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CONTROL PANEL OPERATING MANUAL

WATER-COOLED SCREW CHILLER

MICROTECH III and MICROTECH 4 CONTROLLERS

D–EOMWC00A07-16_01EN

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1 Introduction

This manual provides setup, operating, troubleshooting and maintenance information for the DAIKIN Water Cooled Chillers listed below with 1, 2 and 3 circuits using Microtech III and Microtech 4 Controllers (Microtech in the following sections to be intended as the two mentioned controllers; this manual does not apply to the previous Microtech controllers).

HAZARD IDENTIFICATION INFORMATION

⚠ DANGER

Dangers indicate a hazardous situation which will result in death or serious injury if not avoided.

⚠ WARNING

Warnings indicate potentially hazardous situations, which can result in property damage, severe personal injury, or death if not avoided.

⚠ CAUTION

Cautions indicate potentially hazardous situations, which can result in personal injury or equipment damage if not avoided.

Software Version: This manual covers EWWD G-EWLD G-EWWD I-EWLD I-EWWD J-EWLD J-EWWQ B units. The unit's software version number can be viewed by selecting the "About Chiller" menu item accessible without password. Then, pressing the MENU key will return to the Menu screen.

⚠ WARNING

Electric shock hazard: can cause personal injury or equipment damage. This equipment must be properly grounded. Connections to, and service of, the MicroTech control panel must be performed only by personnel who are knowledgeable in the operation of this equipment.

⚠ CAUTION

Static sensitive components. A static discharge while handling electronic circuit boards can cause damage to the components. Discharge any static electrical charge by touching the bare metal inside the control panel before performing any service work. Never unplug any cables, circuit board terminal blocks, or power plugs while power is applied to the panel.

NOTICE

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, can cause interference to radio communications. Operation of this equipment in a residential area can cause harmful interference, in which case the user will be required to correct the interference at the user's own expense. Daikin disclaims any liability resulting from any interference or for the correction thereof.

2 Controller Operating Limits:

Operation (IEC 721-3-3):

- Temperature -40...+70 °C
- Restriction LCD -20… +60 °C
- Restriction Process-Bus -25….+70 °C
- Humidity < 90 % r.h (no condensation)
- Air pressure min. 700 hPa, corresponding to max. 3,000 m above sea level

Transport(IEC 721-3-2):

- Temperature -40...+70 °C
- Humidity < 95 % r.h (no condensation)
- Air pressure min. 260 hPa, corresponding to max. 10,000 m above sea level.

3 Controller Features

Readout of the following temperature and pressure readings:

- Entering and leaving chilled water temperature
- Saturated evaporator refrigerant temperature and pressure
- Saturated condenser refrigerant temperature and pressure
- Outside air temperature
- Suction line, and discharge line temperatures – calculated superheat for discharge and suction lines
- Oil pressure

Automatic control of primary and standby chilled water pumps. The control will start one of the pumps (based on lowest run-hours) when the unit is enabled to run (not necessarily running on a call for cooling) and when the water temperature reaches a point of freeze possibility.

Two levels of security protection against unauthorized changing of setpoints and other control parameters.

Warning and fault diagnostics to inform operators of warning and fault conditions in plain language. All events and alarms are time and date-stamped for identification of when the fault condition occurred. In addition, the operating conditions that existed just prior to an alarm shutdown can be recalled to aid in isolating the cause of the problem.

Twenty-five previous alarms and related operating conditions are available.

Test mode allows the service technician to manually control the controllers' outputs and can be useful for system checkout.

Building Automation System (BAS) communication capability via LonTalk®, Modbus®, or BACnet® standard protocols for all BAS manufacturers.

Pressure transducers for direct reading of system pressures. Preemptive control of low evaporator pressure conditions and high discharge temperature and pressure to take corrective action prior to a fault trip.

4 General Description

The control panel is located on the front of the unit at the compressor end. There are three doors. The control panel is behind to left-hand door. The power panel is behind the middle and right-hand doors.

4.1.1 General Description

The MicroTech control system consists of a microprocessor-based controller and a number of extension modules, which vary depending on the unit size and conformation. The control system provides the monitoring and control functions required for the controlled, efficient operation of the chiller.

The operator can monitor all critical operating conditions by using the screen located on the main controller. In addition to providing all normal operating controls, the MicroTech control system will take corrective action if the chiller is operating outside of its normal design conditions. If a fault condition develops, the controller will shut a compressor, or the entire unit, down and activate an alarm output.

The system is password protected and only allows access by authorized personnel. Except that some basic information is viewable and alarms can be cleared without a password. No settings can be changed.

4.2 Operation Commands Layout

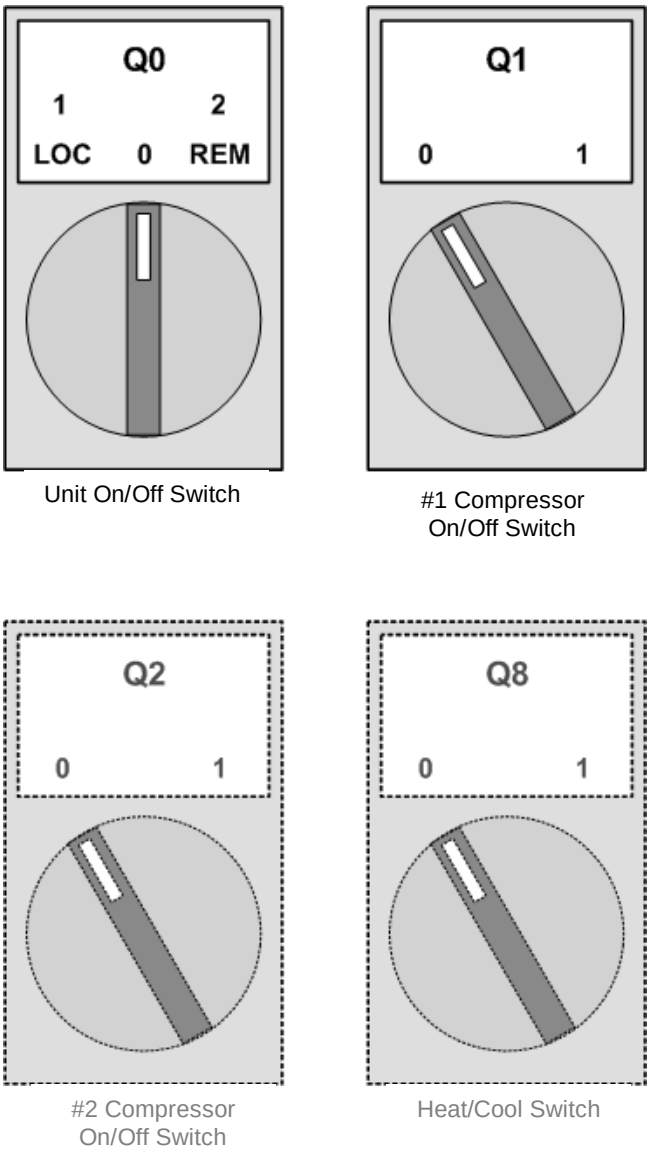


Figure 1, Operation Commands

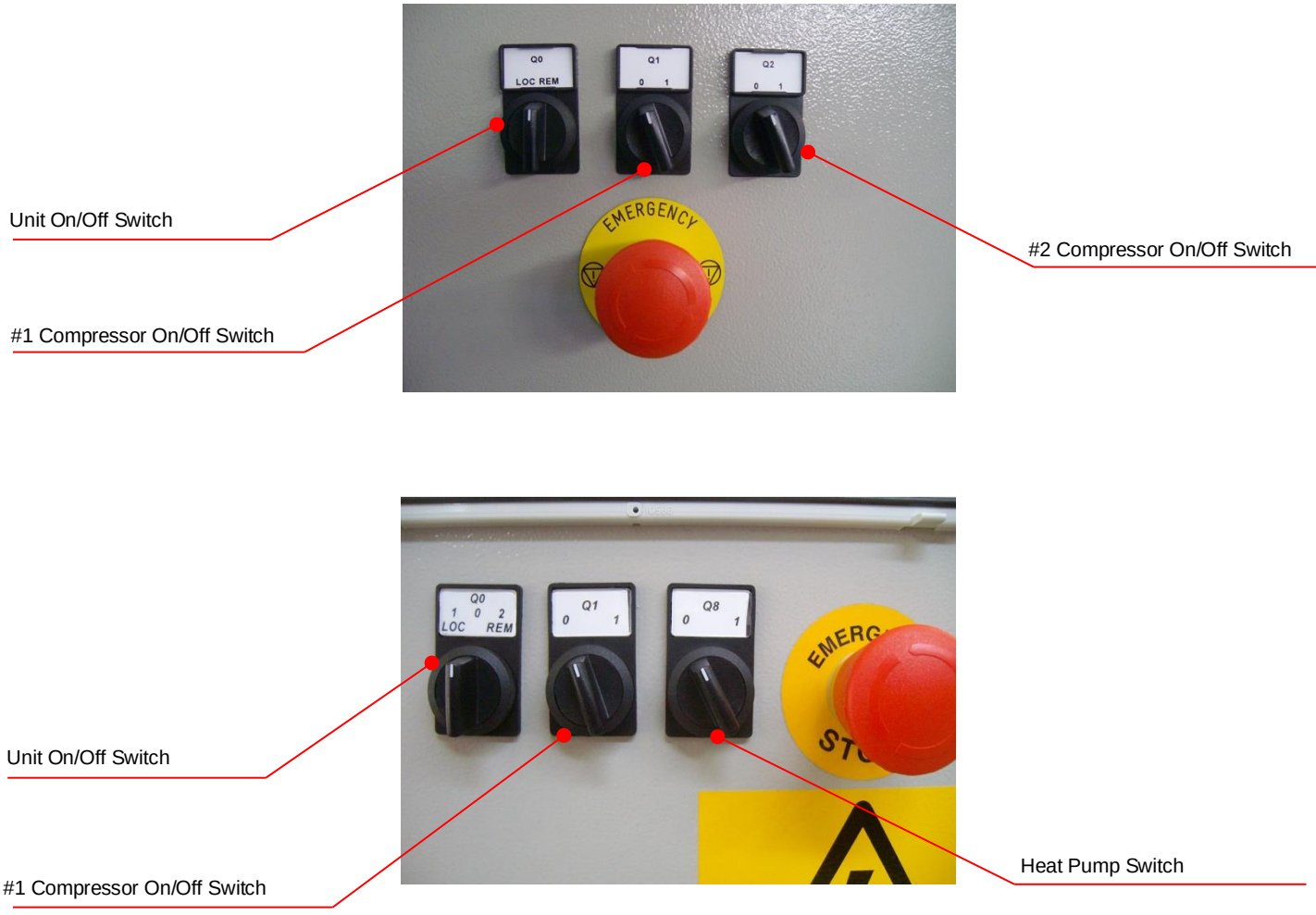


Figure 2, Operation Commands

4.3 Controller Description

4.3.1 Hardware Structure

The MicroTech control system for water cooled screw chillers consists of a main unit controller with a number of extension I/O modules attached depending on the chiller size and configuration.

Up to two optional BAS communication modules may be included on request.

An optional Remote Operator Interface panel may be included, connected with up to nine units.

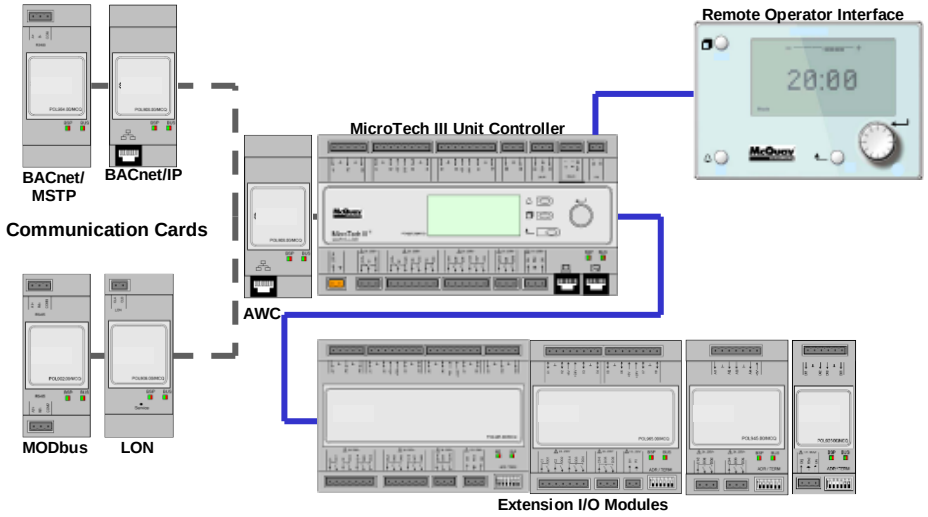


Figure 3, hardware structure

4.3.2 System Architecture

The overall controls architecture uses the following:

- One Microtech main controller
- I/O extension modules as needed depending on the configuration of the unit
- Optional BAS interface as selected

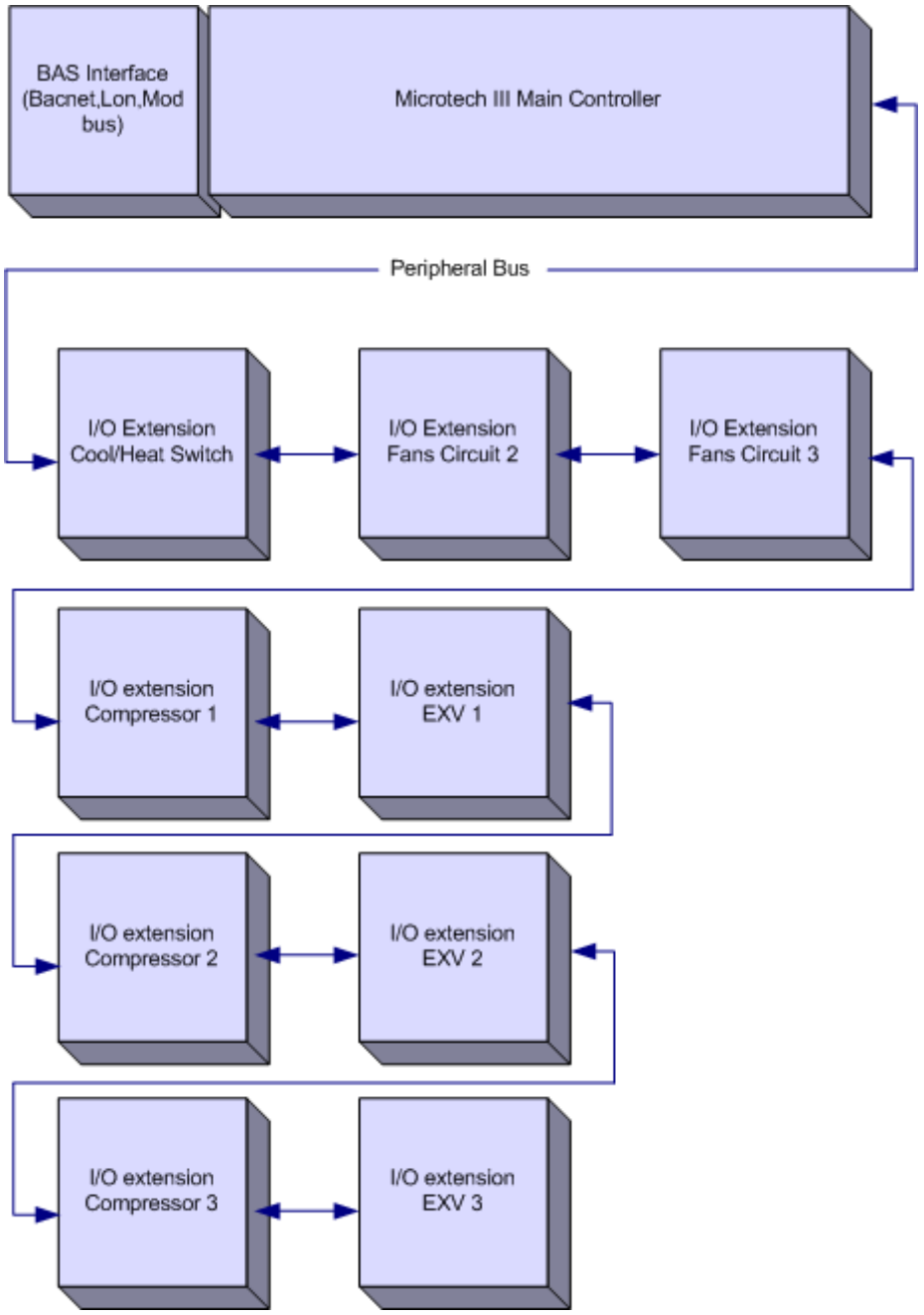


Figure 4, System Architecture

4.4 Control network details

Peripheral Bus is used to connect I/O extensions to the main controller.

Controller/ Extension Module	Siemens Part Number	Address	Usage
Unit	POL687.70/MCQ POL688.80/MCQ	n/a	Used on all configurations
Comp. #1	POL965.00/MCQ	2	
EEXV #1	POL94U.00/MCQ	3	
Comp. #2	POL965.00/MCQ	4	Used when configured for 2
EEXV #2	POL94U.00/MCQ	5	
Fan#2	POL945.00/MCQ	6	
Comp. #3	POL965.00/MCQ	7	Used when configured for 3
EEXV #3	POL94U.00/MCQ	8	
Fan#3	POL945.00/MCQ	9	
HP	POL925.00/MCQ	25	Heat Pump Option (old version)
HP	POL945.00/MCQ	26	Heat Pump Option (new version) + Leak detector + Marine version.

Communication modules

The new Microtech 4 has the possibility to offer Modbus RTU and Bacnet (MSTP or IP) communications integrated in the controller. To activate this feature a specific procedure is used to activate them. This procedure will ask for an activation key to be entered as a setpoint. This will be done in the factory as part of the unit manufacturing or in the field by asking for the activation code as a Spare part. Because these features may conflict with others (for example Bacnet IP and Daikin on Site).

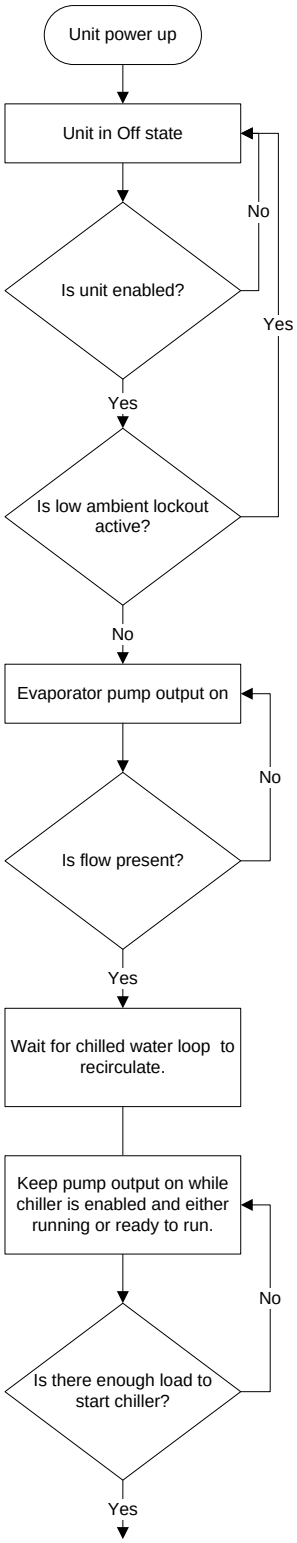
Any of the following modules can be connected directly to the left side of the main controller to allow a BAS interface to function.

Module	Siemens Part Number	Usage
BacNet/IP	POL908.00/MCQ	Optional
Lon	POL906.00/MCQ	Optional
Modbus	POL902.00/MCQ	Optional
BACnet/MSTP	POL904.00/MCQ	Optional

5 Sequence of Operation

Figure 5, Unit Sequence of Operation (see Figure 9 for circuit sequence of operation)

AWS Chiller Sequence of Operation in Cool Mode



The chiller may be disabled via the unit switch, the remote switch, the keypad enable setting, or the BAS network. In addition, the chiller will be disabled if all circuits are disabled, or if there is a unit alarm. If the chiller is disabled, the unit status display will reflect this and also show why it is disabled.

If the unit switch is off, the unit status will be **Off:Unit Switch**. If the chiller is disabled due to network command, the unit status will be **Off:BAS Disable**. When the remote switch is open, the unit status will be **Off:Remote Switch**. When a unit alarm is active, the unit status will be **Off:Unit Alarm**. In cases where no circuits are enabled, the unit status will be **Off:All Cir Disabled**. If the unit is disabled via the Chiller Enable set point, the unit status will be **Off:Keypad Disable**.

Low ambient lockout will prevent the chiller from starting even if it is otherwise enabled. When this lockout is active, the unit status will be **Off:Low OAT Lock**.

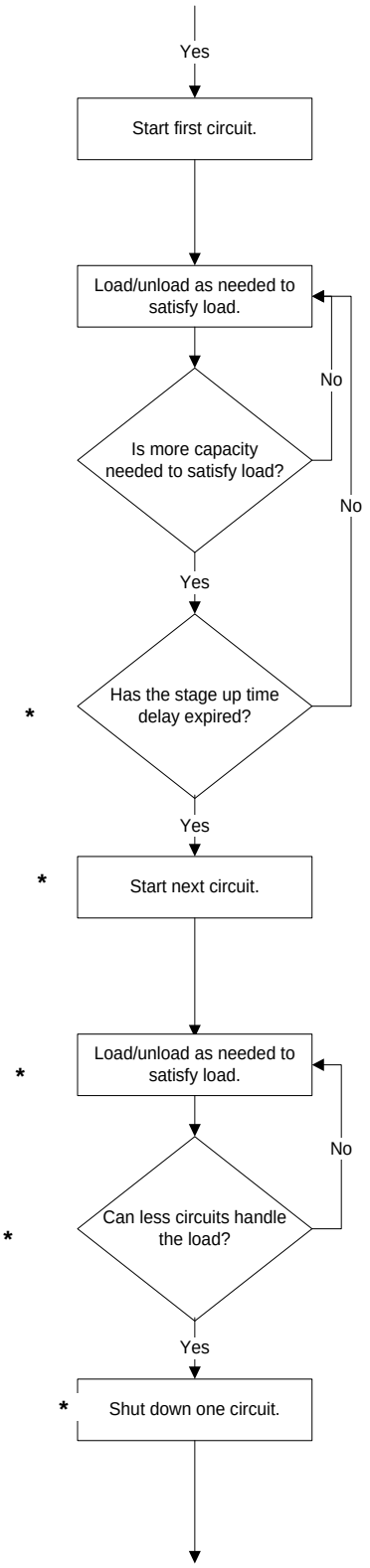
If the chiller is enabled, then the unit will be in the Auto state and the evaporator water pump output will be activated.

The chiller will then wait for the flow switch to close, during which time the unit status will be **Auto:Wait for flow**.

After establishing flow, the chiller will wait some time to allow the chilled water loop to recirculate for an accurate reading of the leaving water temperature. The unit status during this time is **Auto:Evap Recirc**.

The chiller is now ready to start if enough load is present. If the LWT is not higher than the Active Setpoint plus the Start Up Delta T, the unit status will be **Auto:Wait for load**.

If the LWT is higher than the Active Setpoint plus the Start Up Delta T, the unit status will be **Auto**. A circuit can start at this time.



The first circuit to start is generally the available circuit with the least number of starts. This circuit will go through its start sequence at this point.

The first circuit will be loaded and unloaded as needed in an attempt to satisfy the load by controlling LWT to the Active Setpoint.

If a single circuit is not enough to satisfy the load, additional circuits will need to be started. An additional circuit will be started when all running compressors are loaded to a specific capacity and the LWT is higher than the Active Setpoint plus the Stage Up Delta T.

A minimum time must pass between the starting of circuits. The time remaining can be viewed on the HMI if the minimum password level is active.

The second circuit will go through its start sequence at this point.

Note that a third circuit can be started if available. The two preceding conditions must again be satisfied after starting the second circuit before starting the third circuit.

All running circuits will now be loaded/unloaded as needed to satisfy the load. When possible, they will load balance so that running circuits are providing nearly equal capacity.

As the load drops off, the circuits will unload accordingly. If the LWT drops below the Active Setpoint minus the Stage Down Delta T, one circuit will shut off. If all running circuits are unloaded below a minimum value, this can also result in one circuit shutting off.

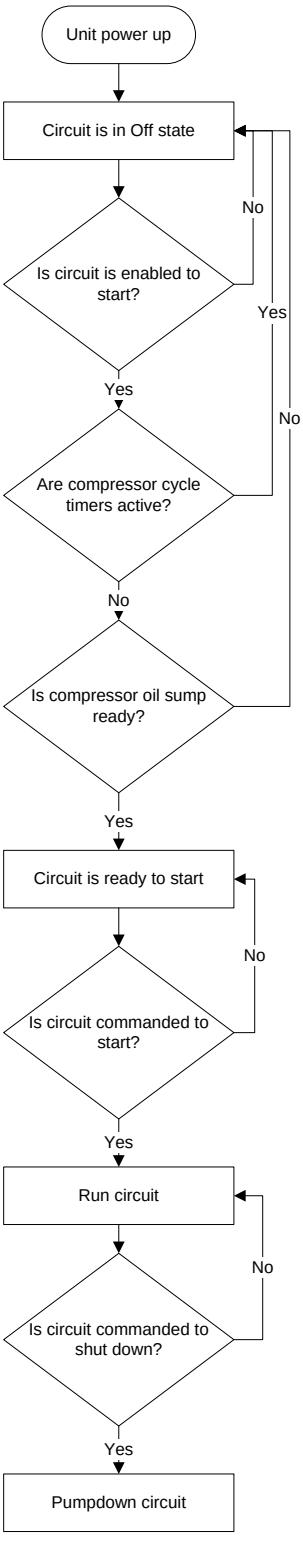
A minimum time must pass between the shutting down of circuits. The time remaining can be viewed on the HMI if the minimum password level is active.

The next circuit to shut off is generally the one with the most run hours.

*** The points highlighted are considered only in 2 or 3 circuits units**

Figure 6, <u>Circuit</u> Sequence of Operation

AWS Sequence of Operation - Circuits



When the circuit is in the Off state the EXV is closed, compressor is off, and all fans are off.

The circuit must be enabled before it can run. It may be disabled for several reasons. When the circuit switch is off, the status will be **Off:Circuit Switch**. If the BAS has disabled the circuit, the status will be **Off:BAS Disable**. If the circuit has an active stop alarm then the status will be **Off:Cir Alarm**. If the circuit has been disabled via the circuit mode set point, the status will be **Off:Cir Mode Disable**.

A minimum time must pass between the previous start and stop of a compressor and the next start. If this time has not passed, a cycle timer will be active and the circuit status will be **Off:Cycle Timer**.

If the compressor is not ready due to refrigerant in the oil, the circuit cannot start. The circuit status will be **Off:Refr In Oil.**

If the compressor is ready to start when needed, the circuit status will be **Off:Ready**.

When the circuit begins to run, the compressor will be started and the EXV, fans, and other devices will be controlled as needed. The normal circuit status at this time will be **Run**.

When the circuit is commanded to shut down, a normal shut down of the circuit will be performed. The circuit status during this time will be **Run:Pumpdown**. After the shut down is completed, the circuit status will normally be **Off:Cycle Timer** initially**.**

6 Controller Operation

6.1 MicroTech Inputs/Outputs

The chiller may be equipped with one up to three compressors.

6.1.1 Analog Inputs

#	Description	Signal Source	Expected Range
AI1	Evaporator Entering Water Temp	NTC Thermister (10K@25°C)	-50°C – 120°C
AI2	Evaporator Leaving Water Temp	NTC Thermister (10K@25°C)	-50°C – 120°C
AI3	Condenser Entering Water Temp	NTC Thermister (10K@25°C)	-50°C – 120°C
X1	Condenser Leaving Water Temp	NTC Thermister (10K@25°C)	-50°C – 120°C
X4	LWT Reset	4-20 mA Current	1 to 23 mA
X7	Demand Limit	4-20 mA Current	1 to 23 mA
X8	Unit Current	4-20 mA Current	1 to 23 mA

6.1.2 Analog Outputs

#	Description	Output Signal	Range
X5	Condenser Pump VFD	0-10VDC	0 to 100% (1000 steps resolution)
X6	Condenser Bypass Valve	0-10VDC	0 to 100% (1000 steps resolution)

6.1.3 Digital Inputs

#	Description	Signal Off	Signal On
DI1	Unit PVM	Fault	No Fault
DI2	Evaporator Flow Switch	No Flow	Flow
DI3	Double Set Point/ Mode Switch	Cool mode	Ice mode
DI4	External Alarm	Remote off	Remote on
DI5	Unit Switch	Unit off	Unit on
DI6	Emergency Stop	Unit off/rapid stop	Unit on
X2	Current Limit Enable	Disabled	Enabled
X3	Condenser Flow Switch	No Flow	Flow

6.1.4 Digital Outputs

#	Description	Output OFF	Output ON
DO1	Evaporator Water Pump #1	Pump Off	Pump On
DO2	Unit Alarm	Alarm not Active	Alarm Active (Flashing= circuit alarm)
DO3	Cooling Tower Out 1	Fan Off	Fan On
DO4	Cooling Tower Out 2	Fan Off	Fan On
DO5	Cooling Tower Out 3	Fan Off	Fan On
DO6	Cooling Tower Out 4	Fan Off	Fan On
DO7			
DO8	Evaporator Water Pump #2	Pump Off	Pump On
DO9	Condenser Water Pump	Pump Off	Pump On

6.2 Extension I/O Compressor #1 to #3

6.2.1 Analog Inputs

#	Description	Signal Source	Expected Range
X1	Discharge Temperature	NTC Thermister (10K@25°C)	-50°C – 120°C
X2	Evaporator Pressure	Ratiometric (0,5-4,5 Vdc)	0 to 5 Vdc
X3	Oil Pressure	Ratiometric (0,5-4,5 Vdc)	0 to 5 Vdc
X4	Condenser Pressure	Ratiometric (0,5-4,5 Vdc)	0 to 5 Vdc
X7	Motor Protection	PTC Thermistor	n/a

6.2.2 Analog Outputs

#	Description	Output Signal	Range
Not Needed			

6.2.3 Digital Inputs

#	Description	Signal Off	Signal On
X6	Starter Fault	Fault	No fault
X8	Circuit Switch	Circuit Off	Circuit On
DI1	High Pressure Switch	Fault	No fault

6.2.4 Digital Outputs

#	Description	Output Off	Output On
DO1	Start Compressor	Compressor Off	Compressor On
DO2	Circuit Alarm	Circuit Alarm Off	Circuit Alarm On
DO3	Load #2 Circuit	Load 2 Circuit Off	Load 2 Circuit On
DO4	Unload #2 Circuit / Liquid Injection	Unload 2 Circuit Off / Liquid Injection Off	Unload 2 Circuit On / Liquid Injection On
DO5	Load #1 Circuit	Load 1 Circuit Off	Load 1 Circuit On
DO6	Unload #1 Circuit	Unload 1 Circuit Off	Unload 1 Circuit On
X5	Turbo Slide	Turbo Slide Off	Turbo Slide On

6.3 I/O EXV Circuit #1 to #3

6.3.1 Analog Inputs

#	Description	Signal Source	Expected Range
X1	Evaporator Leaving Water Temp (*)	NTC Thermister 10K@25°C)	-50°C – 120°C
X2	Suction Temperature	NTC Thermister 10K@25°C)	-50°C – 120°C
X3			

6.3.2 Analog Outputs

#	Description	Output Signal	Range
Not Needed			

6.3.3 Digital Inputs

#	Description	Signal Off	Signal On
DI1	Evaporator Flow Switch (Circuit)	No Flow	Flow

6.3.4 Digital Outputs

#	Description	Output Off	Output On
DO1	Liquid Line Solenoid Valve	Liquid Line Solenoid Valve Off	Liquid Line Solenoid Valve On

6.3.5 Stepper Motor Output

#	Description
M1+	EXV Stepper Coil 1
M1-	
M2+	EXV Stepper Coil 2
M2-	

6.4 Extension I/O Fan Module Circuit #2

6.4.1 Digital Outputs

#	Description	Signal source	Output On
DO1	Circuit #2 Fan Step #1 Fan Off Fan On	Fan Off	Fan On
DO2	Circuit #2 Fan Step #2 Fan Off Fan On	Fan Off	Fan On
DO3	Circuit #2 Fan Step #3 Fan Off Fan On	Fan Off	Fan On
DO4	Circuit #2 Fan Step #4 Fan Off Fan On	Fan Off	Fan On

6.5 Extension I/O Fan Module Circuit #3

6.5.1 Digital Outputs

#	Description	Output Off	Output On
DO1	Circuit #3 Fan Step #1 Fan Off Fan On	Fan Off	Fan On
DO2	Circuit #3 Fan Step #2 Fan Off Fan On	Fan Off	Fan On
DO3	Circuit #3 Fan Step #3 Fan Off Fan On	Fan Off	Fan On
DO4	Circuit #3 Fan Step #4 Fan Off Fan On	Fan Off	Fan On

6.6 Extension I/O Unit Heat Pump (Old Version)

6.6.1 Digital Inputs

#	Description	Signal Off	Signal On
DI1	Cool Heat Switch	Cooling Mode	Heating Mode
DI2	Leak Detector	No Leak detected	Leak detected

6.7 Extension I/O Unit Heat Pump (New Version)

6.7.1 Digital Outputs

#	Description	Output Off	Output On
DO1	Power Request (Marine option)		
DO2			
DO3			
DO4			

6.7.2 Analog Inputs

#	Description	Signal Source	Expected Range
AI1	Common Condenser Water Temperature	NTC Thermister 10K@25°C)	-50°C – 120°C

6.7.3 Digital Inputs

#	Description	Signal Off	Signal On
AI 2	Mode Switch	Cooling Mode	Heating Mode
AI 3	Leak Detector	No Leak detected	Leak detected
AI 4	Power Available (Marine option)		

6.8 Setpoints

6.8.1 Auto Adjusted Ranges

Some settings have different ranges of adjustment based on the refrigerant type and operating mode.

R134A
Cool LWT 1, Cool LWT 2, Heat LWT1 or Heat LWT2

Available Mode Selection	Range SI
Cool (EWWD-J)	4 to 21 °C
Cool (EWWD-I)	4 to 20°C
Cool (EWWD-G)	4 to 20°C
Cool With Glycol (EWWD-J)	-10 to 21 °C
Cool With Glycol (EWWD-I)	-8 to 20°C
Cool With Glycol (EWWD-G)	-8 to 20°C
Heat (EWWD-J)	60°C
Heat (EWWD-I)	55°C
Heat (EWWD-G)	55°C

R410A
Cool LWT 1, Cool LWT 2, Heat LWT1 or Heat LWT2

Available Mode Selection	Range SI
Cool	4 to 25 °C
Cool With Glycol	-4 to 25 °C
Heat	45°C

R1234ZE
Cool LWT 1, Cool LWT 2, Heat LWT1 or Heat LWT2

Available Mode Selection	Range SI
Cool	4 to 20 °C
Cool With Glycol	-5 to 20 °C
Heat (STD)	50°C
Heat (HT)	75°C

R513A
Cool LWT 1, Cool LWT 2, Heat LWT1 or Heat LWT2

Available Mode Selection	Range SI
Cool	4 to 15 °C
Cool With Glycol	-10 to 15 °C
Heat	55°C

7 Unit Functions

7.1 Calculations

7.1.1 LWT Slope

LWT slope is calculated such that the slope represents the change in LWT over a time frame of one minute with at least five samples per minute for both evaporator and condenser.

7.1.2 Pulldown Rate

The slope value calculated above will be a negative value as the water temperature is dropping. For use in some control functions, the negative slope is converted to a positive value by multiplying by –1.

7.2 Unit Model

The unit model can be selected between the four available for this application. Depending on the model temperature ranges and refrigerant type are selected automatically.

7.3 Unit Enable

Enabling and disabling the chiller is accomplished using set points and inputs to the chiller. The unit switch, remote switch input, and Unit Enable Set Point all are required to be on for the unit to be enabled when the control source is set to local. The same is true if the control source is set to network, with the additional requirement that the BAS request must be on.

Unit is enabled according to the following table.
NOTE: An x indicates that the value is ignored.

Unit Switch	Control Source Set Point	Remote Switch Input	Unit Enable Set Point	BAS Request	Unit Enable
Off	x	x	x	x	Off
x	x	x	Off	x	Off
x	x	Off	x	x	Off
On	Local	On	On	x	On
x	Network	x	x	Off	Off
On	Network	On	On	On	On

All of the methods for disabling the chiller, discussed in this section, will cause a normal shutdown (pumpdown) of any running circuits.

When the controller is powered up, the Unit Enable Set Point will be initialized to ‘off’ if the Unit Status After Power Failure Set Point is set to ‘off’.

7.4 Unit Mode Selection

The operating mode of the unit is determined by setpoints and inputs to the chiller. The Available Modes Set Point determines what modes of operation can be used. This setpoint also determines whether the unit is configured for glycol use. The Control Source Set Point determines where a command to change modes will come from. A digital input switches between cool mode and ice mode if they are available and the control source is set to local. The BAS mode request switches between cool mode and ice mode if they are both available and the control source is set to network.

The Available Modes Set Point must only be changed when the unit switch is off. This is to avoid changing modes of operation inadvertently while the chiller is running.

Unit Mode is set according to the following table.
NOTE: An “x” indicates that the value is ignored.

Control Source Set Point	Mode Input	HP Switch	BAS Request	Available Modes Set Point	Unit Mode
x	x	x	x	Cool	Cool
x	x	x	x	Cool w/Glycol	Cool
Local	Off	x	x	Cool/Ice w/Glycol	Cool
Local	On	x	x	Cool/Ice w/Glycol	Ice
Network	x	x	Cool	Cool/Ice w/Glycol	Cool
Network	x	x	Ice	Cool/Ice w/Glycol	Ice
x	x	x	x	Ice w/Glycol	Ice
Local	x	Off	x	Cool/Heat	Cool
Local	x	On	x	Cool/Heat	Heat
Network	x	x	Cool	Cool/Heat	Cool
Network	x	x	Heat	Cool/Heat	Heat
Local	Off	Off	x	Cool/Ice w/Glycol/ Heat	Cool
Local	On	Off	x	Cool/Ice w/Glycol/ Heat	Ice
Local	x	On	x	Cool w/Glycol/Heat	Cool
Local	x	On	x	Cool w/Glycol/Heat	Heat
Network	x	x	Cool	Cool/Ice w/Glycol/ Heat	Cool
Network	x	x	Ice	Cool/Ice w/Glycol/ Heat	Ice
Network	x	x	Heat	Cool/Ice w/Glycol/ Heat	Heat
x	x		x	Test	Test

7.4.1 Glycol Configuration

If the Available Modes Set Point is set to an option w/Glycol, then glycol operation is enabled for the unit. Glycol operation must be disabled only when the Available Modes Set Point is set to Cool.

7.5 Unit Control States

The unit will always be in one of three states:
- Off – Unit is not enabled to run.
- Auto – Unit is enabled to run.
- Pumpdown – Unit is doing a normal shutdown.

The unit will be in the Off state if any of the following are true:
- A manual reset unit alarm is active
- All circuits are unavailable to start (cannot start even after any cycle timers have expired)
- The unit mode is ice, all circuits are off, and the ice mode delay is active

The unit will be in the Auto state if any of the following are true:
- Unit enabled based on settings and switches
- If unit mode is ice, the ice timer has expired
- No manual reset unit alarms are active
- At least one circuit is enabled and available to start

The unit will be in Pumpdown until all running compressors finish pumping down if any of the following are true:
- Unit is disabled via settings and/or inputs in section 7.2

7.6 Unit Status

The displayed unit status is determined by the conditions in the following table:

Enum	Status	Conditions
0	Auto	Unit State = Auto
1	Off:Ice Mode Timer	Unit State = Off, Unit Mode = Ice, and Ice Delay = Active
2	-	-
3	Off:All Cir Disabled	Unit State = Off and all compressors unavailable
4	Off:Unit Alarm	Unit State = Off and Unit Alarm active
5	Off:Keypad Disable	Unit State = Off and Unit Enable Set Point = Disable
6	Off:Remote Switch	Unit State = Off and Remote Switch is open
7	Off:BAS Disable	Unit State = Off, Control Source = Network, and BAS Enable = false
8	Off:Unit Switch	Unit State = Off and Unit Switch = Disable
9	Off:Test Mode	Unit State = Off and Unit Mode = Test
10	Auto:Noise Reduction	Unit State = Auto and Noise Reduction is active
11	Auto:Wait for load	Unit State = Auto, no circuits running, and LWT is less than the active set point + startup delta
12	Auto:Evap Recirc	Unit State = Auto and Evaporator State = Start
13	Auto:Wait for flow	Unit State = Auto, Evaporator State = Start, and Flow Switch is open
14	Auto:Pumpdown	Unit State = Pumpdown
15	Auto:Max Pulldown	Unit State = Auto, max pulldown rate has been met or exceeded
16	Auto:Unit Cap Limit	Unit State = Auto, unit capacity limit has been met or exceeded
17	Auto:Current Limit	Unit State = Auto, unit current limit has been met or exceeded
18	Off:Config Changed, Reboot	Unit State = Off and Unit Enable Set Point = Disable
19	Off:Set Mfg Location	Unit State = Off and Unit Enable Set Point = Disable

7.7 Ice Mode Start Delay

An adjustable start-to-start ice delay timer will limit the frequency with which the chiller may start in Ice mode. The timer starts when the first compressor starts while the unit is in ice mode. While this timer is active, the chiller cannot restart in Ice mode. The time delay is user adjustable.

The ice delay timer may be manually cleared to force a restart in ice mode. A set point specifically for clearing the ice mode delay is available. In addition, cycling the power to the controller will clear the ice delay timer.

7.8 Evaporator Pump Control

Three evaporator pump control states for control of the evaporator pumps:

- Off - No pump on.
- Start – Pump is on, water loop is being recirculated.
- Run – Pump is on, water loop has been recirculated.

The control state is Off when all of the following are true:

- Unit state is Off
- LWT is higher than the Evap Freeze set point or LWT sensor fault is active
- EWT is higher than the Evap Freeze set point or EWT sensor fault is active

The control state is Start when any of the following are true:

- The unit state is auto
- LWT is less than the Evap Freeze set point minus 0.6 °C and LWT sensor fault isn't active
- EWT is less than the Evap Freeze set point minus 0.6 °C and EWT sensor fault isn't active

The control state is Run when the flow switch input has been closed for a time greater than the Evaporator Recirculate set point.

7.8.1 Pump Selection

The pump output used is determined by the Evap Pump Control set point. This setting allows the following configurations:

- #1 only – Pump 1 will always be used
- #2 only – Pump 2 will always be used
- Auto – The primary pump is the one with the least run hours, the other is used as a backup
- #1 Primary – Pump 1 is used normally, with pump 2 as a backup
- #2 Primary – Pump 2 is used normally, with pump 1 as a backup

Primary/Standby Pump Staging

The pump designated as primary will start first. If the evaporator state is start for a time greater than the recirculate timeout set point and there is no flow, then the primary pump will shut off and the standby pump will start. When the evaporator is in the run state, if flow is lost for more than half of the flow proof set point value, the primary pump will shut off and the standby pump will start. Once the standby pump is started, the flow loss alarm logic will apply if flow cannot be established in the evaporator start state, or if flow is lost in the evaporator run state.

Auto Control

If auto pump control is selected, the primary/standby logic above is still used. When the evaporator is not in the run state, the run hours of the pumps will be compared. The pump with the least hours will be designated as the primary at this time.

7.9 Condenser Pump Control

There are three condenser pump control states for control of the condenser pump:

- Off
- Start – Pump is on, water loop is being recirculated
- Run – Pump is on, water loop has been recirculated

The control state is Off when any of the following are true:

- Unit state is Off
- LWT is higher of Evap Freeze set point or LWT sensor fault is active
- EWT is higher of Evap Freeze set point or EWT sensor fault is active

The control state is Start when any of the following are true:

- The unit state is auto
- LWT is lower than (Evap Freeze set point - 0.6 °C) and LWT sensor fault is not active or EWT is lower than (Evap Freeze set point – 0.6 °C) and EWT sensor fault is not active.

The control state is Run when the flow switch input has been closed for a time greater than the loop Recirculate set point.

7.10 Condensation Control

Three condensation control modes are available:

- Cond In – the condensation control measure is the condenser entering water temperature
- Cond Out - the condensation control measure is the condenser leaving water temperature
- Pressure - the condensation control measure is the gas pressure referred to condenser saturated temperature

The Condenser control mode is determined by the Condensation Control Value set point.

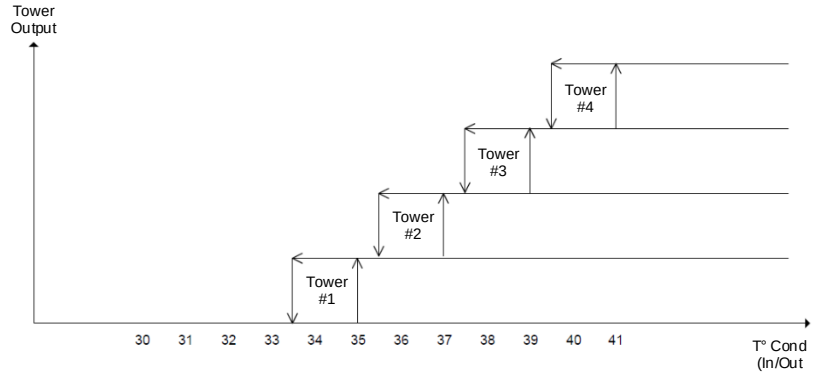
Within these control modes, the application manages the outputs for the control of condensation devices:

- n.4 on/off signals, always available
- n.1 modulating 0-10V signal, whose availability is determined by the Condensation Analog Output type set point.

7.10.1 Cond In/Cond Out condensation control

If the Condensation Control Value Set Point is set to Cond In or Cond Out options, then Tower fan #1..4 control is enabled for the unit.

According to Tower fan #1..4 set point and differential default values listed in the Unit Set Points table, the following graph summarizes the activation and deactivation conditions for Towers fan.



The Tower fan # (# = 1..4) control states are:

- Off
- On

The Tower fan # control state is Off when any of the following are true:

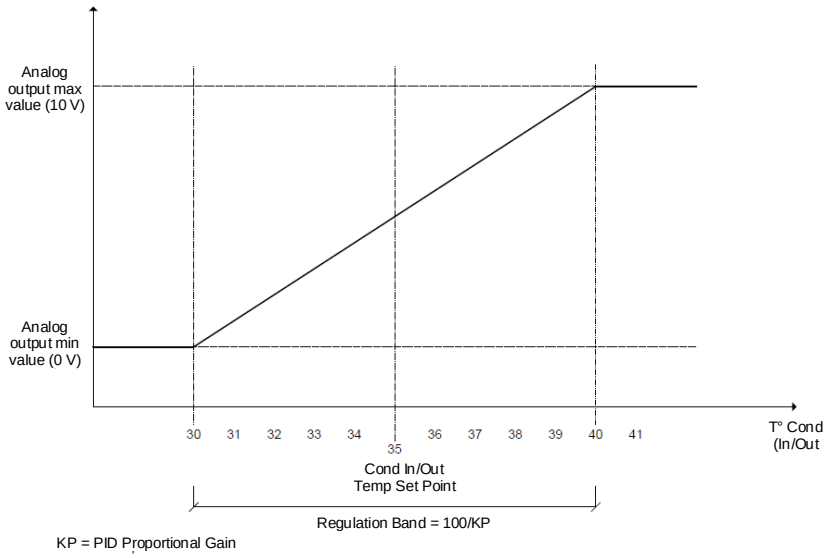
- Unit state is Off
- Tower fan # state is Off and EWT (Cond In) or LWT (Cond Out) is lower than Tower fan # Set point
- Tower fan # state is On and EWT (Cond In) or LWT (Cond Out) is lower than Tower fan # Set point – Tower fan # Diff.

The Tower fan # control state is On when all of the following are true:

- The unit state is auto
- EWT (Cond In) or LWT (Cond Out) is equal or higher than Tower fan # Set point

If the Condensation Control Value Set Point is set to Cond In or Cond Out options and Cond Aout type Set Point is set to Vfd or Byp Valve options, a 0-10V signal is also enabled for the unit to regulate a modulating condensation device by mean of a PID controller.

According to Vfd/Byp Valve default values listed in the Unit Set Points table, the following graph is an example of the modulating signal behavior in case of a control supposed to be purely proportional.



In this case, the analog output varies across the regulation band calculated as Condenser Water Temp Set Point ± 100/kp, where kp is the control proportional gain, and centered on the Condenser Water Temp Set Point.

7.10.2 Pressure condensation control

Refer to Circuit Functions.

7.11 Leaving Water Temperature (LWT) Reset

7.11.1 LWT Target

The LWT Target varies based on settings and inputs and is selected as follows:

Control Source Set Point	Mode Input	HP Switch	BAS Request	Available Modes Set Point	Base LWT Target
Local	OFF	OFF	X	COOL	Cool Set Point 1
Local	ON	OFF	X	COOL	Cool Set Point 2
Network	X	OFF	COOL	COOL	BAS Cool Set Point
Local	OFF	OFF	X	COOL w/Glycol	Cool Set Point 1
Local	ON	OFF	X	COOL w/Glycol	Cool Set Point 2
Network	X	OFF	X	COOL w/Glycol	BAS Cool Set Point
Local	OFF	OFF	x	COOL/ICE w/Glycol	Cool Set Point 1
Local	ON	OFF	x	COOL/ICE w/Glycol	Ice Set Point
Network	x	OFF	COOL	COOL/ICE w/Glycol	BAS Cool Set Point
Network	x	OFF	ICE	COOL/ICE w/Glycol	BAS Ice Set Point
Local	x	OFF	x	ICE w/Glycol	Ice Set Point
Network	x	OFF	x	ICE w/Glycol	BAS Ice Set Point
Local	OFF	ON	X	HEAT	Heat Set Point 1
Local	ON	ON	X	HEAT	Heat Set Point 2
Network	X	x	HEAT	HEAT	BAS Heat Set Point

7.11.2 Leaving Water Temperature (LWT) Reset

The base LWT target may be reset if the unit is in Cool or Heat mode and it is configured for a reset. The type of reset to be used is determined by the LWT Reset Type set point.

When the active reset increases, the Active LWT Target is changed at a rate of **0.05 °C** every 10 seconds. When the active reset decreases, the Active LWT Target is changed all at once.

After resets are applied, the LWT target can never exceed a value of **15°C**.

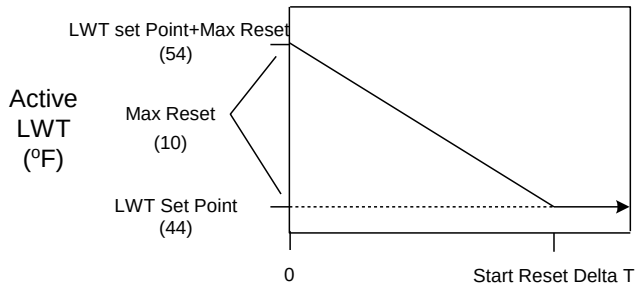
Reset Type – None

The Active Leaving Water variable is set equal to the current LWT set point.

Reset Type – Return

The Active Leaving Water variable is adjusted by the return water temperature.

Return Reset



The active set point is reset using the following parameters:

1. Cool LWT set point
2. Max Reset set point
3. Start Reset Delta T set point
4. Evap Delta T

Reset varies from 0 to Max Reset set point as the Evaporator EWT – LWT (Evap delta t) varies from the Start Reset Delta T set-point to 0.

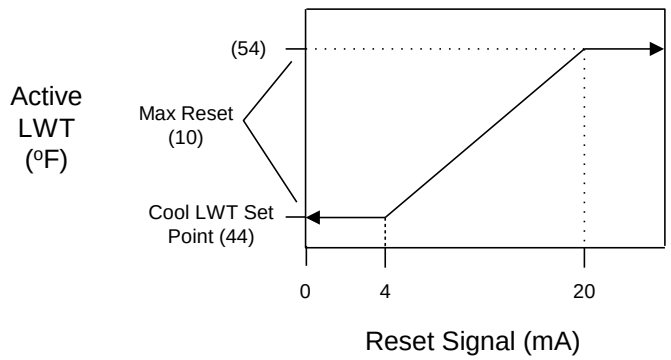
7.11.3 4-20 mA External Signal Reset

The Active Leaving Water variable is adjusted by the 4 to 20 mA reset analog input.

Parameters used:
1. Cool LWT set point
2. Max Reset set point
3. LWT Reset signal

Reset is 0 if the reset signal is less than or equal to 4 mA. Reset is equal to the Max Reset Delta T set point if the reset signal equals or exceeds 20 mA. The amount of reset will vary linearly between these extremes if the reset signal is between 4 mA and 20 mA. An example of the operation of 4-20 reset in Cool mode follows.

4-20 mA Reset - Cool Mode



7.12 Unit Capacity Control

Unit capacity control is performed as described in this section.

7.12.1 Compressor Staging in Cool Mode

The first compressor on the unit is started when evaporator LWT is higher than the target plus the Startup Delta T set point.

An additional compressor is started when Evaporator LWT is higher than the target plus the Stage Up Delta T set point.

When multiple compressors are running, one will shut down if evaporator LWT is lower than the target minus the Stage Down Delta T set point.

The last compressor running will shut down when the evaporator LWT is lower than the target minus the Shut Down Delta T set point.

7.12.2 Compressor Staging in Heat Mode

The first compressor on the unit is started when condenser LWT is lower than the target minus the Startup Delta T set point.

An additional compressor is started when condenser LWT is lower than the target minus the Stage Up Delta T set point.

When multiple compressors are running, one will shut down if condenser LWT is higher than the target plus the Stage Down Delta T set point.

The last compressor running will shut down when the condenser LWT is higher than the target plus the Shut Down Delta T set point.

Stage Up Delay

A minimum amount of time will pass between compressors starting, which is defined by the Stage Up Delay set point. This delay will only apply when at least one compressor is running. If the first compressor starts and quickly fails on an alarm, another compressor will start without this minimum time passing.

Required Load For Stage Up

An additional compressor will not be started until all running compressors are at a capacity higher than the Load Stage Up set point, or running in a limited state.

Light Load Stage Down in Cool Mode

When multiple compressors are running, one will shut down if all running compressors are at a capacity lower than the Load Stage Down set point and the evaporator LWT is less than the target plus the Stage Up Delta T set point. A minimum amount of time will pass between compressors stopping as a result of this logic, which is defined by the Stage Down Delay set point.

Light Load Stage Down in Heat Mode

When multiple compressors are running, one will shut down if all running compressors are at a capacity lower than the Load Stage Down set point and the condenser LWT is greater than the target minus the Stage Up Delta T set point. A minimum amount of time will pass between compressors stopping as a result of this logic, which is defined by the Stage Down Delay set point.

Maximum Circuits Running

If the number of compressors running is equal to the Max Circuits Running set point, no additional compressors will be started.

When multiple compressors are running, one will shut down if the number of compressors running is more than the Max Circuits Running set point.

7.12.3 Compressor Staging in Ice Mode

The first compressor will start when evaporator LWT is higher than the target plus the Startup Delta T set point.

When at least one compressor is running, the other compressors will start only when evaporator LWT is higher than the target plus the Stage Up Delta T set point.

All compressors will be staged off when evaporator LWT is less than the target.

Stage Up Delay

A fixed stage up delay of one minute between compressor starts is used in this mode. When at least one compressor is running, the other compressors will start as quickly as possible with respect to the stage up delay.

7.12.4 Staging Sequence

This section defines which compressor is the next one to start or stop. In general, compressors with fewer starts will normally start first, and compressors with more run hours will normally stop first. Compressor staging sequence can also be determined by an operator defined sequence via setpoints.

Next To Start

The next compressor to start must meet the following requirements:

Lowest sequence number of those compressors available to start
- if sequence numbers are equal, it must have the least starts
- if starts are equal, it must have least run hours
- if run hours are equal, it must be the lowest numbered compressor

Next To Stop

The next compressor to shut down must meet the following requirements:

Lowest sequence number of the compressors that are running
- if sequence numbers are equal, it must have the most run hours
- if run hours are equal, it must be the lowest numbered compressor

7.12.5 Compressor Capacity Control In Cool Mode

In Cool mode, evaporator LWT is controlled to within **0.2 °C** of the target under constant flow conditions by controlling capacity of the individual compressors.

Compressors are loaded with a fixed step scheme. The rate of capacity adjustment is determined by the time between capacity changes. The farther away from the target, the faster compressors will be loaded or unloaded.

The logic projects ahead to avoid overshoot, such that the overshoot does not cause the unit to shut off due to evaporator LWT dropping below the target minus the Shutdown Delta T set point while there is still a load on the loop at least equal to the minimum unit capacity.

Capacity of the compressors is controlled so that when possible their capacities are balanced.

Circuits that are running in manual capacity control or running with active capacity limiting events are not considered in the capacity control logic.

The compressor capacities are adjusted one at a time while maintaining a capacity imbalance that does not exceed 12.5%.

7.12.6 Load/Unload Sequence

This section defines which compressor is the next one to load or unload.

Next To Load

The next compressor to load meets the following requirements:

Lowest capacity of the running compressors that can load up
- if capacities are equal, it must have the highest sequence number of the compressors that are running
- if the sequence numbers are equal, it must have the least run hours
- if run hours are equal, it must have the most starts
- if starts are equal, it must be the highest numbered compressor

Next To Unload

The next compressor to unload must meet the following requirements:

Highest capacity of the running compressors
- if capacities are equal, it must have the lowest sequence number of the compressors that are running
- if sequence numbers are equal, it must have the most run hours
- if run hours are equal, it must have the least starts
- if starts are equal, it must be the lowest numbered compressor

7.12.7 Compressor Capacity Control In Ice Mode

In Ice mode, running compressors are loaded up simultaneously at the maximum possible rate that allows for stable operation of the individual circuits.

7.13 Unit Capacity Overrides

Unit capacity limits can be used to limit total unit capacity in Cool mode only. Multiple limits may be active at any time, and the lowest limit is always used in the unit capacity control.

Soft load, demand limit, and network limit use a deadband around the actual limit value, such that unit capacity increase is not allowed within this deadband. If unit capacity is above the deadband, capacity is decreased until it is back within the deadband.

- For 2 circuit units, the deadband is 7%.
- For 3 circuit units, the deadband is 5%.
- For 4 circuit units, the deadband is 4%.

7.13.1 Soft Load

Soft Loading is a configurable function used to ramp up the unit capacity over a given time. The set points that control this function are:
- Soft Load – (ON/OFF)
- Begin Capacity Limit – (Unit %)
- Soft Load Ramp – (seconds)

The Soft Load Unit Limit increases linearly from the Begin Capacity Limit set-point to 100% over the amount of time specified by the Soft Load Ramp set-point. If the option is turned off, the soft load limit is set to 100%.

7.13.2 Demand Limit

The maximum unit capacity can be limited by a 4 to 20 mA signal on the Demand Limit analog input at the unit controller. This function is only enabled if the Demand Limit set point is set to ON.

As the signal varies from 4 mA up to 20 mA, the maximum unit capacity changes by steps of 1% from 100% to 0%. The unit capacity is adjusted as needed to meet this limit, except that the last running compressor cannot be turned off to meet a limit lower than the minimum unit capacity.

7.13.3 Network Limit

The maximum unit capacity can be limited by a network signal. This function is only enabled if the unit control source is set to network. The signal will be received through the BAS interface on the unit controller.

As the signal varies from 0% up to 100%, the maximum unit capacity changes from 0% to 100%. The unit capacity is adjusted as needed to meet this limit, except that the last running compressor cannot be turned off to meet a limit lower than the minimum unit capacity.

7.13.4 Current Limit

Current Limit control is enabled only when the current limit enable input is closed.

Unit current is calculated based on the 4-20 mA input that receives a signal from an external device. The current at 4 mA is assumed to be 0, and the current at 20 mA is defined by a set point. As the signal varies from 4 to 20 mA, the calculated unit current varies linearly from 0 amps to the amp value defined by the set point.

The current limit uses a deadband centered around the actual limit value, such that unit capacity increase is not allowed when current is within this deadband. If unit current is above the deadband, capacity is decreased until it is back within the deadband. The current limit deadband is 10% of the current limit.

7.13.5 Maximum LWT Pulldown Rate

The maximum rate at which the leaving water temperature can drop is limited by the Maximum Rate set point, only when the LWT is less than 15°C.

If the pulldown rate is too fast, the unit capacity is reduced until the rate is less than the Maximum Pulldown Rate set point.

7.13.6 High Water Temperature Capacity Limit

If the evaporator LWT exceeds **25 °C**, compressor load will be limited to a maximum of 75%. Compressors will unload to 75% or less if running at greater than 75% load when the LWT exceeds the limit. This feature is to keep the circuit running within the capacity of the condenser coil.

A dead-band placed below the limit set-point will be used to increase function stability. If the actual capacity is in the band, unit loading will be inhibited.

7.14 Energy Saving Mode

Some unit types provide the possibility to enable an energy saving function, that reduces the power consumption deactivating the compressors crankcase heater, when the chiller is Disabled.

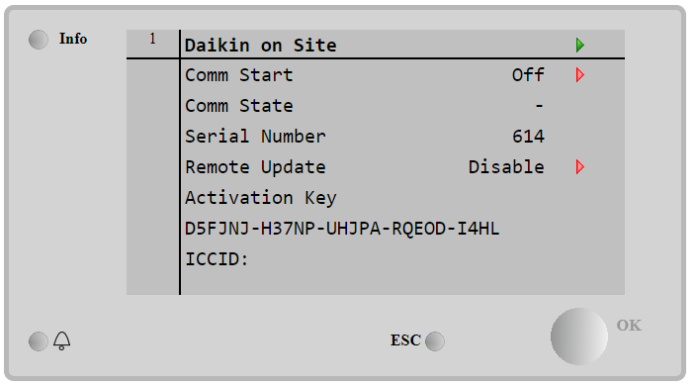
This mode implies that the time needed to start the compressors, after an Off period, could be delayed until a maximum of 90 minutes.

For time critical application, the energy saving function can be disabled by the user to ensure the compressor start within 1 minute from unit On command.

To activate or deactivate this function is required to go into View/Set Unit – Status/Settings and change the value of the Energy Saving setpoint.

7.15 Daikin on Site

The Daikin on Site(DoS) page can be accessed navigating through Main Menu → View/Set Unit → Daikin On Site.



In order to use the DoS utility, the customer has to communicate the Serial Number to Daikin company and subscribe to the DoS service. Then, from this page, it is possible to:

• Start/Stop the DoS connectivity
• Check the connection status to DoS service
• Enable/Disable the remote update option

according to the parameters shown into the table below.

Parameter	Range	Description
Comm Start	Off	Stop the connection to DoS
	Start	Start the connection to DoS
Comm State	-	Connection to DoS is off
	IPErr	Connection to DoS cannot be established
	Connected	Connection to DoS is established and working
Remote Update	Enable	Enable the Remote update option
	Disable	Disable the Remote update option

8 Circuit Functions

8.1 Calculations

8.1.1 Refrigerant Saturated Temperature

Refrigerant saturated temperature is calculated from the pressure sensor readings for each circuit. A function provides the converted value of temperature to match values published data for R134a, R1234ze and R513a

8.1.2 Evaporator Approach

The evaporator approach is calculated for each circuit. The equation is as follows:

Evaporator Approach = LWT – Evaporator Saturated Temperature

8.1.3 Suction Superheat

Suction superheat is calculated for each circuit using the following equation:

Suction superheat = Suction Temperature – Evaporator Saturated Temperature

8.1.4 Discharge Superheat

Discharge superheat is calculated for each circuit using the following equation:

Discharge superheat = Discharge Temperature – Condenser Saturated Temperature

8.1.5 Oil Differential Pressure

Oil Differential Pressure is calculated for each circuit with this equation:

Oil Differential Pressure = Condenser Pressure - Oil Pressure

8.1.6 Maximum Saturated Condenser Temperature

The maximum saturated condenser temperature calculation is modeled after the compressor operational envelope. Its value is 68.3°C basically but it can change when saturated evaporator temperature decreases below 0°C.

8.1.7 High Saturated Condenser – Hold Value

High Cond Hold Value = Max Saturated Condenser Value – 2.78°C

8.1.8 High Saturated Condenser – Unload Value

High Cond Unload Value = Max Saturated Condenser Value – 1.67°C

8.1.9 Condenser Saturated Temperature Target

The saturated condenser temperature target is calculated to maintain the proper pressure ratio, to keep the compressor lubricated and to have the maximum circuit performances.

The calculated target value is limited to a range defined by the Condenser Saturated Temperature Target min and max set points. These set points simply cut off the value to a working range, and this range can be limited to a single value if the two set points are set to the same value.

8.2 Circuit Control Logic

8.2.1 Circuit Availability

A circuit is available to start if the following conditions are true:

- Circuit switch is closed
- No circuit alarms are active
- Circuit Mode set point is set to Enable
- BAS Circuit Mode set point is set to Auto
- No cycle timers are active
- Discharge Temperature is at least 5°C higher than Oil Saturated Temperature

8.2.2 Starting

The circuit will start if all these conditions are true:

- Adequate pressure in the evaporator and condenser (see No Pressure At Start Alarm)
- Circuit Switch is closed
- Circuit Mode set point is set to Enable
- BAS Circuit Mode set point is set to Auto
- No cycle timers are active
- No alarms are active
- Staging logic requires this circuit to start
- Unit state is Auto
- Evaporator pump state is Run

Circuit Startup Logic

Circuit startup is the time period following the starting of the compressor on a circuit. During the startup, the low evaporator pressure alarm logic is ignored. When the compressor has been running at least 20 seconds and the evaporator pressure rises above the low evaporator pressure unload set point, the startup is complete.

If the pressure does not rise above the unload set point and the circuit has been running longer than the Startup Time set point, then the circuit is turned off and an alarm triggered. If the evaporator pressure drops below the absolute low pressure limit then the circuit is turned off and the same alarm triggered.

Stopping

Normal Shutdown

A normal shutdown requires the circuit to pumpdown before the compressor is turned off. This is done by closing the EXV, and closing the liquid line solenoid (if present) while the compressor is running.

The circuit will do a normal shutdown (pumpdown) if any of the following are true:

- Staging logic requires this circuit to stop
- Unit State is Pumpdown
- A pumpdown alarm occurs on the circuit
- Circuit switch is open
- Circuit Mode set point is set to Disable
- BAS Circuit Mode set point is set to Off

The normal shutdown is complete when any of the following are true:

- Evaporator Pressure is less than the Pumpdown Pressure set point
- Service Pumpdown set point is set to Yes and Evaporator Pressure is less than 5 psi
- Circuit has been pumping down for longer than the Pumpdown Time Limit setpoint

Rapid Shutdown

A rapid shutdown requires the compressor to stop and the circuit to go to the Off state immediately.

The circuit will do a rapid shutdown if either of these conditions occurs at any time:

- Unit State is Off
- A rapid stop alarm occurs on the circuit

8.3 Circuit Status

The displayed circuit status is determined by the conditions in the following table:

Enum	Status	Conditions
0	Off:Ready	Circuit is ready to start when needed.
1	Off:Stage Up Delay	Circuit is off and cannot start due to stage up delay.
2	Off:Cycle Timer	Circuit is off and cannot start due to active cycle timer.
3	Off:Keypad Disable	Circuit is off and cannot start due to keypad disable.
4	Off:Circuit Switch	Circuit is off and circuit switch is off.
5	Off:Oil Heating	Circuit is off and Discharge Temperature – Oil Saturated Temperature at gas pressure <= 5°C.
6	Off:Alarm	Circuit is off and cannot start due to active circuit alarm.
7	Off:Test Mode	Circuit is in test mode.
8	EXV Preopen	Circuit is in preopen state.
9	Run:Pumpdown	Circuit is in pumpdown state.
10	Run:Normal	Circuit is in run state and running normally.
11	Run:Disc SH Low	Circuit is running and cannot load due to low discharge superheat.
12	Run:Evap Press Low	Circuit is running and cannot load due to low evaporator pressure.
13	Run:Cond Press High	Circuit is running and cannot load due to high condenser pressure.

8.4 Compressor Control

The compressor will run only when the circuit is in a run or pumpdown state. This means the compressor should not be running any time the circuit is off or during preopening the EXV.

Cycle Timers

A minimum time between starts of the compressor and a minimum time between shutdown and start of the compressor will be enforced. The time values are set by global circuit set points.

These cycle timers are enforced even through cycling of power to the chiller.

These timers may be cleared via a setting on the controller.

Compressor Run Timer

When a compressor starts, a timer will start and run as long as the compressor runs. This timer is used in the alarm log.

Compressor Capacity Control

After starting, the compressor will be unloaded to the minimum physical capacity and no attempt to increase compressor capacity is made until the differential between evaporator pressure and oil pressure meets a minimum value.

After the minimum differential pressure is met, compressor capacity is controlled to 25%.

Compressor capacity will always be limited to a minimum of 25% while it is running, except for the time after compressor start when the differential pressure is being built and except when changes to capacity are performed as needed to meet unit capacity requirements (see unit capacity control section).

Capacity will not be increased above 25% until discharge superheat has been at least 12°C for a time of at least 30 seconds.

Manual capacity control

The capacity of the compressor can be controlled manually. Manual capacity control is enabled via a set point with choices of auto or manual. Another set point allows setting the compressor capacity from 25% to 100%.

The compressor capacity is controlled to the manual capacity set point. Changes will be made at a rate equal to the maximum rate that allows stable circuit operation.

Capacity control reverts back to automatic control if either:

- the circuit shuts down for any reason
- capacity control has been set to manual for four hours

Slide Control Solenoids (Asymmetric compressors)

This section applies to the following compressor models (asymmetric):

Model	Name plate
F3AS	HSA192
F3AL	HSA204
F3BS	HSA215
F3BL	HSA232
F4AS	HSA241
F4AL	HSA263

The required capacity is achieved by controlling one modulating slide and one non-modulating slide. The modulating slide can control 10% to 50% of the total compressor capacity, infinitely variable. The non-modulating slide can control either 0% or 50% of the total compressor capacity.

Either the load or the unload solenoid for the non-modulating slide is on any time the compressor is running. For compressor capacity from 10% up to 50%, the non-modulating slide unload solenoid is on to keep that slide in the unloaded position. For capacity from 60% to 100%, the non-modulating slide load solenoid is on to keep that slide in the loaded position.

The modulating slide is moved by pulsing of the load and unload solenoids to achieve the required capacity.

An additional solenoid is controlled to assist in moving the modulating slide in certain conditions. This solenoid is activated when the pressure ratio (condenser pressure divided by evaporator pressure) is less than or equal to 1.2 for at least 5 seconds. It is deactivated when pressure ratio is more than 1.2.

Slide Control Solenoids (Symmetric compressors)

This section applies to the following compressor models (asymmetric):

Model	Name plate
F4221	HSA205
F4222	HSA220
F4223	HSA235
F4224	HSA243
F3216	HSA167
F3218	HSA179
F3220	HSA197
F3221	HSA203
F3118	HSA3118
F3120	HSA3120
F3121	HSA3121
F3122	HSA3122
F3123	HSA3123

The required capacity is achieved by controlling one modulating slide. The modulating slide can control 25% to 100% of the total compressor capacity, infinitely variable.

The modulating slide is moved by pulsing of the load and unload solenoids to achieve the required capacity.

Capacity Overrides – Limits of Operation

The following conditions override automatic capacity control when the chiller is in COOL mode. These overrides keep the circuit from entering a condition in which it is not designed to run.

Low Evaporator Pressure

If the Low Evaporator Pressure Hold event is triggered, the compressor will not be allowed to increase in capacity.

If the Low Evaporator Pressure Unload event is triggered, the compressor will begin reducing capacity.

The compressor will not be allowed to increase in capacity until the Low Evaporator Pressure Hold event has cleared.

See the Circuit Events section for details on triggering, reset, and unloading action.

High Condenser Pressure

If the High Condenser Pressure Hold event is triggered, the compressor will not be allowed to increase capacity.

If the High Condenser Pressure Unload event is triggered, the compressor will begin reducing capacity.

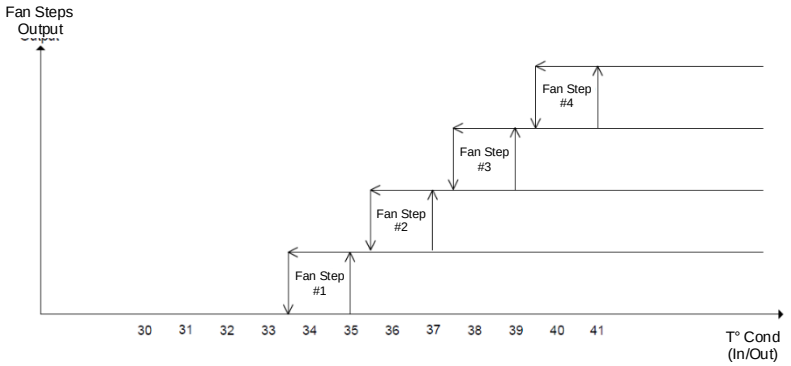
The compressor will not be allowed to increase in capacity until the High Condenser Pressure Hold event has cleared.

See the Circuit Events section for details on triggering, reset, and unloading action.

8.5 Pressure condensation control

If the Condensation Control Value Set Point is set to Press option, then Fan steps #1..4 control is enabled for each enabled circuit.

According to Fan steps set point and differential default values listed in the Circuit Set Points table, the following graph summarizes the activation and deactivation conditions for fan steps.



The Fan step# (# = 1..4) control states are:

- Off
- On

The Fan step # control state is Off when any of the following are true:

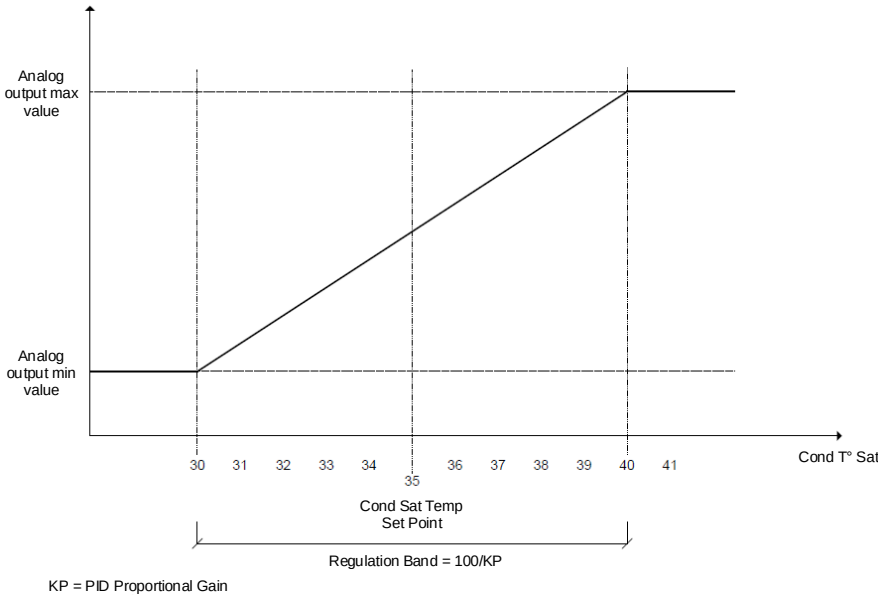
- Unit state is Off.
- Fan step# state is Off and the Saturated Condenser Temperature corresponding to the current Condenser Pressure is lower than Fan step # Set point.
- Fan step # state is On the Saturated Condenser Temperature corresponding to the current Condenser Pressure is lower than Fan step# Set point – Fan step# Diff.

The Tower # control state is On when all of the following are true:

- The unit state is auto
- The Saturated Condenser Temperature corresponding to the current Condenser Pressure is equal or higher than Fan step# Set point

If the Condensation Control Value Set Point is set to Press option and Cond Aout type Set Point is set to Vfd option, a 0-10V signal is also enabled for the circuit to regulate a modulating condensation device by mean of a PID controller.

According to Vfd default values listed in the Circuit Set Points table, the following graph represents the modulating signal behavior in case of a control supposed to be purely proportional.



In this example, the analog output varies across the regulation band calculated as Condenser Saturated Temp Set Point ± 100/kp, where kp is the control proportional gain, and centered on the Condenser Saturated Temp Set Point.

8.6 EXV Control

The control is able to support different valve models from different vendors. When a model is selected, all the operational data for that valves are set including phase and hold currents, total steps, motor speed and extrasteps.

The EXV is moved at a rate which depends on the valve model, with a total range of steps. Positioning is determined as described in the following sections, with adjustments made in increments of 0.1% of the total range.

Preopen Operation

The EXV control includes a preopen operation that is used only when the unit has optional liquid line solenoids. The unit is configured for use with or without liquid line solenoids via a set point.

When a circuit start is required, the EXV opens before the compressor starts. The preopen position is defined by a set point. The time allowed for this preopen operation is at least enough time for the EXV to open to the preopen position based on the programmed movement rate of the EXV.

Startup Operation

When the compressor starts (if no liquid line solenoid valve is installed), the EXV will start to open to an initial position that allows a safe start up. The value of LWT will determine if it is possible to enter the normal operation. A pressostatic (constant pressure) control will start to keep the compressor into the envelope whenever the pressure rises above a predefined limit which depends on the refrigerant. It goes in normal operation as soon as the suction superheat drops below a value equal to the suction superheat setpoint.

Normal Operation

Normal operation of the EXV is used when the circuit has completed startup operation of the EXV and is not in a slide transition conditions.

During normal operation, the EXV controls suction superheat to a target that can vary in a pre-defined range

The EXV controls the suction superheat within 0.5°C in stable operating conditions (stable water loop, static compressor capacity, and stable condensing temperature).

The target value is adjusted as needed to maintain discharge superheat within a safety operating range which depends on refrigerant.

Maximum Operating Pressures

The EXV control maintains the evaporator pressure in the range defined by the maximum operating pressure (MOP). The MOP value depends on the refrigerant type.

Transitions Between Control States

Whenever EXV control changes between Startup Operation, Normal Operation, or Manual Control, the transition is smoothed by gradually changing the EXV position rather than changing all at once. This transition prevents the circuit from becoming unstable and resulting in a shutdown due to alarm trip.

8.7 Liquid Injection

Liquid injection is activated when the circuit is in a run state and the discharge temperature rises above the Liquid Injection Activation set point.

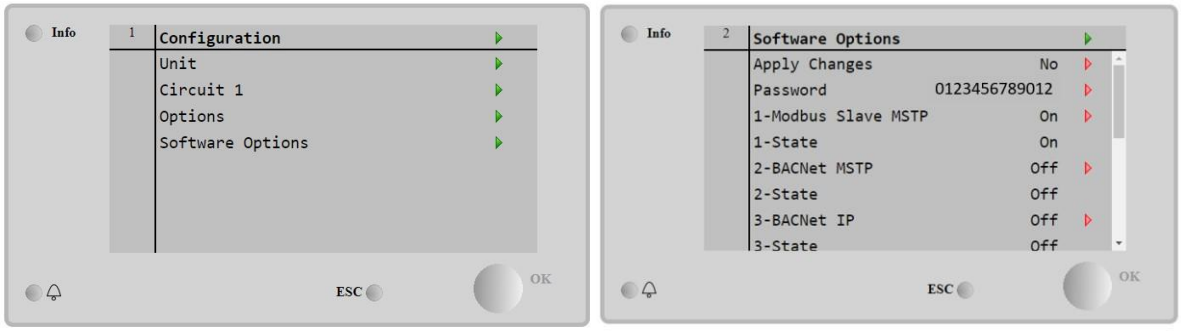
Liquid injection is turned off when the discharge temperature decreases below the activation set point by a differential of 10°C.

9 Software Options

For the EWWD – EWWH – EWWS units, the possibility to employ a set of software options has been added to the functionality of the chiller, in according with the new Microtech 4 installed on the Unit. The Software Options do not require any additional hardware and regard communication channels

During the commissioning the machine is delivered with the Option Set chosen by the customer; the Password inserted is permanent and depends on the Serial Machine Number and the Option Set selected. In order to check the current Option Set:

Main Menu → Commission Unit → Software Options



Parameter	Description
Password	Writable by Interface/Web Interface
Option Name	Option Name
Option Status	Option is activated
	Option is not activated

The Current Password inserted activates the selected options.

The Option Set and the Password are updated in the Factory. If the customer wants to change its Option Set, he needs to contact the Daikin Personnel and asks for a new password.

As soon as the new password is communicated, the follow steps allow the customer to change the Option Set by himself:

1. Wait for the circuits are both OFF, then, from the Main Page,

9.1.1 Go to Main Menu → Commission Unit → Software Options

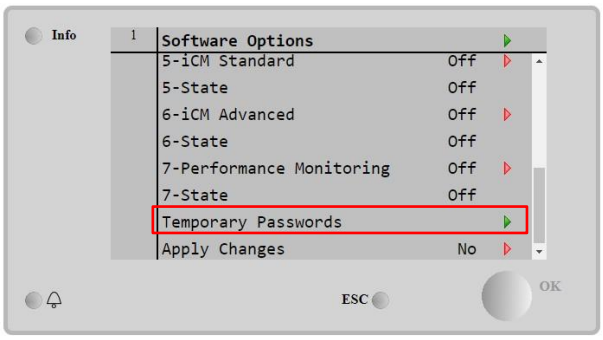
2. Select the Options to Activate
3. Insert the Password
4. Wait for the States of the selected options going to On
5. Apply Changes→Yes (it will reboot the controller)

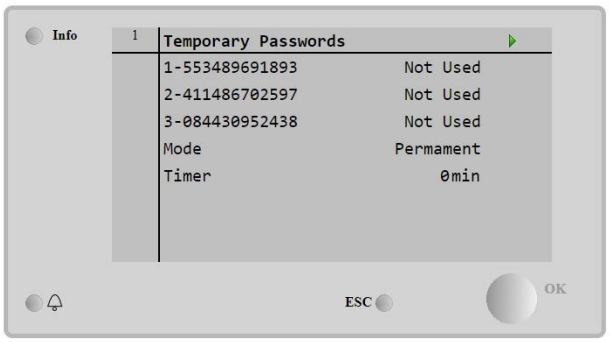
The Password is changeable only if the machine is working in safe conditions: both the circuits are in the State Off.

9.2 Inserting the Password in a Spare Controller

If the Controller is broken and/or it needs to be replaced for any reason, the customer needs to configure the Option Set with a new Password.
If this replacement is scheduled, the customer can ask to Daikin Personnel for a new Password and repeat the steps in chapter 4.15.1.
If there is no enough time to ask for a Password to Daikin Personnel (ex. an expected failure of the controller), a set of Free Limited Password is provided, in order not to interrupt the machine's working.
These Passwords are free and visualized in:

Main Menu→Commission Unit→Configuration→Software Options→Temporary Passwords





Their Use is limited up to three months:

- 553489691893 – 3 Months Duration
- 411486702597 – 1 Month Duration
- 084430952438 – 1 Month Duration

It gives the customer the time enough to contact Daikin Service and insert a new unlimited password.

Parameter	Specific Status	Description
553489691893		Activate the Option Set for 3 Months.
411486702597		Activate the Option Set for 1 Month.
084430952438		Activate the Option Set for 1 Month.
Mode	Permanent	A permanent Password is inserted. Option set can be used for unlimited time.
	Temporary	A temporary Password is inserted. Option set can be used depending on the password inserted.
Timer		Last duration of the Option Set activated. Enabled only if the mode is Temporary.

The Password is changeable only if the machine is working in safe conditions: both the circuits are in the State Off.

10 Alarms and Events

Situations may arise that require some action from the chiller or that should be logged for future reference. A condition that requires a shutdown and/or lockout is an alarm. Alarms may cause a normal stop (with pumpdown) or a rapid stop. Most alarms require manual reset, but some reset automatically when the alarm condition is corrected. Other conditions can trigger what is known as an event, which may or may not cause the chiller to respond with a specific action in response. All alarms and events are logged. In the following sections it will also be indicated how each alarm can be cleared between local HMI, Network (by any of the high level interfaces Modbus, Bacnet or Lon) or if the specific alarm will clear automatically. The following symbols are used:

☑	Allowed
☒	Not allowed
☐	Not foreseen

10.1 Alarm Logging

When an alarm occurs, the alarm type, date, and time are stored in the active alarm buffer corresponding to that alarm (viewed on the Alarm Active screens) also in the alarm history buffer (viewed on the Alarm Log screens). The active alarm buffers hold a record of all current alarms.

A separate alarm log stores the last 25 alarms to occur. When an alarm occurs, it is put into the first slot in the alarm log and all others are moved down one, dropping the last alarm. In the alarm log, the date and time the alarm occurred are stored.

In the Snapshot page all the alarms are also stored together with a list of running parameters when the alarm occurred. These parameters include unit state, LWT, and EWT for all alarms. If the alarm is a circuit alarm, then the circuit state, refrigerant pressures and temperatures, EXV position, compressor load, number of fans on, and compressor run time are also stored.

10.2 Signaling Alarms

The following actions will signal that an alarm has occurred:

1. The unit or a circuit will execute a rapid or pumpdown shutoff.
2. An alarm bell icon 🔔 will be displayed in the upper right-hand corner of all controller screens including the optional remote user interface panel's screens.
3. An optional field supplied and wired remote alarm device will be activated.

10.3 Clearing Alarms

Active alarms can be cleared through the keypad/display or a BAS network. Alarms are automatically cleared when controller power is cycled. Alarms are cleared only if the conditions required to initiate the alarm no longer exist. All alarms and groups of alarms can be cleared via the keypad or network.

To use the keypad, follow the Alarm links to the Alarms screen, which will show Active Alarms and Alarm Log. Select Active Alarm and press the wheel to view the Alarm List (list of current active alarms). They are in order of occurrence with the most recent on top. The second line on the screen shows Alm Cnt (number of alarms currently active) and the status of the alarm clear function. Off indicates that the Clear function is off and the alarm is not cleared. Press the wheel to go to the edit mode. The Alm Clr (alarm clear) parameter will be highlighted with OFF showing. To clear all alarms, rotate the wheel to select ON and enter it by pressing the wheel.

An active password is not necessary to clear alarms.

If the problem(s) causing the alarm have been corrected, the alarms will be cleared, disappear from the Active Alarm list and be posted in the Alarm Log. If not corrected, the On will immediately change back to OFF and the unit will remain in the alarm condition.

10.3.1 Remote Alarm Signal

The unit is configured to allow field wiring of alarm devices. Refer to unit onboard documentation for field wiring information.

10.4 Unit Rapid Stop Alarms

10.4.1 Phase Volts Loss/GFP Fault

This alarm is generated in case of problems with the power supply to the chiller.

Resolution of this fault requires a direct intervention on the power supply of this unit.
Direct intervention on the power supply can cause electrocution, burns or even death. This action must be performed only by trained persons. In case of doubts contact your maintenance company.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: UnitOffPhaveVoltage String in the alarm log: UnitOffPhaveVoltage String in the alarm snapshot UnitOffPhaveVoltage	Loss of one phase.	Check voltage level on each of the phases.
	Not correct sequence connection of L1,L2,L3.	Check sequence of L1, L2, L3 connections according indication on chiller's electrical scheme.
	Voltage level on the unit's panel is not in the allowed range (±10%).	Check that voltage level on each phases is into the allowed range that is indicated on the chiller label. Is important to check the voltage level on each phases not only with chiller not running, but mainly with chiller running from minimum capacity up to full load capacity. That's because voltage drop can occur from a certain unit cooling capacity level, or because of certain working condition (i.e. high values of OAT); In these cases the issue can be related with the sizing of power cables.
	There is a short-circuit on the unit.	Check for correct electrical isolation condition of each unit's circuit with a Megger tester.
Reset		Notes
Local HMI Network Auto	☐ ☐ ☑	

10.4.2 Evaporator Flow Loss

This alarm is generated in case of flow loss to the chiller to protect the machine against freezing.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: UnitOffEvapWaterFlow String in the alarm log: ± UnitOffEvapWaterFlow String in the alarm snapshot UnitOffEvapWaterFlow	No water flow sensed for 3 minutes continuously or water flow too low.	Check the water pump filler and the water circuit for obstructions.
		Check the flow switch calibration and adapt to minimum water flow.
		Check if pump impeller can rotate freely and has no damages.
		Check pumps protection devices (circuit breakers, fuses, inverters, etc.)
		Check if water filter is clogged.
		Check flow switch connections.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.4.3 Evaporator Flow Loss

This alarm is generated in case of flow loss to the chiller to protect the machine against Mechanical High Pressure trips.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: UnitOffCondWaterFlow String in the alarm log: □ UnitOffCondWaterFlow String in the alarm snapshot UnitOffCondWaterFlow	No water flow sensed for 3 minutes continuously or water flow too low.	Check the water pump filler and the water circuit for obstructions.
		Check the flow switch calibration and adapt to minimum water flow.
		Check if pump impeller can rotate freely and has no damages.
		Check pumps protection devices (circuit breakers, fuses, inverters, etc.)
		Check if water filter is clogged.
		Check flow switch connections.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.4.4 Evaporator Water Freeze Protect

This alarm is generated to indicate that the water temperature (entering or leaving) has dropped below a safety limit. Control tries to protect the heat exchanger starting the pump and letting the water circulate.

Symptom	Cause	Solution
Unit status is Off.	Water flow too low.	Increase the water flow.
All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: UnitOffEvapWaterTmpLo String in the alarm log: □ UnitOffEvapWaterTmpLo String in the alarm snapshot UnitOffEvapWaterTmpLo		
	Inlet temperature to the evaporator is too low.	Increase the inlet water temperature.
	Flow switch is not working or no water flow.	Check the flow switch and the water pump.
	Sensors readings (entering or leaving) are not properly calibrated.	Check the water temperatures with a proper instrument and adjust the offsets.
	Wrong freeze limit setpoint.	The freeze limit has not been changed as a function of glycol percentage.
Reset		Notes
Local HMI Network Auto	☑ ☒ ☐	It's required to check if the evaporator has any damage due to this alarm.

10.4.5 Evaporator Water Freeze Protect

This alarm is generated to indicate that the water temperature (entering or leaving) has dropped below a safety limit. Control tries to protect the heat exchanger starting the pump and letting the water circulate.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: UnitOffCondWaterTmpLo String in the alarm log: UnitOffCondWaterTmpLo String in the alarm snapshot UnitOffCondWaterTmpLo	Water flow too low.	Increase the water flow.
	Inlet temperature to the evaporator is too low.	Increase the inlet water temperature.
	Flow switch is not working or no water flow.	Check the flow switch and the water pump.
	Refrigerant temperature become too low (< -0.6°C).	Check the water flow and filter. No good heat exchange condition into the evaporator.
	Sensors readings (entering or leaving) are not properly calibrated.	Check the water temperatures with a proper instrument and adjust the offsets.
	Wrong freeze limit setpoint.	The freeze limit has not been changed as a function of glycol percentage.
Reset		Notes
Local HMI Network Auto	☑ ☒ ☐	It's required to check if the condenser has any damage due to this alarm.

10.4.6 Evaporator Water Temperatures Inverted

This alarm is generated any time the entering water temperature is lower than the leaving by 1°C and at least one compressor is running since 90 seconds.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: UnitOffEvpWTempInvrtd String in the alarm log: UnitOffEvpWTempInvrtd String in the alarm snapshot UnitOffEvpWTempInvrtd	Entering and leaving water temperature sensors are inverted.	Check cabling of the sensors on the unit controller.
		Check offset of the two sensors with the water pump running.
	Entering and leaving water pipes are reversed.	Check if the water flows in counter flow respect to refrigerant.
	Water pump operate reverse.	Check if the water flows in counter flow respect to refrigerant.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.4.7 Leaving Evaporator Water Temperature Sensor Fault

This alarm is generated any time that the input resistance is out of an acceptable range.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: UnitOffLvgEntWTempSen String in the alarm log: □ UnitOffLvgEntWTempSen String in the alarm snapshot UnitOffEvpLvgWTempSen	Sensor is broken.	Check for sensor integrity. according table and allowed kOhm (k□) range.
		Check correct sensors operation.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for absence of water or humidity on electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.4.8 External Alarm

This alarm is generated to indicate that an external device whose operation is linked with this unit operation. This external device could be a pump or an inverter.

Symptom	Cause	Solution
Unit status is Off. All circuits are switched off with the normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: UnitOffExternalAlarm String in the alarm log: □ UnitOffExternalAlarm String in the alarm snapshot UnitOffExternalAlarm	There is an external event that has caused the opening, for at least 5 seconds, of the port on the controller board.	Check causes of the external event or alarm.
		Check electrical wiring from unit controller to the external equipment in case of any external events or alarms have been occurred.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	
NOTE: What above applies in case of configuration of the external fault digital input as Alarm.		

10.4.9 Gas Leakage alarm

This alarm is generated when the external leak detector(s) detects a refrigerant concentration higher that a threshold. To clear this alarm is required to clear the alarm either locally and, if needed, on the leak detector itself.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: UnitOffGasLeakage String in the alarm log: □ UnitOffGasLeakage String in the alarm snapshot UnitOffGasLeakage	Refrigerant leakage	Locate the leakage with a sniffer and fix the leakage.
	Leak detector is not properly powered	Check the power supply of the leak detector.
	Leak detector is not properly connected to the controller.	Check the connection of the detector with reference to the wiring diagram of the unit.
	Leak detector is broken	Replace the leak detector.
	Leak detector is not required/needed	Check the configuration on the unit controller and disable this option.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.4.10 Emergency Stop Alarm

This alarm is generated any time the Emergency Stop button is activated.

Before resetting the Emergency Stop button please verify that the harmful condition has been removed.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: UnitOffEmergencyStop String in the alarm log: □ UnitOffEmergencyStop String in the alarm snapshot UnitOffEmergencyStop	Emergency stop button has been pushed.	Turning counterclockwise the emergency stop button, the alarm should be cleared.
Reset		Notes
Local HMI Network Auto	☑ ☒ ☐	Please see note on the top.

10.5 Unit Pumpdown Stop Alarms

The following unit pumpdown stop alarms. These alarms will not stop the unit immediately but with a normal shutdown procedure.

10.5.1 Evaporator Entering Water Temperature Sensor Fault

This alarm is generated any time the input resistance is out of an acceptable range.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: UnitOffEvpEntWTempSen String in the alarm log: □ UnitOffEvpEntWTempSen String in the alarm snapshot UnitOffEvpEntWTempSen	Sensor is broken.	Check for sensor integrity. according table and allowed kOhm (k⦸) range.
		Check correct sensors operation.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for absence of water or humidity on electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network	☑ ☑	

10.5.2 Condenser Entering Water Temperature Sensor Fault

This alarm is generated any time the input resistance is out of an acceptable range.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: UnitOffCndEntWTempSen String in the alarm log: □ UnitOffCndEntWTempSen String in the alarm snapshot UnitOffcndEntWTempSen	Sensor is broken.	Check for sensor integrity. according table and allowed kOhm (k□) range.
		Check correct sensors operation.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for absence of water or humidity on electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.5.3 Evaporator Water Temperatures inverted

This alarm is generated any time the entering water temperature is lower than the leaving by 1°C and at least one compressor is running for 90 seconds.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown precedure. Bell icon is moving on controller's display. String in the alarm list: UnitOffEvpWTempInvrtd String in the alarm log: □ UnitOffEvpWTempInvrtd String in the alarm snapshot UnitOffEvpWTempInvrtd	Entering and leaving water temperature sensors are inverted.	Check cabling of the sensors on the unit controller.
		Check offset of the two sensors with the water pump running.
	Entering and leaving water pipes are reversed.	Check if the water flows in counter flow respect to refrigerant.
	Water pump operate reverse.	Check if the water flows in counter flow respect to refrigerant.
Reset		Notes
Local HMI Network Auto	□ □ □	

10.5.4 Condenser Water Temperatures inverted

This alarm is generated any time the entering water temperature is lower than the leaving by 1°C and at least one compressor is running for 90 seconds.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: UnitOffCndWTempInvrtd String in the alarm log: □ UnitOfFCndWTempInvrtd String in the alarm snapshot UnitOffCndWTempInvrtd	Entering and leaving water temperature sensors are inverted.	Check cabling of the sensors on the unit controller.
		Check offset of the two sensors with the water pump running.
	Entering and leaving water pipes are reversed.	Check if the water flows in counter flow respect to refrigerant.
	Water pump operate reverse.	Check if the water flows in counter flow respect to refrigerant.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.5.5 HP Module Communication Failure

This alarm is generated in case of communication problems with the HP module.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: HeatPCtrlrCommFail String in the alarm log: HeatPCtrlrCommFail String in the alarm snapshot HeatPCtrlrCommFail	Module has no power supply	Check the power supply from the connector on the side of the module.
		Check if LEDs are both green.
		Check if the connector on the side is tightly inserted in the module.
	Module address is not properly set	Check if module's address is correct referring to the wiring diagram.
	Module is broken	Check if LED are on and both green. If BSP LED is solid red replace the module.
		Check if power supply is ok but LEDs are both off. In this case replace the module.
Reset	☑ ☑ ☐	Notes

10.6 Unit Events

10.6.1 Password Over Time

This event indicates that one of the temporary passwords is going to expire in one day. To solve this it is possible to activate another temporary password

Symptom	Cause	Solution
Unit status is Run. Bell icon is moving on controller's display. String in the alarm list, log and snapshot: Pass1TimeOver 1dayleft Pass2TimeOver 1dayleft PassTimeOver 1dayleft	Temporary Password Inserted is going to expire. One day is left before Option set is deactivated.	Activate another temporary password or purchase a permanent license.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☑	

10.6.2 External Event

This alarm indicates that a device, whose operation is linked with this machine, is reporting a problem on the dedicated input.

Symptom	Cause	Solution
Unit status is Run. Bell icon is moving on controller's display. String in the alarm list: UnitExternalEvent String in the alarm log: UnitExternalEvent String in the alarm snapshot UnitExternalEvent	There is an external event that has caused the opening, for at least 5 seconds, of the digital input on the controller board.	Check for reasons of external event and if it can be a potential problem for a correct chiller operation.
Reset		Notes
Local HMI Network Auto	☐ ☐ ☑	The alarm is automatically cleared when the problem is solved.
NOTE: What above applies in case of configuration of the external fault digital input as Event		

10.6.3 Evaporator Entering Water Temperature Sensor Fault

This alarm is generated any time the input resistance is out of an acceptable range.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *UnitOffEvpEntWTempSen* String in the alarm log: *UnitOffEvpEntWTempSen* String in the alarm snapshot *UnitOffEvpEntWTempSen*	Sensor is broken.	Check for sensor integrity. according table and allowed kOhm (k□) range.
		Check correct sensors operation.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for absence of water or humidity on electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network	☑ ☑	

10.6.4 Condenser Entering Water Temperature Sensor Fault

This alarm is generated any time the input resistance is out of an acceptable range.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: UnitOffCndEntWTempSen String in the alarm log: □ UnitOffCndEntWTempSen String in the alarm snapshot UnitOffcndEntWTempSen	Sensor is broken.	Check for sensor integrity. according table and allowed kOhm (k□) range.
		Check correct sensors operation.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for absence of water or humidity on electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.6.5 Bad Current Limit Input

This alarm is generated when the Current Limit option has been enabled and the input to the controller is out of the admitted range.

Symptom	Cause	Solution
Unit status is Run. Bell icon is moving on controller's display. Current Limit function cannot be used. String in the alarm list: *BadCurrentLimitInput* String in the alarm log: *BadCurrentLimitInput* String in the alarm snapshot *BadCurrentLimitInput*	Flexible current limit input out of range. For this warning out of range means a signal less than 3mA or more than 21mA.	Check for values of input signal to the unit controller. It has to be in the allowed mA range. Check for electrical shielding of wirings. Check for right value of the unit's controller output in case input signal is into allowed range.
Reset		Notes
Local HMI Network Auto	☐ ☐ ☑	Automatically clears when the signal returns in the allowed range.

10.6.6 Bad Demand Limit Input

This alarm is generated when the Demand Limit option has been enabled and the input to the controller is out of the admitted range.

Symptom	Cause	Solution
Unit status is Run. Bell icon is moving on controller's display. Demand Limit function cannot be used. String in the alarm list: *BadDemandLimitInput* String in the alarm log: *BadDemandLimitInput* String in the alarm snapshot *BadDemandLimitInput*	Demand limit input out of range. For this warning out of range is considered to be a signal less than 3mA or more than 21mA.	Check for values of input signal to the unit controller. It has to be in the allowed mA range; Check for electrical shielding of wirings. Check for right value of the unit's controller output in case input signal is into allowed range.
Reset		Notes
Local HMI Network Auto	☐ ☐ ☑	Automatically clears when the signal returns in the allowed range.

10.6.7 Bad Leaving Water Temperature Reset Input

This alarm is generated when the Setpoint Reset option has been enabled and the input to the controller is out of the admitted range.

Symptom	Cause	Solution
Unit status is Run. Bell icon is moving on controller's display. LWT Reset function cannot be used. String in the alarm list: *BadSetPtOverrideInput* String in the alarm log: *BadSetPtOverrideInput* String in the alarm snapshot *BadSetPtOverrideInput* □	LWT reset input signal is out of range. For this warning out of range is a signal less than 3mA or more than 21mA.	Check for values of input signal to the unit controller. It has to be in the allowed mA range.
		Check for electrical shielding of wirings.
		Check for right value of the unit's controller output in case input signal is into allowed range.
Reset		Notes
Local HMI Network Auto	☐ ☐ ☑	Automatically clears when the signal returns in the allowed range.

10.7 Circuit Alarms

All circuit stop alarms require shutdown of the circuit on which they occur. Rapid stop alarms do not do a pumpdown before shutting off. All other alarms will do a pumpdown.

When one or more circuit alarms are active and no unit alarms are active, the alarm output will be switched on and off on 5 second intervals.

Alarm descriptions apply to all circuits, the circuit number is represented by 'N' in the description.

10.8 Circuit Rapid Stop Alarms

10.8.1 Low Evaporator Pressure

This alarm is generated in case the evaporating pressure drops below the Low Pressure Unload and the control is not able to compensate to this condition.

Symptom	Cause		Solution
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped immediately. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffEvpPressLo* String in the alarm log: *CxCmp1 OffEvpPressLo* String in the alarm snapshot *CxCmp1 OffEvpPressLo*	Transitory condition like a fan staging (A/C units).		Wait until the condition is recovered by EXV control
	Refrigerant charge is low.		Check sight glass on liquid line to see if there is flash gas.
			Measure sub-cooling to see if the charge is correct.
	Protection limit not set to fit customer application.		Check the evaporator approach and the corresponding water temperature to evaluate the low pressure hold limit.
	High Evaporator Approach.		Clean the evaporator
			Check the quality of the fluid that flows into heat exchanger.
			Check the glycol percentage and type (ethylenic or propylenic)
	Water flow into water heat exchanger is too low.		Increase the water flow.
			Check that evaporator water pump is operating correctly providing the required water flow.
	Evaporating pressure transducer is not working properly.		Check the sensor for proper operation and calibrate the readings with a gauge.
	EEXV is not working correctly. It's not opening enough or it's moving in the opposite direction.		Check if pump-down can be finished for pressure limit reached;
			Check expansion valve movements.
			Check connection to the valve driver on the wiring diagram.
			Measure the resistance of each winding, it has to be different from 0 Ohm.
	Water temperature is low		Increase inlet water temperature. Check the low pressure safeties settings.
Reset	A/C units	W/C units	Notes
Local HMI Network Auto	☑ ☒ ☐	☑ ☑ ☐	

10.8.2 Low Pressure Start Fail

This alarm indicates that at the compressor start the evaporating pressure or condensing pressure is below a minimum fixed limit at compressor start.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *Cx OffStartFailEvpPrLo* String in the alarm log: *Cx OffStartFailEvpPrLo* String in the alarm snapshot *Cx OffStartFailEvpPrLo*	Ambient temperature is too low (Condenserless units) or evaporator water temperature is too low (W/C units)	Check the operating envelope for this machine.
	Circuit refrigerant charge is too low	Check refrigerant charge.
		Check for gas leakage with a sniffer.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.3 High Condenser Pressure

This alarm is generated in case the Condensing saturated temperature rise above the Maximum condensing saturated temperature and the control is not able to compensate to this condition. The maximum condenser saturated temperature is 68.5°C but it can decrease when the evaporator saturated temperature become negative.
In case units operating at high condenser water temperature and with HT option, if the Condensing saturated temperature exceeds the Maximum condenser saturated temperature, the circuit is only switched off without any notification on the screen as this condition is considered acceptable in this range of operation.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffCndPressHi* String in the alarm log: *CxCmp1 OffCndPressHi* String in the alarm snapshot *CxCmp1 OffCndPressHi*	One or more condenser fans do not operate properly (Condenserless units).	Check if fans protections have been activated.
		Check that the fans can turn freely.
		Check that there is not any obstacle to the free ejection of the air blown.
	Condenser pump may not be operating correctly.	Check if the pump can run and give the required water flow.
	Dirty or partially blocked condenser coil (Condenserless units).	Remove any obstacle; Clean the condenser coil using soft brush and blower.
	Dirty condenser heat exchanger.	Clean the condenser heat exchanger.
	Inlet air temperature of the condenser is too high (Condenserless units).	The air temperature measured at the inlet of the condenser may not exceed the limit indicated in the operational range (working envelope) of the chiller.
		Check the location where the unit is installed and check that there are no any short circuit of the hot-air blown from the fans of the same unit, or even from fans of next chillers (Check IOM for proper installation).
	Entering water temperature at condenser is too high.	Check the cooling tower operation and settings.
		Check the three way valve operation and settings.
	One or more condenser fan turning in wrong direction (Condenserless units).	Check for correct phases sequence (L1, L2, L3) in the electrical connection of the fans.
	Excessive charge of refrigerant into the unit.	Check liquid sub-cooling and suction super-heat to control indirectly the correct charge of refrigerant. If necessary recover all the refrigerant to weight the entire charge and to control if the value is in line with kg indication on unit label.
	Condensing pressure transducer could not operate properly.	Check for proper operation of the high pressure sensor.
	Wrong unit configuration.	Check that the unit has been configured for high condenser temperature applications.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.4 Mechanical High Pressure Switch

This alarm is generated when the condenser pressure rises above the mechanical high pressure limit causing this device to open the power supply to all the auxiliary relays. This causes an immediate shutdown of compressor and all the other actuators in this circuit.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffMechPressHi* String in the alarm log: *CxCmp1 OffMechPressHi* String in the alarm snapshot *CxCmp1 OffMechPressHi*	One or more condenser fans do not operate properly (Condenserless units).	Check if fans protections have been activated.
		Check that the fans can turn freely.
		Check that there is not any obstacle to the free ejection of the air blown.
	Condenser pump may not be operating correctly.	Check if the pump can run and give the required water flow.
	Dirty or partially blocked condenser coil (Condenserless units).	Remove any obstacle; Clean the condenser coil using soft brush and blower.
	Dirty condenser heat exchanger.	Clean the condenser heat exchanger.
	Inlet air temperature of the condenser is too high (Condenserless units).	The air temperature measured at the inlet of the condenser may not exceed the limit indicated in the operational range (working envelope) of the chiller
		Check the location where the unit is installed and check that there are no any short circuit of the hot-air blown from the fans of the same unit, or even from fans of next chillers (Check IOM for proper installation).
	One or more condenser fan turning in wrong direction.	Check for correct phases sequence (L1, L2, L3) in the electrical connection of the fans.
	Entering water temperature at condenser is too.	Check the cooling tower operation and settings.
		Check the three way valve operation and settings.
	Mechanical high pressure switch is damaged or not calibrated.	Check for proper operation of the high pressure switch.
Reset		Notes
Local HMI Network Auto	☑ ☒ ☐	Reset of this alarm requires a manual action on the high pressure switch.

10.8.5 High Discharge Temperature

This alarm indicates that the temperature at the discharge port of the compressor exceeded a maximum limit which may cause damages to the mechanical parts of the compressor.

When this alarm occurs compressor's crankcase and discharge pipes may become very hot. Be careful when getting in contact with the compressor and discharge pipes in this condition.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffDischTmpHi* String in the alarm log: *CxCmp1 OffDischTmpHi* String in the alarm snapshot *CxCmp1 OffDischTmpHi*	Liquid Injection solenoid valve is not operating properly.	Check the electrical connection between the controller and the liquid injection solenoid valve.
		Check if the solenoid coil operates properly.
		Check if the digital output operates correctly.
	Liquid injection orifice is small.	Check if when the liquid injection solenoid is activated the temperature can be controlled between the limits.
		Check that the liquid injection line is not obstructed by observing the discharge temperature when it is activated.
	Discharge temperature sensor could not operate properly.	Check for proper operation of the discharge temperature.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.6 High Oil Pressure Difference

This alarm indicates that the oil filter is clogged and needs to be replaced.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffOilPrDiffHi* String in the alarm log: *CxCmp1 OffOilPrDiffHi* String in the alarm snapshot *CxCmp1 OffOilPrDiffHi*	Oil filter is clogged.	Replace oil filter.
	Oil Pressure Transducer is reading incorrectly.	Check Oil Pressure Transducer readings with a gauge.
	Condensing Pressure Transducer is reading incorrectly.	Check Condensing Pressure Transducer readings with a gauge.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.7 Compressor Starter Fault

This alarm is generated any time starter fault input is open or if the compressor has been running for at least 14 seconds and starter fault input is open

Symptom	Cause	Solution
Circuit status is OFF. Bell icon is moving on controller's display. String in the alarm list: C# Cmp1 OffStarterFlt String in the alarm log: C# Cmp1 OffStarterFlt String in the alarm snapshot C# Cmp1 OffStarterFlt	Contactors may be broken or weared	Check if contactors operate properly.
		Check the status of the electrical internal contacts.
		check the integrity of fuses.
		Check for problem in wiring connection between contactors unit controller.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.8 High Motor Temperature

This alarm indicates that the motor temperature has exceeded the maximum temperature limit for safe operations.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffMotorTempHi* String in the alarm log: *CxCmp1 OffMotorTempHi* String in the alarm snapshot *CxCmp1 OffMotorTempHi*	Insufficient motor cooling.	Check refrigerant charge.
		Check if operational envelope of the unit is respected.
	Motor temperature sensor could not operate properly.	Check the readings of the motor temperature sensor and check the Ohmic value. A correct reading should be around hundreds of Ohm at ambient temperature.
		Check the electrical connection of the sensor with the electronic board.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.9 No Pressure Change After Start

This alarm indicates that the compressor is not able to start or to create a certain minimum variation of the evaporating or condensing pressures after start.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *Cx OffNoPressChgStart* String in the alarm log: *Cx OffNoPressChgStart* String in the alarm snapshot *Cx OffNoPressChgStart*	Compressor cannot start.	Check if the start signal is properly connected to the inverter.
	Compressor is turning in wrong direction.	Check correct phases sequence to the compressor (L1, L2, L3) according to the electrical scheme.
		Inverter is not properly programmed with the right direction of rotation.
	Refrigerant circuit is empty of refrigerant.	Check circuit pressure and presence of refrigerant.
	Not proper operation of evaporating or condensing pressure transducers.	Check proper operation of evaporating or condensing pressure transducers.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.10 No Pressure At Startup

This alarm is used to indicate a condition where the pressure at the evaporator or at the condenser is lower than 35kPa, so the circuit is potentially empty of refrigerant.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not start Bell icon is moving on controller's display. String in the alarm list: *Cx OffNoPressAtStart* String in the alarm log: *Cx OffNoPressAtStart* String in the alarm snapshot *Cx OffNoPressAtStart*	Evaporator or condenser pressure are below 35kPa	Check transducers calibration with an appropriate gauge.
		Check transducers cabling and readout.
		Check refrigerant charge and set it to the proper value.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.11 CC Comm Failure

This alarm is generated in case of communication problems with the CCx module.

Symptom	Cause	Solution
Circuit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: *Cx OffCmpCtrlrComFail* String in the alarm log: *Cx OffCmpCtrlrComFail* String in the alarm snapshot *Cx OffCmpCtrlrComFail*	Module has no power supply	Check the power supply from the connector on the side of the module.
		Check if LEDs are both green.
		Check if the connector on the side is tightly inserted in the module.
	Module address is not properly set	Check if module's address is correct referring to the wiring diagram.
	Module is broken	Check if LED are on and both green. If BSP LED is solid red replace the module.
		Check if power supply is ok but LEDs are both off. In this case replace the module.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.12 FC Comm Failure Circuit 2 or 3

This alarm is generated in case of communication problems with the Fan module.

Symptom	Cause	Solution
Circuit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: *Cx OffFnCtlrComFail* String in the alarm log: *Cx OffFnCtlrComFail* String in the alarm snapshot *Cx OffFnCtlrComFail*	Module has no power supply	Check the power supply from the connector on the side of the module.
		Check if LEDs are both green.
		Check if the connector on the side is tightly inserted in the module.
	Module address is not properly set	Check if module's address is correct referring to the wiring diagram.
	Module is broken	Check if LED are on and both green. If BSP LED is solid red replace the module.
		Check if power supply is ok but LEDs are both off. In this case replace the module.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.13 EEXV Comm Failure

This alarm is generated in case of communication problems with the EEXVx module.

Symptom	Cause	Solution
Circuit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: Cx OffEXVCtrlrComFail String in the alarm log: □ Cx OffEXVCtrlrComFail String in the alarm snapshot Cx OffEXVCtrlrComFail	Module has no power supply	Check the power supply from the connector on the side of the module.
		Check if LEDs are both green.
		Check if the connector on the side is tightly inserted in the module.
	Module address is not properly set	Check if module's address is correct referring to the wiring diagram.
	Module is broken	Check if LED are on and both green. If BSP LED is solid red replace the module.
		Check if power supply is ok but LEDs are both off. In this case replace the module.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.14 Evaporator Pressure Sensor Fault

This alarm indicates that the evaporating pressure transducer is not operating properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: CxCmp1 EvapPressSen String in the alarm log: CxCmp1 EvapPressSen String in the alarm snapshot CxCmp1 EvapPressSen	Sensor is broken.	Check for sensor integrity. Check correct sensors operation according information about mVolt (mV) range related to pressure values in kPa.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for correct installation of the sensor on refrigerant circuit pipe. The transducer must be able to sense the pressure through the valve's needle.
		Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.15 Condenser Pressure Sensor Fault

This alarm indicates that the condensing pressure transducer is not operating properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 CondPressSen* String in the alarm log: *CxCmp1 CondPressSen* String in the alarm snapshot *CxCmp1 CondPressSen*	Sensor is broken.	Check for sensor integrity. Check correct sensors operation according information about mVolt (mV) range related to pressure values in kPa.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for correct installation of the sensor on refrigerant circuit pipe. The transducer must be able to sense the pressure through the valve's needle.
		Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.8.16 Motor Temperature Sensor Fault

This alarm is generated to indicate that the sensor is not reading properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffMtrTempSen* String in the alarm log: *CxCmp1 OffMtrTempSen* String in the alarm snapshot *CxCmp1 OffMtrTempSen*	Sensor is shorted.	Check for sensor integrity.
		Check correct sensors operation according information acceptable resistance range related to temperature values.
	Sensor is broken.	Check if sensor is shorted with a resistance measurement.
	Sensor is not good connected (open).	Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according with electrical scheme.
Reset		Notes
Local HMI Network Auto	□ □ □	

10.8.17 Maximum Number of Restart Alarm (condenserless units only)

This alarm indicates that for three consecutive times after the compressor start the evaporating pressure is under a minimum limit for too much time

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *Cx OffNbrRestarts* String in the alarm log: *Cx OffNbrRestarts* String in the alarm snapshot *Cx OffNbrRestarts*	Ambient temperature is too low.	Check the operating envelope for this machine.
	Pressure drops between unit and remote condenser exceeds the limit for a proper operation.	
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.9 Circuit Pumpdown Stop Alarms

10.9.1 Low Discharge Superheat Fault

This alarm indicates that the unit has worked for too long with low discharge super heat.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffDishSHLo* String in the alarm log: *CxCmp1 OffDishSHLo* String in the alarm snapshot *CxCmp1 OffDishSHLo*	EEXV is not working correctly. It's not opening enough or it's moving in the opposite direction.	Check if pump-down can be finished for pressure limit reached;
		Check expansion valve movements.
		Check connection to the valve driver on the wiring diagram.
		Measure the resistance of each winding, it has to be different from 0 Ohm.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.9.2 Low Pressure Ratio

This alarm indicates that the ratio between evaporating and condensing pressure is below a limit which depends on compressor speed and guarantees the proper lubrication to compressor.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffPrRatioLo* String in the alarm log: *CxCmp1 OffPrRatioLo* String in the alarm snapshot *CxCmp1 OffPrRatioLo*	Compressor is not able to develop the minimum compression.	Check fan setpoint and settings, it could be too low (Condenserless units).
		Check compressor absorbed current and discharge superheat. Compressor can be damaged.
		Check the correct operation of suction / delivery pressure sensors.
		Check the internal relief valve didn't opened during previous operation (check the unit history). Note: If the difference between delivery and suction pressure exceed 22bar, the internal relief valve open and need to be replaced.
		Inspect the gate rotors / screw rotor for possible damages.
		Check if the cooling tower or three way valves are operating correctly and properly set.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.9.3 Oil Pressure Sensor Fault

This alarm is generated to indicate that the sensor is not reading properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffOilFeedPSen* String in the alarm log: *CxCmp1 OffOilFeedPSen* String in the alarm snapshot *CxCmp1 OffOilFeedPSen*	Sensor is broken.	Check for sensor integrity. Check correct sensors operation according information about mVolt (mV) range related to pressure values in kPa.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for correct installation of the sensor on refrigerant circuit pipe. The transducer must be able to sense the pressure through the valve's needle.
		Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.9.4 Suction Temperature Sensor Fault

This alarm is generated to indicate that the sensor is not reading properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffSuctTempSen* String in the alarm log: *CxCmp1 OffSuctTempSen* String in the alarm snapshot *CxCmp1 OffSuctTempSen*	Sensor is shorted.	Check for sensor integrity.
		Check correct sensors operation according information about kOhm (k□) range related to temperature values.
	Sensor is broken.	Check if sensor is shorted with a resistance measurement.
	Sensor is not good connected (open).	Check for correct installation of the sensor on refrigerant circuit pipe.
		Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according with electrical scheme.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.9.5 Discharge Temperature Sensor Fault

This alarm is generated to indicate that the sensor is not reading properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: CxCmp1 OffDischTmpSen String in the alarm log: □ CxCmp1 OffDischTmpSen String in the alarm snapshot CxCmp1 OffDischTmpSen	Sensor is shorted.	Check for sensor integrity.
		Check correct sensors operation according information about kOhm (k□) range related to temperature values.
	Sensor is broken.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for correct installation of the sensor on refrigerant circuit pipe.
		Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according with electrical scheme.
Reset		Notes
Local HMI Network Auto	☑ ☑ ☐	

10.10 Circuit Events

The following events limit operation of the circuit in some way as described in the Action Taken column. The occurrence of a circuit event only affects the circuit on which it occurred. Circuit events are logged in the event log on the unit controller.

10.10.1 Low Evaporator Pressure – Hold/Unload

These events are generated to indicate a temporary condition with the evaporating pressure below the hold and unload limits

Symptom	Cause	Solution
Circuit status is: Run: Evap Press Low The compressor does not load anymore or even unload its capacity. String in the Event log: *CxCmp1 LoEvapPrHold* *CxCmp1 LoEvapPrUnld*	Transitory condition like a fan staging (Condenserless units).	Wait until the condition is recovered by EXV control.
	Refrigerant charge is low.	Check sight glass on liquid line to see if there is flash gas.
		Measure sub-cooling to see if the charge is correct.
	Protection limit not set to fit customer application.	Check the evaporator approach and the corresponding water temperature to evaluate the low pressure hold limit.
	High Evaporator Approach.	Clean the evaporator.
		Check the quality of the fluid that flows into heat exchanger.
		Check the glycol percentage and type (ethilenic or propilenic).
	Water flow into water heat exchanger is too low.	Increase the water flow.
		Check that evaporator water pump is operating correctly providing the required water flow.
	Evaporating pressure transducer is not working properly.	Check the sensor for proper operation and calibrate the readings with a gauge.
	EEXV is not working correctly. It's not opening enough or it's moving in the opposite direction.	Check if pump-down can be finished for pressure limit reached;
		Check expansion valve movements.
		Check connection to the valve driver on the wiring diagram.
		Measure the resistance of each winding, it has to be different from 0 Ohm.
	Water temperature is low.	Increase inlet water temperature. Check the low pressure safeties settings.

10.10.2 High Condenser Pressure – Hold/Unload

These events are generated to indicate a temporary condition with the condensing pressure above the hold and unload limits.

Symptom	Cause	Solution
Circuit status is Run: High Cond Press The compressor does not load anymore or even unload. String in the Event log: *CxCmp1 HiCondPrHold* *CxCmp1 HiCondPrUnld*	One or more condenser fans do not operate properly (Condenserless units).	Check if fans protections have been activated.
		Check that the fans can turn freely.
		Check that there is not any obstacle to the free ejection of the air blown.
	Condenser pump may not be operating correctly.	Check if the pump can run and give the required water flow.
	Dirty or partially blocked condenser coil (Condenserless units).	Remove any obstacle; Clean the condenser coil using soft brush and blower.
	Dirty condenser heat exchanger.	Clean the condenser heat exchanger.
	Inlet air temperature of the condenser is too high (Condenserless units).	The air temperature measured at the inlet of the condenser may not exceed the limit indicated in the operational range (working envelope) of the chiller.
		Check the location where the unit is installed and check that there are no any short circuit of the hot-air blown from the fans of the same unit, or even from fans of next chillers (Check IOM for proper installation).
	Entering water temperature at condenser is too high.	Check the cooling tower operation and settings.
		Check the three way valve operation and settings.
	One or more condenser fan turning in wrong direction (Condenserless units).	Check for correct phases sequence (L1, L2, L3) in the electrical connection of the fans.
	Excessive charge of refrigerant into the unit.	Check liquid sub-cooling and suction super-heat to control indirectly the correct charge of refrigerant. If necessary recover all the refrigerant to weight the entire charge and to control if the value is in line with kg indication on unit label.
	Condensing pressure transducer could not operate properly.	Check for proper operation of the high pressure sensor.
	Wrong unit configuration.	Check that the unit has been configured for high condenser temperature applications.

10.10.3 Failed Pumpdown

This event can indicate a wrong operation of the exv that needs to be checked.

Symptom	Cause	Solution
Circuit status is Off: Ready Pumpdown procedure is ended for timeout. String in the Event log: *Cx PdFail*	Wrong operation of the exv which doesn't close.	Check the exv driver to verify that it can correctly move the valve. The LEDs on the driver should show the "C" LED solid green.
		Check the proper electrical connection of the exv to the driver. If the "C" and "O" LED blink alternatively the driver sees the motor as disconnected.
		Check if any debris can hold the valve from moving. Dismount the motor and check for scratches on the shutter.
		Measure the winding resistance and compare with the exv datasheet.

10.10.4 Power Loss While Running

This event indicates a power loss while the compressor was running.

Symptom	Cause	Solution
Circuit status can be any depending on the actual situation. String in the Event log: *C# PwrLossRun*	Power failure to the unit	Check if this events are too frequent and eventually check with the local maintenance.
		Check the fuses. In this case the compressor should not be able to start.

11 Basic Control System Diagnostic

MicroTech controller, extension modules and communication modules are equipped with two status LED (BSP and BUS) to indicate the operational status of the devices. The meaning of the two status LED is indicated below.

Controller LED

BSP LED	BUS LED	Mode
Solid Green	OFF	Application running
Solid Yellow	OFF	Application loaded but not running (*)
Solid Red	OFF	Hardware Error (*)
Flashing Yellow	OFF	Application not loaded (*)
Flashing Red	OFF	BSP Error (*)
Flashing Red/Green	OFF	Application/BSP update

(*) Contact Service.

Extension Module LED

BSP LED	BUS LED	Mode
Solid Green		BSP running
Solid Red		Hardware Error (*)
Flashing Red		BSP Error (*)
	Solid Green	Communication running, I/O working
	Solid Yellow	Communication running, parameter missing (*)
	Solid Red	Communication down (*)

(*) Contact Service.

Extension Module EXV Driver

Open LED	Close LED	Status
Off	Off	Valve not moving
On	Off	Valve full open (not applicable)
Off	On	Valve full closed
Off	Flashing	Valve closing or going to reference after power fail
Flashing	Off	Valve opening
Flashing	Flashing	Motor disconnected or shorted

Communication Module LED

BSP LED	Mode
Solid Green	BPS running, communication with controller
Solid Yellow	BSP running, no communication with controller (*)
Solid Red	Hardware Error (*)
Flashing Red	BSP Error (*)
Flashing Red/Green	Application/BSP update

(*) Contact Service.

BUS LED status vary depending on the module.

LON module:

BuS LED	Mode
Solid Green	Ready for Communication. (All Parameter loaded, Neuron configured). Doesn't indicate a communication with other devices.
Solid Yellow	Startup
Solid Red	No Communication to Neuron (internal error, could be solved by downloading a new LON application).
Flashing Yellow	Communication not possible to the Neuron. The Neuron must be configured and set online over the LON Tool.

Bacnet MSTP:

BuS LED	Mode
Solid Green	Ready for Communication. The BACnet Server is started. It doesn't indicate a active communication.
Solid Yellow	Startup
Solid Red	BACnet Server down. Automatically a restart after 3 seconds are initiated.

Bacnet IP:

BuS LED	Mode
Solid Green	Ready for Communication. The BACnet Server is started. It doesn't indicate a active communication.
Solid Yellow	Startup. The LED stays yellow until the module receives a IP Address, therefore a link must be established.
Solid Red	BACnet Server down. Automatic restart after 3 seconds is initiated.

Modbus

BuS LED	Mode
Solid Green	All Communication running.
Solid Yellow	Startup, or one configured channel not communicating to the Master.
Solid Red	All configured Communications down. Means no communication to the Master. The timeout can be configured. In case that the timeout is zero the timeout is disabled.

12 Using the Controller

12.1.1 The Unit Controller Operation

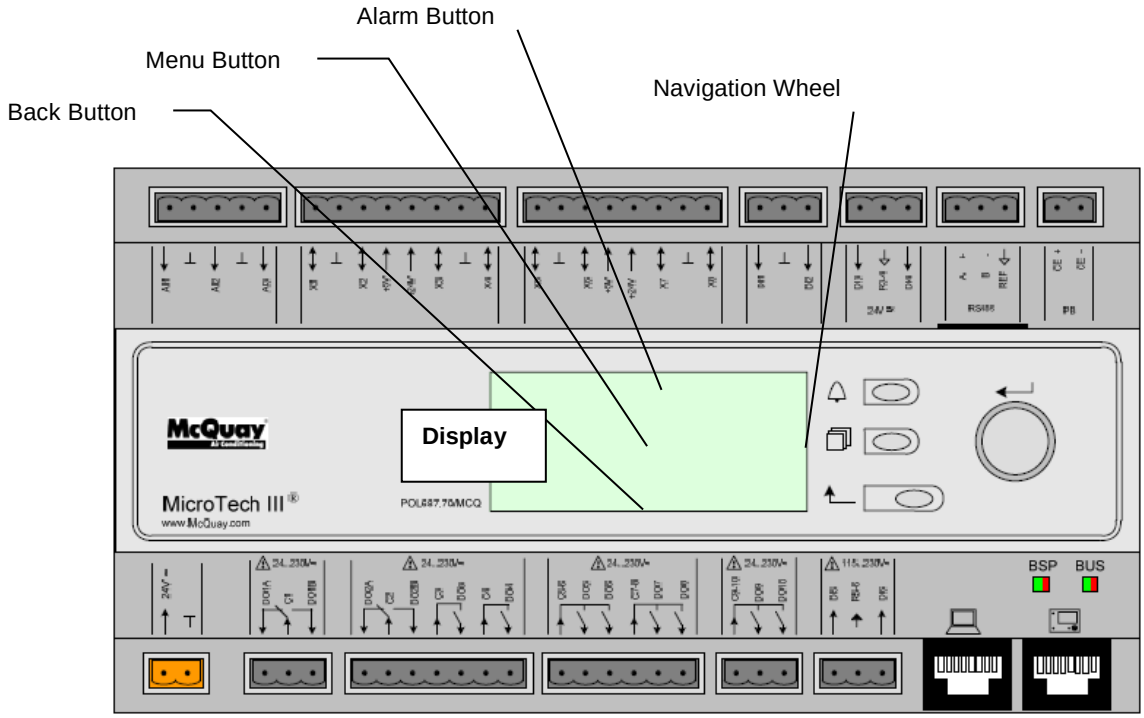


Figure 7, Unit Controller

The keypad/display consists of a 5-line by 22 character display, three buttons (keys) and a “push and roll” navigation wheel. There is an Alarm Button, Menu (Home) Button, and a Back Button. The wheel is used to navigate between lines on a screen (page) and to increase and decrease changeable values when editing. Pushing the wheel acts as an Enter Button and will jump from a link to the next set of parameters.

♦6	View/Set Unit 3
Status/Settings	>
Set Up	>
Temperature	>
Date/Time/Schedule	>

Figure 8, Typical Screen

Generally, each line contains a menu title, a parameter (such as a value or a setpoint), or a link (which will have an arrow in the right of the line) to a further menu.

The first line visible on each display includes the menu title and the line number to which the cursor is currently “pointing”, in the above case 3. The left most position of the title line includes an “up” arrow to indicate there are lines (parameters) “above” the currently displayed line; and/or a “down” arrow to indicate there are lines (parameters) “below” the currently displayed items or an “up/down” arrow to indicate there are lines “above and below” the currently displayed line. The selected line is highlighted.

Each line on a page can contain status only information or include changeable data fields (setpoints). When a line contains status only information and the cursor is on that line, all but the value field of that line is highlighted, meaning the text is white with a black box around it. When the line contains a changeable value and the cursor is at that line, the entire line is highlighted.

Or a line in a menu may be a link to further menus. This is often referred to as a jump line, meaning pushing the navigation wheel will cause a “jump” to a new menu. An arrow (>)is displayed to the far right of the line to indicate it is a “jump” line and the entire line is highlighted when the cursor is on that line.

NOTE - Only menus and items that are applicable to the specific unit configuration are displayed.

This manual includes information relative to the operator level of parameters; data and setpoints necessary for the every day operation of the chiller. There are more extensive menus available for the use of service technicians.

12.2 Navigating

When power is applied to the control circuit, the controller screen will be active and display the Home screen, which can also be accessed by pressing the Menu Button The navigating wheel is the only navigating device necessary, although the MENU, ALARM, and BACK buttons can provide shortcuts as explained later.

12.2.1 Passwords

The home screen has eleven lines:

- Enter Password, links to the Entry screen, which is an editable screen. So pressing the wheel goes to the edit mode where the password (5321) can be entered. The first (*) will be highlighted, rotate the wheel clockwise to the first number and set it by pressing the wheel. Repeat for the remaining three numbers.

  The password will time out after 10 minutes and is cancelled if a new password is entered or the control powers down.

- Other basic information and links are shown on the Main Menu page for ease of usage and includes Active setpoint, Evaporator Leaving Water Temperature, etc. The About Chiller link connect to a page where is possible to see the software version.

	Main Menu	1/11
Enter Password		>
Unit Status=		
Auto		
Active Setpt=		xx.x°C
Evap LWT=		xx.x°C
Unit Capacity=		xxx.x%
Unit Mode=		Cool
Time Until Restart		>
Alarms		>
Scheduled Maintenance		>
About Chiller		>

Figure 9, Password Menu

	Enter Password	1/1
Enter		****

Figure 10, Password Entry Page

Entering an invalid password has the same effect as continuing without a password.

Once a valid password has been entered, the controller allows further changes and access without requiring the user to enter a password until either the password timer expires or a different password is entered. The default value for this password timer is 10 minutes. It is changeable from 3 to 30 minutes via the Timer Settings menu in the Extended Menus.

12.2.2 Navigation Mode

When the navigation wheel is turned clockwise, the cursor moves to the next line (down) on the page. When the wheel is turned counter-clockwise the cursor moves to the previous line (up) on the page. The faster the wheel is turned the faster the cursor moves. Pushing the wheel acts as an “Enter” button.

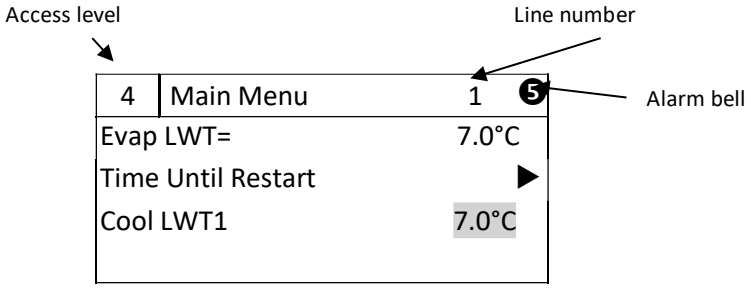


Figure 11: Typical page layout

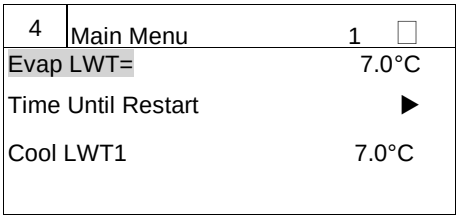


Figure 12: Parameter

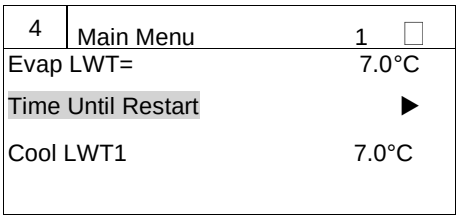


Figure 13: Link to a sub-menu

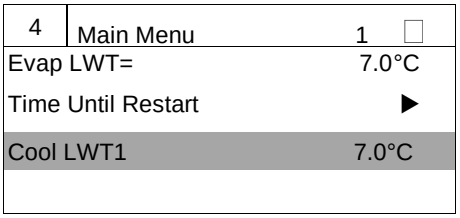


Figure 14: Adjustable setpoint

For example, “Time Until Restart” jumps from level 1 to level 2 and stops there.

When the Back Button is pressed the display reverts back to the previously displayed page. If the Back button is repeated pressed the display continues to revert one page back along the current navigation path until the “main menu” is reached.

When the Menu (Home) Button is pressed the display reverts to the “main page.”

When the Alarm Button is depressed, the Alarm Lists menu is displayed.

12.2.3 Edit Mode

The Editing Mode is entered by pressing the navigation wheel while the cursor is pointing to a line containing an editable field. Once in the edit mode pressing the wheel again causes the editable field to be highlighted. Turning the wheel clockwise while the editable field is highlighted causes the value to be increased. Turning the wheel counter-clockwise while the editable field is highlighted causes the value to be decreased. The faster the wheel is turned the faster the value is increased or decreased. Pressing the wheel again cause the new value to be saved and the keypad/display to leave the edit mode and return to the navigation mode.

A parameter with an “R” is read only; it is giving a value or description of a condition. An “R/W” indicates a read and/or write opportunity; a value can be read or changed (providing the proper password has been entered).

Example 1: **Check Status,** for example **-**is the unit being controlled locally or by an external network? We are looking for the Unit Control Source Since this a unit status parameter, start at Main Menu and select View/Set Unit and press the wheel to jump to the next set of menus. There will be an arrow at the right side of the box, indicating that a jump to the next level is required. Press the wheel to execute the jump.

You will arrive at the Status/ Settings link. There is an arrow indicating that this line is a link to a further menu. Press the wheel again to jump to the next menu, Unit Status/Settings.

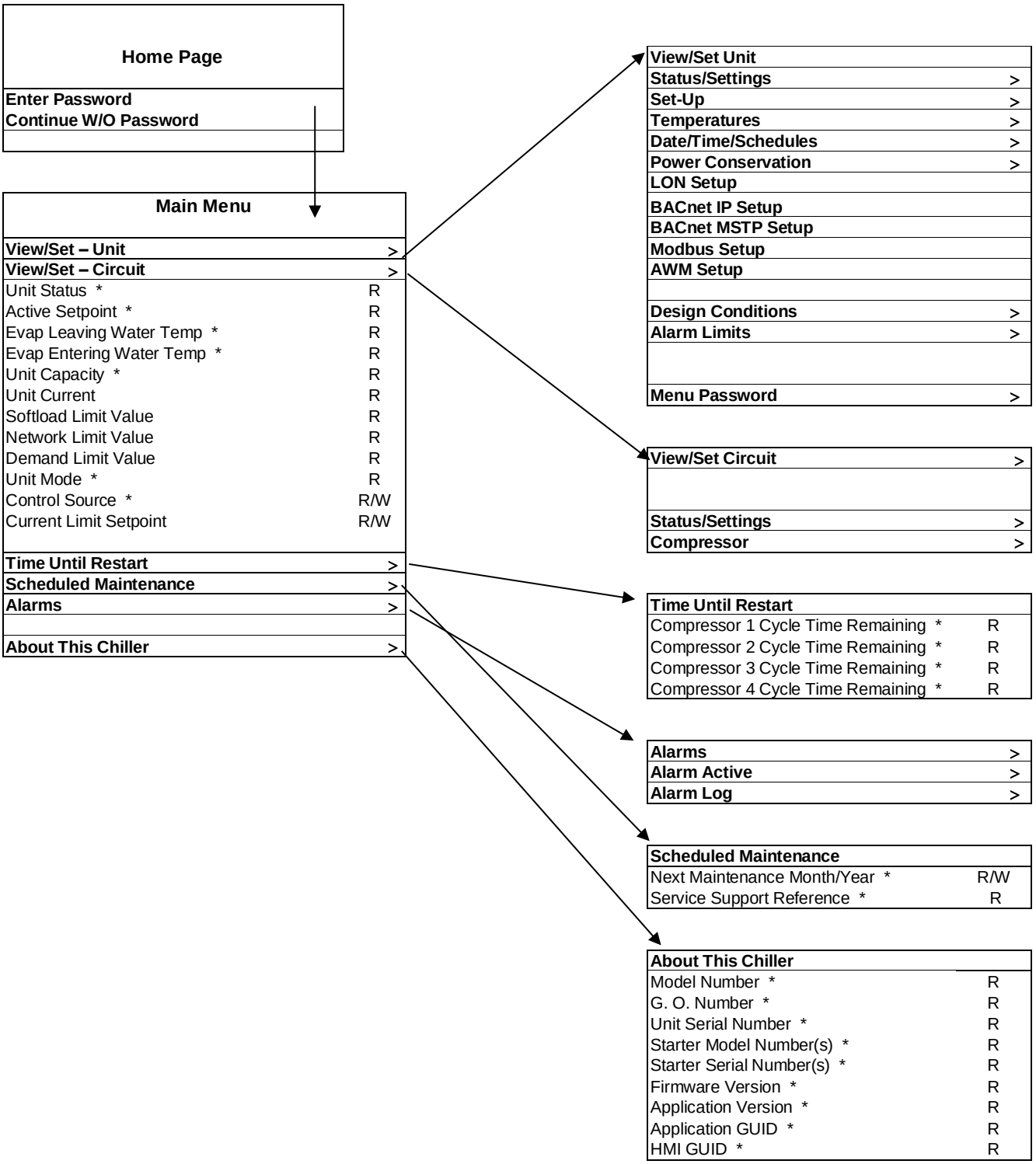
Rotate the wheel to scroll down to Control Source and read the result.

Example 2; Change a Set point, the chilled water set point for example. This parameter is designated as Cool LWT Set point 1 and is a unit set parameter. From the Main Menu select View/Set Unit. The arrow indicated that this is link to a further menu.

Press the wheel and jump to the next menu View/Set Unit and use the wheel to scroll down to Temperatures. This again has an arrow and is a link to a further menu. Press the wheel and jump to the Temperatures menu, which contains six lines of temperatures set points. Scroll down to Cool LWT 1 and press the wheel to jump to the item change page. Rotate the wheel to adjust the set point to the desired value. When this is done press the wheel again to confirm the new value. With the Back button it will be possible to jump back to the Temperatures menu where the new value will be displayed.

Example 3; Clear an Alarm. The presence of a new alarm is indicated with a Bell ringing on the top right of the display. If the Bell is frozen one or more alarm had been acknowledged but are still active. To view the Alarm menu from the Main Menu scroll down to the Alarms line or simply press the Alarm button on the display. Note the arrow indicating this line is a link. Press the wheel to jump to the next menu Alarms There are two lines here; Alarm Active and Alarm Log. Alarms are cleared from the Active Alarm link. Press the wheel to jump to the next screen. When the Active Alarm list is entered scroll to the item AlmClr which is set to off by default. Change this value to on to acknowledge the alarms. If the alarms can be cleared then the alarm counter will display 0 otherwise it will display the number of alarms still active. When the alarms are acknowledged the Bell on the top right of the display will stop to ring if some of the alarms are still active or will disappear if all the alarms are cleared.

Figure 15, Home Page, Main Menu Parameters and Links



Note: Parameters with an "*" are available without entering a password.

Figure 16, Navigation, Part A

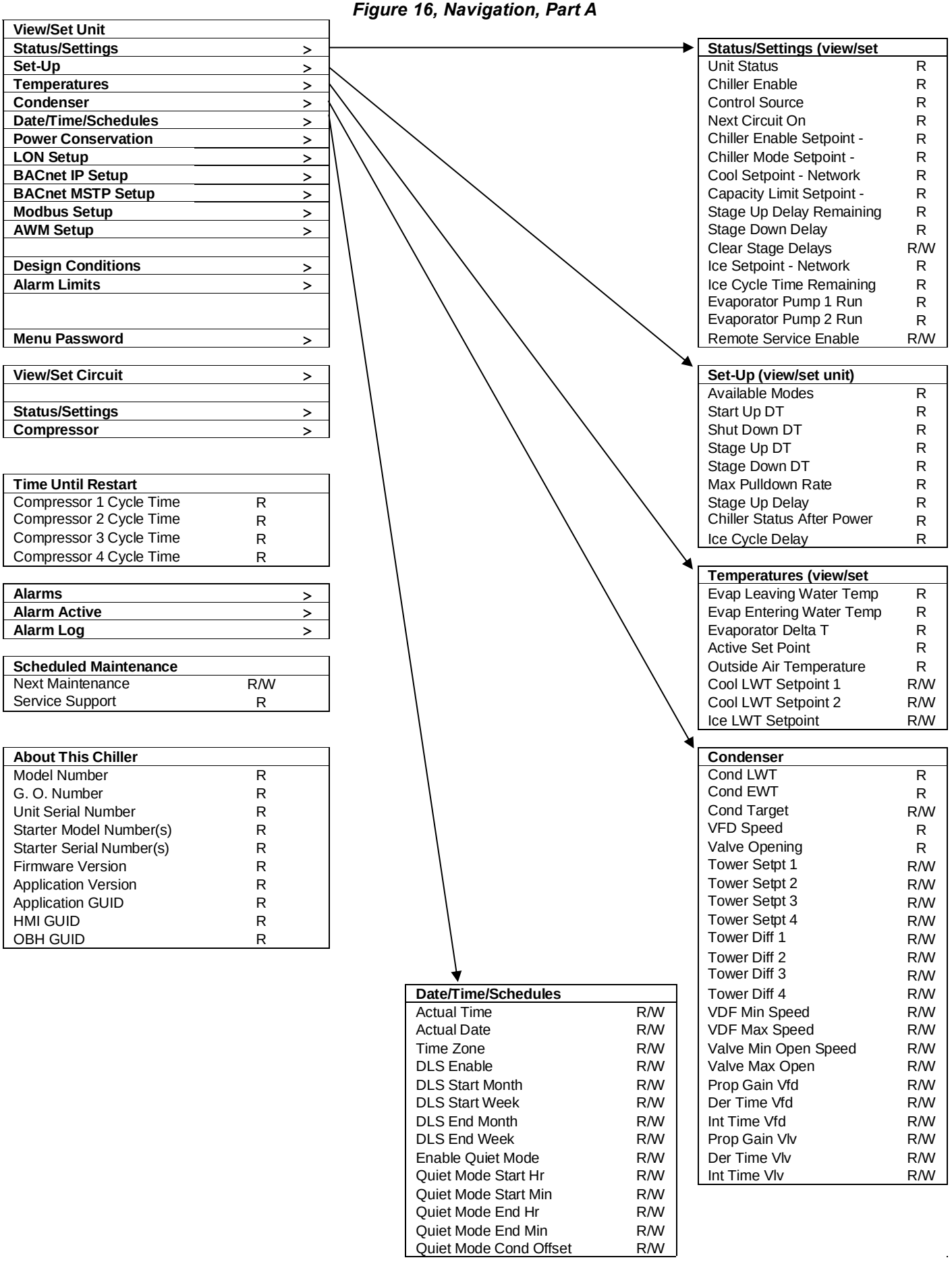


Figure 17, Navigation, Part B

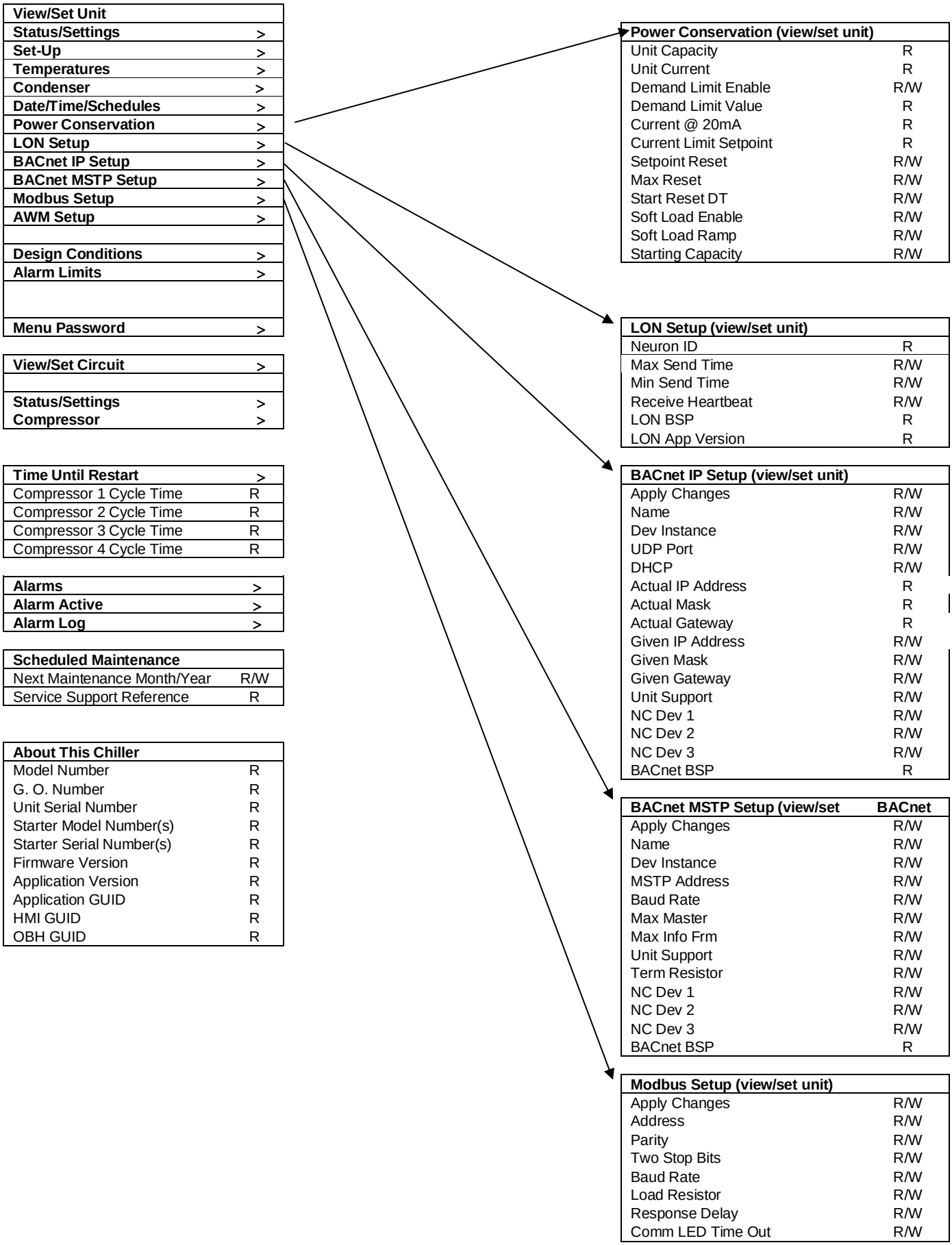
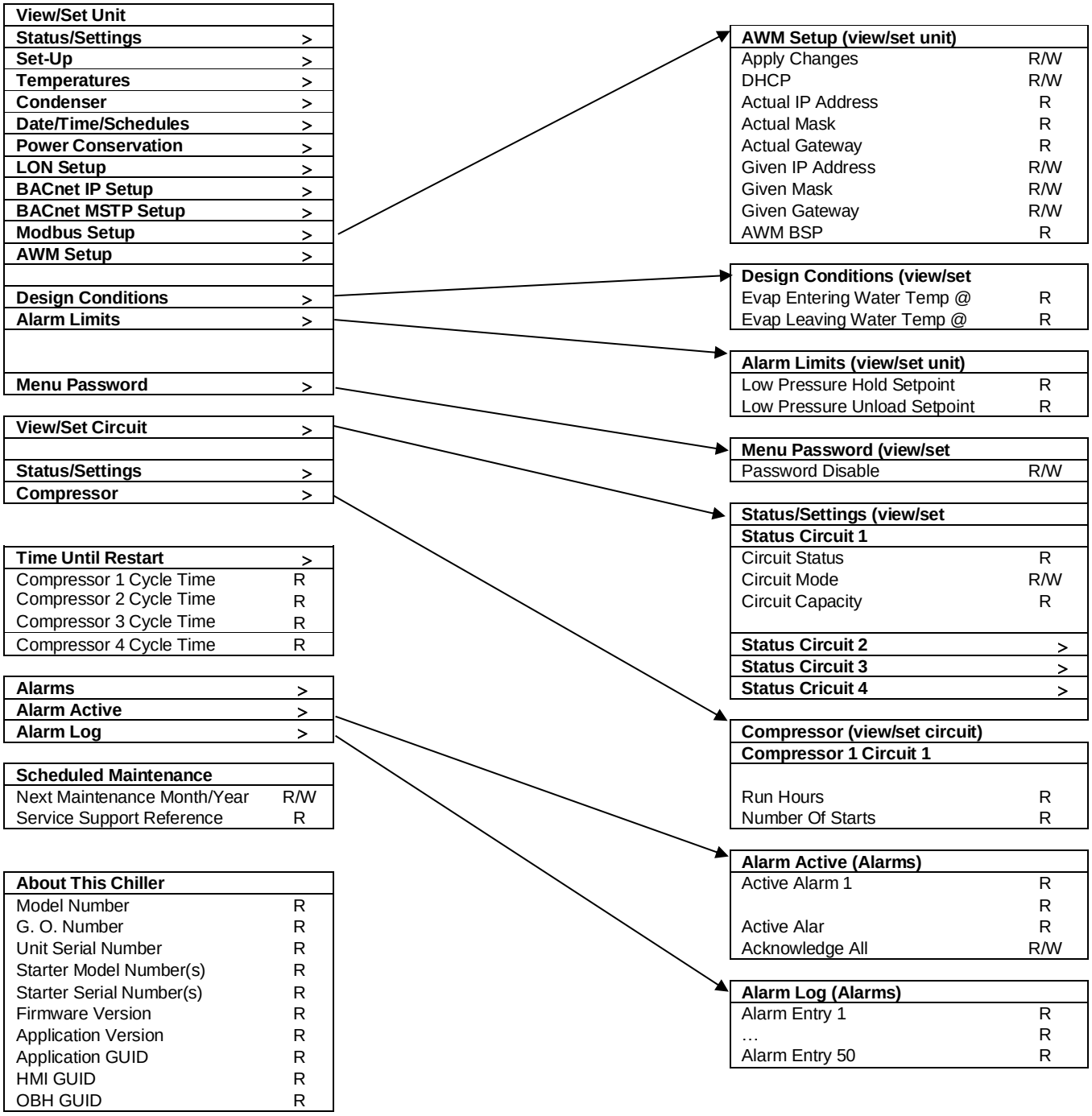


Figure 18, Navigation, Part C



Note: Parameters with an "*" are available without entering a password.

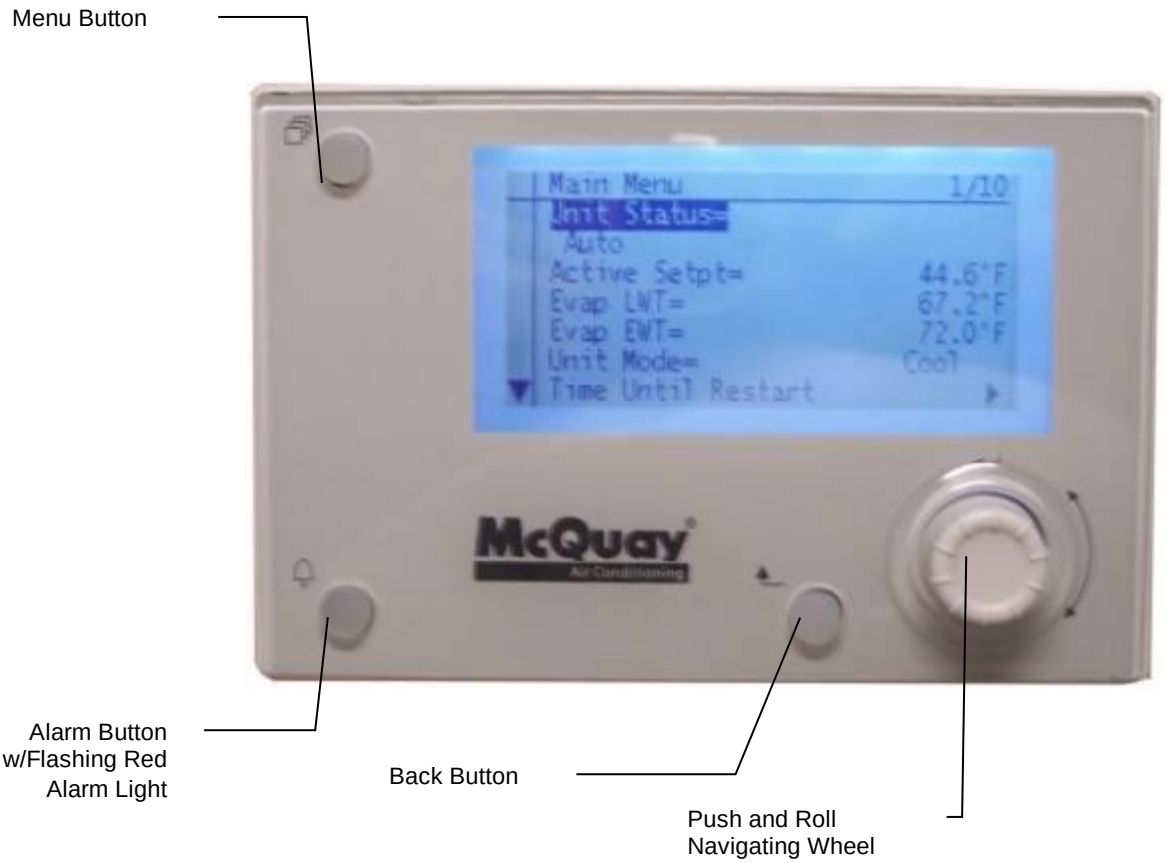
13 Optional Remote User Interface

The optional remote user interface is a remote control panel that mimics operation of the controller located on the unit. Up to eight AWS units can be connected to it and selected on the screen. It provides HMI (Human Machine Interface) within a building, the building engineer's office for example, without going outdoors to the unit.

It can be ordered with the unit and shipped loose as a field installed option. It can also be ordered anytime after chiller shipment and mounted and wired on the job as explained on the following page. The remote panel is powered from the unit and no additional power supply is required.

All viewing and setpoint adjustments available on the unit controller are available on the remote panel. Navigation is identical to the unit controller as described in this manual.

The initial screen when the remote is turned on shows the units connected to it. Highlight the desired unit and press the wheel to access it. The remote will automatically show the units attached to it, no initial entry is required.

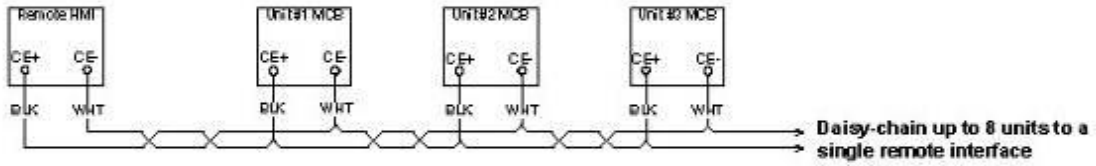


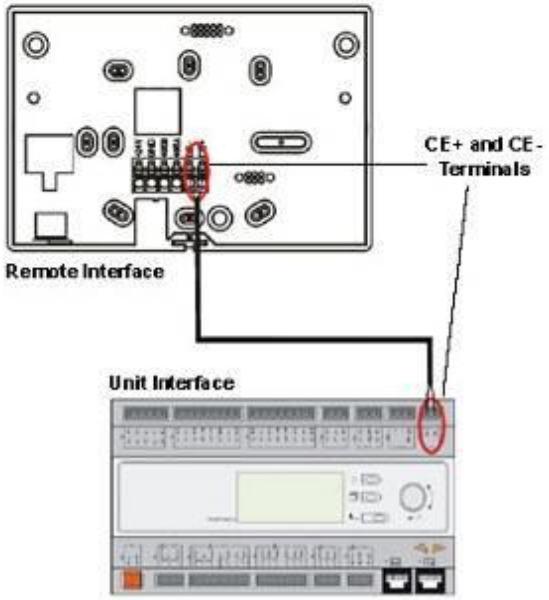
Technical Specifications

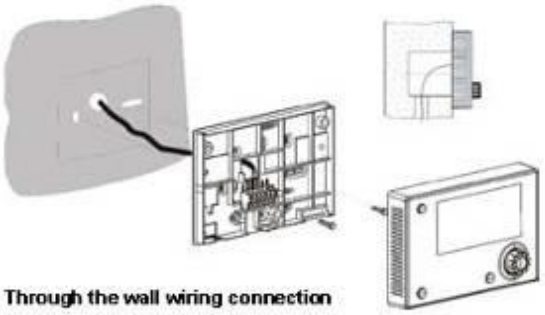
Interface		
Process Bus	Up to eight interfaces per remote	
Bus connection		CE+, CE-, not interchangeable
Terminal	2-screwconnector	
Max. length	700 m	
Cable type	Twisted pair cable; 0.5...2.5 mm2	
Display		
LCD type	FSTN	
Dimensions	5.7 W x 3.8 H x 1.5 D inches (144 x 96 x 38 mm)	
Resolution	Dot-matrix 96 X 208 pixels	
Backlight	Blue or white, user-configurable	
Environmental Conditions		
Operation	IEC 721-3-3	
Temperature	-40 to 70 °C	
Restriction LCD		-20 to 60 °C
Humidity	<90% r.h. (no condensation)	
Air pressure	Min. 700 hPa, corresponding to Max. 3,000 m above sea level	

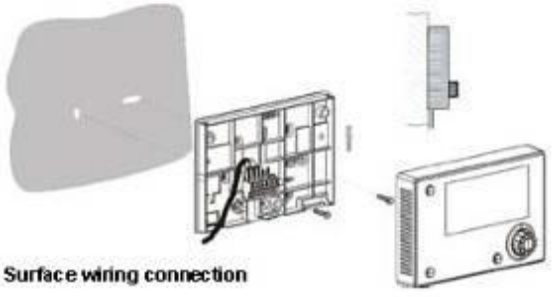
Cover Removal

Process Bus Wiring Connections






Through the wall wiring connection


Surface wiring connection

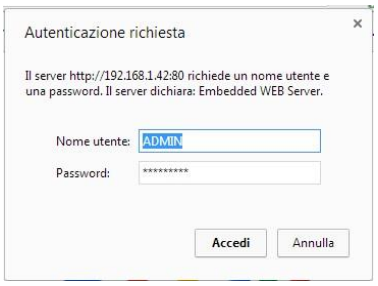
14 Embedded Web Interface

The MicroTech controller has an embedded web interface that can be used to monitor the unit when connected to a local network. It is possible to configure the IP addressing of the MicroTech as a fixed IP or DHCP depending on the network configuration.

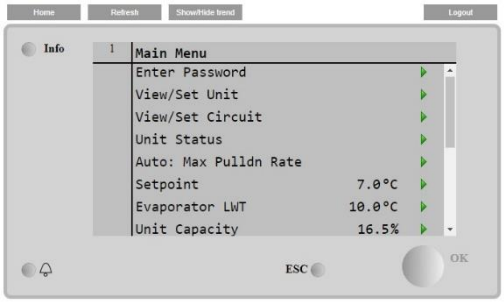
With a common web browser, a PC can connect with the unit controller entering the IP address of the controller or the host name, both visible in the View/Set Unit – Controller IP Setup page accessible with the Maintenance password.

When connected, it will be required to enter a user name and a password. Enter the following credential to get access to the web interface:

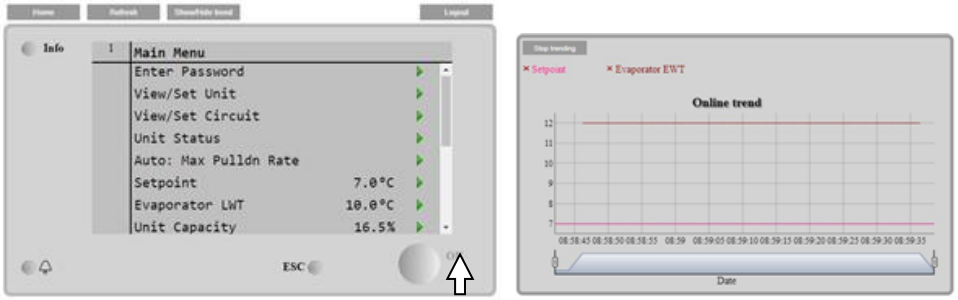
User Name: ADMIN
Password: SBTAdmin!



The Main Menu page will be displayed. The page is a copy of the onboard HMI and follows the same rules in terms of access levels and structure.



In addition it allows to trend log a maximum of 5 different quantities. It's required to click on the value of the quantity to monitor and the following additional screen will become visible:



Depending on the web browser and its version the trend log feature may not be visible. It's required a web browser supporting HTML 5 like for example:

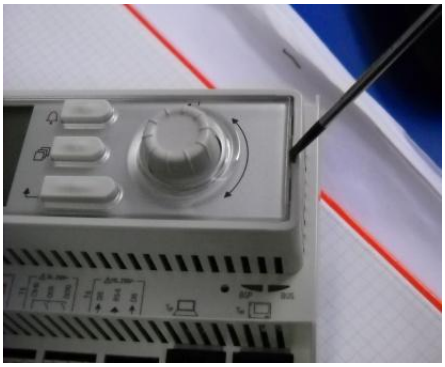
- Microsoft Internet Explorer v.11,
- Google Chrome v.37,
- Mozilla Firefox v.32.

These are only an example of the browser supported and the versions indicated have to be intended as minimum versions.

15 Controller maintenance

The controller requires to maintain the installed battery. Every two years it's required to replace the battery. Battery model is: BR2032 and it is produced by many different vendors.

To replace the battery remove the plastic cover of the controller display using a screw driver as shown in the following picture:



Be careful to avoid damages to the plastic cover. The new battery shall be placed in the proper battery holder which is highlighted in the following picture, respecting the polarities indicated into the holder itself.

16 iCM and Master/Slave

The unit controller also contains system control functionalities named Master/Slave (offered for free) and iCM (payable option).

Master/Slave is a basic system controlller that can control up to 4 units in the same loop.

iCM can extend the functionalities to control up to 8 units with additional plant control functionalities (pump control, cooling towers etc.) and flexibility.

Please, refer to the dedicated manual for further information.

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