outlet temperature			If P3 = 3
1	261.2	Master/slave water outlet temperature			If P3 = 3 P28 = Yes **on master machine**
1	265	Hydraulic module temperature			If P24 = Yes
1	270	Controller action time			
1	272	Oil warm-up time	Cut lasting between 0 and 12 hours Cut lasting between 12 and 24 hours If cut longer than 24 hours	0 1 h 2 h	
1	273.1	Supply voltage (Module 1)			P15 = Yes
1	273.2	Supply voltage (Module 2)			If P3 = 3 and P15 = Yes
1	274.1	Machine current input			
1	274.2	Current input (module 1)			If P3 = 3 and P15 = Yes
1	274.3	Current input (module 2)			If P3 = 3 and P15 = Yes
1	275.1	Machine power input			P15 = Yes
1	275.2	Power input (module 1)			If P3 = 3 and P15 = Yes
1	275.3	Power input (module 2)			If P3 = 3 and P15 = Yes
1	276.1	Electricity consumption			P15 = Yes

Access level	No.	Description	Setting	Default	Display conditions
Operation *(continued)*					
1	276.2	Electricity (module 1)			If P3 = 3 and P15 = Yes
1	276.3	Electricity (module 2)			If P3 = 3 and P15 = Yes
1	285	Runtime in heating mode			If P119 ≠ Cooling
1	286	Runtime in cooling mode			If P119 ≠ Heating
1	287	Pump 1 runtime (in hours)			
1	288	Pump 2 runtime (in hours)			
1	289	No. of times P99 set to "No"			
1	290	Number of water flow cut-offs in 1 hour			Visible in cooling mode
Circuit 1					
1	300	Circuit 1 HP			
1	300.1	Circuit 1 HP control setpoint			If P2 = Air-to-water and P3 = 1 or 2
1	301	Circuit 1 condensing temperature	See appendix		
1	302.1	Discharge temperature 1			
1	303.1	Desuperheat on discharge 1	P302.1 - P 301		
1	304	Circuit 1 LP			
1	305	Circuit 1 evaporating temperature	See appendix		
1	306	Circuit 1 suction temperature	(°C)		
1	307	Circuit 1 superheat	(°C)		
1	309	No. of LP1 cut-outs in 24 hours			
1	316	No. of circuit 1 start-ups			
1	317	Circuit 1 runtime (in hours)			
1	318	Circuit 1 short-cycle protection			
1	324.1	No. of discharge 1 temp. cut-outs in 24 h			
1	326	Circuit 1 liquid temperature	(°C)		If P2 = 1 or 2 or (3 + cooling mode)
1	327	Circuit 1 subcooling	(°C)		If P2 = 1 or 2 or (3 + cooling mode)
Circuit 2					
1	330	Circuit 2 HP			If P2 = Air-to-water and P3 = 2
1	330.1	Circuit 2 HP control setpoint			If P3 = 2 and ≠Intertwined
1	331	Circuit 2 condensing temperature	See appendix		If P3 = 2
1	332.1	Discharge temperature 2	(°C)		
1	333.1	Desuperheat on discharge 2	P332.1 - P 331		
1	334	Circuit 2 LP			If P3 = 2
1	335	Circuit 2 evaporating temperature	See appendix		If P3 = 2
1	336	Circuit 2 suction temperature	(°C)		P3 = 2
1	337	Circuit 2 superheat	(°C)		P3 = 2
1	339	No. of LP2 cut-outs in 24 hours			If P3 = 2
1	346	No. of circuit 2 start-ups			
1	347	No. of circuit 2 runtime (in hours)			
1	348	Circuit 2 short-cycle protection			
1	354	No. of circuit 2 discharge temperature cut-outs in 24 hours			
1	354.1	No. of discharge 2 temperature cut-outs in 24 hours			
1	356	Circuit 2 liquid temperature	(°C)		
1	357	Circuit 2 subcooling	(°C)		
Circuit 3 display					
1	360	Circuit 3 HP			If P2 = Air-to-water and P3 = 3
1	361	Circuit 3 condensing temperature			If P3 = 3
1	362	Circuit 3 discharge temperature			If P3 = 3
1	363	Circuit 3 discharge desuperheat	P363 - P362		If P3 = 3
1	364	Circuit 3 LP			If P3 = 3
1	365	Circuit 3 evaporating temperature			If P3 = 3
1	366	Circuit 3 suction temperature			If P3 = 3
1	367	Circuit 3 superheat	P366 - P365		If P3 = 3

Access level	No.	Description	Setting	Default	Display conditions
Circuit 3 display *(continued)*					
1	369	No. of LP3 cut-outs in 24 hours			If P3 = 3
1	370	No. of circuit 3 start-ups			If P3 = 3
1	371	Circuit 3 runtime (in hours)			If P3 = 3
1	372	Circuit 3 short-cycle protection			If P3 = 3
1	384	No. of circuit 3 discharge temperature cut-outs in 24 hours			
1	386	Circuit 3 liquid temperature	(°C)		If P3 = 3
1	387	Circuit 3 subcooling	(°C)		If P3 = 3
			INPUTS		
1	400	Automatic operation control of machine	Open/Closed		
1	401	Automatic operation control of water pump	Open/Closed		
1	402	Setpoint 1 / Setpoint 2 selection	Open/Closed		If P120 = 2 via on/off
1	403	Water flow check	Open/Closed		
1	404	Fan fault check	Open/Closed		If P2 = 2
1	405	Cooling/Heating input check	Open/Closed		If P119 = 4
1	406.1	Circuit 1/2 phase controller	Open/Closed		
1	406.2	Circuit 3 phase controller	Open/Closed		If P3 = 3
1	407	Recovery operating mode selection	Open/Closed		If P29 = Yes
1	408	Pump 1 check	Open/Closed		If P24 = Yes
1	409	Pump 2 check	Open/Closed		If P24 = Yes and P25 = 2
1	410	Emergency stop check (remote condenser)	Open/Closed		If P2 = 2
1	411	Customer check (unassigned input)	Open/Closed		
1	412	Compressor 1 fault check	Open/Closed		
1	413.1	Compressor 1 load shedding input check	Open/Closed		
1	418	Manual HP1 pressure switch input check	Open/Closed		
1	421	Compressor 2 fault check	Open/Closed		
1	422	Manual HP2 pressure switch input check	Open/Closed		If P3 = 2
1	425	Compressor 3 fault check	Open/Closed		If P3 = 3
1	426	Compressor 3 load shedding input check	Open/Closed		If P3 = 3
1	427	Manual HP3 pressure switch check	Open/Closed		If P3 = 3
			OUTPUTS		
1	447	Circuit 1 HP control drive voltage	0-10V		If 21 ≠ 1
1	448	Circuit 2 HP control drive voltage	0-10V		If 21 ≠ 1
1	449	Circuit 3 HP control drive voltage	0-10V		If 21 ≠ 1 and P3 = 3
1	450	Water pump 1 state			
1	451	Water pump 2 state			
1	455	State of evaporator's electric defrost heater			
1	456	Pipe heat trace cable state			If P24 = Yes
1	457	State of hydraulic module's electric defrost heater			If P24 = Yes
1	460	State of circuit 1 fan stage 1			If P2 = 2
1	461	State of circuit 1 fan stage 2			If P2 = 2
1	462	State of circuit 1 fan stage 3			If P2 = 2
1	463	State of circuit 1 fan stage 4			If P2 = 2 and P8 > 2500
1	464	State of circuit 1 fan stage 5			If P2 = 2 and P8 > 2500
1	465	State of circuit 1 fan stage 6			If P2 = 2 and P8 > 2800
1	466	State of compressor 1 winding 1			
1	467	State of compressor 1 winding 2			
1	470	Compressor 1 reset			
1	471	Compressor 1 intake valve state			
1	472	Compressor 1 exhaust valve state			
1	473	Circuit 1 liquid valve state			
1	474	Circuit 1 HPS valve state			
1	475	State of circuit 2 fan stage 1			If P2 = 2
1	476	State of circuit 2 fan stage 2			If P2 = 2

Access level	No.	Description	Setting	Default	Display conditions
			OUTPUTS (continued)		
1	477	State of circuit 2 fan stage 3			If P2 = 2
1	478	State of circuit 2 fan stage 4			If P2 = 2 and P8 > 2500
1	479	State of circuit 2 fan stage 5			If P2 = 2 and P8 > 2500
1	480	State of circuit 2 fan stage 6			If P2 = 2 and P8 > 2800
1	481	State of compressor 2 winding 1			
1	482	State of compressor 2 winding 2			
1	485	Compressor 2 reset			
1	486	Compressor 2 intake valve state			
1	487	Compressor 2 exhaust valve state			
1	488	Circuit 2 liquid valve state			
1	489	Circuit 2 HPS valve state			
1	490	State of circuit 3 fan stage 1			If P2 = 2 and P2 = 3
1	491	State of circuit 3 fan stage 2			If P2 = 2 and P2 = 3
1	492	State of circuit 3 fan stage 3			If P2 = 2 and P2 = 3
1	493	State of circuit 3 fan stage 4			If P2 = 2 and P2 = 3
1	494	State of circuit 3 fan stage 5			If P2 = 2 and P2 = 3
1	495	State of circuit 3 fan stage 6			If P2 = 2 and P2 = 3
1	496	State of compressor 3 winding 1			If P3 = 3
1	497	State of compressor 3 winding 2			If P3 = 3
1	500	Compressor 3 reset			If P3 = 3
1	501	Compressor 3 intake valve state			If P3 = 3
1	502	Compressor 3 exhaust valve state			If P3 = 3
1	503	Circuit 3 liquid valve state			If P3 = 3
1	504	Circuit 3 HPS valve state			If P3 = 3
1	555	CPU version number			
1	556	Console version number	*		
1	557.2	ADD3 board version number			If P3 = 3
1	557.3	ADD3 board version number (circuit 3)			If P3 = 3
1	557.4	ADD1 board version number (circuit 3)			P3 = 3
1	570	"SO" order number			To be entered via a PC
1	571	MO number			To be entered via a PC
1	572	Machine identification name			To be entered via a PC
1	573	Machine identification number			To be entered via a PC
			COMMUNICATION		
1	700	Communication protocol	ModBus	ModBus	
1	701	Transmission speed	Jbus: 4800 or 9600 baud (adjustable)	9600 baud	
1	702	Parity	Without, even or odd	Without	
1	703	Number of stop bits	1 or 2	1	
1	704	Swapped real number format	Yes or No	YES	
1	705	Bus Number	0 to 255	1	
			MASTER/SLAVE (2 MACHINES)		
2	800	Master machine on loop	Yes/No	No	If P28 = Yes
2	801	Backup machine	Yes/No	No	If P28 = Yes
2	802	Switch backup machine	Yes/No	No	If P28 = Yes
2	803	Name of backup machine	Master/Slave	Slave	If P28 = Yes
2	804	Loop control mode	CASCADE or PARALLEL or PROGRESSIVE	CASCADE	If P28 = Yes
2	805	Machine differential	0.5 to 5°C	1.5	If P28 = Yes
2	806	Differential between machines	1 to 10°C	4.0	If P28 = Yes
2	807	Maximum differential, additional machine	1 to 10°C	0.0	If P801 = Yes
2	808	Time delay between machines	0 to 60 min.	1	If P28 = Yes
2	809	Machine 1 'on' authorisation	Yes/No	Yes	If P28 = Yes
2	810	Machine 2 'on' authorisation	Yes/No	Yes	If P28 = Yes
2	811	Pump turned off by control	No Yes, except for one Yes: stop machine	No	

5 CONTENTS OF THE MENUS

The list of parameters as well as the parameter values will scroll faster and faster if you press and hold down the **+** or **–** the button.
To access a numbered submenu from the main menu, simply place the cursor on the corresponding line with the **+** or the **–** button then press **OK**.
Important: In certain cases the last letter in a message may be replaced by an arrow.

5.1 Main menu

Use the cursor to move from one menu to the next.
Press the **+** button to increment values and the **-**button to decrement them.

```
1 - S E T P O I N T S
2 - U N I T   S T A T U S

3 - M E A S U R E D   V A L U E S
4 - U N I T   P A R A M E T E R S

5 - A D J U S T M E N T   P A R A M E T E R S
6 - R E A D I N G   P A R A M E T E R S

7 - F A U L T   M E M O R Y
8 - T E S T   M O D E

9 - T I M E   S C H E D U L E S
1 1 -   C O M M U N I C A T I O N

1 2 -   M A S T E R / S L A V E
1 3 -   A E R O - C O N N E C T

1 4 -   A C C E S S   L E V E L   S E L E C T .
```

5.2 Setpoint menu

This menu gives quick access to settings for the control setpoints depending on the control mode and the selected operating mode. To move from one parameter to another, press **+ or**–. The letter P flashes when a parameter is selected. To change the value, press **OK**. The value can be changed once it starts flashing.
Press **+** to increase the value or **–** to decrease it.
When finished, press **OK** to confirm or **ESC** to cancel the changes.
When returning to menu 1 the last parameter consulted is displayed.

```
P 1 2 1   C O O L I N G   S E T P O I N T   1
                         - x x . x °
P 1 2 2   C O O L I N G   S E T P O I N T   2
                         - x x . x °
P 1 2 3   H E A T I N G   S E T P O I N T   1
                         - x x . x °
P 1 2 4   H E A T I N G   S E T P O I N T   2
                         - x x . x °
```

In access level 1, the setpoint adjustment range is **+** or **–** 5 K lower than that set in a higher access level.

5.3 Unit status menu

The unit status is displayed at power-up and automatically reappears if the console is not used after a period of one hour.
To enter the UNIT STATUS menu, use the **+** or **-** buttons to position the cursor on 2 then press **OK**.
Press **–** to display the following message.

➢ **Table 1**

- If no general faults have occurred and the automatic operation controls are closed.

```
X T R A C O N N E C T 2          h h / m n
I N L E T   T E M P : - x x . x °
S E T P O I N T : - x x . x °              ↓
1 ⊖: O F F   2 ⊖: O N   3 ⊖: ⧖
```

The ↓ arrow appears if there is another message.

- If a general fault corresponding to several faults occurs, the fault messages appear in order of importance.

Example:

```
  U N I T   S T O P
  W A T E R   F L O W   F A U L T
```

- If an automatic operation control or on/off fault occurs.
Example:

```
  U N I T   S T A T U S
  O N / O F F
```

➢ **Unit status table**
- Appears only if a message is displayed
Example:

```
  U N I T   S T A T U S
F A N   F A U L T
```

➢ **Circuit x status table:**
- Appears only if a message is displayed
Example:

```
  C I R C U I T   X   S T O P
  L P x   F A U L T
```

or for a time delay

```
  C I R C U I T   X   S T A T E
A N T I - S H O R T   C Y C L E   X x   m n x x s
```

```
C O M P . X   U N A V A I L A B L E
M I N .   S T O P     x m n x x s
```

5.4 Measured values menu

To access the MEASURED VALUES menu, use the **+** or **–** buttons to position the cursor on 3, then press **OK** (the list of submenus can then be accessed).
Position the cursor on CIRCUIT 2 or CIRCUIT 3 then press **OK**. The values for the circuit selected appear.
Press **+** or **–** to scroll through the tables at a rate of two rows at a time.
Press the **ESC** button to return to the main menu. Example:

If measurement of electrical quantities (option) selected

```
C I R C U I T   2
C I R C U I T   3
```

For circuit 1

Evaporator in cooling mode. Condenser in heating mode.

```
C O O L I N G   I N L E T   C T R L          ↑
S E T P O I N T :                - x x . x ° ↓

W A T E R   I N L E T :          - x x . x ° ↑
W A T E R   O U T L E T :        - x x . x ° ↓

H P 1   x x . x b   T . C O N D 1 . x x . x ° ↑
D I S C H A R G E 1   T . :      - x x . x °
D E S U P E R H E A T   1 :        x x . x ° ↓

L I Q U I D 1   T . :              x x . x ° ↑
S U B C O O L I N G   1 :        - x x . x °
E X T E R N A L   T E M P . :      x x . x ° ↓

L P 1   x x . x b   E V A P . T . 1 - x . x ° ↑
S U C T I O N   1   T . :          x x . x °
S U P E R H E A T   1              x x . x ° ↓

H O T   W A T E R   I N L E T    - x x . x ° ↑
H O T   W A T E R   O U T L E T    - x x . x °
M A N   W A T E R   O U T L E T    x x . x ° ↓

U 1 : x x x V   U 2 : x x x V   U 3 : x x x V ↑
T O T A L   A B S O R B E D   I :    x x A
T O T A L   A B S O R B E D   P :    x x k W ↓
```

Identical for circuit 2, circuit 3 and

5.5 Unit parameters menu

To enter the UNIT PARAMETERS menu, press **+** or **–** to position the cursor on 4 then press **OK**.
The display shows the list of configuration parameters.
Use the **+** and **–** buttons to scroll through the tables at a rate of two rows at a time.
To modify a parameter the configuration must be unlocked (via parameter P99). This turns off the machine.

➢ To change a value:

Press **OK** to enter the parameter.
Use the **+** or **–** buttons to increment or decrement the value of the parameter then press **OK** to confirm the changes.
Press **OK** to save the change to memory.
The square at the bottom right (↓arrow) should flash while the value of a parameter is being changed.
In the case of parameters, the letter **P** flashes.
The text in messages scrolls in a loop. Numerical values (with adjustment ranges), however, do not scroll in a loop.

If a parameter is locked (P99 = yes), the  symbol is displayed at the top left.
To return to the main menu, press the **ESC** button repeatedly.

```
4 - U N I T   P A R A M E T E R S
```

If the user tries to access a locked parameter, the following message appears for 2 seconds then the parameter is redisplayed.

```
P A R A M E T E R   L O C K E D
C A N N O T   B E   C H A N G E D
```

If the user changes the status of a parameter from "LOCKED" to "NO", the text is replaced by **Pxx** and the  symbol disappears.
The following parameters can then be accessed:

P01 Refrigerant type: R134a

```
P01  R E F R I G E R A N T
R 1 3 4 a
```

P02 Unit type: water-to-water or air-to-water.
P03 Number of circuits: number of circuits in the chiller.
P08 Unit size.
P09 Compressor start-up: compressor start-up configuration.
P15 Measurement of electrical quantities: yes or no.
P16 Rating of primary current transformer (module 1)
P17 Rating of secondary current transformer (module 1)
P18 Rating of primary current transformer (module 2)
P19 Rating of secondary current transformer (module 2)
P21 Variable speed drive: whether or not the optional VSD is used and how it is controlled
P24 Hydraulic module: whether or not a hydraulic mode is installed.
P25 Number of pumps: 1 or 2.
P26 0-10 V programmable output: used to control a three-way valve on the hot water circuit
P28 Master/slave control of two parallel-connected units: yes or no.
P29 Total heat recovery on the condenser: yes or no.
PXX HP1/HP2/HP3 sensor high pressure: adjustment of the HP sensors.
PXX HP1/HP2/HP3 sensor low pressure: adjustment of the HP sensors.
PXX LP1/LP2/LP3 sensor high pressure: adjustment of the LP sensors.
PXX LP1/LP2/LP3 sensor low pressure: adjustment of the LP sensors.
P42 Electronic expansion valve.
P43 Superheat protection: enable or disable superheat protection.
P44 Minimum superheat temperature
P45 Maximum superheat temperature
P48 Liquid injection cut-in temperature for reducing the discharge temperature.
P49 Differential for adjusting the injection cut-off temperature.
P51 Discharge temperature limit: determined by the compressor manufacturer.
P52 Water line frost protection limit: determined based on the refrigerant type.
P54 HP control limit: corresponds to the HP control.
P55 LP fault threshold: corresponds to the LP safety.
P56 Minimum discharge superheat temperature: determined by the compressor manufacturer.
P57 HPS cut-out HP value: HPS management.
P61 Liquid valve opening time.
P61 Liquid valve closing time.
P70 Control LP limit.
P99 Parameter lock: locks the machine parameters (set by the manufacturer).

5.6 Adjustment parameters menu

To enter the ADJUSTMENT PARAMETERS menu, press **+** or **–** to position the cursor on 5 then press **OK**.
The display shows the list of control parameters.
The letter **P** flashes. To select a setpoint, press **+** (up) and **–** (down).
Example:

```
Pxx  S T A G E   D I F F
                          x x . x
```

Press **+** or **–** to scroll through the parameters two lines at a time.
To change a value: The bottom right of the screen flashes. Press **+** to raise the value or **–** to lower it.
To return to the main menu, press the **ESC** button repeatedly.

```
5 - A D J U S T M E N T   P A R A M E T E R S
```

P100 Language: used for setting the display language.
P101 Date: used for setting the date.
P102 Time: used for setting the time.
P103 Control mode: used for selecting the control mode (see section 2).
P108 Pump 2 control: used for setting the control mode for pump 2 (see section 9).
P116 Link with AEROCONNECT controller: yes or no.
P117 Power input limit: yes or no.
P118.1 Maximum electrical power level.
P118.2 Electrical power differential.
P119 Operating mode: used for setting the operating mode and its changeover mode.
P120 Number of setpoints: used for setting the number of setpoints (1 or 2) and how they are controlled (see section 17).
P121 Cooling setpoint 1 (see section 17).
P122 Cooling setpoint 2 (see section 17).
P123 Heating setpoint 1 (see section 17).
P124 Heating setpoint 2 (see section 17).
P125.1 4-20 mA low setpoint (section 17).
P125.2 4-20 mA low setpoint (section 17).
P126.1 4-20 mA high setpoint (section 17).
P126.2 4-20 mA high setpoint (section 17).
P127 Adjustment of the cooling setpoint based on the outdoor temperature (see section 17).
P128 Start of drift in cooling mode (see section 17)
P129 End of drift in cooling mode (see section 17)
.

P129 E N D O F C O O L I N G
D R I F T x x °

P130 Setpoint at end of drift in cooling mode (see section 17).
P131 Adjustment of the heating setpoint based on the outdoor temperature (see section 17).
P132 Start of drift in heating mode (see section 17)
P133 End of drift in heating mode (see section 17)
P134 Setpoint at end of drift in heating mode (see section 17).
P141 Control mode: used for setting the control mode for the system supply and return temperature.
P142 Water loop winter safety (see section 10).
P143 Compressor stage differential.
P144 Interstage differential.

Fan management:
P181 HP control setpoint (see section 18).
P182 Outdoor air temperature for forced fan operation (see section 18).
P185 Circuit 1 fan stage differential (see section 18).
P186 Circuit 1 fan interstage differential (see section 18).
P187 Circuit 2 fan stage differential (see section 18).
P188 Circuit 2 fan interstage differential (see section 18).
P189 Circuit 3 fan stage differential (see section 18).
P190 Circuit 3 fan interstage differential (see section 18).
HP control:
P193 Enable HP control shift for recovery on the condensers: yes or no.
P196 Differential requiring return to standard condensing pressure control (see section 18).
P197 Condenser water outlet temperature corresponding to a signal voltage of 0 V for the three-way valve.
P198 Condenser water outlet temperature corresponding to a signal voltage of 10 V for the three-way valve.
P220 Winter protection outdoor temperature (see section 10).
P221 Ambient temperature at which the hydraulic module's defrost heater is turned on (see section 10).
P222 Winter protection outdoor temperature differential (see section 10).
P225 Minimum outdoor temperature below which HEATING is no longer authorised.
P225.1 Maximum outdoor temperature above which COOLING is no longer authorised.
P225.2 Maximum outdoor temperature above which HEATING is no longer authorised.
P225.3 Minimum outdoor temperature below which COOLING is no longer authorised.
P227/P228/P229 Authorisation for compressor stages to turn on.
P145 Proportional coefficient (see section 17).
P146 Integral coefficient (see section 17).
P147 Derivative coefficient (see section 17).
P148 Time coefficient (see section 17).
P149 Additional exhaust coefficient.
P150/P151 Control with compensation (see section 17).
P154 Enable storage control: yes or no.
P155 Storage control differential (see section 17).
P170 Intercircuit start time.
P175 Compressor load shedding (see section 6).

5.7 Reading parameters menu

To enter the READING PARAMETERS menu, press **+** or **–** to position the cursor on **6** then press **OK**.
The display shows the list of reading parameters.
Example:

Pxxx E V A P . W A T E R I N L E T
T E M P . - 1 2 . 5 °

Press **+** or **–** to scroll through the parameters two lines at a time.
The values of these parameters cannot be changed.
To return to the main menu, press the **ESC** button repeatedly.

6 - R E A D I N G P A R A M E T E R S

Important:
The reading parameters menu allows read-only access to all parameters in the other menus and to the following parameters as well:
P250 LED test: used to turn on the console LEDs corresponding to the machine configuration.
P251 Control setpoint: displays the setpoint used by the controller.
P252 P251 Outdoor air temperature.
P253 Evaporator water inlet temperature.
P254.1 Evaporator water outlet temperature (module 1).
P254.2 Evaporator water outlet temperature (module 2).
P257 Condenser water inlet temperature (water-to-water unit).
P258 Condenser water outlet temperature (water-to-water unit).
P261.1 Manifold water outlet temperature.
P261.2 Master/slave water outlet temperature.
P265 Air temperature inside the hydraulic module.
P270 Controller action time delay.
P272 Oil warm-up time.
P273.1 Supply voltage (module 1).

P273.2 Supply voltage (module 2).
P274.1 Machine current input.
P274.2 Current input (module 1).
P274.3 Current input (module 2).
P275.1 Machine power input.
P275.2 Power input (module 1).
P275.3 Power input (module 2).
P276.1 Electricity consumption.
P276.2 Electricity consumption (module 1).
P276.3 Electricity consumption (module 2).
P285 Heating mode runtime (in hours).
P286 Cooling mode runtime (in hours).
P287 Pump 1 runtime (in hours).
P288 Pump 2 runtime (in hours).
P289 Number of times P99 (parameter lock) has been accessed.
P290 Number of water flow switch cut-outs.

• Circuit 1 information:
P300 Circuit high pressure value.
P300.1 Circuit 1 HP control setpoint
P301 Corresponding circuit 1 condensing temperature for the above pressure value.
P302.1 Circuit 1 discharge temperature value.
P303.1 Circuit 1 condenser desuperheat temperature (= discharge temperature – condensation dew point temperature).
P304 Circuit 1 low pressure value.
P305 Corresponding circuit 1 evaporating temperature for the above pressure value.
P306 Circuit 1 compressor suction temperature.
P307 Circuit 1 superheat temperature (circuit 1 suction temperature above – circuit 1 evaporating temperature).
P309 Number of cut-outs caused by a low pressure fault on circuit 1 in 24 hours.
P316 Number of circuit starts.
P317 Circuit 1 runtime.
P318 Circuit 1 short-cycle protection.
P324.1 Number of cut-outs caused by a discharge temperature fault on circuit 1 in 24 hours.

• Circuit 2 information:
P330 to P354 same as P300 to P324.1 but for circuit 2.

• Circuit 3 information:
P360 to P384 same as P300 to P324.1 but for circuit 3.

Inputs:
P400 State of unit automatic operation control input (open or closed).
P401 State of pump automatic operation control input (open or closed).
P402 Setpoint selection input state (1 or 2).
P403 Water flow input state.
P404 Fan fault input state.
P405 Operating mode input state.
P406.1 State of phase controller input (circuits 1 and 2).
P406.2 State of phase controller input (circuit 3).
P408 Pump 1 input state.
P409 Pump 2 input state.
P410 Manual operation input state for unit (remote condenser):
P411 Customer input state (general fault).
P412 Compressor 1 fault input state.
P413.1 State of compressor 1 load shedding input.
P413.2 State of compressor 2 load shedding input.
P413.3 State of compressor 3 load shedding input.
P418 High-pressure switch 1 input state.
P421 Stage 2 fault input state.
P422 High-pressure switch 2 input state.
P425 Stage fault input state.
P426 Stage load shedding input state.
P427 High-pressure switch 3 input state.

Outputs:
P447 Voltage of HP control drive signal for circuit 1.
P448 Voltage of HP control drive signal for circuit 2.
P449 Voltage of HP control drive signal for circuit 3.
P450 Pump 1 contact output state.
P451 Pump 2 contact output state.
P455 State of evaporator defrost heater contact output.
P456 State of pipe heat trace cable contact output.
P457 State of the contact output for the hydraulic module's electric heating elements.
P460/P475/P490 State of circuit 1/2/3 fan stage 1 contact output.
P461/P476/P491 State of circuit 1/2/3 fan stage 2 contact output.
P462/P477/P492 State of circuit 1/2/3 fan stage 3 contact output.
P463/P478/P493 State of circuit 1/2/3 fan stage 4 contact output.
P464/P479/P494 State of circuit 1/2/3 fan stage 5 contact output.
P465/P480/P495 State of circuit 1/2/3 fan stage 6 contact output.
P466/P481/P496 State of compressor 1/2/3 winding 1 contact output.
P467/P482/P497 State of compressor 1/2/3 winding 2 contact output.
P470/P485/P500 Compressor 1/2/3 reset contact.
P471/P486/P501 Compressor 1/2/3 intake valve contact.
P472/P487/P502 Compressor 1/2/3 exhaust valve contact.
P473/P488/P503 Circuit 1/2/3 liquid valve contact.
P474/P489/P504 Circuit 1/2/3 HPS valve contact.
P555 CPU version number.
P556 Console version number.
P557.2 ADD3 board version number.
P557.3 ADD3 board version number (circuit 3).
P557.4 ADD1 board version number (circuit 3).
P570 "SO" order number.
P571 MO number.
P572 Machine identification name.
P573 Machine identification number.

5.8 Fault memory menu

This menu records the last 20 faults on the machine and the associated values measured at the time the faults occurred.
To enter the FAULT MEMORY menu, use the **+** or **–** buttons to position the cursor on 7 then press **OK**.
The list of faults appears on the display. The top left of the screen flashes first, followed by the line being queried. Press the **+** or **–** buttons to scroll through the faults.
Accessing the fault memory.

```
7 - H P 1   P R E S S U R E   S W I T C H
  X x / x x / x x x x   x x H x x
```

Below is a list partial of fault memory messages for all fault types (main circuit fault, main unit fault, temporary fault).
Important: Faults can be manually reset from this menu only.

```
x - P O W E R   C U T
x - P H A S E   C O N T R O L L E R
x - W A T E R   F L O W
x - A N T I F R E E Z E / W A T E R
x - P U M P   X   F A U L T
```

```
x - EMERGENCY  STOP
x - CUSTOMER  FAULT
x - CIRCUIT  HP  x
x - CIRCUIT  LP  x
x - COMPRESSOR  MOTOR  X
x - LUBRICATION  X
x - DISCHARGE  T.  CIRC.  X
x - DESUPERHEATING  x
x - MIN.  OVERHEAT  CX
x - MAX.  OVERHEAT  CX
x - FAN
x - EVAP.  INLET  SENSOR
x - EVAP.  OUTLET  SENSOR
x - INLET  COND.  SENSOR
x - OUTLET  COND.  SENSOR
x - DISCHARGE  SENSOR  X
x - SUCTION  SENSOR  X
x - HYDRAUL.MOD.  SENSOR
x - EXTERNAL  T.SENSOR
x - EXPANS  VALVE  FAULT  X
x - ADD3  BOARD  LINK  FAULT
x - LP  X  SENSOR
x - HP  X  SENSOR
FAULT  MEMORY  EMPTY
```

To access measured values when a fault occurred, press **OK**.
Press **+** or **–** to scroll through the faults line by line. To go back to the main menu, press the **ESC** button until the menu appears.
Reading for saving faults to memory.

```
HPx:xx.xb  LPx:xx.xb
DIS:xxx°  DESUP:xx°
```

{ If a circuit fault occurs

```
EVAP  WATER  IN  T  -xx.x°
EVAP  WATER  OUT  T  -xx.x°
```

```
CDR  WATER  IN  T  -xx.x°
CDR  WATER  OUT  T  -xx.x°
```

{ If P2 = 1

```
SETPOINT:-xx.x°
EXTERNAL  TEMP.:-xx.x°
```

5.9 Test mode menu

TEST mode makes it possible to shorten the time delays (without deactivating the protections) as well as jump the control whilst forcing the stages.
The other menus (measured values, parameters, fault memory, etc.) can be accessed while in test mode.
During test mode, a 'TEST MODE ON' message is sent to the other control modes (remote control console, BMS, modems, etc.) and the modes are disabled.
Accessing TEST mode via menu 8 on the local console.
Display:

```
TEST  MODE
                                  YES
TEST  MODE
                                  NO
```

Use **+** or **–** to select Yes or No. Press **OK** to confirm your choice.
The Power LED flashes (75-25) when Yes is selected.
If compressor forcing (intake or exhaust) is selected) :

```
COMP  1  TEST
COMP  2  TEST  YES
COMP  3  TEST
```

Select the desired compressor. Confirm by pressing **OK**.

```
  CIRCUIT  X  TEST
+:INTAKE  EXHAUST:
```

To run the compressor at full capacity (100%), press **+** . The word •intake• flashes if the intake valve is open.
To run the compressor at half capacity (50%), press **–** . The word •exhaust• flashes if the exhaust valve is open.
If the compressor is off: compressor started then adjusted to the desired capacity (full load or half load)
The following message appears if the compressor cannot be started (2 minute off time; fault; forced stop):

```
  C I R C U I T   X   T E S T
  M A C H I N E   S T O P P E D
  M A C H I N E   A U T O   O P E N
  P U M P   A U T O   O P E N
  C O M P   X   N O T   A V A I L A B L E
  P U M P   S T A R T - U P
```

Line 2 on LCD

To go back to the previous table and exit test mode, press **OK**:
Enter "No" in all the submenus in menu 8.
Note: The machine will automatically return to automatic mode if no buttons are pressed on the console for 1 hour.

➢ **Checking the direction of rotation of the compressors**
Go to the TEST MODE menu:

```
T E S T   M O D E
                                        Y E S
T E S T   M O D E
                                        N O
```

Select Yes. Confirm by pressing **Enter**.
The Power LED flashes (75-25) when Yes is selected.
Select the MEASURED VALUES menu
Press **OK** to confirm your choice.

```
C I R C U I T   1
C I R C U I T   2
```

Select the desired circuit then press **OK** to confirm your choice.
Using the **+** or **–** buttons, scroll through the tables until the following table appears (circuit 1 in this example:

```
L P 1   x x . x b   E V A P . T . 1 x x . x ° ↑
S U C T I O N   T .   x :   x x . x °
S U P E R H E A T   1   x x . x ° •
```

Then proceed as follows:
Press the Cooling/Heating button followed by the **+** button (the buttons must be pressed in this order).
Voltage is applied to the star contactors for 1 second.
Read the low pressure directly on the console. If it drops, the direction of rotation is correct. If not, check the power supply wiring.
This function is available in all operating states (even if faults occur)

5.10 TIME SCHEDULES menu

To enter the TIME SCHEDULES menu, use the **+** or **-** buttons to position the cursor on **9** then press **OK**.
The display shows the two submenus below:

```
  T I M E   S C H E D U L E S
  H O L I D A Y   B A N D S
```

To return to the main menu, press the **ESC** button repeatedly.

```
9 - T I M E   S C H E D U L E S
```

The adjustment and operation of this function are explained in the TIME SCHEDULES section.

5.11 COMMUNICATION Menu

To enter the COMMUNICATION menu, use the **+** or **-** buttons to position the cursor on **11** then press **OK**.
The display shows the list of communication parameters. Example:

```
P x x x   C O M M U N I C A T I O N
M O D B U S   P R O T O C O L
```

Press **+** or **–** to scroll through the parameters two lines at a time.
To change a value: The bottom right of the screen flashes. Press **+** to raise the value or **–** to lower it).
To return to the main menu, press the **ESC** button repeatedly.

```
1 1 - C O M M U N I C A T I O N
```

P700 Communication protocol.
P701 Transmission speed.
P702 Parity.
P703 Number of stop bits.
P704 Swapped real number format.
P705 Bus number.

5.12 MASTER/SLAVE menu

The MASTER/SLAVE menu is accessible only if P128 = Yes. Use the **+** or **–** buttons to position the cursor on **12** then press **OK.**
The display shows the list of master/slave parameters.
Example:

```
P x x x   M A S T E R   M A C H I N E
O N   L O O P   x x x
```

Press **+** or **–** to scroll through the parameters two lines at a time.
To change a value: The bottom right of the screen flashes. Press **+** to raise the value or **–** to lower it)
To return to the main menu, press the **ESC** button repeatedly.

```
1 2 - M A S T E R / S L A V E
```

P800 Designation of the master machine on the loop.
P801 Usage of a backup machine (yes or no).
P802 Usage of the backup machine changeover function (yes or no).
P803 Name of the backup machine.
P804 Loop control mode.
P805 Machine control differential.
P806 Intermachine control differential.
P807 Maximum differential for starting the additional machine.
P808 Time delay between machines.
P809 Authorise machine 1 to operate (yes or no).

5.13 AERO-CONNECT menu

To enter the AERO-CONNECT menu while P116 = Yes, use the **+** or **-** buttons to position the cursor on 13 then press **OK**.
The display shows all the Aero-connect parameters in read and write modes.
- The Aero-connect parameters are preceded by the letter **A** to differentiate them from the Xtraconnect 2 parameters.
- If a dry cooler equipped with its Aero-connect console is connected to Xtraconnect 2 and P116 is set to 'Yes', neither console has priority over the other.
- If menu 13 remains open for 1 hour and no buttons are pressed during this time, the screen switches to the Xtraconnect 2 display.
- Parameter A99 (lock parameters) cannot be set to 'No' via the Xtraconnect 2 console.
- Parameter A116 (CIAT water chiller link) is not accessible via the Xtraconnect 2 console because setting A116 to 'No' will cut the link with the console.
- Parameter A250 is not accessible because the LED test on the Xtraconnect 2 console is performed via parameter P250 on Xtraconnect 2.
- The forced fan operation function on the console is not accessible via the Xtraconnect 2 console.

To return to the main menu, press the **ESC** button repeatedly.

```
1 3 - A E R O - C O N N E C T
```

5.14 ACCESS LEVEL SELECTION menu

To access the ACCESS LEVEL SELECTION menu, use the **+** or **–** buttons to position the cursor on 14 then press **OK**.
The display shows the submenus below:

```
C O N T R O L L E R   A T   L E V E L   x
1 4 - 1   L E V E L   2   A C C E S S
1 4 - 2   L E V E L   3   A C C E S
```

To return to the main menu, press the **ESC** button repeatedly.

```
1 4 -   A C C E S S   L E V E L   S E L E C T .
```

Selecting access levels and navigating from one access level to another are explained in the ACCESS LEVEL section.

6 MANAGEMENT OF THE ON/OFF INPUTS

6.1 Automatic machine operation control

This input allows the customer to remotely disable the machine. However, it does not disable the pumps.
- The On/Off LED flashes when this control is on.
- Message displayed: SHUT OFF BY AUTOMATIC OPERATION CONTROL.

Contact state: closed or connected by a jumper (automatic machine operation control = Yes)

6.2 Automatic water pump control

This input allows the pumps to be remotely disabled. Disabling the pumps automatically disables the machine as well.
- The On/Off LED flashes when this control is on.
- Message displayed: SHUT OFF BY AUTOMATIC PUMP CONTROL.

Contact state: closed or connected by a jumper (automatic pump control = Yes)

6.3 Load shedding control

The load shedding controls on the motherboard shut off circuits 1 and 2.
The load shedding input on expansion board 1 of module 2 disables the operation of circuit 3.
The circuit to be shut off will be selected:
- Either by means of runtime balancing, i.e. the controller will turn off the stages that have been running the longest (P175 = automatic).
- Or selectively (P175 = Selective). For example: Input 1/Circuit 1, Input 2/Circuit 2 and Input 3/Circuit 3.

This is an NO contact.

```
      C I R C U I T   X   S T O P
          L O A D   S H E D D I N G
```

The stages can also be load-shed over the Modbus network, either by shutting them down (bits 515, 517 and 519), or by lowering them to minimum capacity (P516, P518 and P520). For more information, see the communication protocol section at the end of this document.
- If P175 = Selective, the circuit(s) are load-shed (via information from the bus or the on/off input).
- If P175 = Automatic, the circuits will be shut off by the greatest number of inputs between the on/off inputs and the Bus.

Load shedding is cancelled if no information is sent by the bus for more than 6 hours.

6.4 Water flow switch

This on/off input detects a low water flow through the evaporator of the machine that is operating (automatic machine control input closed).

➢ Operation in cooling mode:

- This input must be read 10 second after pump 1 is started (or pump 2 if P24 = Yes and P25 = 2. Case of CIAT hydraulic module with two pumps).
- If the contact is open for more than 3 seconds.

► **If ≤ 3 shutdowns occur in 1 hour**

● **If a fault occurs:**
- Pumps turned off.
- Compressors turned off.
- 3-minute time delay
- Fault stored in fault memory.
- Machine and circuit fault output off.
- Water flow fault relay on optional board in Off position.
- General fault led on console flashes.
- Number of faults over a 1-hour period managed.

Display:

```
  W A T E R   F L O W   F A U L T
    X   S T O P   I N   1 H
```

► **If > 3 shutdowns occur in 1 hour**

● **If a fault occurs:**
- Pumps turned off.
- Compressors turned off.
- Fault stored in fault memory.
- Machine and circuit fault output on.
- Water flow fault relay on optional board in On position.
- General fault LED on console lit steadily.
- Number of faults over a 1-hour period managed.

Display:

```
      U N I T   S T O P
  W A T E R   F L O W   F A U L T
```

● **Resetting:**
- If the number of faults in 1 hour ≤ 3, the fault is automatically acknowledged at the end of the 3-minute time delay.
- If the number of faults in 1 hour > 3, press **RESET** on the console to acknowledge the fault.

➢ Operation in heating mode:

- This input must be read 10 seconds after pump 2 is started.

● **If a fault occurs:**
- Compressors turned off.
- Fault stored in fault memory.
- Machine and circuit fault output on.
- Water flow fault relay on optional board in On position.
- General fault LED on console lit steadily.

Display:

```
      U N I T   S T O P
  W A T E R   F L O W   F A U L T
```

● **Resetting:**
- The fault is automatically acknowledged when the input closes

Important: the pumps are protected in cooling mode only, the only case where pumps are supplied by CIAT (POWERCIAT currently)

6.5 Phase controller fault

The phase controller protects the entire machine. It must be wired to terminals 7-8 on terminal block J5 on the motherboard.
The machine is shut off when a fault occurs on the phase controller (contact opens.
Fault message:

```
   M A C H I N E   S T O P P E D
 P H A S E   C O N T R O L L E R   F A U L T
```

● If a fault occurs:
- Fault stored in fault memory.
- Relay in On position.
- Phase control fault relay on relay board in On position.
- General fault LED on console lit steadily.

● Resetting:
- A 2-minute time delay starts when this input opens.
- When the time delay elapses, the fault is acknowledged if the contact is closed. The input is not read during this time delay.

Message in fault memory :

```
X - P H A S E   C O N T R O L L E R
```

6.6 Pump 6 fault

➢ **If P24 = No** (unit without hydraulic module)
- Pump faults are not managed.

➢ **If P24 = Yes and P25 = 1** (unit with hydraulic module and one pump)

● Operation :
- Detected by opening of contact.

● If a fault occurs:
- Compressors turned off.
- Machine and circuit fault output on.
- Pump fault relay on optional board in On position.
- General fault LED on console lit steadily.

Display:

```
      U N I T   S T O P
      P U M P   X   F A U L T
```

● Resetting:
- Once the input closes, acknowledge the fault by pressing **RESET** on the console.

➢ **If P24 = Yes and P25 = 2** (unit with hydraulic module and two pumps)

● Operation :
- Detected by opening of contact (one per pump)

● If a fault occurs on a pump:
- Compressors turned off.
- Restart with second pump after 10 seconds (unless pump already off).
- Machine and circuit fault output on.
- Pump fault relay on optional board in On position.
- General fault led on console flashes.

Display:

```
      P U M P   X   F A U L T
S T A N D B Y   P U M P   O N
```

● Resetting:
- Once the input closes, acknowledge the fault by pressing **RESET** on the console.

● If a fault occurs on both pumps:
- Compressors turned off.
- Machine and circuit fault output on.
- Pump fault relay on optional board in On position.
- General fault and circuit fault LEDs on console lit steady.

Display:

```
      U N I T   S T O P
      P U M P   F A U L T
```

6.7 Emergency stop (split system unit and dry cooler.

● Operation:
- This input is used for split-system units and dry coolers.

● If a fault occurs:
- Compressors turned off.
- Fans turned off.
- Machine and circuit fault output on.

- Emergency stop fault relay on optional board in On position.
- General fault LED on console lit steadily.
Display:

```
      U N I T   S T O P
      E M E R G E N C Y   S T O P
```

● Resetting:
- Once the input closes, acknowledge the fault by pressing **RESET** on the console.

6.8 Fan fault (circuits 1, 2 and 3)

● Operation :
- As the fan faults are wired in series, there is only one fan fault input (available only if P2 = air-to-water).

● If a fault occurs:
- Compressor remains on.
- Other fans remain on.
- Machine fault output on.
- "Fault on 3 circuits" output on.
- Fan fault relay on optional board in On position.
- General fault LED on console flashes.

Display:

```
F A N   F A U L T
```

● Resetting:
- The fault is automatically acknowledged when the input closes.

6.9 External fault

● Operation :
- This on/off input is reserved for immediately shutting off the machine in the event of adverse conditions (overvoltage, undervoltage, etc.).

● If a fault occurs:
- Compressors turned off.
- Pumps turned off.
- Machine and circuit fault output on.
- General fault LED on console lit steadily.

Display:

```
U N I T   F O R C E D   S T O P
    E X T E R N A L   F A U L T
```

● Resetting:
- The fault is automatically acknowledged after 2 minutes.

6.10 Compressor 1, 2 or 3 protection ("SE" box)

● Operation :
- The reset outputs on the "SE" protection box are enabled when power is applied to the board.
- These three inputs monitor the operation of each compressor.
- They are associated with the operation of their respective circuits (phase loss - rotation - winding temperature - discharge temperature).

● If a fault occurs:
- Compressor turned off.
- Compressor X protection fault relay on optional board in On position.
- Circuit LED on console lit steadily.

Display:

```
      C I R C U I T   X   S T O P
C O M P R E S S O R   S A F E T Y
```

● Resetting:
- The fault is acknowledged pressing the **RESET** button. The compressor X reset output on the circuit opens for 5 seconds then is read 5 seconds later.

6.11 Discharge fault on circuit 1, 2 or 3

● Operation :
- This information is sent by a sensor on the discharge pipe. The maximum discharge temperature is set in parameter P51.

► If < 5 shutdowns occur in 24 hours

● If a fault occurs:
- Compressor turned off.
- 5-minute time delay (disabled in test mode)
- Circuit fault output off.
- Circuit X discharge temperature fault relay on optional board in Off position.
- Circuit fault LED on console flashes.
- The number of faults over a 24 hour period is managed.

Display:

```
D I S C H . T E M P   T O O   H I G H
    X   S T O P   I N   2 4   H
```

► If ≥ 5 shutdowns occur in 24 hours

● If a fault occurs:

- Compressor turned off.
- Circuit fault output on.
- Circuit X discharge temperature fault relay on optional board in On position.
- Circuit LED on console lit steadily.
- The number of faults over a 24 hour period is managed.

Display:

```
      C I R C U I T   X   S T O P
  D I S C H A R G E   F A U L T
```

● Resetting:

- If the number of faults in 24 hours < 5, the fault is automatically acknowledged provided the discharge temperature ≤ P51 –20°C and the 5-minute time delay has elapsed.
- If the number of faults in 24 hours ≥ 5, the fault is acknowledged provided the discharge temperature ≤ P51 –20°C and the **RESET** button on the console is pressed.

6.12 High-pressure switch fault on circuit 1, 2 or 3

● Operation :

- These three inputs monitor the state of the HP pressure switches on each refrigerating circuit.
- They are associated with the operation of their respective circuits.
- They are read 3 seconds after the compressor starts up (due to wiring)

● If a fault occurs:

- Compressor turned off.
- Circuit fault output on.
- Circuit X HP fault relay on optional board in On position.
- Circuit LED on console lit steadily.

Display:

```
      C I R C U I T   X   S T O P
            H P   X   F A U L T
```

● Resetting:

- Reset the high-pressure switch manually then acknowledge the fault by pressing **RESET**.

6.13 LP fault on circuit 1, 2 or 3

● Operation :

- If the pressure measured by the LP pressure transmitter is ≤ P55, the Xtraconnect 2 controller records an LP fault.
- The low pressure is monitored 120 seconds after the compressor starts up (it is also monitored when the compressor is stopped).

► If < 3 shutdowns occur in 24 hours

● If a fault occurs:

- Compressor turned off.
- Circuit fault output off.
- Circuit X LP fault relay on optional board in Off position.
- Circuit fault LED on console flashes.
- The number of faults over a 24 hour period is managed.

Display:

```
C I R C U I T   X   L P   F A U L T
    X   S T O P   I N   2 4 H
```

► If ≥ 3 shutdowns occur in 24 hours

● If a fault occurs:

- Compressor turned off.
- Circuit fault output on.
- Circuit X LP fault relay on optional board in On position.
- Circuit fault LED on console lit steadily.
- The number of faults over a 24 hour period is managed.

Display:

```
      C I R C U I T   X   S T O P
          L P   X   F A U L T
```

● Resetting:

- If the number of faults in 24 hours < 3, the fault is automatically acknowledged provided LP > P55 + 1b.
- If the number of faults in 24 hours ≥ 3, the fault is acknowledged provided the LP > P55 + 1b. and the RESET button on the console is pressed.

6.14 Minimum desuperheat discharge fault

• Operation:
- This function monitors the compressor desuperheat temperature (prevents slugging).
- The minimum superheat temperature is calculated by the following equation: (discharge temperature – condensing temperature).
- The minimum superheating discharge threshold is stored in parameter P56.
- The fault is taken into account 15 minutes after the compressor is turned on. The compressor is stopped if desuperheat is < P56 and superheat is < 4 K for 1 minute.

• If a fault occurs:
- Compressor turned off.
- Circuit fault output on.
- Circuit X discharge minimum superheat fault relay on optional board in On position.
- Circuit fault LED on console lit steadily.

Display:

```
    C I R C U I T   X   F A U L T
M I N .   D E S U P E R H E A T
```

• Resetting:
- Press **RESET** to acknowledge the fault.

6.15 Electronic expansion valve fault

• Operation:
- This input is used only if the optional electronic expansion valve is installed (P42 = Yes).
- The circuit is turned off when the input closes.

► If < 3 shutdowns occur in 24 hours

• If a fault occurs:
- Compressor turned off.
- Circuit fault output off.
- Fault stored in fault memory.
- Circuit fault LED on console flashes.
- The number of faults over a 24 hour period is managed.

Display:

```
  E X P A N S . V A L V E   F A U L T
    X   S T O P ( S )   I N   2 4 H
```

► If ≥ 3 shutdowns occur in 24 hours

• If a fault occurs:
- Compressor turned off.
- Circuit fault output on.
- Fault stored in fault memory
- Circuit fault LED on console lit steadily.
- The number of faults over a 24 hour period is managed.

Display:

```
      C I R C U I T   X   S T O P
  E X P A N S . V A L V E   F A U L T
```

• Resetting:
- If the number of faults in 24 hours < 3, the fault is automatically acknowledged after 120 seconds and the fault input opens.
- If the number of faults in 24 hours • 3, the fault is acknowledged via the **RESET** button on the console and the fault input opens.

6.16 Lubrication fault

• Operation:
- This function checks for proper compressor lubrication by monitoring the oil pressure (HP-LP) over two separate stages.

• Fault after 1 minute

- The first check for this fault is taken into account 1 minute after the compressor starts if HP-LP < 1 bar for 5 seconds (fault not managed when compressor off).

• If the first fault occurs at start-up :
- Compressor turned off.
- 16-minute time delay
- Circuit fault output off.
- Fault stored in fault memory
- Circuit X lubrication fault relay on optional board in Off position.
- Circuit fault LED on console off.
- Compressor restarted in short-cycle protection mode.

• If another fault occurs after start-up:
- Compressor turned off.
- Circuit fault output on.
- Fault stored in fault memory.
- Circuit X lubrication fault relay on optional board in On position.
- Circuit fault LED on console lit steadily.

Display:

```
      C I R C U I T   X   S T O P
L U B R I C A T I O N   F A U L T
```

• Resetting:
- The first fault is automatically acknowledged after 16 minutes.
- Press **RESET** to acknowledge the second fault.

► **Fault after 3 minutes** (P2 = 2 and outdoor temperature below –10°C)
- The second check for this fault is taken into account 3 minutes after the compressor starts if HP-LP < 3 bar for 5 seconds (fault not managed when compressor stopped).

● When this fault occurs:
- Compressor turned off.
- Circuit fault output on.
- Fault stored in fault memory.
- Circuit X lubrication fault relay on optional board in On position.
- Circuit fault LED on console lit steadily.

Display:

```
      C I R C U I T   X   S T O P
L U B R I C A T I O N   F A U L T
```

● Resetting:
- Press **RESET** to acknowledge the fault.

► **Fault after 10 minutes**
- The second check for this fault is taken into account 10 minutes after the compressor starts if HP-LP < 3 bar for 5 seconds (fault not managed when compressor stopped).

● When this fault occurs:
- Compressor turned off.
- Circuit fault output on.
- Fault stored in fault memory.
- Circuit X lubrication fault relay on optional board in On position.
- Circuit fault LED on console lit steadily.

Display:

```
      C I R C U I T   X   S T O P
L U B R I C A T I O N   F A U L T
```

● Resetting:
- Press **RESET** to acknowledge the fault.

6.17 Minimum and maximum superheat fault

The superheat temperature on the suction end of each circuit is monitored by comparing the LP saturation temperature to the suction temperature.
This protection is enabled by setting P43 to 'Yes' ('No' by default). It protects the compressors from excessively low or high superheat temperatures.

► If superheat protection = Yes
- This function is turned on five minutes after the compressor starts up.

● Minimum superheat fault:
- If the superheat value (P307, P337 or P367) drops below the minimum superheat limit value (P44) for 1 minute, the compressor is shut off and the minimum superheat error message is displayed.
- The compressor automatically restarts after 5 minutes (5 seconds in test mode).
- This function remains on in test mode.

Display:

```
C I R C U I T   X   M I N I M U M   O V E R H E A T I N G
X   C U T ( S )   I N   1 H
```

► If there are more than 3 cuts in 1 hour
- The unit is turned off by the superheat protection. The **RESET** button must be pressed in order to restart the circuit.

Display:

```
      C I R C U I T   3   S T O P
M I N .   O V E R H E A T I N G   F A U L T
```

● Maximum superheat fault:
- If the superheat value (P307, P337 or P367) rises above the maximum superheat limit value (P45) for 1 minute and the evaporating temperature < 15°C, the circuit is shut off and the maximum superheat error message is displayed.
- The unit automatically restarts after 5 minutes (5 seconds in test mode).
- This function remains on in test mode.

Display:

```
C I R C U I T   X   M A X I M U M   O V E R H E A T I N G
F A U L T   X   C U T S   I N   1 H
```

► If there are more than 3 cuts in 1 hour
- The unit is turned off by the maximum superheat protection. The **RESET** button must be pressed in order to restart the circuit.

Display:

```
  C I R C U I T   X   S T O P   M A X I M U M
O V E R H E A T I N G   F A U L T
```

● If a permanent fault occurs:
- Fault stored in memory in case of a mains power failure.
- Fault stored in fault memory.
- Relay in On position.

● **If a temporary fault occurs:**
- Fault not stored in memory if a mains power failure occurs.
- Fault stored in fault memory.
- The minimum or maximum superheat fault relay on the relay board is in the Off position.

During test mode, the time delays are counted down in seconds, not minutes.

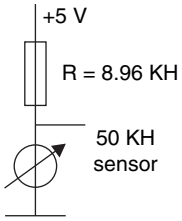
Messages in the fault memory:

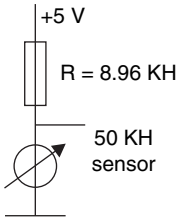
M I N . S U P E R H E A T C X

M A X . S U P E R H E A T C X

7 MANAGEMENT OF THE ANALOGUE INPUTS

Sensor diagram: all sensor faults are stored in the fault memory.





► **Evaporator water inlet sensor: NTC 10 K at 25°C**
Monitors the water temperature on the exchanger inlet in order to:
- Adjust the unit (water return control).
- Monitor the operation of the unit if the water return temperature is too high (load limiting).
- Display the chilled water or hot water inlet temperature (display range:–40 to 99°C, resolution: 0.1 K).
- If the sensor wire is cut or a short circuit occurs, the unit is turned off if it is in cooling mode, and the main fault is displayed.

In heating mode, a secondary fault is displayed, the fault LED flashes, and the machine fault and circuit fault relays change to the On position.
- This fault is acknowledged automatically.

► **Evaporator water outlet sensor (module x): NTC 10 K at 25°C**
Monitors the water temperature on the exchanger outlet in order to:
- Adjust the unit (to water return)
- Turn on the frost protection.
- Display the water outlet temperature (display range: –40 to 99.9°C, resolution: 0.1 K)

The frost protection turns on if the sensor wire is cut. If a short circuit occurs, the unit (module x) is turned off regardless of its operating mode, the main fault is displayed, and the evaporator defrost heater is turned on.
- This fault is acknowledged automatically.

► **Manifold water outlet sensor (modules 1 and 2): NTC 10 K at 25°C**
Monitors the outlet water temperature on the two modules in order to:
- Adjust the unit (to water return)
- Display the water outlet temperature (display range: –40 to 99.9°C, resolution: 0.1 K).

If the sensor wire is cut or a short circuit occurs and control is on the output, each unit runs on its own setpoint.
- This fault is acknowledged automatically.

► **Master/slave water outlet sensor: NTC 10 K at 25°C**
Monitors the outlet water temperature on the two machines in order to:
- Adjust the unit (to water return)
- Display the water outlet temperature (display range: –40 to 99.9°C, resolution: 0.1 K).

If the sensor wire is cut or a short circuit occurs and control on the output, each unit runs on its own setpoint.
- This fault is acknowledged automatically

► **Outdoor air sensor: NTC 10 K at 25°C**
Monitors the temperature of the outdoor air in order to:
- Adjust the system based on the outdoor temperature (cooling, heating).
- If the sensor wire is cut and a short circuit occurs, the unit is adjusted to the setpoint value (heating and cooling) and a fault is displayed.
- Display the outdoor air temperature (display range: –40 to 99.9°C, resolution: 0.1 K).

If the sensor wire is cut and a short circuit occurs, a secondary fault is displayed, the fault LED flashes, and the machine fault and circuit fault relays change to the On position.
- This fault is acknowledged automatically.

► **Hydraulic module internal air sensor: NTC 10 K at 25°C (P24 = Yes)**
Monitors the temperature of the air inside the hydraulic module in order to:
- Turn on or off the hydraulic module's defrost heater.
- Display the temperature of the air inside the hydraulic module (display range: –40 to 99.9°C, resolution: 0.1 K).

If the sensor wire is cut, the defrost heater turns on, the secondary fault is displayed, the fault LED flashes, and the machine fault and circuit fault relays change to the On position.
- This fault is acknowledged automatically.

► **Condenser hot water inlet and outlet sensor: NTC 10 K at 25°C (available if P2 = 1)**
Monitors the condenser's water outlet (or inlet) temperature in order to:
- Adjust in heating mode.
- Display the condenser's water temperature (display range: –40 to 99.9°C, resolution: 0.1 K).

If the sensor wire is cut or a short circuit occurs, the unit is turned off if it is in heating mode, and the main fault is displayed.

In cooling mode, a secondary fault is displayed, the fault LED flashes, and the machine fault and circuit fault relays change to the On position.
- This fault is acknowledged automatically.

► **Compressor discharge sensor: NTC 50 K at 25°C**
Monitors the compressor discharge temperature in order to:
- Check that the compressor discharge temperature is not too high (safety).

If the sensor wire is cut (checked after 5 minutes of operation), the board discharge protection cuts in. If a short-circuit occurs (monitored continuously), the stage(s) are turned off and the circuit main fault is displayed.
- This fault must be acknowledged manually.
- Display the discharge temperature (display range: 0 to 150°C, resolution 1 K).

► **Compressor suction sensor: NTC 10 K at 25°C**
Monitors the suction temperature in order to:
- Display the superheat temperature (display range: –40 to 99.9°C, resolution: 0.1 K).
- This fault is acknowledged automatically.

If the sensor wire is cut, a secondary fault is displayed, the fault LED flashes, and the circuit fault relay moves to the On position.

► **Circuit liquid sensor: NTC 10 K at 25°C**
Measures the liquid temperature in order to:
- Display the subcooling temperature (display range: –40 to 99.9°C, resolution: 0.1 K).
- This fault is acknowledged automatically.

If the sensor wire is cut or the sensor short-circuits, a secondary fault is displayed, the fault LED flashes, the circuit fault relay is in the On position, and the fault is automatically acknowledged.

► **Fault detection values:**
- 50 K sensors: short circuit fault if < 5°C and the unit has been running for 5 minutes. Sensor cut (or sensor missing) if > 148°C.
- 10 K sensors: short circuit fault if < –40°C. Sensor cut (or sensor missing) if > 99°C.

► **Correspondence table**

Temperature (°C)	Sensor resistance (Ω)	
	50 KΩ discharge sensor	**10 KΩ control and outdoor sensor**
-10	-	55340
-5	-	42340
0	162250	32660
5	126977	25400
10	99517	19900
15	78570	15710
20	62468	12490
25	50000	10000
30	40280	8058
35	32650	6532
40	26624	5326
45	21834	4368
50	18005	3602

8 PRESSURE SENSOR

The high and low values for the HP/LP pressure sensors are given below:
- Power supply: 5 V DC
- Signal: 0.5 - 4.5 V
- Measurement range:

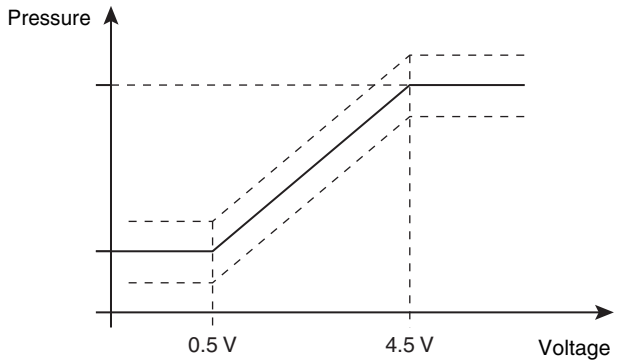
From	to	
P31	P30	HP1
P33	P32	HP2
P35	P34	HP3
P37	P36	LP1
P39	P38	LP2
P41	P40	LP3

● **The HP sensor will:**
- Monitor the high pressure in the circuit and relay this information
- Control the unit using the HP
- Adjust the speed of the fans (if P21 = Yes) or turn them on and off

● **The LP sensor will :**
- Monitor the low pressure in the circuit and relay this information
- Monitor for refrigerant leaks before turning on stages

● **The slopes of the sensors are adjusted** using parameters P30 to P41.

Important: The pressure values given are for relative pressure



Short-circuit faults will be detected for a voltage ≥ 4.75 V.
Open-circuit faults will be detected for a voltage ≤ 0.25 V.
If a difference is found between a reading parameter and the value measured by the corresponding pressure gauge, the sensors can be adjusted by pressing the **OK** button.
Example:

```
P x x x  H I G H  P R E S S U R E  C I R C U I T  X     ↑
                                          x x  x b ↓
```

Press **OK** to directly access and change the adjustment value.

P R E S S U R E S E N S O R A D J U S T M E N T ↑ x x b ↓	[-1, +1] default value = 0 Resolution: 0.1

Press **OK** to confirm the change and go back to the reading parameter, or press **ESC** to cancel the changes and go back to the reading parameter.

Note: This readjustment will be used to correct the difference between the value measured by a pressure sensor and the value read on a pressure gauge.

The resulting new slope will then be used for control.

For the sensors, the value displayed by the LP transmitters (P304, P334 and P364) during maximum compensation is related to the LP cut-out threshold (P55) after the shift with transmitters 0 → 17.3 bar.

The maximum positive compensation becomes:

- P55 = –0.1 bar if P55 < 1, under standard control for P55 = 0.3 maximum positive compensation +0.2 bar.
- 1 bar if P55 ≥ 1.

9 PUMP MANAGEMENT

➢ One or two pumps without fault management (P24 = No) Unit without hydraulic module • Customer pump control.

► One pump

- Evaporator pump in cooling mode (POWERCIAT or HYDROCIAT units)
- Condenser pump in heating mode (HYDROCIAT units)

► Two pumps

- Evaporator dual pump in cooling mode (POWERCIAT units).
- Evaporator pump and condenser pump in cooling or heating mode (HYDROCIAT units)

• Pump 1:

- Pump 1 is necessarily in On/Off operation.
- It runs if it is turned on via the console and the automatic pump operation control is closed.
- It cannot shut off until 1 minute after the last control stage turns off.

• Pump 2:

→ P108 = Fct (on/off)

- It runs if it is turned on via the console and the automatic pump control is closed.
- Unless a fault occurs on the pump, it cannot shut off until 1 minute after the last control stage turns off.

→ P108 = Fct (control).

If the pump control is connected to the unit control.

- The pump turns on 15 seconds before the first control stage.
- Unless a fault occurs on the pump, it cannot shut off until 1 minute after the last control stage turns off.

► One pump with fault management

→ P24 = Yes and P25 = 1 CIAT hydraulic module with one pump (POWERCIAT LXH)

- Pump 1 is necessarily in On/Off operation.
- It runs if there are no pump faults, if it is turned on via the console, and the automatic pump control is closed.
- It cannot shut off until 1 minute after the last control stage turns off. However, it will be immediately shut off if a pump fault occurs.

► Two pumps with fault management

→ P24 = Yes and P25 = 2, CIAT hydraulic module with two pumps (POWERCIAT LXH)

• The runtime of each pump is managed.

- The pump that has run the shortest is turned on.
- Both pumps are in on/off operation if neither has a fault.
- The second available pump is turned on if a fault occurs on either pump.
- The machine is turned off if a fault occurs on both pumps.
- Unless a pump fault occurs, the pump(s) will not shut off until 1 minute after the last control stage turns off.

• Unseizing and switching the pumps

If any of the pumps remains off (for a reason other than a fault) for over 7 days, it must be turned on between 9.00 am and 9.00 pm and be allowed to run for 2 minutes.

- If P25 = 2, the pump with the longest runtime is turned off after being unseized.
- If the unit is turned off via the On/Off button or the automatic operation control and a water flow fault occurs during unseizing, both pumps are turned off.

10. EVAPORATOR WINTER AND FROST PROTECTION

➢ POWERCIAT LXH hydraulic module defrost heater (if P24 = Yes)

The heater's operation is dependent on the temperature measured by the hydraulic module's sensor.

- Turned on when the hydraulic module's temperature ≤ the setpoint of parameter P221
- Turned off when the hydraulic module's temperature ≥ the setpoints of parameter P221 + parameter P222
- The heater is turned on if a fault occurs on the hydraulic module's sensor.

Display:

H Y D R A U L I C M O D U L E A N T I F R E E Z E P R O T E C T .

➢ POWERCIAT LXH evaporator pipe heat trace cable (if P24 = Yes)

The heat trace cable's operation is dependent on the temperature measured by the outdoor temperature sensor.

- Turned on when the outdoor temperature ≤ the setpoint of parameter P220.
- Turned off when the outdoor temperature ≥ the setpoint of P220 +3°C.
- The evaporator pipe heat trace cable is turned on when a fault occurs on the outdoor temperature sensor or the evaporator water outlet temperature sensor.

➢ Evaporator water freezing protection (heater)

The chilled water outlet temperature is checked against the freeze limit setpoint set in parameter P52. This value adjusts itself based on the chilled water outlet temperature.

- For a chilled water outlet temperature > +5°C, set the frost limit to +2°C.
- For chilled water outlet temperature < +5°C, set the frost limit to +3°C below the evaporator water outlet temperature.
- The evaporator defrost heater is turned on if a fault occurs on the evaporator water outlet sensor.

Note: if the unit operates with two cooling control setpoints, the frost protection setpoint adjusts itself based on the lowest evaporator water outlet temperature.

• Operation

- Turned on when the chilled water outlet temperature ≤ the value of P52.
- Turned on if a fault occurs on the evaporator outlet sensor.

• If a fault occurs
- Compressors turned off.
- Fans turned off.
- Contact closes (board output 3) and turns on the evaporator heater (option).
- Machine fault relay on optional board in On position.
- General fault LED on console lit steadily.
- Display:

```
    E V A P O R A T O R   A N T I F R E E Z E
        F A U L T
```

• To acknowledge the fault
- The chilled water outlet temperature must be ≥ the value of P52 +2°C and **OK** must be pressed.
- The heater contact opens.

➢ Evaporator antifreeze protection triggered by the evaporating temperature

- If the saturation temperature on the evaporator outlet drops below P52 – P70, the control will lower the compressor's output. If, after two minutes, the saturation temperature remains below P52 – P70, the circuit is turned off by its protection device.
- If the evaporator saturation temperature drops below P52 – P70 more than three times in 24 hours, the machine is turned off.
- Display:

```
    C I R C U I T   X   S T O P
E V A P .   T .   F R E E Z E   F A U L T
```

➢ Water loop winter protection

• In heating mode

This function is available if P142 = Yes, the automatic machine control input is open, and On/Off set to On.
The function must maintain the condenser water inlet temperature at 30°C as soon as the outdoor temperature ≤ 3°C (2 K differential). The control is identical to P141 = 1 with a control setpoint (P251) of 30°C.
The related parameter is P142 (water loop winter safety)
Corresponding message:

```
W A T E R   T E M P E R A T U R E
    M A I N T A I N   3 0 °
```

• In cooling mode

This function is available if P142 = Yes, Automatic pump control input open and On/Off set to On.
In this case:
- The pump cuts in when the outdoor temperature ≤ P220.
- The pump cuts out at P220 + P222 or if the evaporator water inlet temperature > 30°C (it cuts back in when the evaporator inlet temperature < 20°C)
- Pump faults and reversals (depending on operating times) are managed.

Corresponding message:

```
  W A T E R   C I R C U L A T I O N
F O R C E D   P U M P   R U N N I N G
```

In both modes of operation, winter protection mode is maintained if a fault occurs on the outdoor sensor.
In cooling mode, the function is activated if a fault occurs on the water inlet sensor.
Note: water is circulated during freezing weather.
The customer must install a bypass on the system to avoid creating temperature conflicts during operation.

11. MANAGEMENT OF THE OUTPUTS OF LIQUID VALVES 1, 2 AND 3

These outputs may be used either to directly power an electric liquid valve or to interlock the electronic expansion valve with the compressor. If the outputs are used for either purpose, they must be controlled by a relay.
The liquid valve outputs are managed as each compressor cuts in.
The opening and closing of each output can be timed via the configuration system (P61 and P62) or managed in relation to the low pressure level.

• Operation

Cut-in:
-If P61 = 0, the output is energised while the compressor runs.
-If P61 ≠ 0, the output is energised x seconds (P61) after the compressor cuts in. This time delay is cancelled if the LP ≤ P55 +0.5 b (prevents a cut in the LP).

Cut-out:
-If P62 = 0, the output is no longer energised when the compressor shuts off.
-If P62 ≠ 0:

- If the compressor is shut off by a fault or by pressing the On/Off button more than twice in 10 seconds, the output is de-energised when the compressor shuts off.
- If the compressor is shut off by pressing the On/Of button once in 10 seconds or by the automatic operation control and in the other cases, the output is de-energised x amount of time (P62) before the compressor shuts off. During this period, if the LP ≤ P55 + 0.5 b, the compressor is shut off before the time delay elapses (prevents a cut in the LP).

12. MANAGEMENT OF THE ECONOMISER VALVES (HPS)

The control of the economiser outlets is interlocked with each refrigerating circuit.
When the compressor cuts in, the corresponding HPS outlet is opened.
The economiser is shut off when its operation falls outside the compressor curve.
- If the high pressure > P57, the HPS valve is closed and a 30-minute time delay is activated.

At the end of this time delay, the condensing temperature is read:
- If the HP ≤ P57, the HPS valve is opened.
- If the HP > P57, the 30-minute time delay is restarted and the HPS valve remains closed.

The end result is that the condensing temperature is checked against P57 during operation.
Note: The 30-minute time delay is disabled in test mode (= 0)
Liquid injection cooling of the compressor is accomplished by an interlock with the operation of each compressor (electrical circuit diagram) instead of by the electronic circuit board.

13. MANAGEMENT OF THE 25% OUTPUT COMPRESSOR VALVES

These valves are interlocked with the compressors. In other words, they are open while the compressor is off and closed after 5 minutes in the event of a prolonged stop.
The valves must be opened for 2 minutes after the compressor is turned off during a power failure.

14 MANAGEMENT OF THE LIQUID INJECTION VALVES

These outputs are used to power an electric valve that supplies liquid to the compressor's injection port so as to lower the discharge temperature.
P48 is used to set the valve opening temperature (start of injection).
P49 is the differential between the opening threshold used to set the valve closing temperature (end of injection).

15. MANAGEMENT OF THE FUNCTIONS

15.1 Compressor starting order (3 circuits) and runtime balancing

The controller cuts the compressors, called STAGES, in and out and controls their suction and exhaust lines.
The order in which the compressors are started depends on any faults that have occurred on them and their runtimes.
An available compressor is a compressor that is off, free of any faults, has an SCP = 0, has been off for at least 2 minutes, and is authorised to run [P227, P228 and P229 = Yes (not load-shedded)].
Stage 1: The first compressor to start is one that is available and has run for the shortest time.
Stage 2: The next available compressor with the shortest run time starts next.
Stage 3: The remaining available compressor starts up last (if P3 = 3).
If a fault occurs on a stage that is running or a stage is forced off, stage ″n″ becomes ″n –1″ .
The stages are turned off in the reverse order that they were turned on, regardless of their runtimes.

- **Runtime balancing:**

After every 50 hours of compressor operation, the system switches to the compressor which has operated the least in order to balance the runtimes.
While the system is on (and before it is shut off), the time counters of the compressors that are running are compared and the order number is changed so that the compressor that has run the longest is shut off first.
Ignore the compressor short cycle protection.

15.2 Short-cycle protection and minimum off-time

This function limits the number of compressor starts to 4 per hour. It is disabled in testing mode.
Important: the compressors must be stopped for at least 5 minutes, even during testing mode.
If an additional stage is called for when a compressor has been turned off by the short-cycle protection or has been off for 5 minutes, the LED for the compressor flashes and the short-cycle protection function and number of starts are displayed:
If the number of starts > 140 in 24 hours, the following message is sent to the fault memory:

```
   B E W A R E   R U N N I N G   A N T I - S H O R T - C Y C L E
 A N T I - S H O R T - C Y C L E   X
```

This fault is counted only once. Another fault must occur in the interim before it will be registered again.

15.3 Forced stop of compressors

This function is used to disable a compressor on the machine. It is selected in the Adjustment Parameters menu.
The related parameters are as follows: P227: Compressor 1 operation authorisation
P228: Compressor 2 operation authorisation
P229: Compressor 3 operation authorisation

Confirm by pressing **OK**.

15.4 Time counter

The runtime (in hours) and number of start-ups of each compressor and pump can be displayed.
The related parameters are as follows: P287: Pump 1 runtime (in hours)
P288: Pump 2 runtime (in hours)
P316: Number of circuit 1 (compressor 1) starts
P317: Circuit 1 (compressor 1) runtime in hours
P346: Number of circuit 2 (compressor 2) starts
P347: Circuit 2 (compressor 2) runtime in hours
P370: Number of circuit 3 (compressor 3) starts
P371: Circuit 3 (compressor 3) runtime in hours

Confirm by pressing **OK**.

15.5 Oil warm-up time

A power cut will start a time delay during which the compressor is prevented from turning on and the compressor heaters are turned on. The duration of the time delay depends on the duration of the power cut: If cut < 12 hours, Oil warm-up time = 0
If cut > 12 hours and < 24 hours, Oil warm-up time = 1 hour
If cut > 24 hours, Oil warm-up time = 2 hours

This time delay is disabled in test mode.

15.6 Management of electrical quantities

Using an off-the-shelf module, the values are retrieved over the Bus connection and displayed in the measured values and reading parameter menus on the Xtraconnect 2 controller's display.

```
U 1 : 4 0 6 V   U 2 : 4 0 6 V   U 3 : 4 0 6 V ↑
T O T A L   A B S O R B E D   I :         x A
T O T A L   A B S O R B E D   P :       x K W ↓
```

```
P  2 7 6 . 1  E L E C  P O W E R
C O N S U M E D            x x x x K W H
```

To reset parameter P276.1 (electric power consumed), select it then press **OK**. The following message appears:

```
R E S E T  E L E C  P O W E R
C O N S U M E D      O K : C O N F I R M
```

Press **OK** to reset the energy meter.
In the case of a POWERCIAT unit consisting of two modules, only the total energy meter may be reset.

15.7 Limitation of operation of the machines based on the outdoor temperature:

15.7.1 Minimum air temperature limit in heating mode for water-to-water units

```
P 2 2 5  M I N I  A I R  T E M P
H E A T I N G  M O D E      D I S A B L E D
```

- This parameter can be set to between –25°C and 5°C in 1° increments
- Default setting: DISABLED

The unit shuts off once the outdoor temperature ≤ P225.
The unit restarts once the temperature rises to above P225 +2K.
Display:

```
M A C H I N E  S T O P P E D  H E A T I N G  M O D E
   L O W  L I M I T  E X T .  T E M P
```

A fault does not appear on the controller if the machine is turned off by this limit.
- To enable this function, simply enter a value between –25 and +5°C and press **OK**

15.7.2 Maximum air temperature limit in heating mode for water-to-water units:

This function is used to prohibit the machine operating in heating mode when the outdoor temperature rises above a configurable value.

```
P 2 2 5 . 2  M A X I  A I R  T E M P .
   H E A T I N G  M O D E
```

- This parameter can be set to between –5 and +20°C in 1° increments 1
- Default setting: DISABLED

The unit shuts off once the outdoor temperature ≥ P225.2
The unit restarts once the temperature rises back to above P225.2 –2K.
Display:

```
M A C H I N E  S T O P P E D  H E A T I N G  M O D E
   O U T .  T E M P .  T O O  H I G H
```

A fault does not appear on the controller if the machine is turned off by this limit.
- To enable this function, simply enter a value between –5°C and +25°C and press **OK**.

15.7.3 Maximum air temperature limit in cooling mode

```
P 2 2 5 . 1  M A X I  A I R  T E M P .
C O O L I N G  M O D E
```

- This parameter can be set to between 35°C and 50°C in 1° increments.
- Default setting: DISABLED

The unit shuts off once the outdoor temperature ≥P225.1.
The unit restarts once the temperature rises back to above P225.1 - 2K.
Display:

```
M A C H I N E  S T O P P E D  C O O L I N G  M O D E
  O U T .  T E M P .  T O O  H I G H
```

A fault does not appear on the controller if the machine is turned off by this limit.
- To re-enable it, simply enter a value between 35°C and 50°C and press **OK**.

15.7.4 Minimum air temperature limit in cooling mode

This function is used to prohibit the machine operating in cooling mode when the outdoor temperature rises above a configurable value.

```
P 2 2 5 . 3  M I N I  A I R  T E M P
C O O L I N G  M O D E
```

- This parameter can be set to between –20 and +12°C in 1° increments
- Default setting: DISABLED

The unit shuts off once the outdoor temperature ≤P225.3.
The unit restarts once the temperature rises back to above P225.3 +2K.

Display:

```
MACHINE  STOPPED  COOLING
MODE
  LOW  LIMIT  EXT.  TEMP
```

A fault does not appear on the controller if the machine is turned off by this limit.

15.8 Soft stop via the On/Off button:

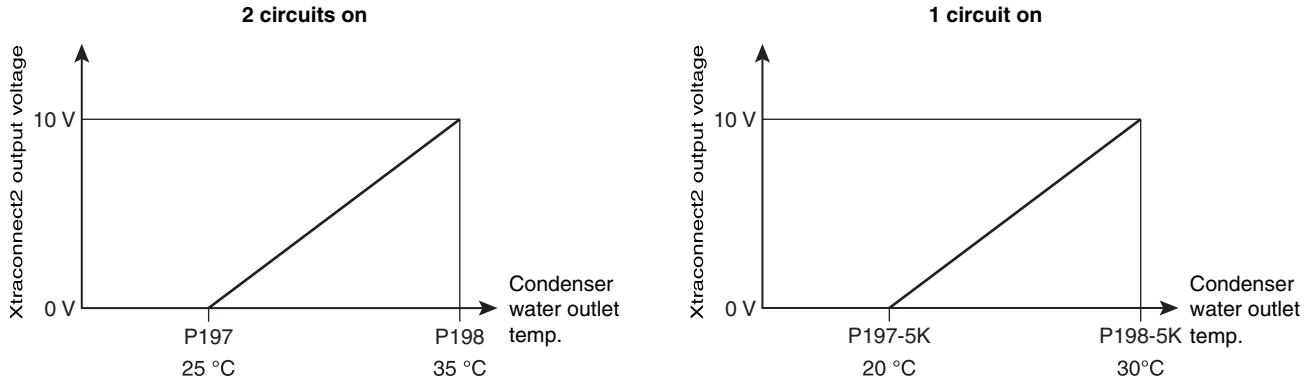
Pressing the On/Off button while the machine is on will cause the compressors to drop to 50% capacity.
Fifteen seconds later, each compressor is turned off in turn at 5 second intervals. The fans turn off at the same time as the compressor on the corresponding circuit. The pumps turn off 1 minute after the last compressor shuts off.
The following message appears during this phase:

```
OPERATING  STOP
```

The machine can also be completely shut off by pressing the On/Off button twice in less than 10 seconds. Only the pumps will be turned off 1 minute after the last compressor shuts off.

16. CONTROLLING A THREE-WAY VALVE ON THE HOT WATER CIRCUIT FOR HYDROCIAT UNITS

This function is activated by assigning the three-way valve value to parameter P26 (programmable output).
The valve must be connected between terminals 2 (0 V) and 3 (10 V) on terminal block J4 on expansion board 3 (ADD3) of the Xtraconnect 2.
Parameters P197 and P198 are used to define the valve control slope.
If only one circuit is used, it must heat water to a temperature greater than P98 (35°C) so that the valve will open completely. To ensure this, lower the three-way valve's control slope by 5°C as illustrated below:



A limitation logic is used, in cooling mode, to start up the machine and, if the valve opening time is too long, to reduce the compressor capacity for 2 minutes:
- If the condensing temperature rises to above 50°C during the first 2 minutes after a compressor restarts, the compressor is forced to lower its capacity for 2 minutes.

Nevertheless, we recommend selecting a three-way valve with the fastest possible fully-closed to fully-open time for the dry cooler circuit or other applications.

```
  P26  PROG.  OUTPUT  0-10V
3  WAY  VALVES
```

```
  P197  OUTLET  LINK  TO
P26  VALUE  AT  0V  xx.x °
```

```
  P198  OUTLET  LINK  TO
P26  VALUE  AT  10V  xx.x °
```

17. MASTER/SLAVE CONTROL OF TWO PARALLEL-CONNECTED MACHINES

For a master/slave setup involving two parallel-connected machines, the machines must be connected by a Bus link and one must be designated as the master machine in control of the slave machine.
Menu 12 (Master/Slave) appears when parameter P28 is set to 'Yes'.

```
12-  MASTER/SLAVE
```

Designation of master machine:

```
P800  MASTER  MACHINE
ON  LOOP  YES
```

Important: alone one machine may be configured as the master on each loop. If the master machine has already been configured and you try to configure the slave machine as the master, the slave machine's parameter will be locked and not be accessible.
Parameter P808 sets the minimum time delay between the turning-on of machines 1 and 2.

17.1 Operating principle:

The master machine sends the following information to the slave machine:
- On/off.
- Heating/cooling mode
- Control temperature.

The master machine will not have access to detailed information about the slave machine (fault details, operation readings, unit parameters, reading parameters, etc.) and vice versa.
If a BMS is used, each machine will have access to all the information on the other machine.
Important: The master machine's BMS link manages information from the loop and the master machine. To obtain information on the slave machine, its BMS link must be connected.

• **Loop description:**
- The loop is limited to two units. Both may be assigned to the loop's operation or one may be assigned as a backup.
- The loop may be controlled in either heating or cooling mode. Switching between modes is managed in the same way as when a single machine is running (no master/slave control).
- Each machine will be adjusted by its own software and the adjustments made to the master machine will control the units on the loop in cascade mode.

17.2 General:

In all cases, the slave machine's On/Off button can be used to cut the master machine's control over the slave machine.
Once a machine is configured as the master, it has control over the slave machine.
The machine with the most control stages must always be designated as the master machine.
The slave machine's control parameters become locked when P28 = Yes.
The time on the master machine's console is sent to the slave machine so that both have the same time.
If communication between the master and slave machine is lost for more than 10 minutes, the slave machine switches to independent operation with its own information and displays the following message:

```
     B O A R D   L I N K   F A U L T
  M U L T I U N I T   M A N A G E M E N T
```

• **Automatic acknowledgment:**
- The automatic operation controls are managed by each machine as if the machines were not linked.
- Load shedding via the on/off inputs is managed by each machine as if the machines were not linked.
- The pumps are also managed by each machine as if the machines were not linked.

Parameters P801 to P810 are hidden if P800 = No (i.e. on the slave machine.

17.3 Management of the functions:

► Machine operation priority and operating time balancing:

- The order in which machines are started is determined based on faults and the number of hours of operation.
- A machine is available when it is off, has no faults, and is authorised to operated.
- The first machine to start is one that is available and has run for the shortest time.

• **Runtime balancing:**
- After every 50 hours of machine operation, the system switches to the machine which has operated the least in order to balance the runtimes.
- While the system is on (and before it is shut off), the time counters of the machines that are running are compared and the order number is changed so that the machine that has run the longest is shut off first.
- If a fault occurs on an active stage (or the stage is forced off), stage ″n″ becomes ″n –1″.
- Stages are shut off in the reverse order that they were turned on regardless of their number of hours of operation.

The total runtime of each machine calculated by adding P285 and P286 on each machine.

► B) Backup or auxiliary machine (P801 = Yes):

• **Without changeover:**
The backup machine is designated by the customer (P803 = X).
Important: In this configuration, the customer will have to run this machine twice a year to prevent the pump from seizing.

• **With changeover:**
- The stopped machine with the longest running time is automatically set as the spare.
- If a partial fault occurs on a machine on the loop, that machine is automatically made the backup.
- If parameter P807 ≠ 0, the backup machine also serves as the auxiliary machine. It is started up if the temperature > setpoint + P807, and stopped at 1 K below this value.

• **The backup machine may operate if:**
- A machine has a link fault.
- A machine has a total fault.
- Operation of backup authorised if P807 ≠ 0 and the temperature > setpoint + P807.

On the backup machine the pumps are off, the LED flashes on and off at 1-second intervals and the following message is displayed:

```
   M U L T I U N I T   M A N A G E M E N T
     B A C K U P   M A C H I N E
```

► Forced stop of machines:

This function can be configured to prevent a machine from operating.

► Water loop winter protection:

If parameter P142 on the master machine = Yes

• **In heating mode:**
- This function is possible if P142 on the master machine = Yes, if the automatic operation control inputs on both machines are open, and both machines are set to On. The function must maintain the water inlet temperature on the heat exchanger at 30°C as soon as the outdoor temperature ≤ 3°C (2 K differential = pump and compressors shut off immediately)(Cascade control on the return line).
- Adjust water-to-water units to the hot water sensor.
- The heating LED is lit; the On/Off LED flashes.
- If a fault occurs on the outdoor sensor, maintain the water loop at 30°C.

Corresponding message on each machine:

```
W A T E R   T E M P E R A T U R E
   M A I N T A I N   3 0 °
```

• In cooling mode:
- This function is possible if P142 on the master machine = Yes, the units are set to On, and the automatic operation control inputs on both machines are open. In this mode, the pump is turned on when the outdoor temperature ≤ P220 and shut off at P220 + P222.
Corresponding message on both machines:

```
W A T E R   C I R C U L A T I O N
F O R C E D   P U M P   R U N N I N G
```

If a fault occurs on the outdoor temperature sensor, the pump is forced on.
Note regarding the circulation of water during freezing weather: the customer must install a bypass so as to avoid creating a temperature problem during use.

17.4 Controls:

► Operating mode:
Note: The slave machine's operation is determined by the master unit (P119). If P28 = Yes, its operation cannot be changed via the corresponding on/off input, via the console or because of the outdoor temperature.
If the slave machine has a different P199 value than the master machine (e.g. master set to cooling/heating while slave set to cooling only) and a call is made for the slave to operate in a different mode than the master, the slave machine is shut off and the following message is displayed:

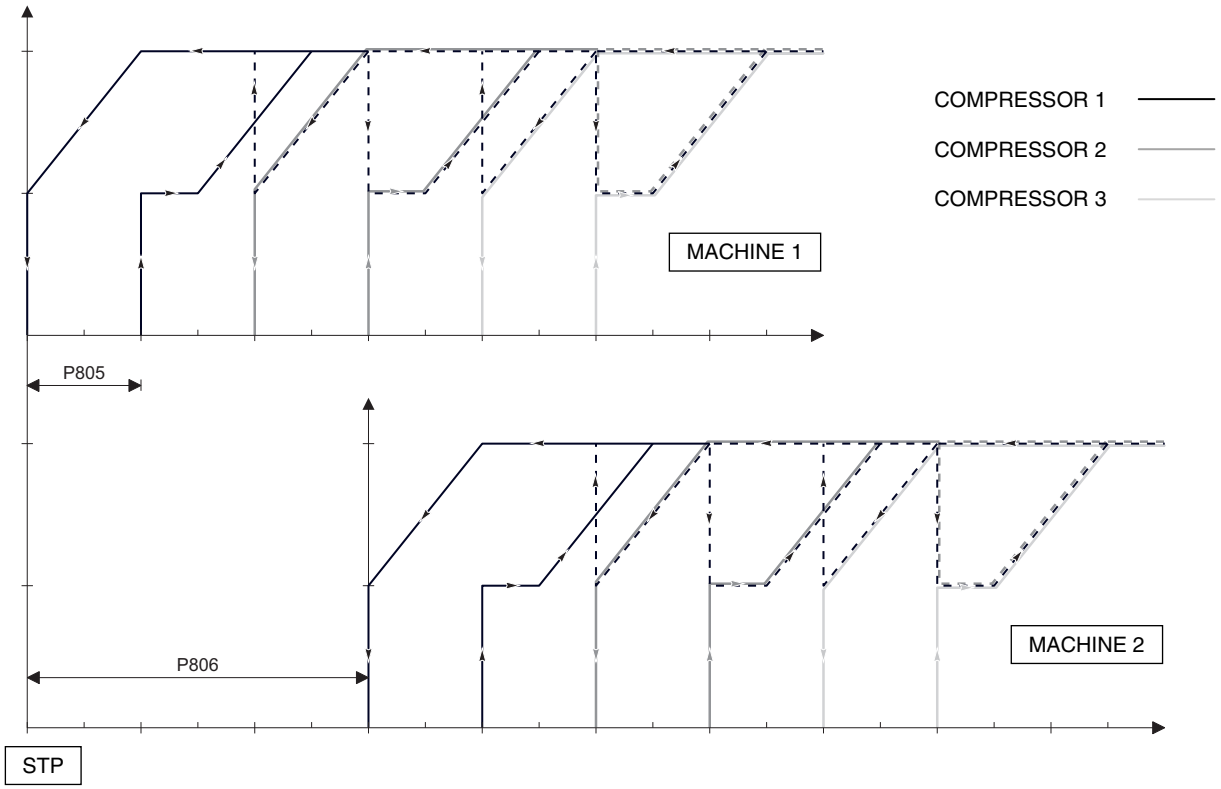
```
S L A V E   F A U L T
P 1 1 9   O P E R A T I N G   M O D E
```

► Control setpoint calculation:
The control setpoint is set by the master machine. If a fault occurs on the master machine, the slave machine operates using its own setpoint and its own sensors.

• Return control:
The control sensor used is on the master machine. If it is shut off (On/Off by automatic operation control) or a fault has occurred on it, the slave machine will operate using its own setpoint and its own sensors.

• Supply control:
- A sensor must be added on the water supply manifold connecting the two machines. This sensor must connected between terminals 10 and 11 on terminal block J3 of the ADD3 board on the master machine.
- If at least one of the two machines has three circuits (POWERCIAT chiller with cooling control only):
Parameter P261.1 (displayed on the controller for both machines) is the water outlet temperature of the manifold connecting modules 1 and 2 on each machine. Parameter P261.2 is the water outlet temperature of the manifold shared by the master/slave machines.
In the measured values menu for the master machine, the manifold water outlet is the water outlet of the manifold shared by the master/slave machines.
In the same menu for the slave machine, the water outlet temperature displayed is that for the manifold between the two modules of the 3-circuit slave machine.

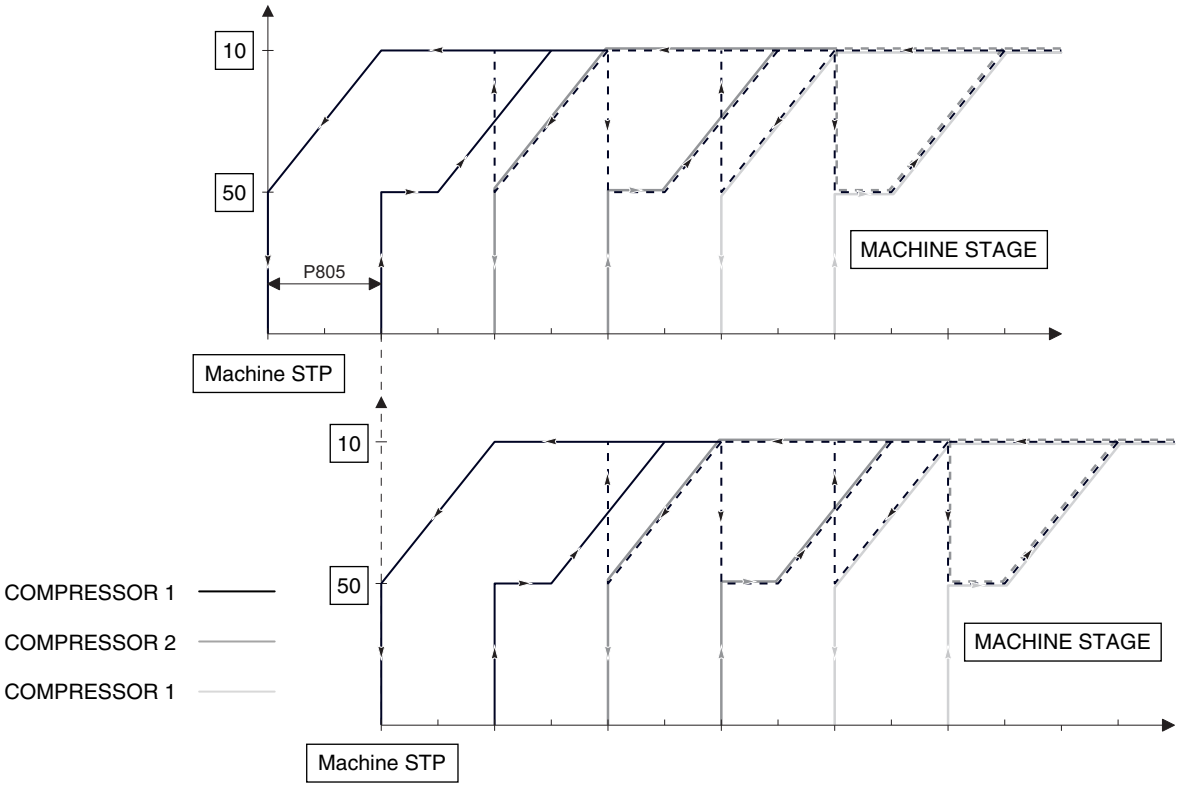
• Cascade control:



Note: P804 = Cascade, Parameter P805 is the differential that determines when stage 1 on machine 1 turns on in relation to the setpoint. P806 is the differential that determines when the last stage on machine 2 turns off in relation to the setpoint.

The parameters that determine when the other stages turn on and off remain managed by each machine.
The value of P806 will have to be selected based on machine 1 in order to achieve an operating order similar to the start-up of the last stage (see figure previous page).{

• Control in parallel with "setpoint offset":



Machine 1 adjusts itself to the master machine's setpoint. Machine 2's setpoint is shifted by the value of P805.
Thus, machine 2's setpoint is machine 1's setpoint + P805.

► Water return control for storage (P154 on master machine = Yes):

This type of control makes it possible to generate a maximum amount of capacity during a given period, often when electricity is cheapest.
Both machines are turned on at an interstage time delay of 10 seconds when P122 + P155 is achieved. The machines are shut off at P122 at an interstage time delay of 1 second.
- If P154 = Yes, storage control is enabled and the control mode based on the selected setpoint is controlled by the master machine.
Cascade control is used by default for both machines when setpoint 1 selected (standard control).
The 'Yes' value of P154 on the slave machine becomes inaccessible if P28 = Yes.

► Time schedules:

If P27 = Yes, the programming of two parallel-connected machines will be controlled by the control parameters on the master machine and the time schedule on the slave machine will become inaccessible.

17.5 Unit status menu

If there are no general faults and the automatic operation inputs are closed, a submenu (overrides the fault message) is added to the unit status menu.

```
M A S T E R   S L A V E   C T R L
M A S T E R   M A C H I N E
S L A V E   M A C H I N E
```

17.6 Management of pumps using P811 (pumps stopped by control):

• If P811 = No:
- No pumps are turned off by the control (default value).

• If P811 = Yes except for one:
- If P801 = No (no backup machine), only the pumps on one machine are stopped by the control. The pumps on the last machine running must remain on until it is turned off by the control.
- Only the pump on the machine that has run the least remains on (important: this pump is started back up before the pump on the other machine is stopped).

• If P811 = Yes machine stop:
- The pumps on both machines are stopped by the control (all the protections except for water flow rate are maintained).
This implies that the customer controls one or more pumps that circulate the water through both machines.

18. CONTROLS

18.1 Main control in cooling and heating modes

Control principle:
The temperature of the chilled water or hot water is monitored and checked against the setpoint value in order to control the compressor and the capacity control slide valve. The controlled temperature is measured on the evaporator (cooling mode) and the condenser (heating mode).
The controller uses a variable pulse width modulated (VPWM) batch PID algorithm.

18.2 Operating mode

The operating mode cannot be changed while the machine is running unless P119 = 5 (automatic machine control or automatic pump control input open, or On/Off set to Off).
If the unit is turned back on while P119 is being modified, the parameter closes and returns to its initial value.

► If P119 = 1 (cooling)
Cooling only.

► If P119 = 2 (heating)
Heating only.

► If P119 = 3 (Cooling/Heating via console)
The operating mode cannot be changed while the machine is running (automatic control input set to On, or On/Off button set to Off).
The Heating/Cooling button will be disabled if it is pressed while the machine is running.

► If P119 = 4 (Cooling/Heating via on/off input)
The operating mode cannot be changed while the machine is running (automatic control input set to On, or On/Off button set to Off).
Attempting to change the operating mode while the machine is running will result in a fault:
- Machine stopped.
- Machine fault and circuit fault relays change to the On position.
- General fault LED on.
- Initial operating mode LED flashing (50-50)

Display:

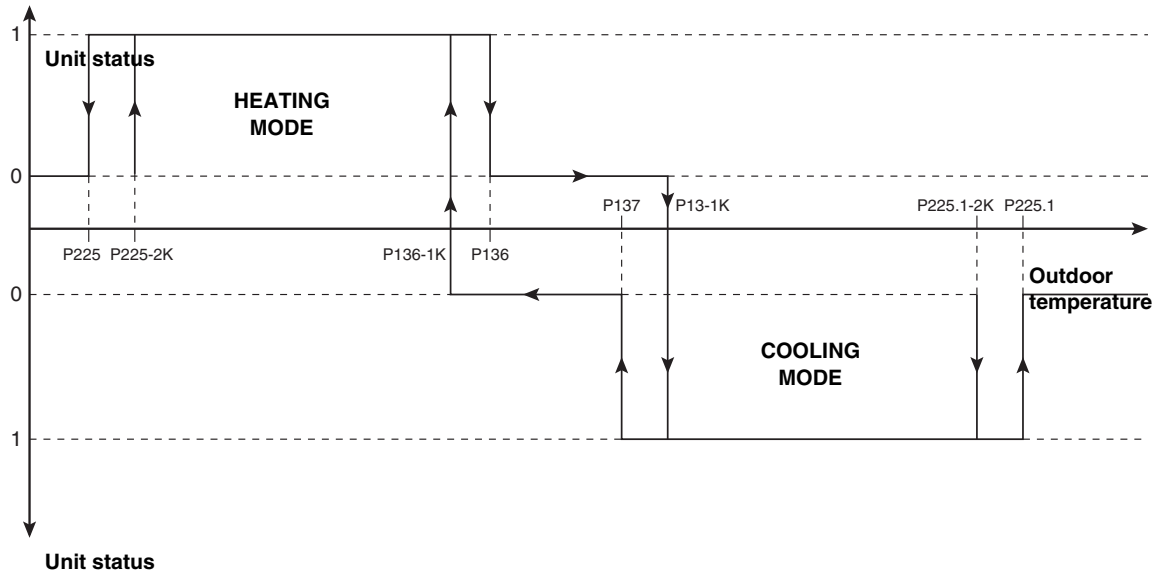
```
U N I T   S T O P   C H A N G E
O F   O P E R A T I O N   M O D E
```

• Automatic reset:
- Either the machine changes its operating mode if the change is confirmed by pressing On/Off or if the automatic control input is open;
- Or the mode change is not confirmed (contact returns to initial state) and the unit resumes its initial operation state.

► If P119 = 5, the machine switches between heating and cooling depending on the outdoor temperature:
- This function is displayed only if P2 = water-to-water
- The minimum/maximum heating/cooling limits are disabled by default. As a result, it is best to adjust the limits when this function is enabled.
- This function only manages changes in the machine's operating mode. It does not manage the valves on the hydraulic circuit; they must be controlled by the customer.

```
P 1 3 6   M A X   A I R   T E M P .
A U T O   H E A T I N G   M O D E   - x x
```

```
P 1 3 7   M I N   A I R   T E M P .
A U T O   C O O L I N G   M O D E   - x x
```



- When an operating mode reaches its end temperature setpoint in automatic mode, the following message is displayed until a mode is turned on:

```
    D E A D   B A N D   A U T O
      H E A T I N G / C O O L I N G
```

The two heating and cooling LEDs flash while this message is displayed.
The pump is shut off in the deadband.

18.3 Control setpoint calculation

18.3.1 Fixed setpoint

► If P120 = 1 (1 setpoint)

• In cooling mode:

- If P127 = No or outdoor sensor fault, control setpoint = P12
- If P127 = Yes (law based on outdoor temperature) and there are no outdoor sensor faults, fixed setpoint (Tout) is calculated using P121

• In heating mode:

- If P131 = No or outdoor sensor fault, control setpoint = P123
- If P131 = Yes (law based on outdoor temperature) and there are no outdoor sensor faults, fixed setpoint (Tout) is calculated using P123

► If P120 = 2 (2 setpoints with selection made via console)

• In cooling mode:

- If P127 = No or outdoor sensor fault, control setpoint = P121 or P122 based on the selection made via the console.
- If P127 = Yes (law based on outdoor temperature) and there are no outdoor sensor faults, fixed setpoint (Tout) is calculated using P121 or P122 based on the selection made via the console.

• In heating mode:

- If P131 = no or outdoor sensor fault, control setpoint = P123 or P124 based on the selection made via the console.
- If P131 = Yes (law based on outdoor temperature) and there are no outdoor sensor faults, fixed setpoint (Tout) is calculated using P123 or P124 based on the selection made via the console.

► If P120 = 3 (2 setpoints with selection on On/Off input)

• In cooling mode:

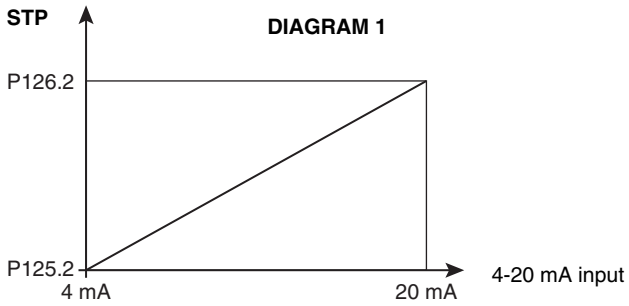
- If P127 = No or outdoor sensor fault:
  - Control setpoint = P121 if on/off input open.
  - Control setpoint = P122 if on/off input closed.
- If P127 = Yes (law based on outdoor temperature) and there are no outdoor sensor faults:
  - Fixed setpoint (Tout) calculated using P121 if on/off input open.
  - Fixed setpoint (Tout) calculated using P122 if on/off input closed.

• In heating mode:

- If P131 = No or outdoor sensor fault:
  - Control setpoint = P123 if on/off input open.
  - Control setpoint = P124 if on/off input closed.
- If P131 = Yes (law based on outdoor temperature) and there are no outdoor sensor faults:
  - Fixed setpoint (Tout) calculated using P123 if on/off input open.
  - Fixed setpoint (Tout) calculated using P124 if on/off input closed.

► If P120 = 4 (setpoint on 4-20 mA input)

• In heating mode:



Displayed if P120 = 3 and HEATING mode activated:

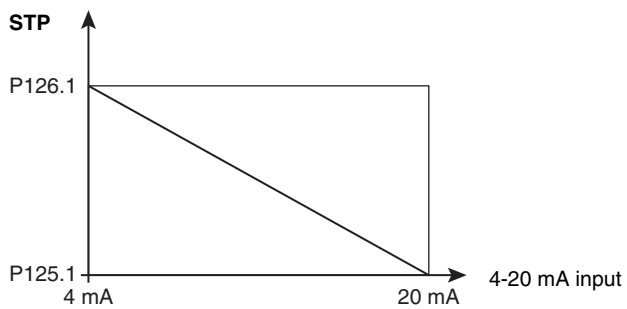
P125.2 SETPOINT FOR 4mA
HEATING -xx,x°

P126.2 SETPOINT FOR 20mA
HEATING -xx,x°

If setpoint adjustment based on outdoor temperature = No or there is an outdoor sensor fault →Control setpoint = result of diagram 1.
If the setpoint is adjusted based on the outdoor temperature = Yes and there are no faults on the outdoor sensor:
- The derived setpoint is calculated using the outdoor temperature. The result of diagram 1 is taken as the setpoint (P123 or P124).

If P120 is set to '3', P131 switches to 'No'.
- To reverse the direction of the slope, simply set P125.2 > P126.2 with a minimum difference of 5 K.

• In cooling mode:



Displayed if P120 = 3 and cooling mode activated

P125.1 SETPOINT FOR 4mA
COOLING -xx,x°

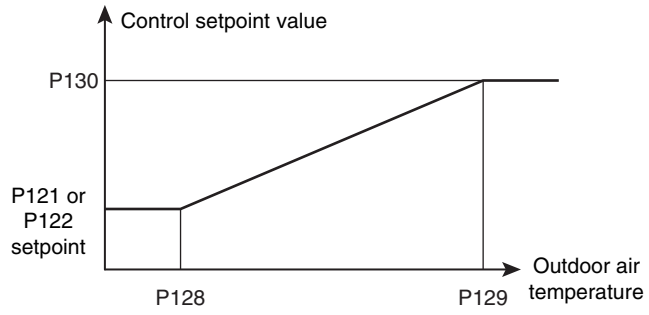
P126.1 SETPOINT FOR 20mA
COOLING -xx,x°

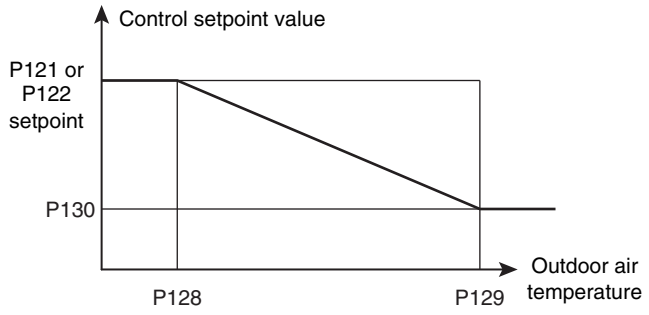
If setpoint adjustment based on outdoor temperature = No or there is an outdoor sensor fault, Control setpoint = result of diagram 2.
If setpoint adjustment based on outdoor temperature = Yes and there are no faults on the outdoor sensor, The derived setpoint is calculated using the outdoor temperature. The result of diagram 2 is taken as the setpoint (P121 or P122).
If P120 is set to '3', P127 automatically switches to 'No
- To reverse the direction of the slope, simply set P125.1 >P126.1 with a minimum difference of 5 K.

Important note about this function: operating problems may occur if parameters P127 and P131 are set to 'Yes' and the controller delivering the 4-20 mA signal has its own function for shifting the setpoint based on the outdoor temperature.
If the minimum value of the signal becomes less than 4 mA, the value of the setpoint will not drop below the minimum setpoint.

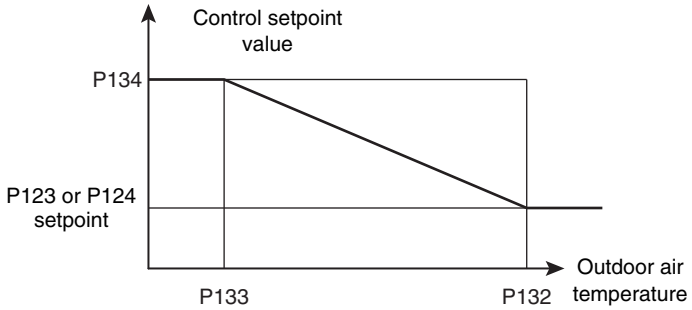
18.3.2 Setpoint based on outdoor temperature - water law

• **In cooling mode** (P127 = Yes)
Slope adjustment in COOLING mode
Associated parameters:
- P128: Outdoor air temperature corresponding to start of drift.
- P129: Outdoor air temperature corresponding to end of drift.
- P130: Setpoint value at end of drift.
- P121 or P122: Control setpoint.



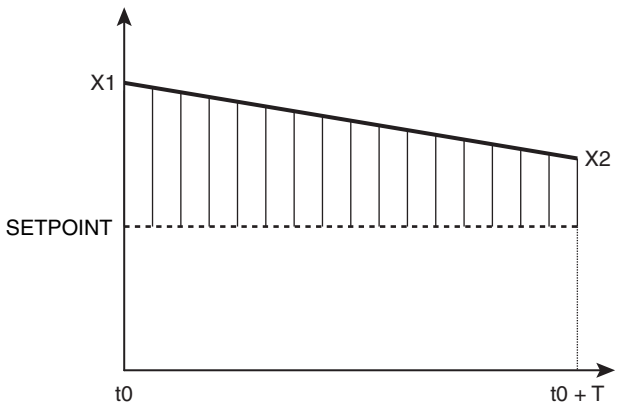


• **In heating mode** (P131 = Yes)
Slope adjustment in HEATING mode
Associated parameters:
- P132: Outdoor air temperature corresponding to start of drift.
- P133: Outdoor air temperature corresponding to end of drift.
- P134: Maximum setpoint value at end of drift.
- P123 or P124: Control setpoint.



18.4 Definition of the controller for PID control (water supply only)

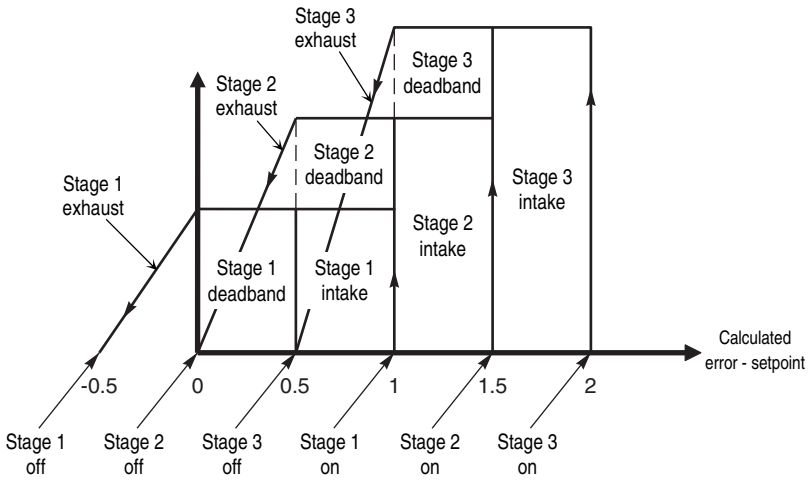
The conduction time is the time the controller moves the actuator.



• **Proportional control (P coefficient): X2 - Setpoint**
Proportional control is the difference, or error (e), between the measurement and the setpoint when the controller time delay equals 0.
It is corrected (multiplied) by the **P** coefficient.
Proportional control accelerates the response to the measurement depending on the difference between the measurement and the setpoint.
On its own, it does not reduce the difference between the measurement and the setpoint when the load on the loop is stable.
• **Integral control (I coefficient): Σ (incremental areas)**
Integral control is the sum of the errors between the measurement and the setpoint between two consecutives actions of the controller.
It is corrected (multiplied) by the **I** coefficient.
Integral control cancels out the difference between the measurement and the setpoint.
• **Derivative control (D coefficient): X2 - X1**
Derivative control is the difference between two errors (measurement - setpoint) between two consecutive actions of the controller (slope).
It is corrected (multiplied) by the **D** coefficient.
Derivative control offsets the effects of the process' dead time. Although derivative control has a stabilising effect, instability can be caused by an overly-high value.

18.4.1 Action of the controller in cooling mode

•Circuit control:
- If e > 1 → Stage 1 turns on
- If 1 < e < 1.5 → Stage 1 intake pulse
- If e > 1.5 → Stage 2 turns on and stage 1 at full capacity
- If 1.5 < e < 2 → Stage 2 intake pulse
- If e > 2 → Stage 3 turns on and stages 1 and 2 at full capacity
- If 1 < e < 2.5 → Stage 3 intake pulse
- If e > 2.5 → Stage 3 intake valve continuously open
- If 1.5 < e < 2 → Stage 3 intake and stage 2 at full capacity 100%
- If 1 < e < 1.5 → Stage 3 deadband and stages 1 and 2 at full capacity
- If 1 < e < 1.5 → Stage 2 intake and stage 1 at full capacity (stage 3 not turned on)
- If 0.5 < e < 1 → Stage 3 exhaust and stages 1 and 2 at full capacity
- If 0.5 < e < 1 → Stage 2 deadband and stage 1 at full capacity (stage 3 not turned on)
- If 0.5 < e < 1 → Stage 1 intake (stages 2 and 3 not turned on)
- If 0 < e < 0.5 → Stage 2 exhaust and stage 1 at full capacity
- If 0 < e < 0.5 → Stage 1 deadband (stages 2 and 3 not turned on)
- If –0.5 < e < 0 → Stage 1 exhaust

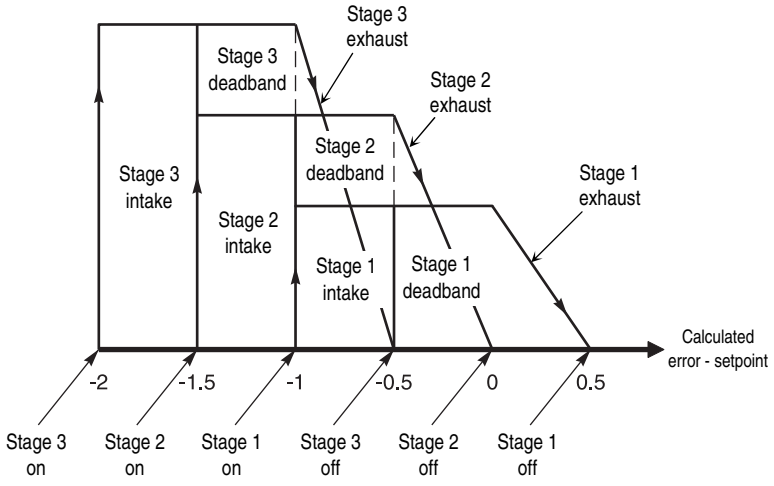


•In all cases:
- If e < 0.5 → Stage 3 turns off
- If e < 0 → Stage 2 turns off
- If e < –0.5 → Stage 1 turns off

NOTE: The intake and exhaust valves are actuated on only one compressor at a time.

18.4.2 Action of the controller in heating mode

•Circuit control:
- If e < –1 → Stage 1 turns on
- If –1.5 < e < –1 → Stage 1 intake pulse
- If e < –1.5 → Stage 2 turns on and stage 1 at full capacity
- If -2 < e < –1.5 → Stage 2 intake pulse
- If e < –2 → Stage 3 turns on and stages 1 and 2 at full capacity
- If –2.5 < e < –2 → Stage 3 intake pulse
- If e < –2.5 → Stage 3 intake valve continuously open
- If –2 < e < –1.5 → Stage 3 intake and stages 1 and 2 at full capacity
- If –1.5 < e < –1 → Stage 3 deadband and stages 1 and 2 at full capacity
- If –1.5 < e < –1 → Stage 2 intake and stage 1 at full capacity (stage 3 not turned on)
- If –1 < e < –0.5 → Stage 3 exhaust and stages 1 and 2 at full capacity
- If –1 < e < –0.5 → Stage 2 deadband and stage 1 at full capacity (stage 3 not turned on)
- If –1 < e < –0.5 → Stage 1 intake (stages 2 and 3 not turned on)
- If –0.5 < e < 0 → Stage 2 exhaust and stage 1 at full capacity
- If –0.5 < e < 0 → Stage 1 deadband (stages 2 and 3 not turned on)
- If 0 < e < –0.5 → Stage 1 exhaust



•In all cases:
- If e > –0.5 → Stage 3 turns off
- If e > 0 → Stage 2 turns off
- If e > 0.5 → Stage 1 turns off

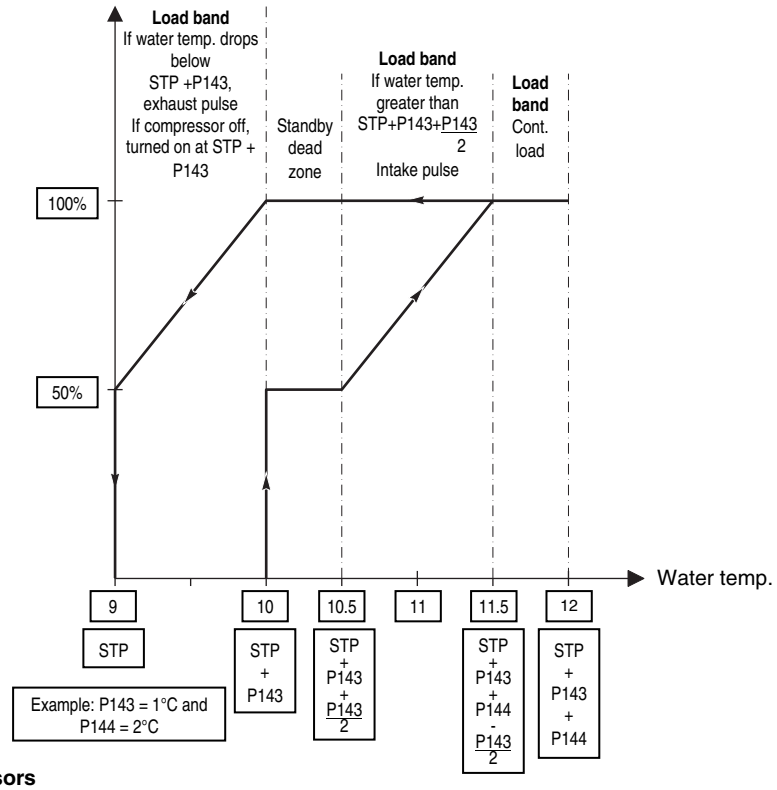
NOTE: The intake and exhaust valves are actuated on only one compressor at a time.

18.5 Water return control for storage (CRISTOPIA)

This type of control makes it possible to generate a maximum amount of capacity during a given period, often when electricity is cheapest. All the circuits are turned on in turn at 10 second intervals and adjusted to setpoint 2 (P122) and the P155 differential. This type of control is only possible in cooling mode. The setpoint 2 LED turns on.
- If P154 = No, the control mode remains standard and the return or supply can be controlled based on P141.
- If P154 = Yes, Storage control is enabled. The control mode is managed based on the setpoint selected:
- If setpoint 1 is selected, the control remains standard and the mode (supply return) is selected via P141.
- If setpoint 2 is selected, the control automatically switches to 'return with storage' mode.

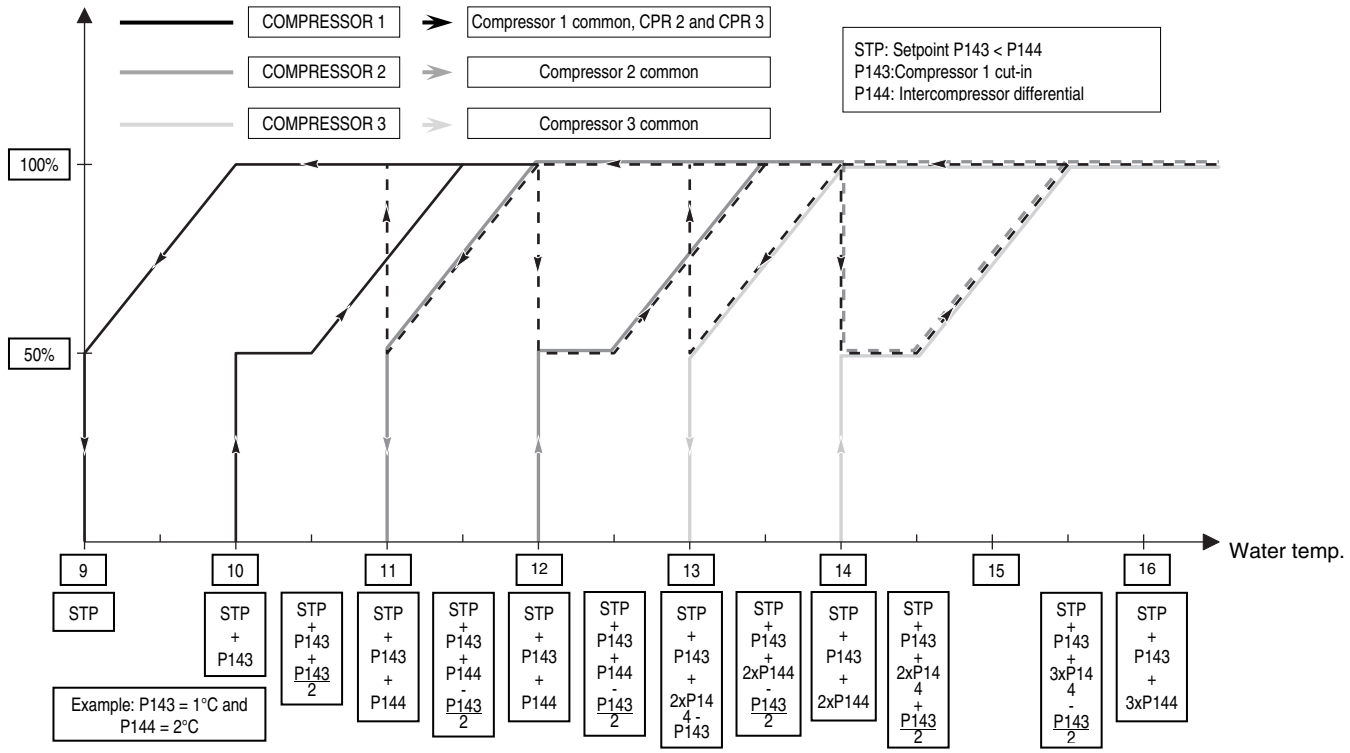
18.6 Modulating control (water return only)

• Control of one compressor



• Control of three compressors

When just one compressor is insufficient, the second compressor is turned on and the first compressor drops to 50% capacity.
The capacities of both compressors then rise simultaneously until each is 100%.
If these two compressors are insufficient, the third compressor is turned on and the first two drop to half capacity.
The capacities of all three compressors then rise simultaneously until each is at 100%.
This control mode works the same way when ramping down.



18.7 Automated self-regulating control

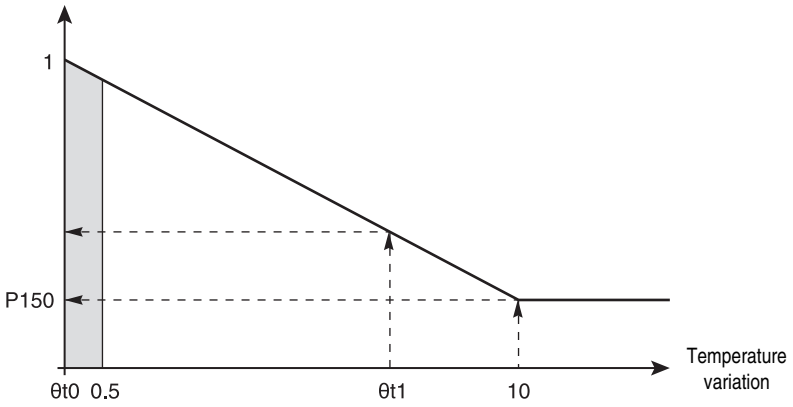
This type of control adjusts the operation of the unit at the head end of the system.
If the compressor stops after running for less than 5 minutes, the compressor stage cut-in value is changed but the cut-out points remain unchanged.
The following message appears in the unit status table:

A D A P T I V E S Y S T E M C O N T R O L M O D E

This message is saved in the fault memory:
Only one message is saved at a time, i.e. each control fault must be separated by another type of fault.
However, if the compressor runtime is > 7 minutes, the initial state resumes.
Note: This control mode is turned off if the system is switched to test mode or turned off via the On/Off button, or if the automatic machine control or automatic pump control output opens.

18.8 Compensation

Enabled if P150 ≠ 1.
► **Purpose:**
Allow the control system to anticipate changes in load on the loop by monitoring for variations in the return temperature.
► **Action:**
It adjusts the controller time delay.
► **Principle:**
The water return temperature is measured: θt0 ; evaporator in cooling mode, condenser in heating mode at time t0 then t0 + P151.
The calculated temperature variation |θt1-θt0| is used to define the compensator coefficient.
The PID control polling time then becomes: remaining time × compensator coefficient.
• **Configuring the compensator coefficient:**
The compensator coefficient can be set to between 0.1 and 1 (parameter P150).
If the compensator coefficient = 1, the function is disabled.
If the water return temperature variation < 0.5°C, there is no compensation.
The compensator coefficient is maximum when the temperature variation = 10°C between each time. α.
• **Compensator coefficient diagram:**



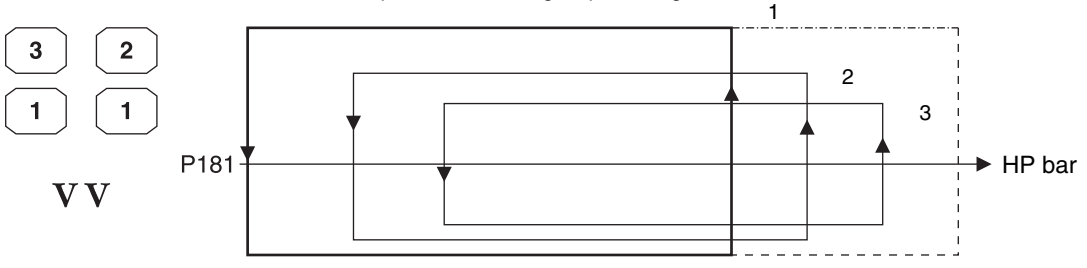
19. CONDENSING PRESSURE CONTROL

19.1 Staged control for a machine with an air-cooled condenser

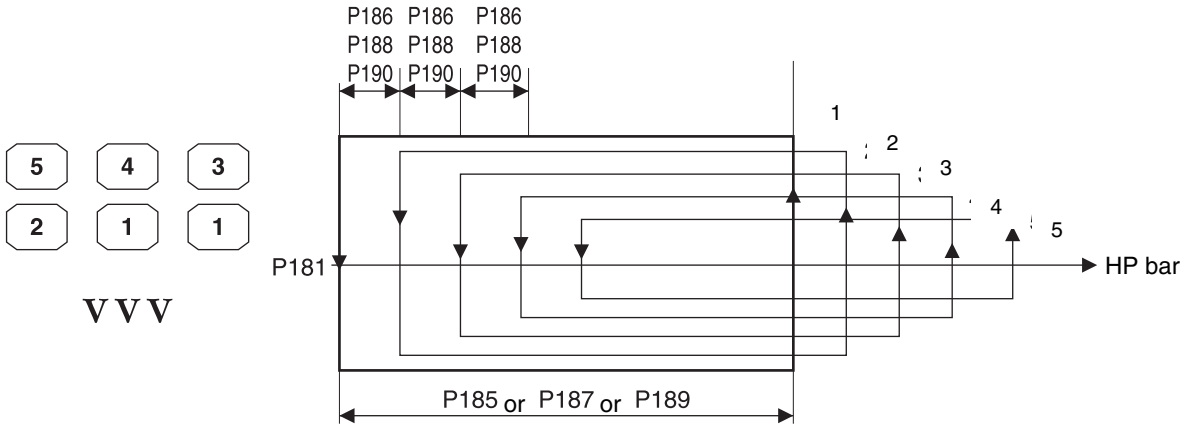
This type of control, known as CASCADE control, is used to control the air-cooled condenser fans.
The condensing pressure is adjusted in relation to the operation of the associated compressor. The fans are shut off by the On/Off button, the automatic operation control or the emergency stop fault.
For each circuit, the number of condenser modules can vary and the number of HP control stages varies.
The first stage is turned on by a set setpoint value (P181 + stage differential). Each additional stage is turned on by a set interstage differential.
Each circuit has its own stage differential and interstage differential.
- If the condenser air inlet temperature is > P182, all the fans are forced on while the compressors are on. Control resumes at P182 –2°C.
- If the condenser air inlet temperature is < P182, the control is as follows:

➢Description of condensing pressure control possible per circuit:

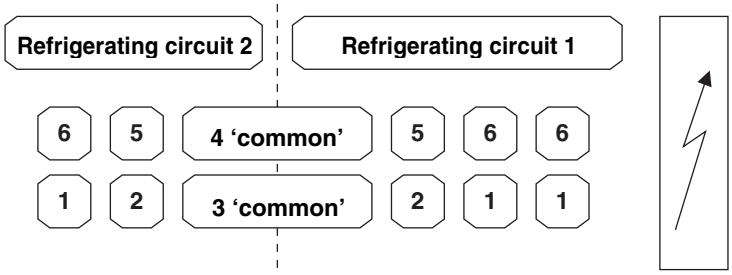
• **LX 1800 to 2500:** 2 V-frame condenser fan modules per circuit = 3 single-speed stages



• **LX 2800:** 3 V-frame condenser fan modules per circuit = 5 single-speed stages

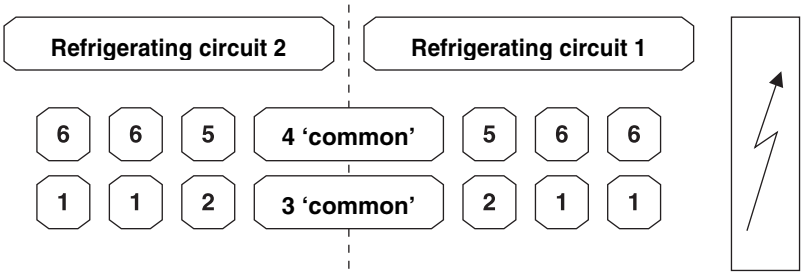


• LX 3050 - 3500 with three-and-a-half V-frame condenser fan modules on one circuit and two-and-a half V-frame condenser fan modules on the other = 6 single-speed stages



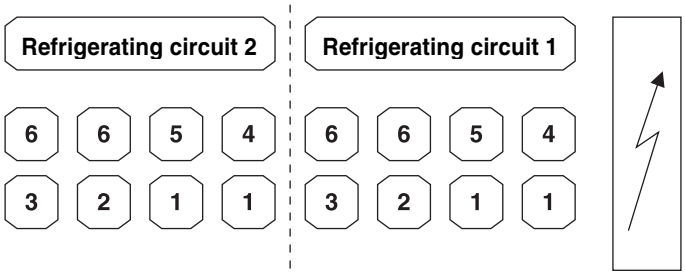
'Common' fans 3 and 4 will be controlled, respectively, by standard stages 3 and 4 on circuit 1

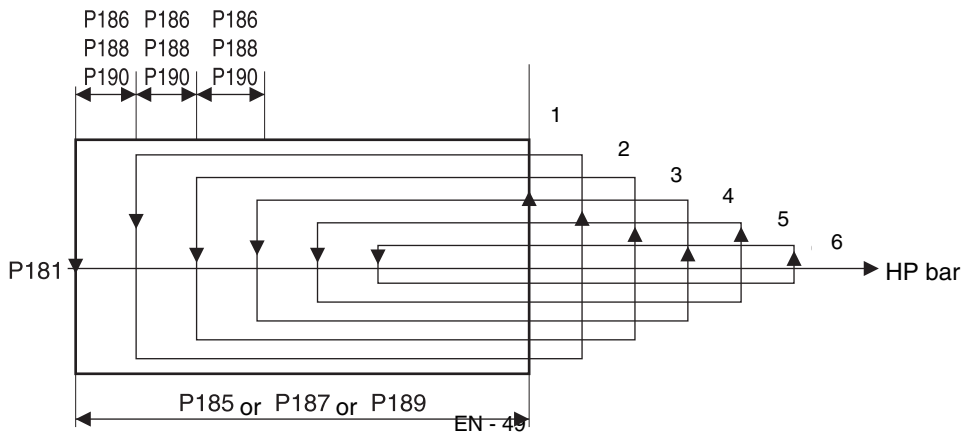
• **LX 3600 - 3900** with three-and-a half V-frame condenser fan modules on both circuits = 6 single-speed stages



'Common' fans 3 and 4 will be controlled, respectively, by standard stages 3 and 4 on circuit 1
On LX 3050-3900 units, the common fans are controlled by the circuit with the highest high pressure.

• **LX 4200 - 4500 - 4800** with 4 V-frame condenser fan modules = 6 single-speed stages





Number of control stages for each size of LX/LXH or LWN unit.

P08: Unit size	Circuit	Number of V-frame condenser fans	Number of HP control stages	Standard condensation pressure control (fan assignments)						Speed control option	
				Stage 1	Stage 2	Stage 3 or 3 Common	Stage 4 or 4 Common	Stage 5	Stage 6	Controlled stages	On/Off stages
1800	Circuit 1	2	3 stages	MC01 MC03	MC02	MC04				1	2 - 3
	Circuit 2	2	3 stages	MC05 MC07	MC06	MC08				1	2 - 3
2150	Circuit 1	2 V	3 stages	MC01 MC03	MC02	MC04				1	2 - 3
	Circuit 2	2 V	3 stages	MC05 MC07	MC06	MC08				1	2 - 3
2500	Circuit 1	2 V	3 stages	MC01 MC03	MC02	MC04				1	2 - 3
	Circuit 2	2 V	3 stages	MC05 MC07	MC06	MC08				1	2 - 3
2800	Circuit 1	3 V	5 stages	MC01 MC03	MC05	MC02	MC04	MC06		1 - 2	3 - 4 - 5
	Circuit 2	3 V	5 stages	MC07 MC09	MC011	MC08	MC10	MC12		1 - 2	3 - 4 - 5
3050	Circuit 1	3.5 V	6 stages	MC01 MC03	MC05	MC07	MC08	MC06	MC02 MC04	1- 2- 3 com	4 com -5 - 6
	Circuit 2	2.5 V	6 stages	MC11	MC09	MC07	MC08	MC10	MC12	1- 2- 3 com	4 com -5 - 6
3500	Circuit 1	3.5 V	6 stages	MC01 MC03	MC05	MC07	MC08	MC06	MC02 MC04	1- 2- 3 com	4 com -5 - 6
	Circuit 2	2.5 V	6 stages	MC011	MC09	MC07	MC08	MC10	MC12	1- 2- 3 com	4 com -5 - 6
3600	Circuit 1	3.5 V	6 stages	MC01 MC03	MC05	MC07	MC08	MC06	MC02 MC04	1- 2- 3 com	4 com -5 - 6
	Circuit 2	3.5 V	6 stages	MC13 MC11	MC09	MC07	MC08	MC10	MC12 MC14	1- 2- 3 com	4 com -5 - 6
3900	Circuit 1	3.5 V	6 stages	MC01 MC03	MC05	MC07	MC08	MC06	MC02 MC04	1- 2- 3 com	4 com -5 - 6
	Circuit 2	3.5 V	6 stages	MC13 MC11	MC09	MC07	MC08	MC10	MC12 MC14	1- 2- 3 com	4 com -5 - 6
4200	Circuit 1	4 V	6 stages	MC01 MC03	MC05	MC07	MC02	MC04	MC06 MC08	1- 2- 3	4 -5 - 6
	Circuit 2	4 V	6 stages	MC09 MC11	MC13	MC15	MC10	MC12	MC14 MC16	1- 2- 3	4 -5 - 6
4500	Circuit 1	4 V	6 stages	MC01 MC03	MC05	MC07	MC02	MC04	MC06 MC08	1- 2- 3	4 -5 - 6
	Circuit 2	4 V	6 stages	MC09 MC11	MC13	MC15	MC10	MC12	MC14 MC16	1- 2- 3	4 -5 - 6
4800	Circuit 1	4 V	6 stages	MC01 MC03	MC05	MC07	MC02	MC04	MC06 MC08	1- 2- 3	4 -5 - 6
	Circuit 2	4 V	6 stages	MC09 MC11	MC13	MC15	MC10	MC12	MC14 MC16	1- 2- 3	4 -5 - 6
Without condenser	Circuit 1		6 stages	Not Given	Not given	Not given	Not given	Not given	Not given	Not given	Not given
	Circuit 2		6 stages	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given

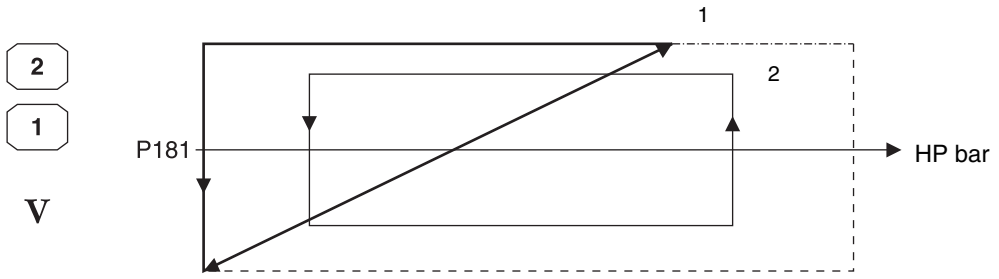
19.2 Fan speed control

The speed is controlled by the HP pressure sensor and the 0-10 V outputs on the motherboard.
If P21 = Yes, the speed is controlled by fan stage 1 of each circuit. The other fans will be managed by the on/off inputs.
All the controlled stages on a circuit are connected to the same 0-10 V output.
When one circuit is running, the speed is controlled by the circuit's HP sensor.
When both circuits are running, the speed is controlled by each circuit's HP sensor. In the case of LX 3050-3900 units (where one speed-controlled fan is shared by both circuits), the speed is controlled by the circuit with the highest pressure. The common stage must therefore be connected to the designated output on the motherboard.
The controlled stages merge together to form a single control stage. The other on/off stages take the place of stages 2, 3 and 4:
- Stage 4 or common 4 become control stage 2
- Stage 5 becomes control stage 3
- Stage 6 becomes control stage 4

When the machine is turned on, the outputs of the controlled stages are energised and the flow is controlled by the 0-10 V signal.
Adjustment parameters P181 to P193 must be reinitialised when the setting of P21 is changed.

➢ HP with acoustic optimisation

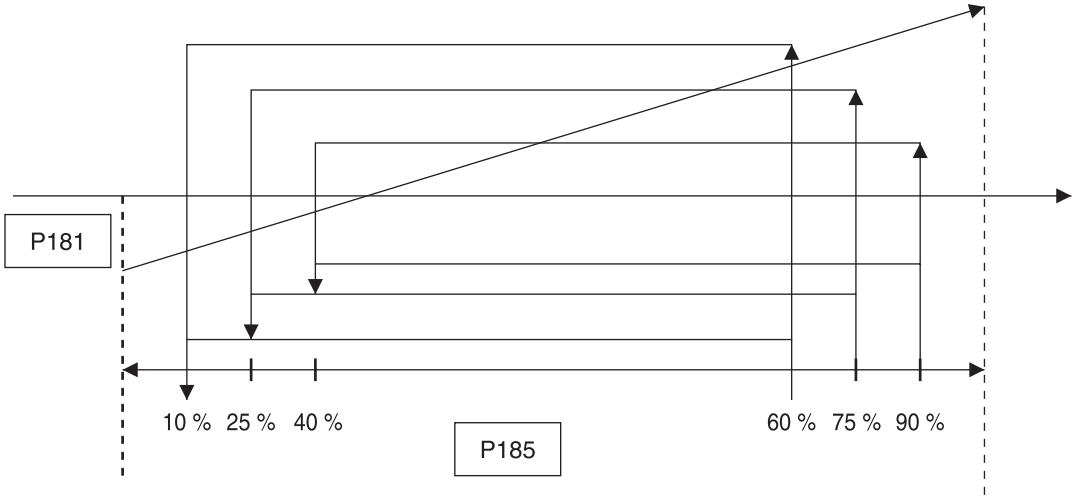
P21 = 2 with acoustic optimisation



Default value of P181:
5 to 13 bar (resolution: 0.1) if P1=R134a, Default value: 8
Default value of P182: 25°C
Standard control applies to the other parameters.
1 V-frame condenser fan module per circuit = 1 stage (1 fan) with speed control + 1 single-speed stage (same as standard)
2 V-frame condenser fan modules per circuit = 1 stage (2 fans) with speed control + 2 single-speed stages (same as standard)
3 V-frame condenser fan modules per circuit = 1 stage (3 fans) with speed control + 3 single-speed stages (same as standard)
4 V-frame condenser fan modules per circuit = 1 stage (4 fans) with speed control + 3 single-speed stages (same as standard)

➢ HP with energy optimisation

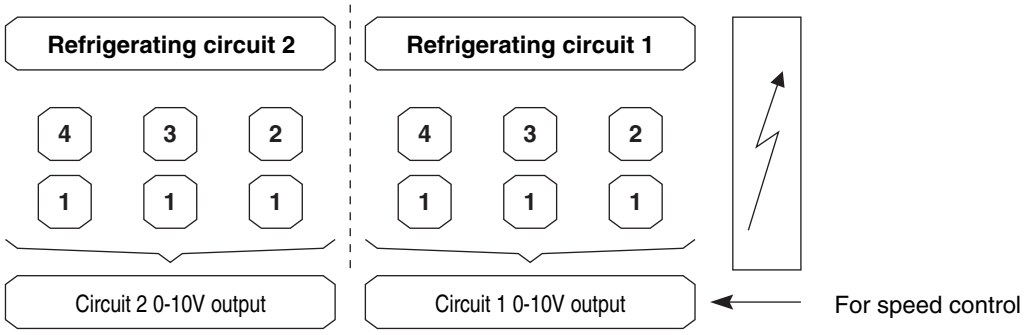
P21 = 3 With energy optimisation (available only with an electronic expansion valve)



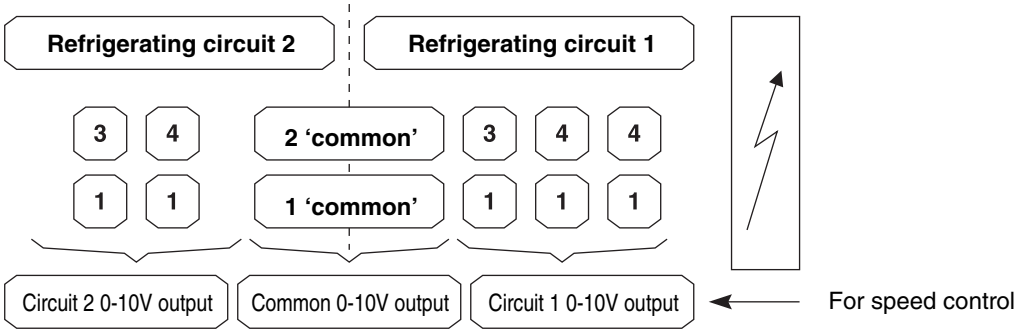
If 4 stages: 10-25-40% and 60-75-90% for stages 2-3-4
If 3 stages: 15-30% and 70-85% for stages 2-3
If 2 stages: 20 and 80% for stage 2

The settings of parameters P181, P182, P185, P187 and P189 must be reset.
P181 = 6.8 b
P185 = 3.8 b
P182 = 30°C
In this case, parameters P181, P185, P187 and P189 can be adjusted in increments of 0.1.
Parameters P186, P188 and P190 are not necessary and therefore made inaccessible.

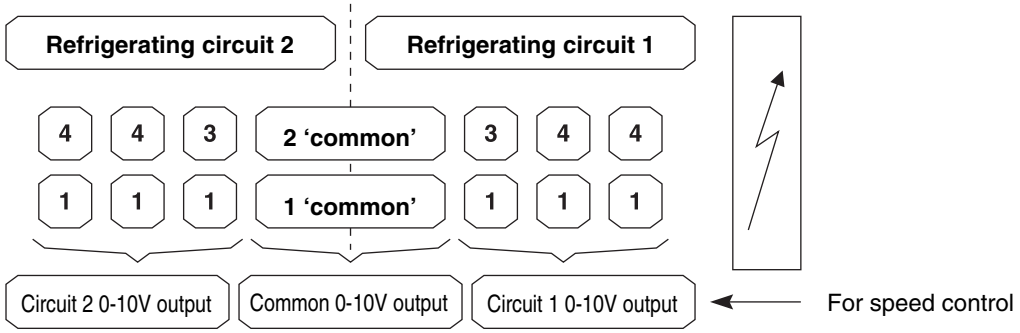
• **LX 2800** with one stage of three speed-controlled fans and three stages of three on/off fans per circuit:



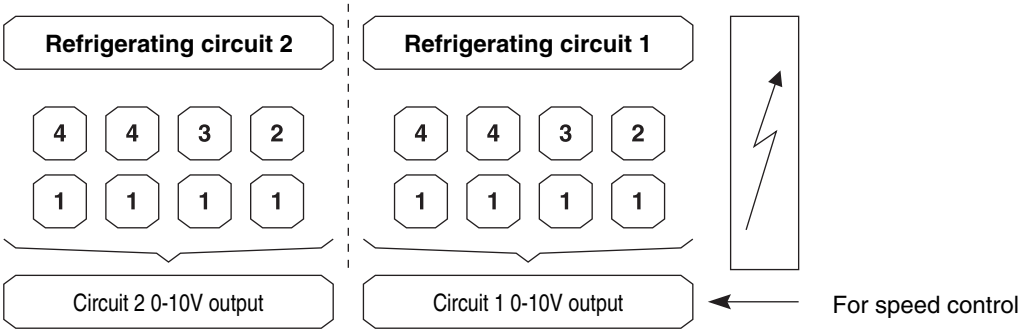
• **LX 3050 - 3500** with one stage of two or three fans plus one speed-controlled common fan and three stages of two or three fans plus one on/off common fan per circuit:



• **LX 3600 – 3900** with one stage of three fans plus one speed-controlled common fan and three stages of three fans plus one on/off common fan per circuit:



• **LX 4200 to 4800** with one stage of four speed-controlled fans and three stages of four on/off fans per circuit:



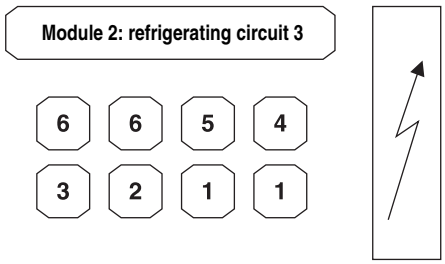
19.3 Condensing pressure control on 3-circuit machines:

Three-circuit machines are always made up of two separate modules (machines), each with its own circuits. Module 1 has two circuits and module 2 has one circuit. Their designations are provided in the table below:

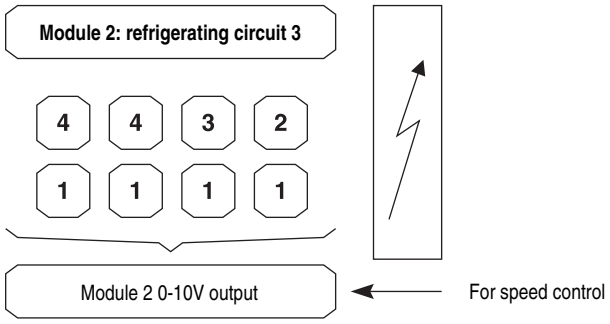
Sizes	Module		Number of V-frame modules	Standard condensation pressure control (fan assignments)						Speed control option	
	Number	Reference		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Controlled stages	On/Off stages
4850	1	3050	6	Same as table in previous section.							
	2	1800	4	MC31 MC33	MC35	MC37	MC32	MC34	MC36 MC38	1- 2- 3	4 -5 - 6
5400	1	3600	7	Same as table in previous section.							
	2	1800	4	MC31 MC33	MC35	MC37	MC32	MC34	MC36 MC38	1- 2- 3	4 -5 - 6
6000	1	4200	8	Same as table in previous section.							
	2	1800	4	MC31 MC33	MC35	MC37	MC32	MC34	MC36 MC38		
6600	1	4800	8	Same as table in previous section.							
	2	1800	4	MC31 MC33	MC35	MC37	MC32	MC34	MC36 MC38	1- 2- 3	4 -5 - 6

The condensing pressure on the machine in module 1 is controlled exactly as described in the previous section. The condensing pressure on the machine in module 2 is controlled exactly like a six-stage circuit with four V-frame modules:

• **On/Off control** with 4 V-frame condenser fan modules = 6 single-speed stages:



• **Speed control** with one stage of four speed-controlled fans and three stages of four on/off fans:



19.4 Control of air-cooled condenser for split-system unit and dry cooler

P02 = air-to-water; P08 = condenserless
The type of control selected will automatically be six-stage control (connected or not) for all split-system machines.

19.5 Total heat recovery

The total recovery function is enabled in cooling mode only (i.e. if P2=2).
The "heating/cooling selection" input (terminal 5-1 on J14) will be used by the customer to set the operating mode (standard or recovery).

```
P 1 7 9 . T O T A L   R E C O V E R Y
                      Y E S / N O
```

```
P 1 9 3 . H P   S T P   S H I F T   D U R I N G
T O T A L   R E C O V E R Y     x x . x b
```

• **Without recovery:** standard fan management (P179 = No and terminals 2-3 on J3 open).
• **With total recovery:** P179 = Yes and terminals 2-3 on J3 closed = On.
- The HP control setpoint then becomes equal to P181 + P193.
- The stage differentials (P185, P187 and P189) remain at 3.5 bar.
- The function that forces on all the fans is disabled when the outdoor temperature is higher than P182.

20. COMPRESSOR START-UP CYCLE

➢ Compressor start-up

• If short-cycle protection

If the power is accidentally cut or a short interruption occurs during start-up or operation, the unit will restart after a period of 5 minutes. The exhaust valves are opened at 25% capacity during this 5-minute time delay.

```
A N T I - S H O R T - C Y C L E
C O M P   X              x x m n x x s
```

The counter should decrement.
The operating states and any faults that occurred before the cut are saved in memory.
Message in fault memory: faults appear one after the other (another type of fault must always appear between two power cut faults)

```
  P O W E R   C U T
```

• If compressor start-up

10-second time delay during which the intake and exhaust valves are not actuated.
The exhaust valve is opened (50%) and the intake valve is opened (100%) during the 2 second on/off cycle.
A 90-second time delay starts.

➢ **When the time delay has elapsed:**
a) If the first fan stage is turned on, standard control is resumed.
b) If the first fan stage is not turned on, the 90-second time delay is repeated.
Standard control is resumed at the end of the time delay.
During this 3 minute period, the control has priority over any stop requests and the protections remain on.

• **After running for 1 minute:**
- The compressor continues adjusting if the pressure difference (HP-LP) is greater than 1 bar.
- The compressor is turned off if the pressure difference (HP-LP) is less than 1 bar (lubrication fault).

• **After running for 8 minutes:**
- The compressor continues adjusting if the pressure difference (HP-LP) is greater than 3 bar.
- If the pressure difference (HP-LP) is lower than 3 bar, the compressor is forced to operate at full capacity (100%) until the 10th minute elapses (up to 4 bar).

• **After running for 10 minutes:**
- The compressor continues adjusting if the pressure difference (HP-LP) is greater than 3 bar.
- The compressor is turned off if the pressure difference (HP-LP) is less than 3 bar (lubrication fault).

21. LIMIT MANAGEMENT

These limitations are used to reduce the capacity of the compressors to prevent their safety devices tripping when the machine nears its operating limits.

• **High pressure operation:**
If the condensing pressure is greater than the control HP limit (P54), Xtraconnect 2 forces the compressor to lower its capacity while running. When the high pressure drops to below 98% of P54, the HP limitation remains on but the compressor is not requested to do anything (intake and exhaust valves left closed).
The high pressure limit is disabled when the high pressure drops to below 90% of P54.
Message displayed:

```
    H P   L I M I T   C I R C U I T
      X   I N   P A R T   L O A D
```

• **Water freeze limit:**
If the water temperature drops below the freeze limit (P52) **+** 2°C, Xtraconnect 2 forces the compressor to lower its capacity while running.
This freeze limit is disabled when the water temperature rises above P52 **+** 3.5°C.
Message displayed:

```
      W A T E R   F R E E Z E   L I M I T
  U N I T   I N   P A R T   L O A D
```

• **Evaporator freeze limit**
P70: ΔT between the antifreeze water temperature and the evaporating temperature (compressor suction saturation). P70 = 6°C by default if P52 ≥ 2 or P70 = 8 if P52 < 2 and adjustable between 0 to 10 (resolution: 0.5)
This control is enabled 2 minutes after the compressor is turned on.
P70 message:

```
  P 7 0   A N T I F R E E Z E   D I F F
L P / E V A P   T   x . x °
```

• If the saturation temperature on the evaporator outlet drops below P52 **–** P70, the control will lower the compressor's output. If, after two minutes, the saturation temperature remains below P52 **–** P70, the circuit is turned off by its protection device.
Display:

```
C X   E V A P   T . / F R E E Z E   L I M .
      U N I T   I N   P A R T   L O A D
```

- If the saturation temperature on the evaporator outlet rises to an allowable value, the compressor is authorised in increase its capacity.

• **Power input limitation**
- This function is accessible only if the optional DIRIS energy meter is installed on the machine and parameter P117 is set to Yes.
This limitation can be activated at all times or it can activated by an on/off input (terminals 8-9 on terminal block J3 on the ADD3 board) or over a Bus, but always in relation to parameters P118.1 and P118.2 (adjustable over a Bus).

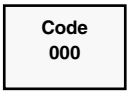
```
  P 1 1 8 . 1   M A X I M U M   P O W E R
  L E V E L                     x x x K W
```

```
  P 1 1 8 . 2   D I F F E R E N C E   F R O M
    M A X   P O W E R       x x x K W
```

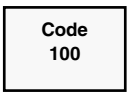
When the machine's total power input exceeds the set threshold for 10 seconds and at least two compressors are running, the controller opens the exhaust valve on one of the compressors. If the total power input does not fall below the threshold after 60 seconds, the exhaust valves on the other compressors are opened in turn until a maximum of three compressors are running at minimum capacity.
If this does not work, the compressors are turned off in turn. However, one compressor must be kept running.
- In order for a compressor to start up again or its intake valve to open, the power input must be less than P118.1 – P118.2 and the outdoor or water inlet temperature (depending on the unit type) must be less 1°C lower than that stored in memory when the compressor was load-shed.

22 ASSIGNING A COMMUNICATION ADDRESS TO THE DIRIS ENERGY METER

Follow the procedure described below when replacing a DIRIS energy meter already installed on a machine.
Turn on the meter and press the PROG button for 5 seconds. The following message is displayed:

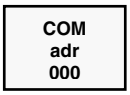


Press the P PF button until the 0 on the left starts flashing. Press the ▲ or ▼ button until the following screen appears:

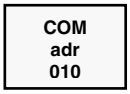


Confirm by pressing **OK**. The following message appears:

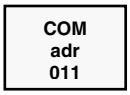
Press the ▲ or ▼ button until the following message appears:



Now press the P PF button twice so that the 0 in the middle starts flashing. Press ▲ or ▼ until 1 appears on the display.



If the DIRIS meter is installed on a 2-circuit machine, confirm by pressing **OK** then exit the configuration menu by pressing the **PROG** button for 5 seconds.
If the DIRIS meter is installed on module 2 of a 3-circuit machine, press the P PF button a third time so that the 0 on the right starts flashing. Select 1 so that the message is as follows:



Confirm by pressing OK and exit the configuration menu by pressing the PROG button for 5 seconds. The measured values will appear on the display.
Now enter the measured values menu of one of the circuits and make sure that the electrical quantities screen (last screen) appears when P15 = Yes. If so, communication between the meter and the controller has been established. If the screen does not appear, check the continuity of the Bus.

23 MANAGEMENT OF THE PROTECTIONS FOR 3-CIRCUIT AIR-TO-WATER UNITS (MODULES 1 AND 2)

- A link fault between modules 1 and 2 may indicate that the RS485 cable is not connected correctly or a lack of voltage on module 2 (circuit 3 off only).
- It is recommended to energise both modules at the same time to ensure adequate warming of the oil before starting up the machine and to prevent the time delays on each module from activating together.
- The oil warm-up time is activated if module 1 and module 2 do not turn on (link fault).
- Phase controller, water flow, and water outlet faults are managed independently for each module. They only shut off the module on which they occur, not the entire machine.
- Water outlet sensor faults are also managed independently on the two modules. Also, if the manifold water outlet sensor is controlled and a fault occurs on the sensor, module 1 switches to standalone mode and uses its own water outlet sensor to make adjustments.

Other faults (compressor, electronic expansion valve, high pressure, low pressure, discharge, desuperheat, lubrication and freon frost protection) are managed on the 2-circuit machines and only affect the refrigerating circuit in question.

24. TIME SCHEDULES

24.1 Overview

This function is used to manage liquid chillers on a weekly basis by selecting:
- 6 program steps (maximum).
- 6 holiday bands (maximum).

24.2 Definition of program steps

• **Settings:**
- Start time,
- End time
- Selected days (M.T.W.T.F.S.S)
- Control mode: setpoint 1 - off/setpoint 2 - off/setpoint 1 - setpoint 2/setpoint 2 - setpoint 1/disabled.

• **Default setting:**
- Start time: 00.00
- End time: 00.00
- Enabled days: none
- Control mode disabled.

24.3 Definition of holiday bands.

• **Settings:**
- Band type: Disabled, off, operate per setpoint 1, operate per setpoint 2.
- Start date dd-mm
- End date dd-mm
- Default setting: Disabled, from 01-01 to 01-01

24.4 Operation

- When the controller is powered up or the time is set, the unit status information is updated to reflect the schedule settings.
- Users may change the unit's settings (on/off - setpoint 1 or 2 control). However, if a time range or holiday band is on, this information is updated at the start or end of the schedule.
- If at least one time range or holiday band is enabled, parameter P120 is set to '2 via console or BMS' and cannot be modified.
- The schedule is disabled when test mode is activated. The unit status information is updated to the schedule settings when test mode is deactivated.
- If periods or bands overlap, On takes priority over Off and setpoint 1 takes priority over setpoint 2

- If a program step is active (# disabled) and the current day is selected, the unit status is as follows :

Program type	State before start time	State between start time and end time	State after end time
STP1-off	Off	Start per setpoint 1	Off
STP2-off	Off	Start per setpoint 2	Off
STP1-STP2	Start per setpoint 2	Start per setpoint 1	Start per setpoint 2
STP2-STP1	Start per setpoint 1	Start per setpoint 2	Start per setpoint 1

- If at least one time range or one holiday band is enabled, the machine stop or temp./setpoint message alternates with a message informing the user that the state will be updated on the next time range state change. Each message is displayed for 3 seconds.
Message displayed:

```
      T I M E   P R O G R A M M I N G
      O N
```

Access:
Via menu 9: "9 SCHEDULING"

```
9 - S C H E D U L I N G
```

Increment number selected (1 to 6)

The control mode is displayed on line 2

- Pressing **OK** will cause the TIME SCHEDULES and HOLIDAY BANDS submenus to appear

```
    T I M E   S C H E D U L E S
       H O L I D A Y   B A N D S
```

Select the desired submenu with the **+** and **–** buttons then press **OK**.
Cursor position:
- Located at the top left when moving through the various menus.
- Located at the bottom right just before the last character when adjusting the settings.
- In the TIME SCHEDULES menu

Display:

```
T I M E T A B L E   x                ↑
                                     ↓
```

Increment number selected (1 to 6)

The control mode is displayed on line 2

Press **+**or **–** to scroll through the range numbers the press **OK**.
Now that the time range has been selected, the control mode must be selected.
Press **OK** to open the settings. Press **+** or **–** to display the following menus. Press **OK** to confirm your selection.

```
C O N T R O L   M O D E              ↑
   S T P . 1   -   O F F             ↓
```

```
C O N T R O L   M O D E              ↑
        S T P . 2   -   O F F        ↓
```

```
C O N T R O L   M O D E              ↑
   S T P . 1   -   S T P . 2         ↓
```

```
C O N T R O L   M O D E              ↑
   S T P . 2   -   S T P . 1         ↓
```

```
C O N T R O L   M O D E              ↑
       D I S A B L E D               ↓
```

After confirming the control mode, the Selected Days submenu appears.

```
S E L E C T E D   D A Y S            ↑
M   T   W   T   F   S   S            ↓
```

Press **OK** then select the days. Press **+** to enable a day and **–** to disable it.
The schedules are set in the following order: start hour, start minute, end hour, and end minute.

```
S T A R T   O F   T I M E   y y H x x      ↑
E N D   O F   T I M E   y y H x x •
```

Press **OK** to set the hours then the minutes.
The unit status will be automatically updated.
All types of adjustment are possible (start time < end time, start time; start time = end time; start time > end time)
If the end time ≤ start time, the schedule will end on the following day.
In the HOLIDAY BANDS menu
Display:

```
  H O L I D A Y   B A N D S          ↑
  N o   x                            ↓
```

Select the number of the holiday band to be set then press **OK**.
Setting selections:

```
TYPE OF ZONE                    ↑
        NO VALID                ↓
```

```
TYPE OF ZONE                    ↑
                        OFF     ↓
```

```
TYPE OF ZONE                    ↑
        SETPOINT 1              ↓
```

```
TYPE OF ZONE                    ↑
        SETPOINT 2              ↓
```

Start day and end day.
Set in the following order: start day/start month/end day/end month

```
DATE OF START DD/MM             ↑
DATE OF END DD/MM               ↓
```

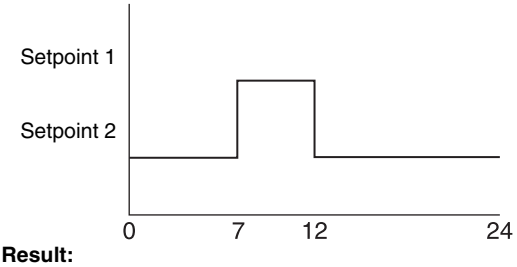
All types of adjustment are possible (start day < end day; start day = end day; start day > end day)
If the end day is before the start day the period is assumed to end the following year.

• **Operation of holiday bands:**

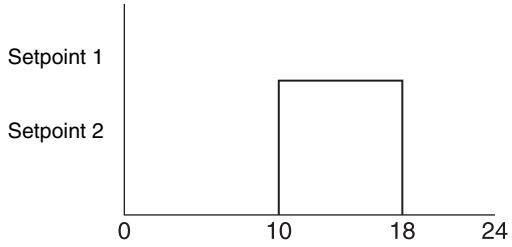
If a holiday band is enabled (start date ≤ current date ≤ end date), the time ranges are disabled. The machine operates in accordance with the active band setting (On/Off per setpoint 1 or On per setpoint 2)
If no time range is enabled at the end of the holiday band, the operating mode prior to the start of the holiday band resumes.

Example:
Schedule 1: 7.00-12.00 STP1-STP2 MTW TF
Schedule 2: 10.00-18.00 STP1-off MT TF
Holiday band: 10-30 August: off

Schedule 1: MTWTF

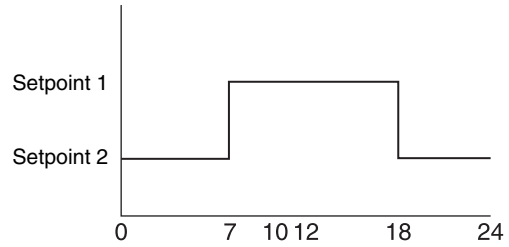


Schedule 2: MTWTF

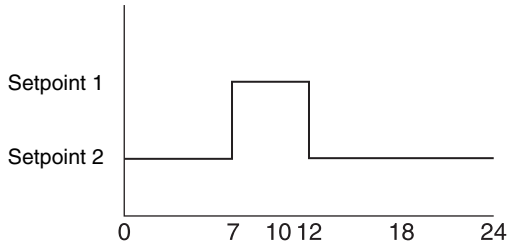


Result:

State: MTWTF



State: MTWTF



As Saturday and Sunday are not selected in the time ranges, the machine is therefore off over the weekend.
The machine is off during the period lasting from 10 to 30 August, which corresponds to the holiday band.

25 COMMUNICATION PROTOCOL

25.1 Communication interface.

• **RS485**

3-pin connector (J11) Terminal 1: A or **+**
Terminal 2: B or **–**
Terminal 3: connected to earth for shielding if desired

Two LEDs indicate the state of the communication:
- D50:Receive LED. Usually off; flashes when a message is received by the board.
If this LED remains on, the bus is reversed. Swap terminals 1 and 2 on J11.
- D52: Send LED. Usually off; lights up when the CPU sends a message over the bus.

25.2 Transmission mode.

● **Serial, asynchronous, half duplex, RTU mode.**
- 1 start bit.
- 8 data bits.
- The parity is set via parameter P702,
- The number of stop bits is set via parameter P703,
- The transmission speed is set via parameter P701,
- The unit number on the Bus is set via parameter P705.

● **Coding of analogue values.**
Standard 32-bit IEEE format (2 registers).
Order of values:
- If P704 = No: low order, high order.
- If P704 = Yes: high order, low order.

● **Function codes used.**
1 or 2: read n bits.
3 or 4: read multiple registers (16 bits)
5: write one bit ……..
6: write register function…
8: read diagnostics counters.
11: read event counter.
15: write n bits.
16: write multiple registers (16 bits)
Note: the write functions are enabled if parameter P103 is set to "Remote, BMS…"

● **Error codes:**
1: function code unknown.
2: address incorrect.
3: data error.

25.3 Customer-accessible register

Register No. hexadecimal	Register No. decimal	Description	Format	Type	Setting
Registers accessible in read-only mode (Functions 3 or 4)					
0x01	1	Controller name	Decimal	Read-only	36 = Xtra Connect 2
0x02	2	Actual operating mode	Decimal	Read-only	0 = off; 1 = cooling; 2 = heating
0x3 and 0x4	3 and 4	Outdoor temperature	Float	Read-only	
0x5 and 0x6	5 and 6	Control setpoint	Float	Read-only	
0x7 and 0x8	7 and 8	Evaporator inlet temperature	Float	Read-only	
0x9 and 0xa	9 and 10	Evaporator outlet temperature	Float	Read-only	
0xb and 0xc	11 and 12	Condenser inlet temperature	Float	Read-only	
0xd and 0xe	13 and 14	Condenser outlet temperature	Float	Read-only	
0xf and 0x10	15 and 16	Manifold outlet temperature (modules 1 and 2)	Float	Read-only	
0x11 and 0x12	17 and 18	Master/slave manifold outlet temperature (2 machines)	Float	Read-only	
0x13	19	Number of stages on	Char	Read-only	
0x20 and 0x21	32 and 33	P285 Heating mode runtime (in hours)	Float	Read-only	
0x22 and 0x23	34 and 35	P286 Cooling mode runtime (in hours)	Float	Read-only	
0x24 and 0x25	36 and 37	P287 Pump 1 runtime (in hours)	Float	Read-only	
0x26 and 0x27	38 and 39	P288 Pump 2 runtime (in hours)	Float	Read-only	
0x28 and 0x29	40 and 41	P310 Number of compressor 1 starts	Float	Read-only	
0x2a and 0x2b	42 and 43	P311 Compressor 1 runtime	Float	Read-only	
0x2c and 0x2d	44 and 45	P313 Number of compressor 2 starts	Float	Read-only	
0x2e and 0x2f	46 and 47	P314 Compressor 2 runtime	Float	Read-only	
0x30 and 0x31	48 and 49	P340 Number of compressor 3 starts	Float	Read-only	
0x32 and 0x33	50 and 51	P341 Compressor 3 runtime	Float	Read-only	
0x50 and 0x51	80 and 81	Voltage between phases 1 and 2 (module 1)	Float	Read-only	
0x52 and 0x53	82 and 83	Voltage between phases 2 and 3 (module 1)	Float	Read-only	
0x54 and 0x55	84 and 85	Voltage between phases 1 and 3 (module 1)	Float	Read-only	
0x56 and 0x57	86 and 87	Current input (module 1)	Float	Read-only	
0x58 and 0x59	88 and 89	Instantaneous power consumption (module 1)	Float	Read-only	
0x5a and 0x5b	90 and 91	Module 1 power consumption (kW)	Float	Read-only	Write 0 to reset modules 1 and 2
0x5c and 0x5d	92 and 93	Voltage between phases 1 and 2 (module 2)	Float	Read-only	
0x5e and 0x5f	94 and 95	Voltage between phases 2 and 3 (module 2)	Float	Read-only	
0x60 and 0x61	96 and 97	Voltage between phases 1 and 3 (module 2)	Float	Read-only	
0x62 and 0x63	98 and 99	Current input (module 2	Float	Read-only	
Registers accessible in read-only mode (Functions 3 or 4)					
0x64 and 0x65	100 and 101	Instantaneous power consumption (module 2)	Float	Read-only	
0x66 and 0x67	102 and 103	Module 2 power consumption (kW)	Float	Read-only	Write 0 to reset modules 1 and 2
0x68 and 0x69	104 and 105	Total current input	Float	Read-only	
0x6a and 0x6b	106 and 107	Total instantaneous power consumption	Float	Read-only	
0x6c and 0x6d	108 and 109	Total power consumption (kW)	Float	Read/Write	Write 0 to reset modules 1 and 2
Registers accessible in read mode (Functions 3 or 4) and write mode (Function 16)					
0x101 and 0x102	257 and 258	P121 Cooling setpoint 1	Float	Read/Write	
0x103 and 0x104	259 and 260	P122 Cooling setpoint 2	Float	Read/Write	
0x105 and 0x106	261 and 262	P123 Heating setpoint 1	Float	Read/Write	
0x107 and 0x108	263 and 264	P124 Heating setpoint 2	Float	Read/Write	

Register No. hexadecimal	Register No. decimal	Description	Format	Type	Setting
Registers accessible in read mode (Functions 3 or 4) and write mode (Function 16) (continued)					
0x109 and 0x10a	265 and 266	P125.1 Setpoint for 4 mA in cooling mode	Float	Read/Write	
0x10b and 0x10c	267 and 268	P125.2 Setpoint for 4 mA in heating mode	Float	Read/Write	
0x10d and 0x10e	269 and 270	P126.1 Setpoint for 20 mA in cooling mode	Float	Read/Write	
0x10f and 0x110	271 and 272	P126.2 Setpoint for 20 mA in heating mode	Float	Read/Write	
Registers accessible in read mode (Functions 3 or 4) and write mode (Functions 6 or 16)					
0x200	512	Year	Decimal	Read/Write	0 to 99
0x201	513	Month	Decimal	Read/Write	1 to 12
0x202	514	Day of the month	Decimal	Read/Write	1 to 31
0x203	515	Day of the week	Decimal	Read/Write	1 to 7 (1: Monday, 2: Tuesday,
0x204	516	Hour	Decimal	Read/Write	0 to 23
0x205	517	Minute	Decimal	Read/Write	0 to 59

25.4 Customer access bit

Hexadecimal bit No.	Decimal bit No.	Description	Type	Setting
Read-only bit (function 1 or 2)				
0x01	1	P103 Control mode	Read-only	0 : Local, 1=Remote
0x02	2	Operating summary (On/Off and automatic operation input closed)	Read-only	1 = on
0x03	3	State of pump 1 output	Read-only	1 = on
0x04	4	State of pump 2 output	Read-only	1 = on
0x05	5	Compressor 1 output state	Read-only	1 = on
0x06	6	Compressor 2 output state	Read-only	1 = on
0x07	7	Compressor 3 output state	Read-only	1 = on
0x08	8	Not used		
0x09	9	Not used		
0x0a	10	Not used		
0x0b	11	Not used		
0x0c	12	Not used		
0x0d	13	Energy limiter on	Read-only	1=on
0x0e to 0x0f reserved				
0x10	16	General fault summary (1 fault below present)	Read-only	1 = Fault
0x11	17	Phase controller fault	Read-only	1 = Fault
0x12	18	Water flow fault (module 1)	Read-only	1 = Fault
0x13	19	Pump 1 fault		
0x14	20	Pump 2 fault	Read-only	1 = Fault
0x15	21	Pump fault, 1 loop	Read-only	1 = Fault
0x16	22	Pump fault, 2 loops	Read-only	1 = Fault
0x17	23	Heat exchanger inlet sensor fault	Read-only	1 = Fault
0x18	24	Heat exchanger outlet sensor fault	Read-only	1 = Fault
0x19	25	Outdoor temperature sensor fault	Read-only	1 = Fault
0x1a	26	Condenser inlet sensor fault	Read-only	1 = Fault
0x1b	27	Manifold outlet sensor fault for machine with 500 kW module	Read-only	1 = Fault
0x1c	28	Fan fault	Read-only	1 = Fault
0x1d	29	EEPROM fault	Read-only	1 = Fault
0x1e	30	Loop inlet sensor fault (MULTICONNECT)	Read-only	1 = Fault
0x1f	31	Loop outlet sensor fault (MULTICONNECT)	Read-only	1 = Fault
0x20	32	AEROCONNECT link fault	Read-only	1 = Fault
0x21	33	Outdoor temperature too high in cooling mode	Read-only	1 = Fault
0x22	34	Operating mode change fault	Read-only	1 = Fault
0x23	35	Winter protection	Read-only	1 = Fault
0x24	36	Hydraulic module ambient temperature sensor fault	Read-only	1 = Fault
0x25	37	Condenser outlet sensor fault	Read-only	1 = Fault
0x26	38	Outdoor temperature too high in heating mode	Read-only	1 = Fault
0x27	39	External fault	Read-only	1 = Fault
0x28	40	Emergency stop fault	Read-only	1 = Fault
0x29	41	Control sensor fault	Read-only	1 = Fault

Hexadecimal bit No.	Decimal bit No.	Description	Type	Setting
0x25 to 0x3f reserved				
0x40	64	Circuit 1 fault summary	Read-only	1 = Fault
0x41	65	Compressor 1 fault	Read-only	1 = Fault
0x42	66	Not used	Read-only	1 = Fault
0x43	67	Circuit 1 manual HP fault	Read-only	1 - Fault
0x44	68	Not used	Read-only	1 = Fault
0x45	69	Circuit 1 LP fault	Read-only	1 = Fault
0x46	70	Water freeze fault (circuits 1 and 2)	Read-only	1 = Fault
0x47	71	Not used	Read-only	1 = Fault
0x48	72	Not used	Read-only	1 = Fault
0x49	73	Compressor 1 discharge fault	Read-only	1 = Fault
0x4a	74	Not used		
0x4b	75	Not used		
0x4c	76	Expansion valve fault, circuit 1	Read-only	1 = Fault
0x4d	77	Not used		
0x4e	78	Circuit 1 low superheat fault	Read-only	1 = Fault
0x4f	79	Circuit 1 high superheat fault	Read-only	1 = Fault
0x50	80	Circuit 1 desuperheat fault	Read-only	1 = Fault
0x51	81	Circuit 1 lubrication fault	Read-only	1 = Fault
0x52	82	Not used		
0x53	83	Not used		
0x54	84	Not used		
0x55	85	Not used		
0x56	86	Not used		
0x57	87	Compressor 1 discharge sensor fault	Read-only	1 = Fault
0x58	88	Not used		
0x59	89	Circuit 1 HP sensor fault	Read-only	1 = Fault
0x5a	90	Circuit 1 LP sensor fault	Read-only	1 = Fault
0x5b	91	Circuit 1 suction sensor fault	Read-only	1 = Fault
0x5c	92	Circuit 1 liquid sensor fault	Read-only	1 = Fault
0x5d	93	ADD3 board link fault (circuits 1 and 2)	Read-only	1 = Fault
0x5e	94	Not used		
0x5f	95	Not used		
0x60	96	Not used		
0x61 to 0x7f reserved				
0x80	128	Compressor 1 load shedding	Read-only	1 = Load shedding
0x81	129	Not used		
0x82 to 0x9f free				
0x100	256	Circuit 2 fault summary	Read-only	1 = Fault
0x101	257	Compressor 2 fault	Read-only	1 = Fault
0x102	258	Not used		
0x103	259	Circuit 2 manual HP fault	Read-only	1 = Fault
0x104	260	Not used		
0x105	261	Circuit 2 LP fault	Read-only	1 = Fault
0x106	262	Water freeze fault (circuits 1 and 2)	Read-only	1 = Fault
0x107	263	Not used		
0x108	264	Not used		
0x109	265	Compressor 2 discharge fault	Read-only	1 = Fault
0x10a	266	Not used		
0x10b	267	Not used		
0x10c	268	Expansion valve fault, circuit 2	Read-only	1 = Fault
0x10d	269	Not used		
0x10e	270	Circuit 2 low superheat fault	Read-only	1 = Fault
0x10f	271	Circuit 2 high superheat fault	Read-only	1 = Fault
0x110	272	Circuit 2 desuperheat fault	Read-only	1 = Fault
0x111	273	Circuit 2 lubrication fault	Read-only	1 = Fault
0x112	274	Not used		
0x113	275	Not used		
0x114	276	Not used		
0x115	277	Not used		
0x116	278	Not used		

Hexadecimal bit No.	Decimal bit No.	Description	Type	Setting
0x82 to 0x9f free (continued)				
0x117	279	Compressor 2 discharge sensor fault	Read-only	1 = Fault
0x118	280	Not used		
0x119	281	Circuit 2 HP sensor fault	Read-only	1 = Fault
0x11a	282	Circuit 2 LP sensor fault	Read-only	1 = Fault
0x11b	283	Circuit 2 suction sensor fault	Read-only	1 = Fault
0x11c	284	Circuit 2 liquid sensor fault	Read-only	1 = Fault
0x11d	285	ADD3 board link fault (circuits 1 and 2)	Read-only	1 = Fault
0x11e to 0x13f reserved				
0x140	320	Compressor 2 load shedding	Read-only	1 = Load shedding
0x141	321	Not used		
0x150	336	Circuit 3 fault summary	Read-only	1 = Fault
0x151	337	Compressor 3 fault	Read-only	1 = Fault
0x152	338	Not used	Read-only	1 = Fault
0x153	339	Circuit 3 manual HP fault	Read-only	1 = Fault
0x154	340	Not used	Read-only	1 = Fault
0x155	341	Circuit 3 LP fault	Read-only	1 = Fault
0x156	342	Circuit 3 water freeze fault	Read-only	1 = Fault
0x157	343	Not used	Read-only	1 = Fault
0x158	344	Not used	Read-only	1 = Fault
0x159	345	Compressor 3 discharge fault	Read-only	1 = Fault
0x15a	346	Not used	Read-only	1 = Fault
0x15b	347	Not used	Read-only	1 = Fault
0x15c	348	Expansion valve fault, circuit 3	Read-only	1 = Fault
0c15d	349	Not used	Read-only	1 = Fault
0x15e	350	Circuit 3 low superheat fault	Read-only	1 = Fault
0x15f	351	Circuit 3 high superheat fault	Read-only	1 = Fault
0x160	352	Circuit 3 desuperheat fault	Read-only	1 = Fault
0x161	353	Circuit 3 lubrication fault	Read-only	1 = Fault
0x162	354	Not used	Read-only	1 = Fault
0x163	355	Not used	Read-only	1 = Fault
0x164	356	Not used	Read-only	1 = Fault
0x165	357	Not used	Read-only	1 = Fault
0x166	358	Not used	Read-only	1 = Fault
0x167	359	Compressor 3 discharge sensor fault	Read-only	1 = Fault
0x168	360	Not used	Read-only	1 = Fault
0x169	361	Circuit 3 HP sensor fault	Read-only	1 = Fault
0x16a	362	Circuit 3 LP sensor fault	Read-only	1 = Fault
0x16b	363	Circuit 3 suction sensor fault3	Read-only	1 = Fault
0x16c	364	Circuit 3 liquid sensor fault	Read-only	1 = Fault
0x16d	365	ADD3 board link fault (circuit 3)	Read-only	1 = Fault
0x16e	366	ADD1 board link fault (circuit 3)	Read-only	1 = Fault
0x16f	367	Not used	Read-only	1 = Fault
0x170	368		Read-only	1 = Fault
0x171 to 0x17f reserved				
0x180	384	Compressor 3 load shedding	Read-only	1=Load shedding

For other configurations, refer to the communication protocol document.