

ems55advanced and ems55Radvanced

18 February 2014

Firmware:U01 - n01 - ems55advanced and ems55Radvanced - GDC

Firmware: U02 - r01 - ems55advanced and ems55Radvanced - OFC

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1 **ems controller reference guide**

ems (energy management system) controllers from elstat are used in a variety of drinks coolers, optimising energy savings, without compromising on drinks serving temperature.

A range of controllers are available to suit applications such as:

- single door coolers
- double door coolers
- open front coolers
- vending machines
- sub-zero beer coolers

1.1 about this reference guide

The purpose of this guide is to explain in detail all information regarding elstat controllers including the user interface, parameters, accessories and troubleshooting.

Complimentary information is also available from elstat such as accessory lists, accessory data sheets and single sheet user guides.

2 what is the ems55advanced?

The ems55 series is for use with open front (**OFC**) or glass door (**GDC**) coolers, offering energy savings and guaranteed product temperatures.

Unlike mechanical thermostats, the ems self-learning technology ensures the product is at the optimum serving temperature required by the customer from the moment the outlet opens.

The ems55 series is available with an integrated motion sensor - ems55advanced, and with out and integrated motion sensor - ems55Radvanced

Example ems55advanced pictured below - with integrated motion sensor



Example ems55Radvanced pictured below - with remote motion sensor



The ems55 series with the suitable accessories also provide the following functionality.

feature	description
user and diagnostic information	3-digit, 7-segment display. Shows the product temperature and other information such as defrost and alarm conditions. Push buttons enable end-users to cancel alarms and service technicians to run test routines.
product temperature	an appliance sensor measures the temperature of the refrigeration compartment. ems controllers use the refrigeration temperature to manage the product temperature.
refrigeration system high temperature alarms	a temperature sensor mounted on the gas cooler outlet pipe, measures the temperature of the gas cooler system. ems controllers monitor the temperature to alert to high temperature or pressure problems.
temperature-based defrost (OFC coolers)	an optional evaporator sensor to activate and terminate defrost cycles on OFC coolers based on the evaporator temperature. use the <i>aux</i> input at the rear of the controller for the evaporator sensor.

feature	description
motion detection	a remote (R) or integrated motion sensor enables ems controllers to detect activity in front of the cooler, i.e. a customer
door open detection GDC coolers only	a door switch enables ems controllers to detect activity whenever the cooler doors open not required for OFC coolers.

The ems55 series controllers switch the following cooler components:

feature	description
compressor	ems controllers switch the compressor to manage the temperature of the refrigeration compartment.
evaporator fan	ems controllers switch the evaporator fan to manage the evaporator fan.
lights	ems controllers switch the cooler lights to save energy.

2.1 ems55 series controllers

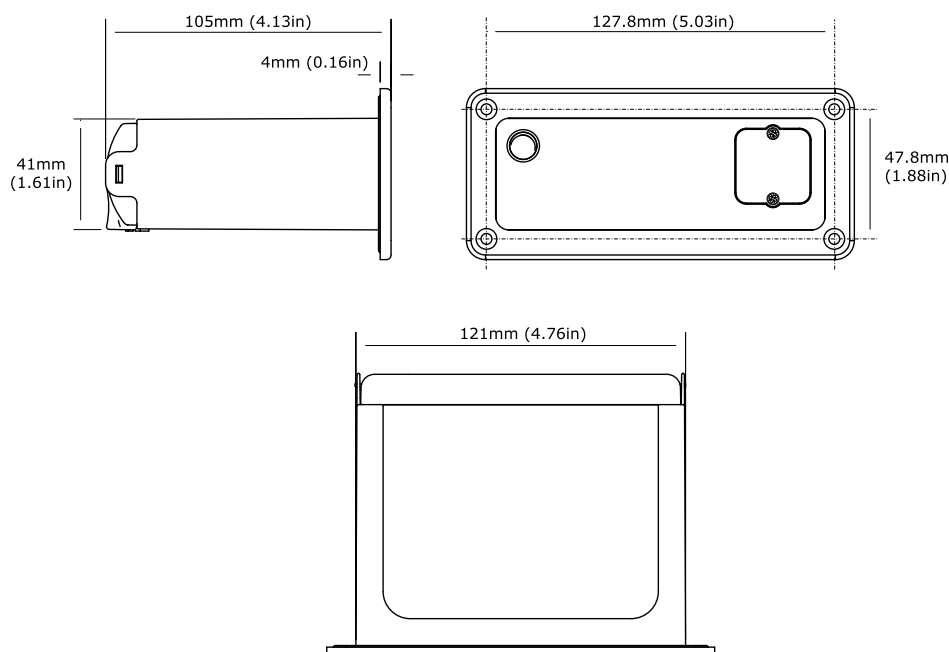
ems55 series controllers have an IP (ingress protection) rating of IPX5.

An appropriate level of protection must be given for the effects of water ingress due to condensation, product spillage, and so on.



ems55 series controllers are designed for panel mounting and are secured using four self-tapping screws in the screw holes at each corner of the fascia.

Dimensions are shown in the following diagram:



2.2 Water ingress – advisory information for FMEA analysis

Elstat products have been designed to minimise any risks associated with water ingress and all controllers are IPX5 certified. The OEM or installer is responsible to ensure that local/country laws and regulatory requirements are met.

2.3 ems55 user interface

The user interfaces of the ems55*advanced* the ems55*Radvanced* are as follows:



LED indicators:

	indicator	function	colour
	compressor	on when the compressor is running	green
	evaporator fan	on when evaporator fan is running.	red

	saving temperature disable	on if the saving mode temperature is disabled. The controller maintains <i>ready mode</i> temperature at all times.	red
	motion	on when motion is detected.	red

Push buttons:

button	name	function
	defrost	starts a defrost cycle.
	set	selects menu options and scrolls through the parameters.
	up	increases the parameter values.
	down	scrolls down menus, decreases parameter values, and cancels alarms.

2.4 environmental ratings

The table below details the general characteristics of ems55 series controllers.

characteristic	value
IP rating	IPX5
maximum operating temperature	55°C (131°F)
minimum operating temperature	0°C (32°F)
housing material	black polycarbonate

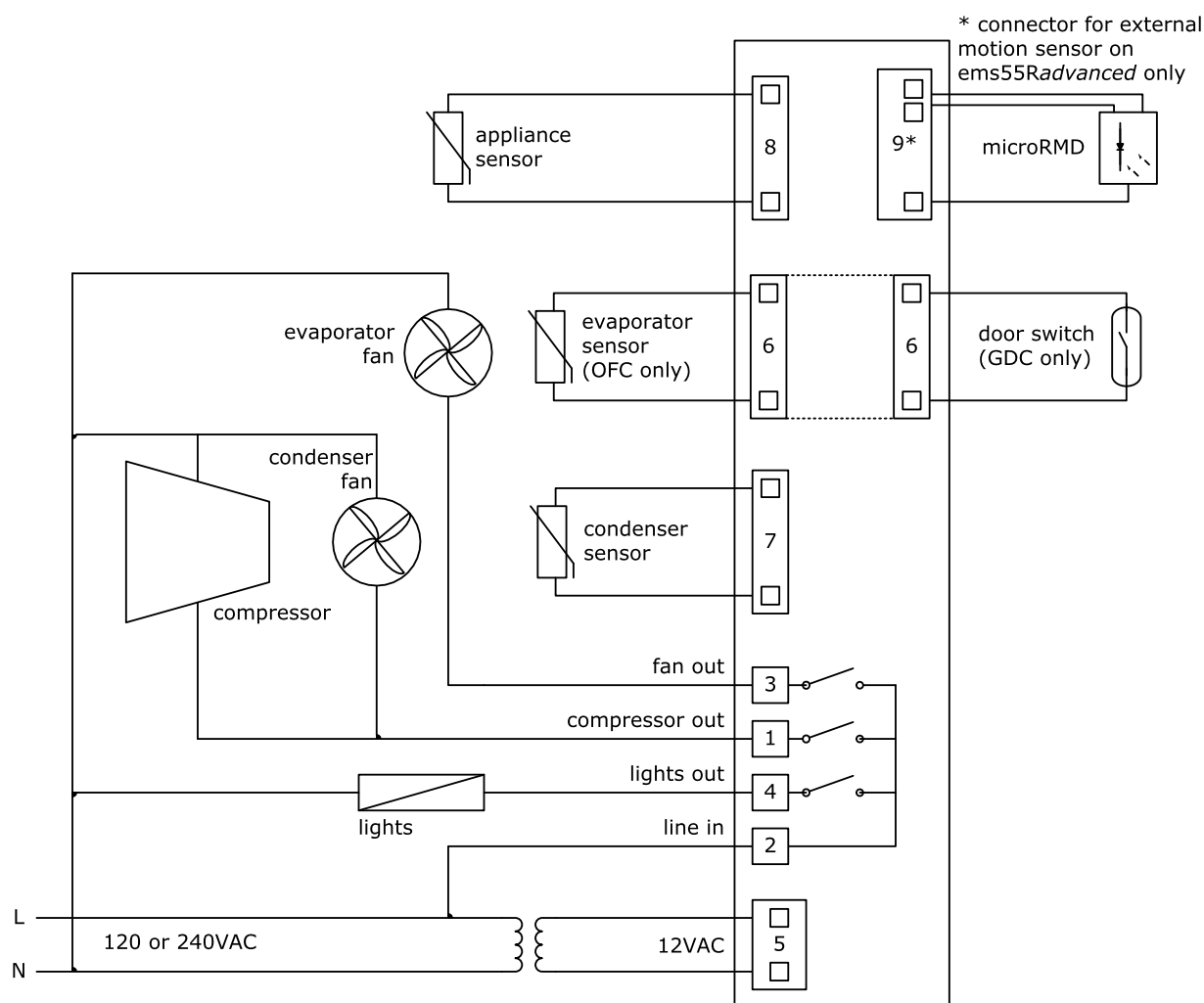
2.5 ems55 series relay ratings

The table below details the relay ratings of ems55*advanced* and ems55*Radvanced* controllers.

relay	maximum IEC rating @100-240VAC	maximum UL ratings @ 120VAC
compressor	10(10)A, p.f. 0.6	16 FLA, 96 LRA
lights	4(4)A, p.f. 0.6	120VAC, 60Hz, 250W ballast
evaporator fan	4(4)A, p.f. 0.6	4.4 FLA, 13.1 LRA

2.6 ems55*advanced* and ems55*Radvanced* wiring diagram

The wiring diagrams for the ems55*advanced* and ems55*Radvanced* are shown below.



2.7 how to mount ems55 series controllers

ems55 series controllers are designed to be mounted horizontally. Ingress protection (IP) rating of IPX5 applies to ems55 controllers mounted in the correction orientation only, as shown below.



Caution: mounting ems55 series ems controllers vertically may result in water ingress as the IP rating of IPX5 applies only if mounted horizontally, in addition, in correct installation may result in the following conditions:

- if mounted vertically with the motion sensor close to floor, the motion sensor not be able to detect motion effectively.
- if mounted vertically with parameter programming port close to the floor, any water ingress may occur.
- if mounted too close the floor, water ingress may occur at the mains or line voltage terminals.

Cable routing to the ems controller is critical as water can trace or follow the cable downwards.

Therefore, immediately prior to the connection to the controller, a drip-loop must be formed in all wiring as shown below.



Attention:

- Cable routing loops must **not** be secured to hot pipes or vibrating components.
- Secure cable routing loops with clips where ever possible.

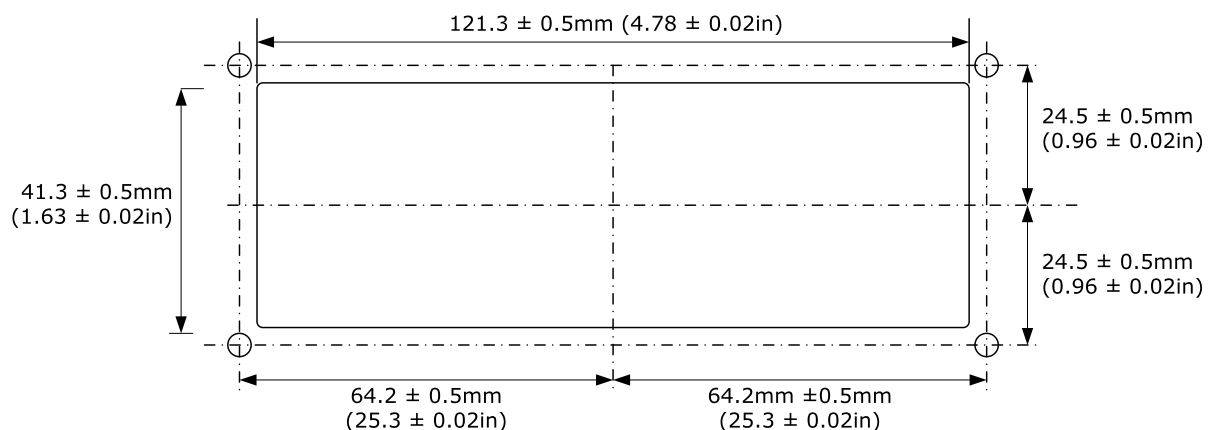
2.8 how to mount ems55 series controllers

ems55 series controllers have an IP (ingress protection) rating of IPX5.

An appropriate level of protection must be given for the effects of water ingress due to condensation, product spillage, and so on.

Caution: The ems55 series controllers must not be exposed to temperatures greater than 55°C (131°F) or lower than 0°C (32°F).

ems55 series controllers are designed for panel mounting and are secured using four countersunk self-tapping screws. The aperture and screw pitch dimensions are shown below.



3 temperature input ranges

The table below shows the temperature input ranges of the ems55 series controllers for each sensor type.

sensor	input range (°C)	input range (°F)
appliance sensor	-10°C to 23.3°C +/- 0.5°C	14°F to 74°F +/- 1°F
condenser sensor	50°C to 125°C +/- 5.0°C	122°F to 257°F +/- 10°F
evaporator sensor	-30°C to 15°C +/- 0.5°C	-22°F to 59°F +/- 1°F

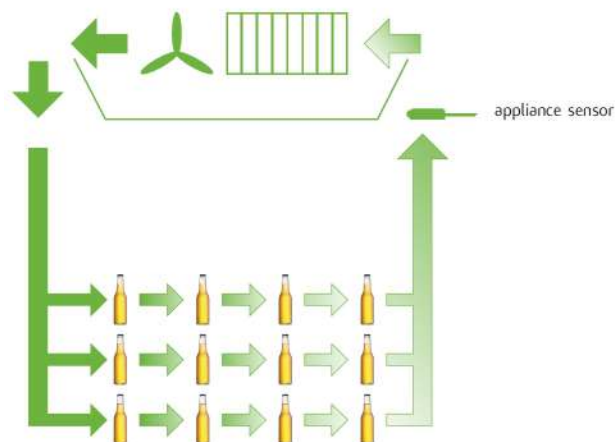
Note:

- The NTC (negative temperature coefficient) thermistor from elstat is rated at:
-35°C to 125°C (-31°F to 257°F).

3.1 how to mount the appliance sensor

The appliance sensor measures air temperature of the refrigerated compartment by measuring the return air temperature.

The diagram below shows the recommended position of the appliance sensor. The appliance sensor measures the air temperature after the air has been drawn over the products. The return air provides a close approximation of the product temperature.



To measure the return air temperature, secure the sensor to allow air to flow over the sensor head.

The sensor head should be placed at a right-angle to the air flow and secured using a P-clip.

The sensor head should not be completely covered by the P-clip or the sensor will not function correctly.



Caution:

- The sensor head is fragile and can easily be damaged. Using cable ties to secure the sensor head or sensor cable is not recommended and invalidates the warranty.

To help place the appliance sensor, the parameter calibration 1 (**CA1**) defines an offset temperature.

- See "calibration 1 (CA1)" on page 69

3.2 how to mount the condenser sensor

This sensor measures the temperature of the refrigeration system. Excessive condenser temperature is usually due to poor preventive maintenance, i.e poorly cleaned condenser, or condenser fan failure.

3.2.1 condenser sensor

ems controllers can generate alarms if the refrigeration system temperature rises too high.

The value of the high temperature is set by measuring the refrigeration system temperature, when the condenser is approximately 75% blocked. The temperature is then set as the value of the condenser high temperature (**Ht**) parameter.

- See "condenser high temperature (Ht)" on page 76

For example, fix using a metal pipe clip or direct fitting, as shown below.

Elstat can supply pipe clips for 6-8mm and 8-10mm pipes.



Caution:

- **Do not** use cable ties.
The head of the sensor is fragile and can be easily damaged. Using cable ties to secure the sensor head or sensor cable invalidates the war-

warranty.

- **Do not** attach sensor cables to hot pipes or allow the sensor cables to come into contact with hot pipes.

3.3 how to mount the evaporator sensor

The evaporator sensor measures the temperature of the evaporator.

ems controllers use the temperature of the evaporator to activate and terminate defrost cycles.

The evaporator sensor should be placed in the immediate proximity of the evaporator. Mount the sensor head inside the evaporator cooling fins, as shown below.

The sensor head must be mounted securely to prevent being dislodged due to vibration.



For coolers fitted with a defrost heater, the evaporator sensor should be placed as far away as possible from the heating element, i.e. at the opposite end of the evaporator.

If the evaporator sensor measures the localized heating from the heating element, defrost cycles will terminate before the whole evaporator has had the opportunity to defrost.

Caution:

- **Do not** use cable ties.
The head of the sensor is fragile and can be easily damaged. Using cable ties to secure the sensor head, or sensor cable, invalidates the warranty.

4 door switch

Door switches are used to detect door openings. Door switches are SELV (safety extra low voltage) components that are able to create an open and closed circuit.

The enhanced door switch, and activator, are SELV (safety extra low voltage) components, over-moulded for strengthened physical protection and resistance to water ingress, and create an open and closed circuit.

Enhanced door switches must be used with enhanced activators.

Enhanced door switches are available in various lengths.



4.1 how to mount the door switch

Door switches are usually mounted with the door switch on the cooler and the activator on the door.

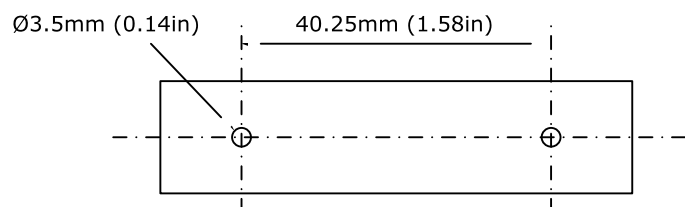
Door switches and activators must be fixed using counter sunk screws or bolts with the following characteristics:

- Head: countersunk head maximum diameter 5.0mm (0.24in).
- Thread: maximum diameter 3.0mm (0.16in).

The screws must be tightened to a maximum torque of 0.5Nm (0.37lb_fft).

Caution:

- Door switches and activators supplied by elstat must not be installed using rivets.
Using rivets invalidates the warranty.

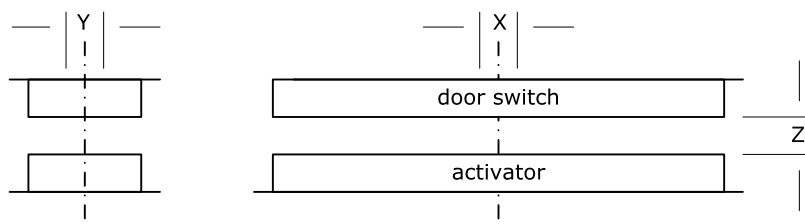


The alignment of the door switch and activator is critical for the correct operation of the door switch. The following table details alignment tolerances.

	alignment	dimensions	notes
X	horizontal	0mm (0in) +/- 20mm (0.7in)	measured when the door is closed and the gap (z-dimension) is correct.
Y	vertical	0mm (0in) +/- 10mm (0.4in)	measured when the door is closed and the gap (z-dimension) is correct.

	alignment	dimensions	notes
Z	gap	0mm (0in) to 5mm (0.2in) +/- 2mm (0.07in)	

The diagram shows the horizontal, vertical, and gap alignment between the door switch and the activator for open and closed doors.



4.2 how to mount the enhanced door switch

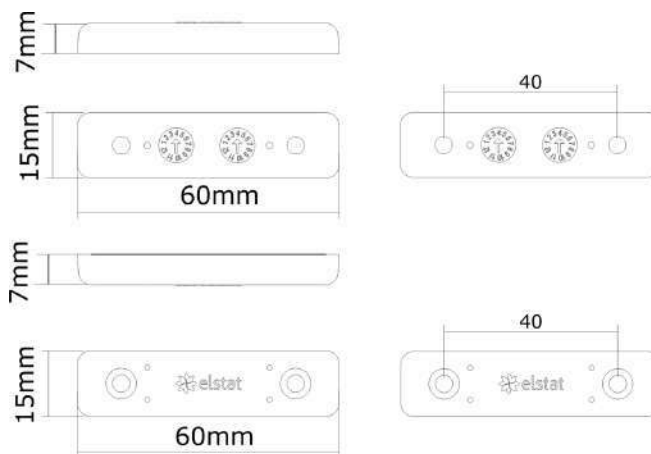
Door switches are usually mounted with the door switch on the cooler and the activator on the door. Door switches and activators must be fixed using counter sunk screws or bolts with the following characteristics:

- Head: countersunk head maximum diameter 6.0mm (0.236in) and minimum diameter 5.0mm (0.196 in).
- Thread: maximum diameter 3.0mm (0.118in).

The screws must be tightened to a maximum torque of 0.5Nm (0.37lb_fft).

Caution:

Door switch kits supplied by elstat must not be installed using rivets. Using rivets invalidates the warranty.

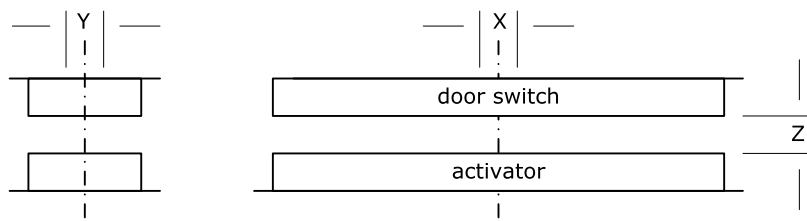


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	alignment	dimensions	notes
X	horizontal	0mm (0in) +/- 20mm (0.7in)	measured when the door is closed and the gap (z-dimension) is correct.
Y	vertical	0mm (0in) +/- 10mm (0.4in)	measured when the door is closed and the gap (z-dimension) is correct.
Z	gap	0mm (0in) to	

	alignment	dimensions	notes
		5mm (0.2in) +/- 2mm (0.07in)	

The diagram below shows the horizontal, vertical, and gap alignment between the door switch and the activator for open and closed doors.



For best results, elstat recommends that enhanced door switches are used with enhanced door switch activators. Performance will not be guaranteed if:

- enhanced activators are paired with current door switches
- enhanced door switches are paired with current activators.

Enhanced door switches and enhanced activators must be used as a set.

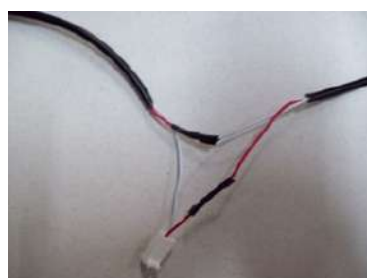
4.3 how to mount door switches on double-door coolers

For double-door coolers, two door switches must be connected in series.

Connect two door switches in series as follows:

1. Remove the two wires from one of the connectors. Be careful not to damage the terminals.
2. Remove the white wire from the second connector. Again, be careful not to damage the terminal.
3. Insert the white wire of the first cable into the connector of the second cable ensuring that the terminal is in the correct orientation.
4. Connect the red wire from the first cable and the white wire from the second cable together using a butt splice or similar.

The image below shows two door switches connected in series.



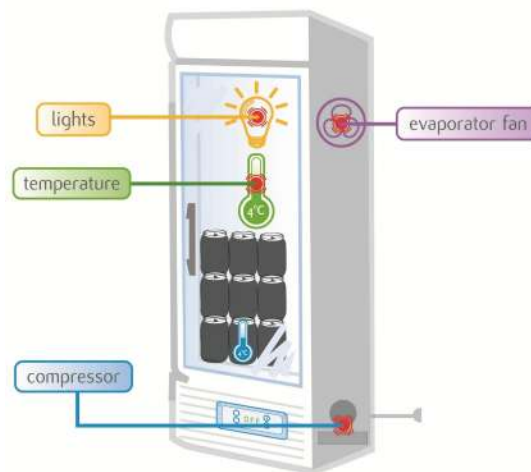
5 ems controllers functionality

ems controllers have the capability to manage the following:

- **temperature:** ems controllers measure the air temperature of the refrigeration compartment to control the temperature of the products. ems controllers ensure that products are at the optimal serving temperature.
- **condenser:** ems controllers manage the temperature on the condenser to prevent high temperature. This is optional for ems controllers, and dependent on controller specification.
- **compressor:** ems controllers switch the compressor to manage the performance of the compressor.
- **evaporator fan:** ems controllers switch the evaporator fan to manage the temperature of the refrigeration compartment. This is optional for ems controllers, and dependent on controller specification.
- **lights:** ems controllers manage the cooler lights for marketing and energy saving purposes.

Note:

- Dependent on controller and sensor configuration.



5.1 product temperature

ems controllers manage the product temperature.

ems controllers use an appliance sensor to measure the air temperature of the refrigeration compartment.

The location of the appliance sensor within the refrigeration compartment depends on the cooler type.

However, to compensate for differences between the air temperature and the product temperature, calibration 1 (**CA1**) can add an offset to the temperature measured on the appliance sensor.

- See "calibration 1 (CA1)" on page 69

ems controllers can be set to use Celsius (°C) or Fahrenheit (°F) - set by the Celsius or Fahrenheit (**CF**) parameter.

- See "Celsius or Fahrenheit (CF)" on page 70

5.2 activity

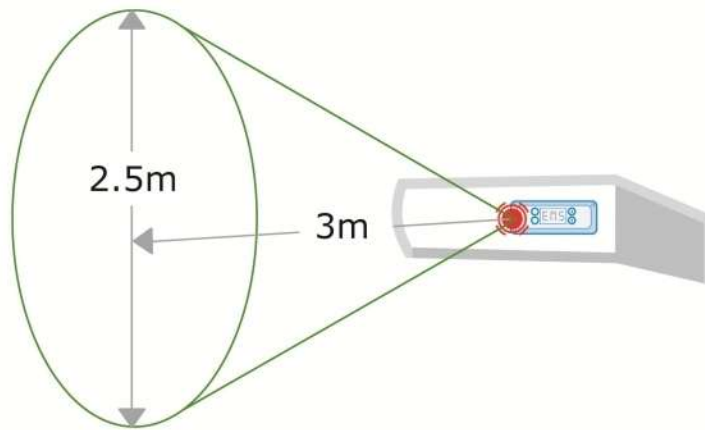
ems controllers learn when retail outlets are open or closed by monitoring activity. For example, people opening and closing the cooler door to retrieve products or movements detected in front of the cooler.

ems controllers detect activity as follows:

- door switch to detect door openings as customers open the cooler door to retrieve products.
- motion sensor to detect movement in the front of the cooler.

Note: ems controllers must be able to detect activity to work correctly. The motion detector should never be obstructed.

The diagram below shows the detection pattern of the motion sensor.



ems controllers use activity to determine when retail outlets are open and closed. Periods with activity mean the retail outlet is open, and periods without activity mean the retail outlet is closed.

ems controllers run coolers in the *ready mode* during periods with activity and the *saving mode* during periods without activity.

ems controllers record the periods with and without activity in the self-learning matrix.

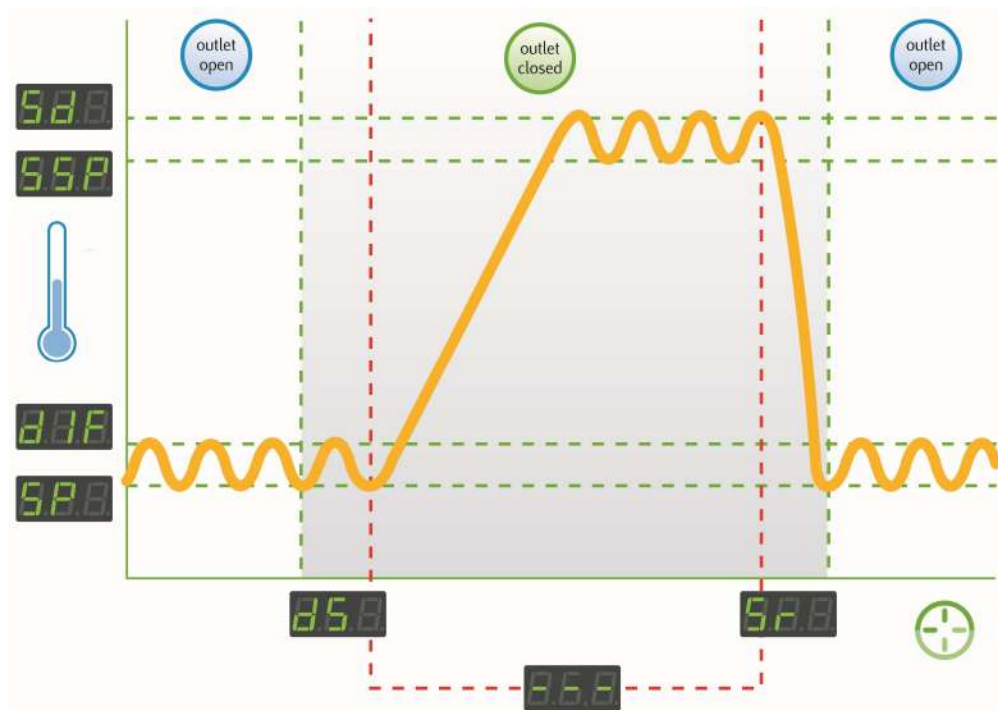
5.3 ready mode

ems controllers run in the *ready mode* when outlets are open.

In the *ready mode*, the product is at the correct serving temperature and the cooler lights are on.

ems controllers ensure that the product is at the correct serving temperature by keeping the product temperature within the range defined by set point (**SP**) parameter and the differential (**dIF**) parameter.

The ems controller runs the compressor until the set point (**SP**) temperature is reached. The compressor is then stopped until the measured temperature reaches the set point (**SP**) plus differential (**dIF**) temperature.



During the *ready mode*, ems controllers display appliance sensor temperature 3.0, for example or the word **USE** as defined by display (**dIS**) parameter.

If the ems controller displays the appliance sensor temperature, the display stability (**d2**) parameter can dampen the rate of change of the displayed temperature.

For example, to filter short fluctuations in the air temperature due to the door opening, which has no affect on the product temperature.

At the end of the *ready mode*, ems controllers switch to the *saving mode*. However, the delay to saving (**dS**) parameter can delay the switch to the saving mode. The delay helps ensure that, for example, the ems controller remains in the *ready mode* during periods without activity immediately prior to outlets closing for marketing purposes.

For more information about the parameters used in *ready mode*:

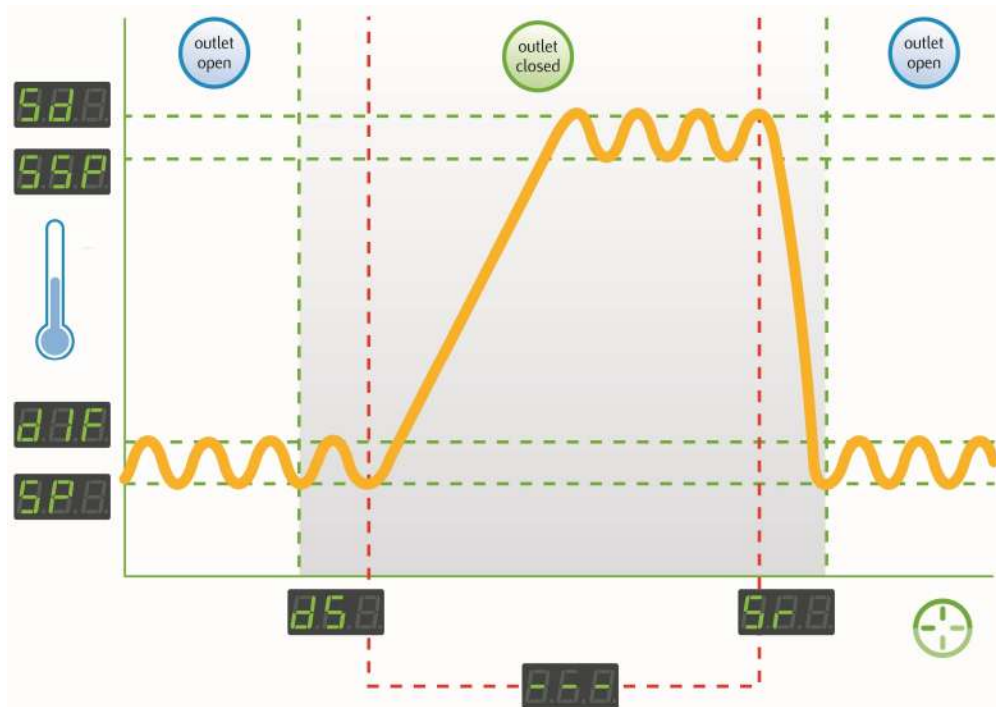
- See "display stability (d2)" on page 70
- See "differential (dIF)" on page 72
- See "display (dIS)" on page 72
- See "delay to saving (dS)" on page 73
- See "set point (SPC or SPF)" on page 80

5.4 saving mode

ems controllers run in the *saving mode* when retail outlets are closed.

In the *saving mode*, the product temperature is allowed to rise to a predefined temperature. The *saving mode* temperature range is defined by saving set point (**SSP**) and the saving differential (**Sd**).

The compressor runs until the saving set point (**SSP**) temperature is reached and then stops until the measured temperature reaches the saving set point (**SSP**) plus saving differential (**Sd**) temperature.



The *saving mode* temperature is set to ensure that the cooler has sufficient time to lower the product to the *ready mode* temperature. The ems controller starts lowering the product temperature by the saving restart period (**Sr**) before the *ready mode* starts ensuring that the cooler has sufficient time to reach the *ready mode* temperature from the *saving mode* temperature.

However, the saving temperature disable (**PEr**) can set ems controllers to maintain the *ready mode* temperature at all times.

During the *saving mode*, the controller displays three dashes, (---), and the cooler lights are usually switched off.

If the cooler door is opened or the motion sensor detects activity during the saving mode, ems controllers switch on the cooler lights for the remainder of the current 30-minute period, but do not start cooling cycle.

For more information about the parameters used in *saving mode*:

- See "saving temperature disable (PEr)" on page 78
- See "saving differential (Sd)" on page 79
- See "saving restart period (Sr)" on page 80
- See "saving set point (SSP)" on page 80

5.5 defrost on glass door coolers (GDC)

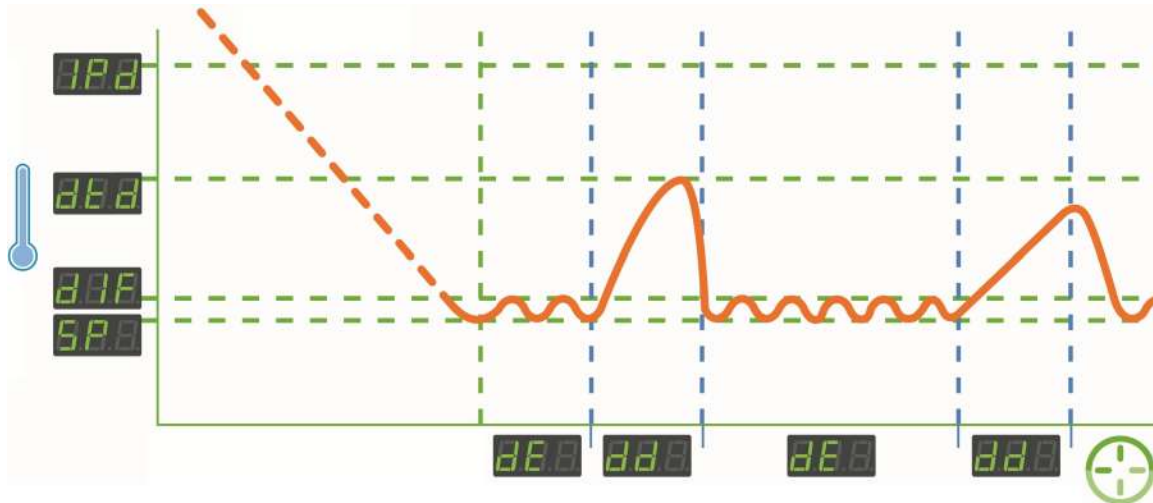
Defrost cycles minimizes the risk of the evaporator icing up.

The defrost cycle occurs periodically as defined by the defrost interval (**dE**).

The defrost interval starts when the ems controller is powered up or at the end of an uninterrupted pull down.

Some ems controllers also enable defrost cycles to be started manually.

The defrost cycle ends after the time defined by the defrost duration (**dd**) or on reaching the defrost termination temperature (**dtd**), as shown:



Note: Manual defrosts also end after the defrost duration (**dd**) or on reaching the defrost termination temperature (**dttd**).

For more information about the parameters used in *defrost*:

- See "defrost duration (dd)" on page 71
- See "defrost interval (dE)" on page 71
- See "defrost termination temperature (dttd)" on page 73

5.6 defrost on open front coolers

Defrost cycles are timed or temperature based as defined by the defrost method (**dF**). The temperature is measured on the evaporator sensor.

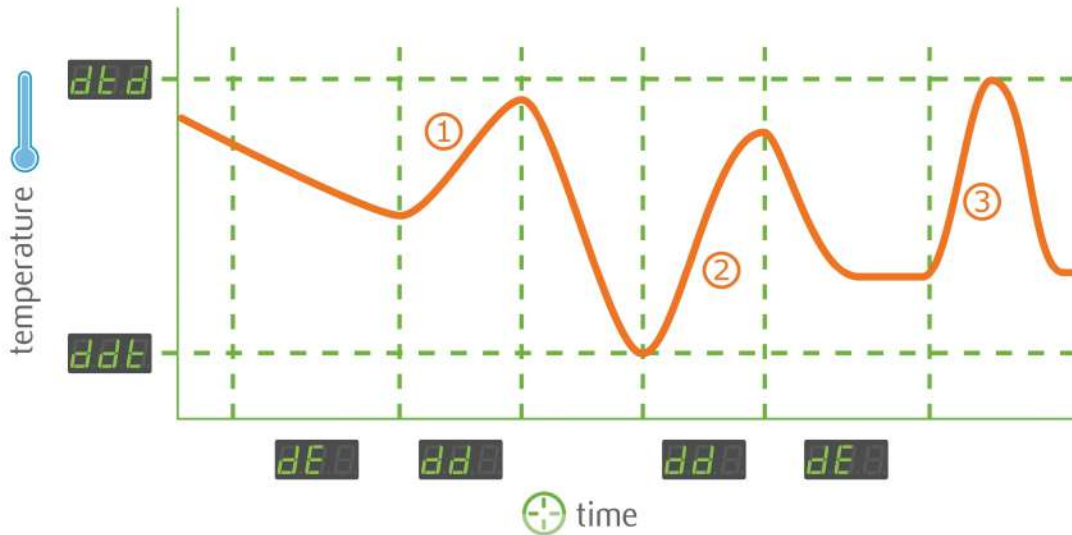
The table below describes the defrost methods.

timed-based	Time-based defrost cycles occur periodically as defined by the defrost interval (dE). Time-based defrost cycles can also be initiated by pressing the defrost button. Starting a defrost cycle manually resets the defrost interval (dE) timer, so the next automatic defrost cycle starts dE hours after the manual defrost. Timed-based defrost cycles end after the defrost duration (dd), or either on the defrost duration or on reaching defrost termination temperature (dttd) as defined by the defrost termination method (dtF).
temperature-based	Temperature-based defrost cycles occur when the temperature measured on the evaporator sensor falls below the defrost activation temperature (ddt). Temperature-based defrost cycles end after the defrost duration (dd) or on reaching the defrost termination temperature (dttd).

Note: Manual defrosts only work if the defrost method is time-based and the temperature measured on the evaporator sensor is below the defrost termination temperature (**dttd**).

The diagram below shows the temperature measured on the evaporator sensor with the following defrost cycles:

1. started after the defrost interval (**dE**) and terminated after the defrost duration (**dd**) – time-based.
2. started on the defrost activation temperature (**ddt**) and terminated after the defrost duration (**dd**) – temperature-based.
3. started after the defrost interval (**dE**) and terminated on the defrost termination temperature (**dttd**) – time-based.



ems controllers can also switch on an external heating element for the duration of the defrost cycle if the evaporator off-cycle alone is not sufficient to defrost the evaporator. The option to use an external heating element is set with the heating element defrost (**dHr**) and is primarily used with sub-zero coolers.

To help place the evaporator sensor, calibration 2 (**CA2**) can add an offset to evaporator sensor temperatures. Failures of the evaporator sensor result in the **PF3** alarms. For **PF3** alarms, ems controllers continue to run the compressor normal and alternate the display **PF3** and the appliance sensor temperature.

5.7 freeze-up protection

Freeze-up protection prevents over cooling.

Freeze-up protection occurs if the temperature measured on the appliance sensor falls below the freeze-up protection (**dt**) temperature.

During freeze-up protection, ems controllers display **888** and stop the compressor to prevent further cooling. ems controllers then resume normal operation when the temperature rises to the freeze-up protection (**dt**) temperature plus the differential (**dIF**) temperature.

For ems controllers that manage the evaporator fan, the ems controller starts the evaporator fan cycle.

For more information about the parameters used in *freeze-up protect*:

- See "differential (dIF)" on page 72
- See "freeze-up protection (dt)" on page 74

5.8 compressor management

ems controllers manage the compressor to maintain the product temperature between the set point (**SP**) temperature and the set point (**SP**) plus differential (**dIF**) temperature in the *ready mode* or between the saving set point (**SSP**) temperature and the saving set point (**SSP**) plus the saving differential (**Sd**) temperature in the saving mode.

To ensure that the pressures within the refrigeration system have time to equalize during compressor off-cycles, the compressor rest time (**rt**) defines the minimum time that the compressor can be switched off.

Compressor manufacturers usually recommend a minimum compressor rest time.

The compressor rest time (**rt**) helps to avoid the following:

- passing peak current through the windings of the compressor motor
- switching off the refrigeration system on the thermal overload protection
- short-cycling the refrigeration system.

However, if *ready mode* and *saving mode* differential temperatures are too small or if the compressor rest time (**rt**) is too short, the ems controller cycles the compressor on the compressor rest time (**rt**) as the compressor rest time (**rt**) overrides the differential temperatures.

If the compressor runs continuously for too long without reaching the set point (**SP**) temperature, a refrigeration system failure (**rSF**) alarm activates alerting to possible problems with the refrigeration system.

ems controllers can monitor the refrigeration system temperature using a condenser sensor. Monitoring the refrigeration system temperature can help detect problems, such as a blocked condenser.

If the temperature measured on the condenser sensor reaches the condenser high temperature (**Ct**), the ems controller disables the compressor and activates the (**Ht**) alarm. The condenser high temperature (**Ct**) is set by measuring the refrigeration system temperature when the condenser is 75% blocked.

ems controllers manage the failure of a temperature sensor as follows:

- Appliance sensor failures indicated by **PF1** alarms, ems controllers stop running the compressor and then waits 60 seconds before rebooting (switch off and then switch on).
If the fault continues, the ems controller repeats and continues the cycle.
- Condenser sensor failures indicated by **PF2** alarms, ems controllers continue running the compressor. ems controllers alternate the display between **PF2** and the appliance sensor temperature.
- **PF2** alarms may also indicate a problem with the gas cooler high temperature sensor when the cooler is a CO2 (R744) version.
An ems55advanced CO2controller will alternate between **PF2** and the gas cooler temperature sensor temperature.
- For evaporator failures indicated by **PF3** alarms, ems controllers continue running the compressor.
ems controllers alternate the display between **PF3** and the appliance sensor temperature.

Note:

- **Ht** alarms do not apply to CO2 coolers

For more information about the parameters used in *compressor management*:

- See "refrigeration system failure (Ct)" on page 70
- See "differential (dIF)" on page 72
- See "compressor rest time (rt)" on page 79
- See "set point (SPC or SPF)" on page 80
- See "saving set point (SSP)" on page 80

For trouble shooting information:

- See "how to troubleshoot refrigeration system failure (rSF) alarms" on page 50
- See "how to troubleshoot temperature sensor alarms" on page 50

5.9 evaporator fan management

ems controllers, depending on model, can be configured to manage the evaporator fan.

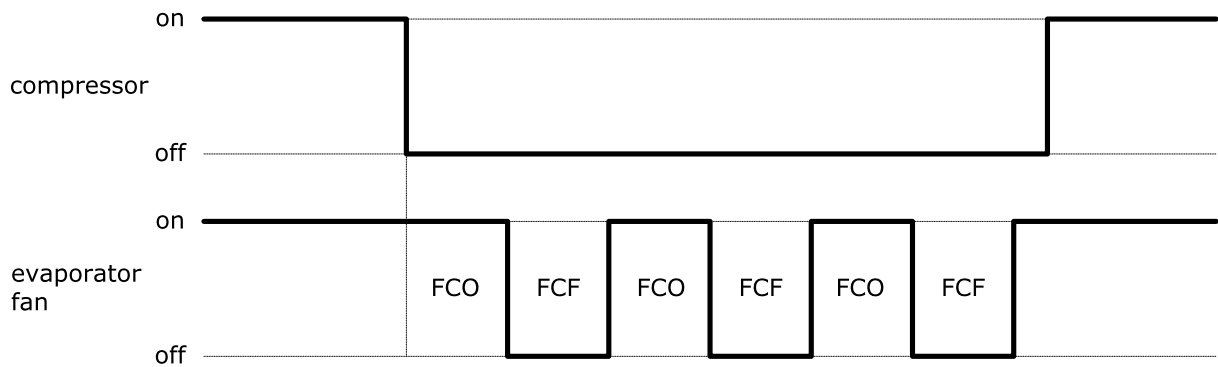
ems controllers always run the evaporator fan when the compressor is running.

For periods that the compressor is not running, the ems controllers run the evaporator fan according to the evaporator fan cycle.

Note: The evaporator fan cycle is not applied whilst the compressor is not running during a defrost period.

The evaporator fan cycle is defined by the fan cycle on (**FCO**) and fan cycle off (**FCF**) parameters.

The fan cycle starts with a fan cycle on (**FCO**) period as shown below.



ems controllers stop the evaporator when the cooler door is opened.

To prevent excessive condensation on the evaporator in environments where warm, and presumed humid air is present, the controller runs the evaporator fan continuously if the temperature exceeds the fan set point (**FSP**) temperature. ems controllers run the evaporator fan, even if the cooler door is opened, and continues to run the evaporator fan until reaching the set point (**SP**) temperature.

For more information about the parameters used in *evaporator fan management*:

- See "fan cycle off (FCF)" on page 75
- See "fan cycle on (FCO)" on page 75
- See "fan set point (FSP)" on page 75
- See "set point (SPC or SPF)" on page 80

5.10 lights management

In the saving mode, the cooler lights are usually off.

For marketing purposes, light delay (**Ld**) can keep the cooler lights on for a short period after the ems controller switches to the *saving mode*.

Marketing mode (**Ar**) can keep the lights on for the duration of the *saving mode*.

For more information about the parameters used in *lights management*:

- See "marketing mode (Ar)" on page 68
- See "lights delay (Ld)" on page 77

5.11 statistics

ems controllers start gathering statistics when first powered up.

Statistics provide information on the following:

- **temperature**: lowest, highest, and average temperature measured on the appliance sensor.
- **activity**: average number of motion counts and door openings.
- **compressor**: average number of compressor cycles and total compressor runtime.
- **operation**: settings of the activity frequency (**AF**) parameter and the saving temperature disable (**PEr**) parameter.
-

Note:

- A full reset clears all the gathered statistics.
- Not all controllers allow statistics to be viewed - the ems25+ is teach enabled and therefore does not display statistics.

5.12 alarms

For alarm conditions, the ems controller displays the appropriate alarm code and, optionally, sounds an alarm buzzer.

Buzzer enable (**b0**) defines whether to sound a warning buzzer for alarm conditions.

Buzzer duration (**b1**) defines the duration of the buzzer for alarm conditions.

Note:

- For door open alarms, the buzzer sounds regardless of the buzzer enable (**b0**) setting.

For more information about the parameters used in *alarms*:

- See "buzzer enable (b0)" on page 68
- See "buzzer duration (b1)" on page 69

6 self-learning

ems controllers start self-learning the moment the ems controllers are first powered-up. ems controllers then run in the *ready mode* whilst the ems controllers learn the activity pattern of outlets.

During self-learning, ems controllers learn the periods that outlets are open or closed by measuring the activity.

ems controllers have a self-learning matrix.

The self-learning matrix is a 7-day (7 x 24 hour) matrix.

Each 24 hour period consists of 48 30-minute periods.

ems controllers then set each 30-minute period with activity or without activity according to the outlet opening and closing pattern.

The activity frequency (**AF**) parameter determines the amount of activity required to set a 30-minute periods as an **active** period.

The activity frequency (**AF**) parameter is usually set to require one door opening or one motion detected to set a 30-minute period to active.

However, for specific installations, the active frequency can be configured to require more activity to set a 30-minute period to ready.

The activity frequency (**AF**) parameter can also be set to automatically determine the optimal level of activity required to a set a 30-minute period to ready.

ems controllers remain learning in the ready mode for the period defined by the learning period (**LP**).

The learning period (**LP**) sets ems controllers to use a 1-day or 7-day learning period.

ems controllers build the complete 7-day self-learning matrix as follows:

- **1-day learning period:** the ems controller runs in *ready mode* for the first day (24 hours).
The ems controller then uses the self-learning matrix of day 1 for the next six days to build a complete 7-day self-learning matrix.
- **7-day learning period:** the ems controller runs in the *ready mode* for the first 7 days to build a complete 7-day self-learning matrix.

To set the activity frequency (**AF**) automatically, ems controllers run for 48 hours to determine the optimum activity frequency (**AF**).

ems controllers then start the learning period (**LP**) after the 48 hours required to set the activity frequency (**AF**).

Note:

- If the activity frequency is set to automatic, ems controllers must be allowed to run (powered up) continuously for **48 hours** before the ems controller starts to build the self-learning matrix.
If power is lost during this period, ems controllers start a new 48 hour learning period.

The table describes the total time that ems controllers run in the *ready mode* only after being powered up.

This is the minimum time before ems controllers switch to the *saving mode*.

learning period (LP)	activity frequency (AF)	minimum time in ready mode only
1 day	pre-set	1 day (24 hours)
1 day	automatic	3 days (72 hours)
7 days	pre-set	7 days
7 days	automatic	9 days

For more information about the parameters used in *self-learning*:

- See "activity frequency (AF)" on page 67
- See "learning period (LP)" on page 78

6.1 what is the self-learning matrix?

The self-learning matrix is a 7 day (7 x 24 hour), matrix with each 24 hour period divided into 48 30-minute periods. Each 30-minute period has a state that ems controllers use to determine the mode as follows:

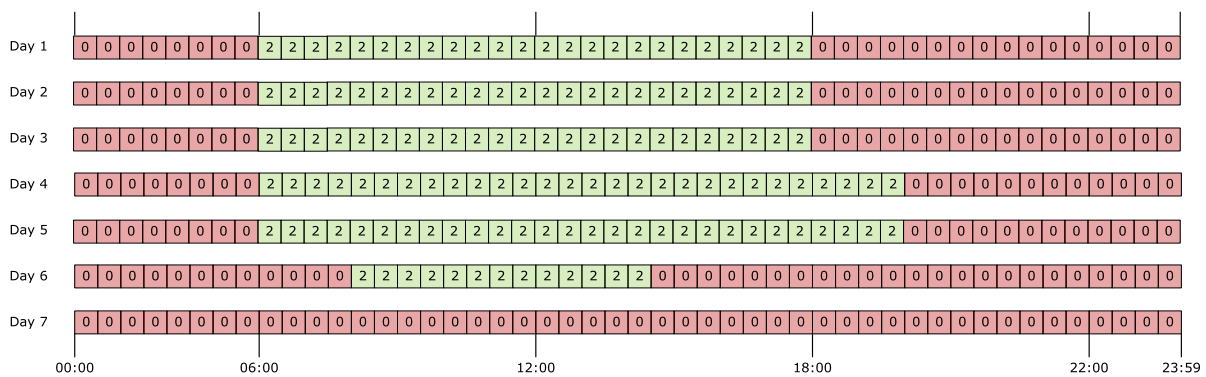
- 0 indicates no activity: ems controllers normally run in the *saving mode*.
- 1 indicates a change in activity: ems controllers run in the *ready mode*.
- 2 indicates activity: ems controller run in the *ready mode*.

For example, the self-learning matrix below shows the following:

- Day 1 to day 3: the ems controller runs in the *ready mode* from 06:00 to 18:00.
- Day 4 and day 5: the ems controller runs in the *ready mode* from 06:00 to 20:00.
- Day 6: the ems controller runs in the *ready mode* from 08:00 to 14:00.
- Day 7: the ems controller remains in the *saving mode*.

Note:

- The self-learning matrix starts the moment the ems controller is first switched on and is not synchronized with calendar days. However, the diagram below starts at 00:00 on Day 1 for clarity.



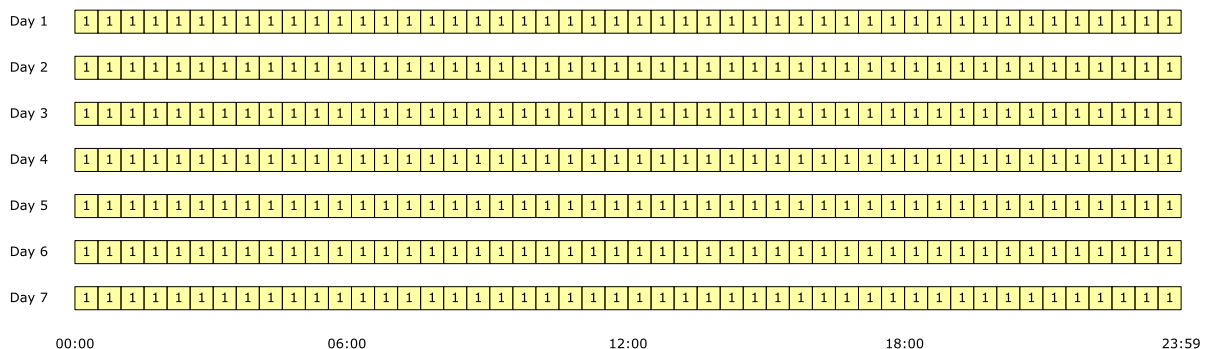
6.2 how a 7-day learning period works

ems controllers with a seven day learning period, **LP** set to 1, run in the *ready mode* for 7 days (7 x 24 hours), whilst the ems controller learns the outlet activity pattern such as opening and closing times.

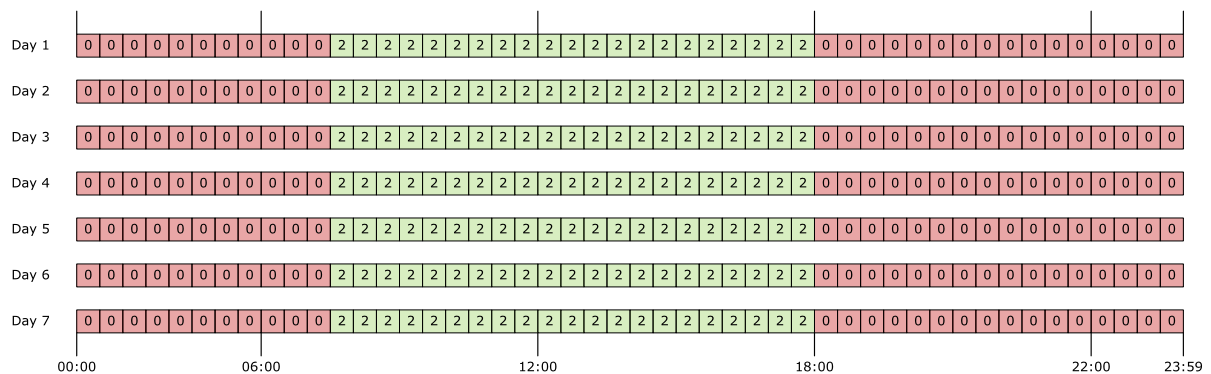
ems controllers start self-learning the moment the ems controllers are first powered-up.

At power-up, all the 30 minute periods are set to monitor (1) as shown in the following example matrix.

For periods set to monitor (1), ems controllers run in the *ready mode*.



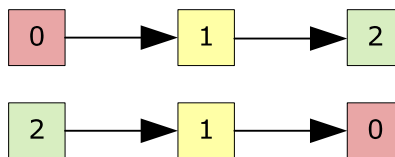
ems controllers then copy the pattern learnt from day 1 to the *remaining six days* of the self-learning matrix, as shown in the following example matrix:



ems controllers with a one day learning period start switching to the *saving mode* on the second day, (second 24 hours), if there are sufficient saving (0) periods.

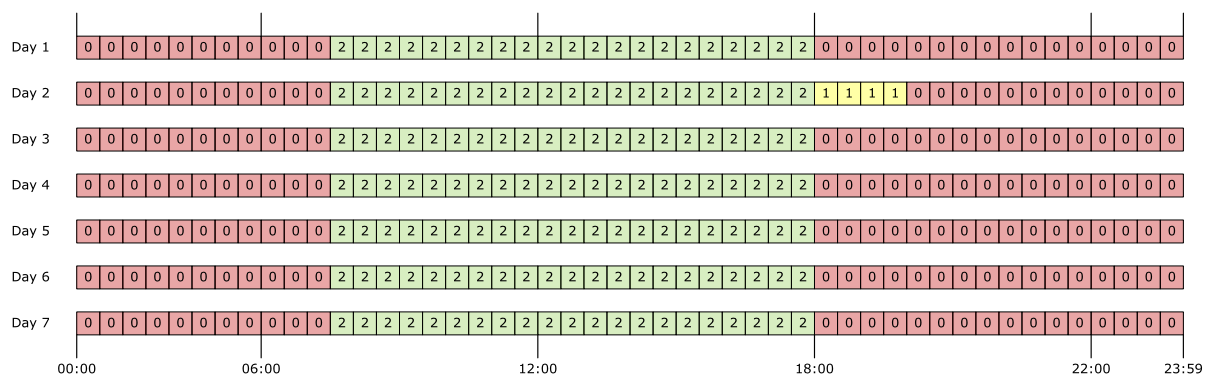
ems controller then continue to update the self-learning matrix as follows:

- For periods set to ready (2), if no activity is detected change to monitor (1). Otherwise, keep the period set to ready (2).
- For periods set to saving (0), if activity is detected change to monitor (1). Otherwise, keep the period set to monitor (0).

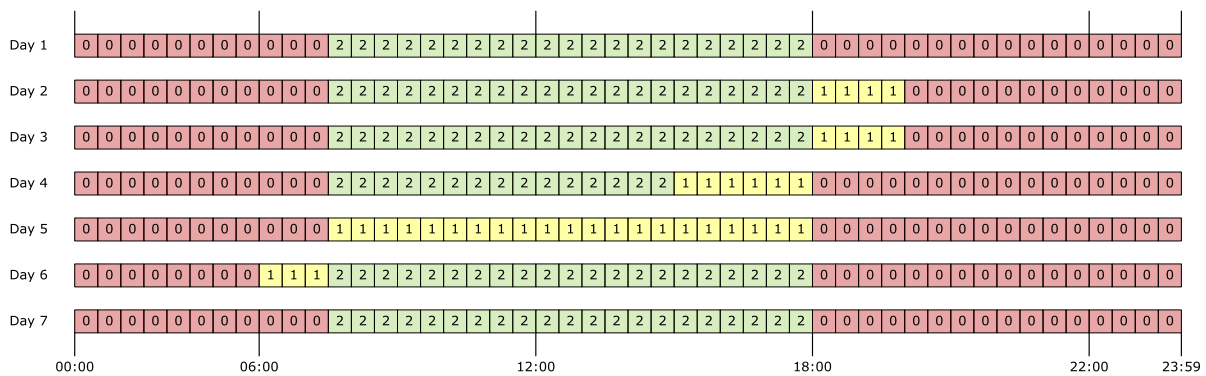


For example, the self-learning matrix shows that the outlet is open for longer on day 2 than day 1.

Therefore, the ems controller has changed the state of the periods that were set to saving (0) to monitor (1) as shown in the following example matrix.



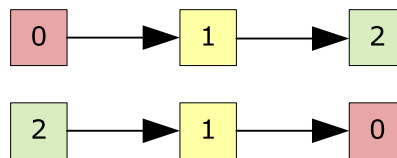
At the end of week 1, the ems controller has updated the self-learning matrix for the outlet activity pattern as shown below. Note that differences for activity patterns learnt on day 2 take two weeks to be implemented. Therefore, 1 day learning periods are recommended only for outlets with regular patterns every day of the week.



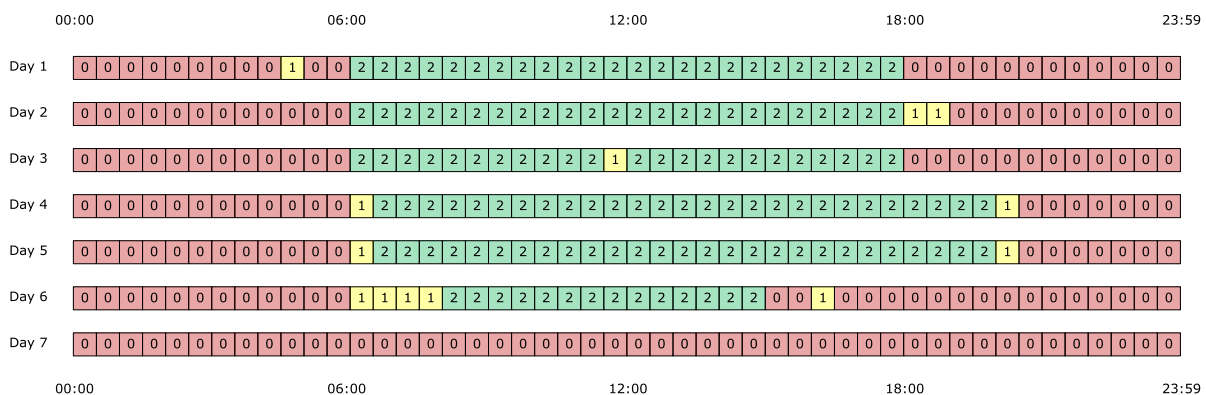
6.4 how the self-learning matrix updates after the learning period

ems controllers continuously updates the self-learning matrix after the learning period as follows:

- if a ready period (2) does not have the minimum number of door openings or motion counts, the ems controller sets the period to monitor (1).
The ems controller runs in the *ready mode* for periods set to monitor.
- if a monitored period (1) does not have the minimum number of door openings or motion counts, the ems controller sets the period to saving (0). Otherwise, the ems controller sets the period to ready (2).
- if a saving period (0) reaches the minimum number of door openings or motion counts, the ems controller sets the period to monitor (1).



For example, the self-learning matrix below shows monitor (1) periods during periods with and without activity.



Note:

- If activity occurs in a saving period (0), such as a motion detection or a door opening, the ems controller switches the cooler lights **on** and sets the period to monitor (1).
However, the ems controller does not start the compressor to cool the product.

6.5 how ems controllers switch between the ready and saving mode

A key characteristic of an ems controller is the saving restart period.

The saving restart period is time allocated for the cooler to lower the product temperature to the *ready mode* temperature

7 user guide

The user guide describes the power-up sequence and how to view parameters and statistics.

The user guide also describes how to:

- perform a half-reset - to clear the self learning matrix only
- run the test routine - for all relays and inputs

7.1 power-up sequence

At the power up, the ems controller displays the power-up sequence as follows:

1		8.8.8. to confirm that all segments of the display are functioning correctly
2		platform type and firmware version. (example)
3		checksum of the parameter set. (example)

The display then shows the appropriate display code. For example, the temperature or the word **USE**.

7.2 display codes

The table below details the display codes for ems controllers.

display	state	description
	ready mode	ems controllers display the appliance sensor temperature, such as 4.0 , or the word USE Also, the cooler lights are switched on . See "how to check that ems controllers are working correctly" on page 46
	saving mode	ems controllers keep products at the saving mode temperature unless the saving temperature is disabled. The saving temperature LED shows whether the saving mode temperature is disabled. The cooler lights are off unless the light delay (Ld) parameter keeps the lights on for a short period after the ems controller switches to the <i>saving mode</i> . The marketing mode (Ar) keeps the lights on for the duration of the <i>saving mode</i> .

display	state	description
	defrost mode	ems controllers switch off the compressor and switch on the fan, if applicable. The compressor LED should be off and the evaporator fan LED should be on .
	door open	ems controllers display d0 to show that the cooler door is open.
	door open alarm	ems controllers sound an alarm buzzer if cooler door remain open for alarm delay (Ad) duration. If the cooler door is still open after the time defined by the buzzer duration (b1) parameter, the ems controller switches off the compressor.
	freeze-up protection	ems controllers disable the compressor to prevent over cooling and run the evaporator fan, if applicable, according to the evaporator fan cycle. Problems may occur if the ambient temperature falls below 0°C (32°F) or if the appliance sensor fails. See "how to troubleshoot problems with freeze-up protection (888)" on page 51
	refrigeration system failure	See "how to troubleshoot refrigeration system failure (rSF) alarms" on page 50
	condenser high temperature	Not applicable to CO2 (R744) coolers.
	appliance sensor failure	See "how to troubleshoot temperature sensor alarms" on page 50
	condenser sensor failure	
	evaporator sensor failure	

7.3 how to access the menu (example)

The password is a unique sequence of button operations.

The password is supplied to OEMs, installers, and service engineers separately.

	step	image
1	Press and hold the set button	

	step	image
2	Release the set button when PAS appears	
3	Press the set button four times (x4)	
4	Press the up button once (x1)	
5	Press the down button twice (x2)	
6	Press the defrost / teach button twice (x2)	

7.4 how to view the *ems55advanced* parameter settings (PS) GDC firmware

View the parameter settings to check the values of the parameters.

View the parameter settings as follows:

1. Press and hold the **set** button until **PAS** is displayed.



2. Enter the button sequence of the password.
3. Ensure that **PS** is displayed.



4. Press and hold the **set** button to view the parameter name and value alternatively.
5. Keep the **menu** button pressed to scroll through the parameter settings.



See "Celsius or Fahrenheit (CF)" on page 70



See "display stability (d2)" on page 70

 	See "set point (SPC or SPF)" on page 80		See "high voltage (HI)" on page 76
	See "differential (dIF)" on page 72		See "low voltage (LO)" on page 77
	See "calibration 1 (CA1)" on page 69		See "buzzer enable (b0)" on page 68
	See "saving set point (SSP)" on page 80		See "buzzer duration (b1)" on page 69
	See "saving differential (Sd)" on page 79		See "alarm delay (Ad)" on page 67
	See "freeze-up protection (dtT)" on page 74		See "activity frequency (AF)" on page 67
	See "fan set point (FSP)" on page 75		See "motion sensor enable (Sn)" on page 79
	See "condenser high temperature (Ht)" on page 76 not used with CO2 (R744) coolers		See "saving temperature disable (PEr)" on page 78
	See "defrost termination temperature (dtd)" on page 73		See "learning period (LP)" on page 78
	See "compressor rest time (rt)" on page 79		See "display (dIS)" on page 72
	See "delay to saving (dS)" on page 73		See "marketing mode (Ar)" on page 68
	See "lights delay (Ld)" on page 77		
	See "saving restart period (Sr)" on page 80		
	See "refrigeration system failure (Ct)" on page 70		

	See "defrost interval (dE)" on page 71		
	See "defrost duration (dd)" on page 71		
	See "fan cycle on (FCO)" on page 75		
	See "fan cycle off (FCF)" on page 75		

7.5 how to view the *ems55advanced* parameter settings (PS) OFC firmware

View the parameter settings to check the values of the parameters.

View the parameter settings as follows:

1. Press and hold the **set** button until **PAS** is displayed.



2. Enter the button sequence of the password.
3. Ensure that **PS** is displayed.



4. Press and hold the **set** button to view the parameter name and value alternatively.
5. Keep the **menu** button pressed to scroll through the parameter settings.

	See "Celsius or Fahrenheit (CF)" on page 70		See "defrost interval (dE)" on page 71
	See "set point (SPC or SPF)" on page 80		See "defrost duration (dd)" on page 71
			
	See "differential (dIF)" on page 72		See "defrost method (dF)" on page 72
	See "calibration 1 (CA1)" on page 69		See "defrost termination method (dtF)" on page 73

	See "calibration 2 (CA2)" on page 69		See "Maximum defrost on demand time (dtO)" on page 74
	See "saving set point (SSP)" on page 80		See "fan cycle on (FCO)" on page 75
	See "saving differential (Sd)" on page 79		See "fan cycle off (FCF)" on page 75
	See "freeze-up protection (dtT)" on page 74		See "display stability (d2)" on page 70
	See "condenser high temperature (Ht)" on page 76		See "high voltage (HI)" on page 76
	See "defrost activation temperature (ddt)" on page 71		See "low voltage (LO)" on page 77
	See "defrost termination temperature (dtd)" on page 73		See "buzzer enable (b0)" on page 68
	See "compressor rest time (rt)" on page 79		See "activity frequency (AF)" on page 67
	See "delay to saving (dS)" on page 73		See "motion sensor enable (Sn)" on page 79
	See "lights delay (Ld)" on page 77		See "saving temperature disable (PEr)" on page 78
	See "saving restart period (Sr)" on page 80		See "learning period (LP)" on page 78
	See "refrigeration system failure (Ct)" on page 70		See "display (dIS)" on page 72

7.6 how to run the test routine (tst)

The test routine tests the following:

- all load relays
- analogue inputs (temperature sensors and door switch)
- motion sensor.

Run the test routine as follows:

1. Press and hold the **set** button until **PAS** is displayed.



2. Enter the button sequence of the password.
3. Ensure that **PS** is displayed.



4. Press the **down** button once to scroll to **tst**.



5. Press the **set** button to display **888**.



6. Press the **set** button to display **rEL** for the relay tests.



7. Press the **down** button to start, and test, the relays as described in the following table:

button	display	test	check
 or 		compressor relay	compressor is running and compressor LED is on
		light relay	cooler lights are on
		evaporator fan relay	evaporator fan is running

Note:

- To switch off the relays that are **on**, press the **defrost** button.

8. Press the **defrost** and **set** buttons simultaneously to test the analogue inputs.
The display changes to **AnA**.

9. Press the **up** button to start, and test, the analogue inputs described in the following table:

button	display	test	check
		appliance sensor temperature	displayed temperature is correct
		door switch	door is open (dO) or closed (CLO)
 or 		condenser sensor temperature	displayed temperature is correct
		evaporator sensor temperature	

10. Press the **defrost** and **set** buttons simultaneously to test the motion sensor.

The display changes to **PIr**.

11. Press the **defrost** button and then place your hand about 300mm in front of the motion sensor.

Move your hand from left to right and ensure the following:

- The display count increments for each detected movement.
- The motion LED flashes for each detected movement.

12. Press the **defrost** and **set** buttons simultaneously to end the test routine.

7.7 how to perform a half reset (Hr)

Perform a half reset to clear the self-learning matrix if the ems controller has been unable to detect activity correctly, for example, the view of the motion sensor was blocked, or if the cooler has been moved to a new location.

Perform a half reset as follows:

1. Press and hold the **set** button until **PAS** is displayed.



2. Enter the button sequence of the *menu entry* password.
3. Ensure that **PS** is displayed.
4. Press **down** to scroll down to the **Hr** menu.



5. Re-enter the button sequence of the *menu entry* password.
6. Ensure that the ems controller resets.
After a reset, the ems controller starts the power-up sequence.

7.8 how to view the last three alarms (FLt)

It is possible to view the last alarms and understand problems that have occurred with the ems controller.

View the last three alarm conditions as follows:

1. Press and hold the **set** button until **PAS** is displayed.



2. Enter the button sequence of the *menu entry* password.
3. Ensure that **PS** is displayed.



4. Press **down** to scroll down to **FLt**.



5. Press the **set** button.
6. The last three faults, or alarms, to occur are displayed.
For example:

	a condenser high temperature alarm has occurred
	a refrigeration system failure alarm has occurred
	a door open alarm has occurred

Please note:

- The alarms may have been cleared, or cancelled, by the retail outlet operators.

7.9 how to view statistics

To view the statistics, press the **up** and **down** buttons simultaneously.

Statistics include door opening, average temperatures and activity counts.

The ems controller then scrolls through the statistics pausing for 20 seconds at each statistic before returning to normal operation.

The 3-digit display can show values from 000 to 999.

For values of 1000 and above, the display shows the value as a rounded decimal number. For example, 1.1 represents 1100, 1.2 represents 1200, and so on.

display	statistic	description prior to July 2012	description post July 2012
	activity frequency	Value of the activity frequency AF parameter. Possible values are: 0, 1, 2 or 3. (0 = low, 2 = high and 3 = auto-matic)	No change
	average temperature	Average temperature measured by the appliance sensor during the last 24 hours.	No change
	compressor cycles	Average number of compressor cycles per day (24 hour period) during the past 7 days (7 x 24 hour periods). Note that the average is a moving average.	Total number of compressor cycles since first powered up or last full reset
	compressor runtime	Total number of hours that the compressor has run since the ems controller was first powered up or since the last full reset.	No change
	door openings	Average number of door openings per day (24 hour period) during the past 7 days (7 x 24 hour periods). Note that the average is moving average.	Total number of door openings since first powered up or last full reset
	highest temperature	Highest temperature measured by the appliance sensor during the past 24 hours.	No changes
	lowest temperature	Lowest temperature measured by the appliance sensor during the last 24 hours.	No changes
	motion counts	Average number of motion counts per day (24 hour period) during the past 7 days (7 x 24	Total number of motion counts since first powered up or last full reset

display	statistic	description prior to July 2012	description post July 2012
		hour periods). Note that the average is moving average.	
	saving temperature disable	Value of the standby temperature disable PEr parameter. Possible values are: OFF or ON. OFF = Standby temperature disable is switched off. ON = Standby temperature disable is switched on.	No changes

8 troubleshooting

The following table shows the display for alarm conditions. ems controllers can be programmed to sound a buzzer with alarm conditions.

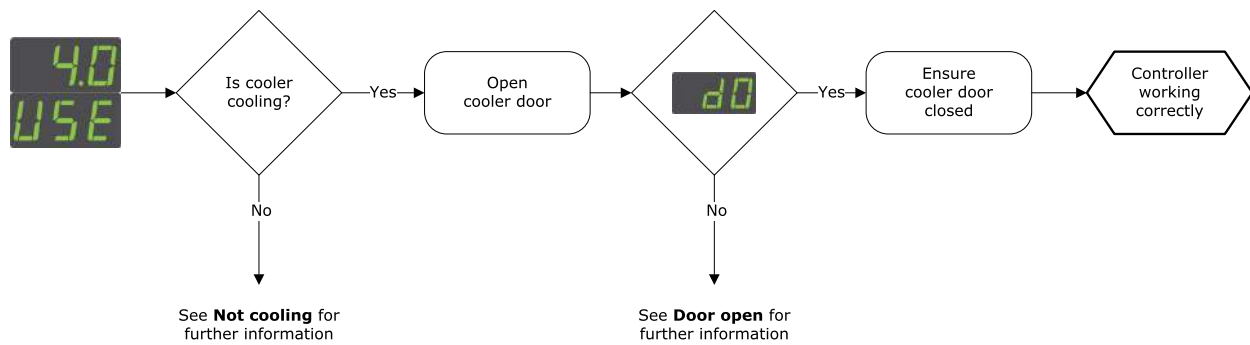
problem or alarm	meaning	action
	door open	- See "how to troubleshoot door alarms (door switch fitted)" on page 48 - See "how to troubleshoot door alarms (no door switch fitted)" on page 48
	refrigeration system failure	See "how to troubleshoot refrigeration system failure (rSF) alarms" on page 50
	condenser high temperature	Not applicable for CO2 coolers
  	sensor failures	- appliance sensor (PF1) - condenser sensor (PF2): display alternates between PF2 and the appliance sensor temperature - evaporator sensor (PF3): display alternates between PF3 and the appliance sensor temperature. - See "how to troubleshoot temperature sensor alarms" on page 50
flashes for 3 seconds then static	CO2 alarm gas cooler high temperature	
continuous flashing	CO2 alarm Lock out	
motion detection LED flashing continuously	motion sensor problem	See "how to troubleshoot motion sensor alarms" on page 49
cooler not cooling		See "how to troubleshoot not cooling problems" on page 52
cooler lights do not switch on		If the ems controller is in the ready mode, check the lights switch inside the cooler. Note that ems controllers normally switch the cooler lights off in the saving mode.

8.1 how to check that ems controllers are working correctly

During the ready mode, the ems controller displays the appliance sensor temperature, such as **4.0**, or the word **USE** as shown below.

The option to display the temperature or the word **USE** is set by the display (**dis**) parameter.

Follow the chart to ensure that the ems controller is working correctly in the *ready mode* for coolers with door switches fitted.



For information about the display (**dIS**) parameter:

- See "display (dIS)" on page 72

8.2 how to troubleshoot condenser high temperature (Ht) alarms

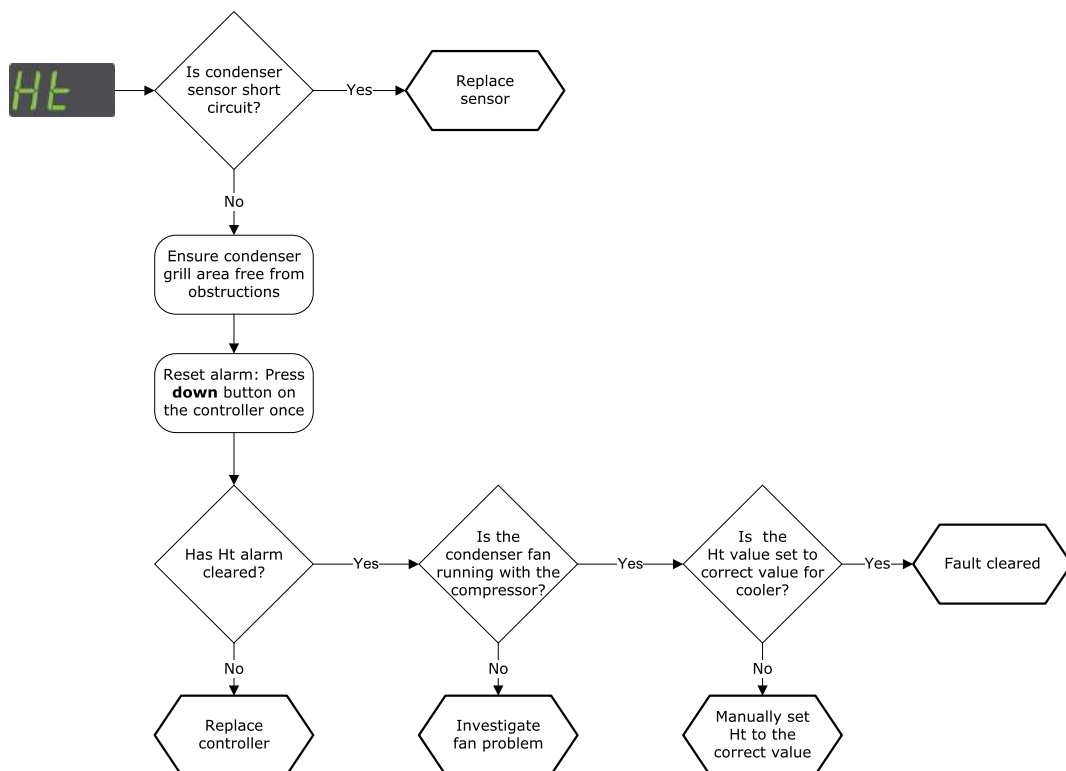
Condenser high temperature (Ht) alert to problems with the refrigeration system such as a blocked condenser or faulty condenser fan.

Note: this alarm is not applicable with CO2 coolers and the *ems55advanced* CO2.

For information about the condenser high temperature (**Ht**) parameter:

- See "condenser high temperature (Ht)" on page 76

Follow the chart to troubleshoot condenser high temperature (**Ht**) alarms.



8.3 how to troubleshoot door alarms (door switch fitted)

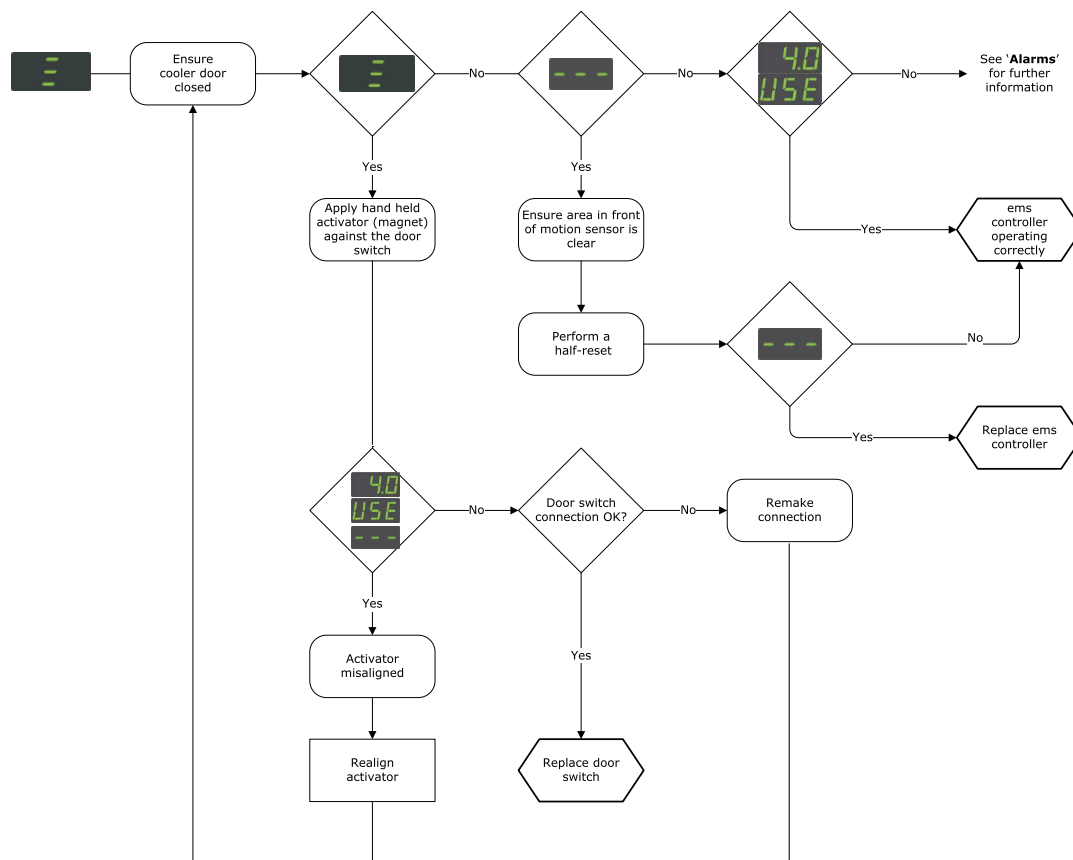
Door open alarms are triggered if the cooler door is left open for longer than the time defined by the alarm delay (**Ad**) parameter.

If the door is closed, and a door open alarm is registered, this may indicate problems with the cooler door or the door switch.

For information about the alarm delay (**Ad**) parameter:

- See "alarm delay (Ad)" on page 67

Follow the chart to troubleshoot door open alarms on coolers with a door switch.



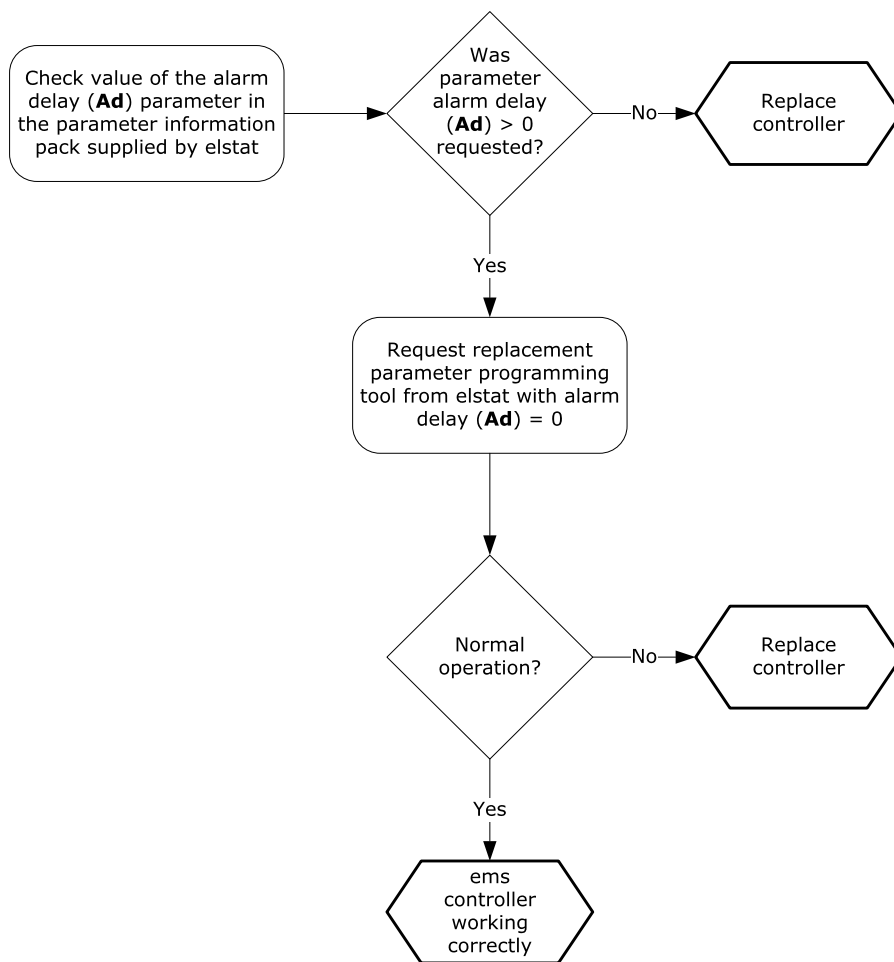
8.4 how to troubleshoot door alarms (no door switch fitted)

Door alarms with coolers without a door switch fitted usually indicates that the ems controller has an incorrect parameter set.

For information about the alarm delay (**Ad**) parameter:

- See "alarm delay (Ad)" on page 67

Follow the chart to troubleshoot door open alarms on coolers without a door switch fitted.



8.5 how to troubleshoot motion sensor alarms

The motion detection LED flashes to indicate that movement has been detected.

However, a motion sensor LED flashing continuously may indicate that the motion sensor is faulty or, if a motion sensor is not fitted, that the parameter settings are incorrect.

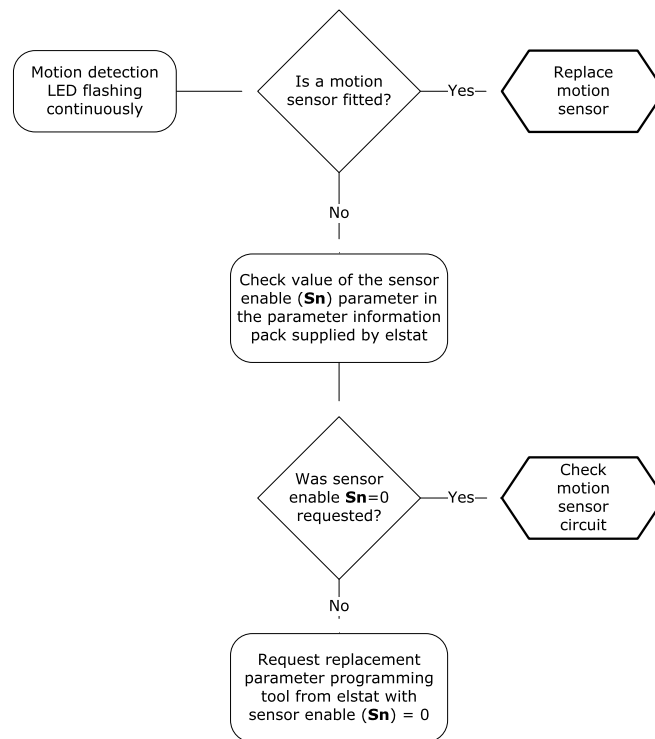
Note:

- The ems controller stays in the ready mode if the motion detection LED is flashing continuously.

For information about the motion sensor enable (**Sn**) parameter:

- See "motion sensor enable (Sn)" on page 79

Follow the chart to troubleshoot problems with the motion sensor.



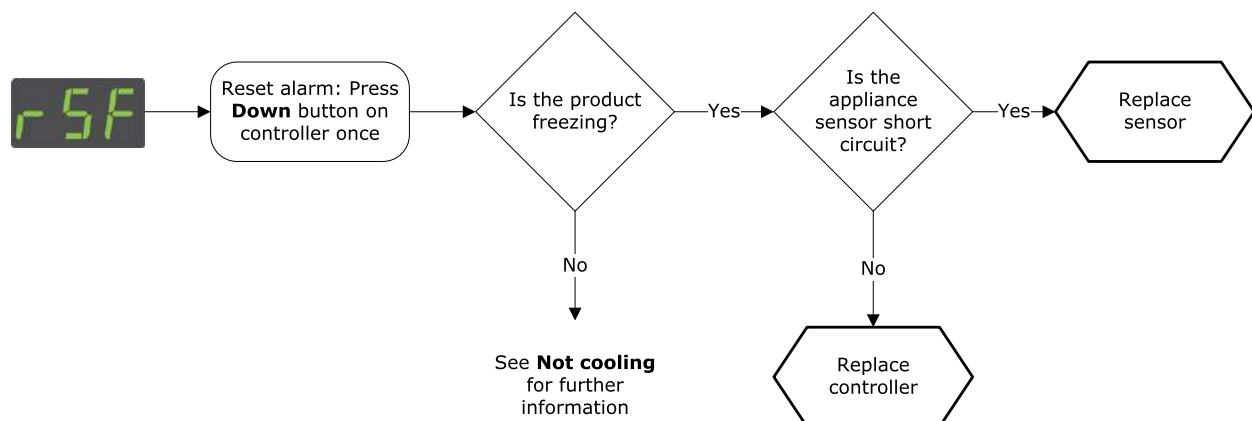
8.6 how to troubleshoot refrigeration system failure (rSF) alarms

Refrigeration system failure (**rSF**) alarms trigger if the set point (**SP**) temperature is not reached within the time defined by the compressor runtime (**Ct**) parameter.

For information about the set point and compressor run time parameters:

- See "refrigeration system failure (Ct)" on page 70
- See "set point (SPC or SPF)" on page 80

Follow the chart to troubleshoot refrigeration system failures.



8.7 how to troubleshoot temperature sensor alarms

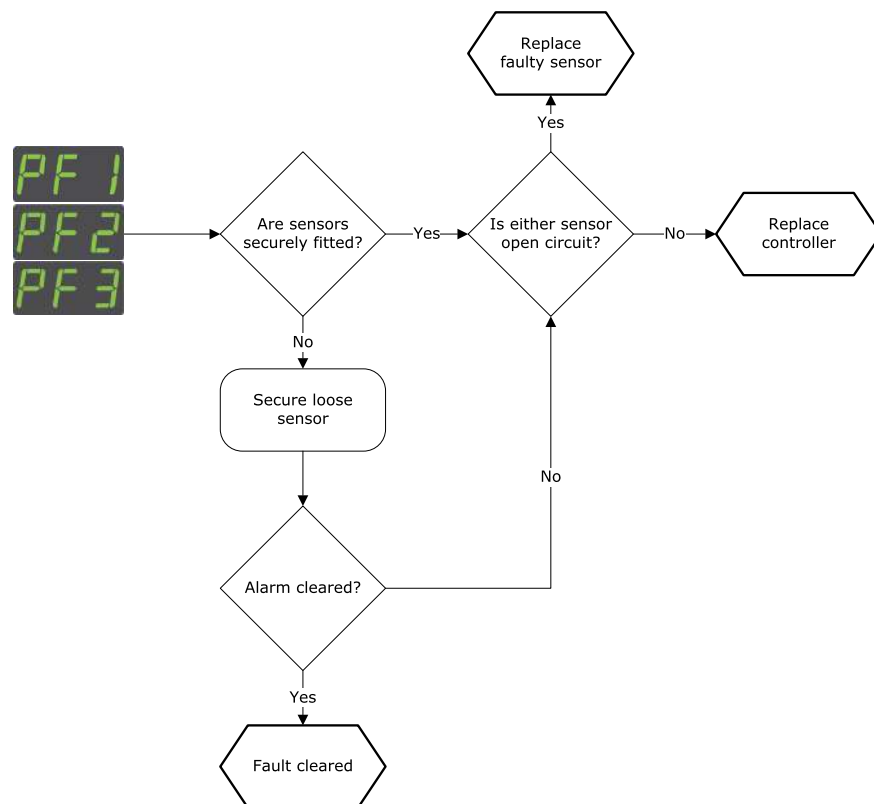
ems controllers manage sensor failures as follows:

- **PF1** alarms: ems controllers stop running the compressor and then waits 60 seconds before re-starting (switch off and then switch on). If the fault continues, the ems controller repeats and continues the cycle until the fault corrected.
- **PF2** alarms: ems controllers continue running the compressor.
ems controllers alternate the display between **PF2** and the appliance sensor temperature indicating a fault.
- **PF2** alarms: ems55advanced CO2 controllers continue to run the compressor normally and alternate the display **PF2** and the gas cooler sensor temperature indicating a fault.
- **PF3** alarms: ems controllers continue to run the compressor normally and alternate the display **PF3** and the appliance sensor temperature.

Sensor faults may also be identified by using the input test within the test routine:

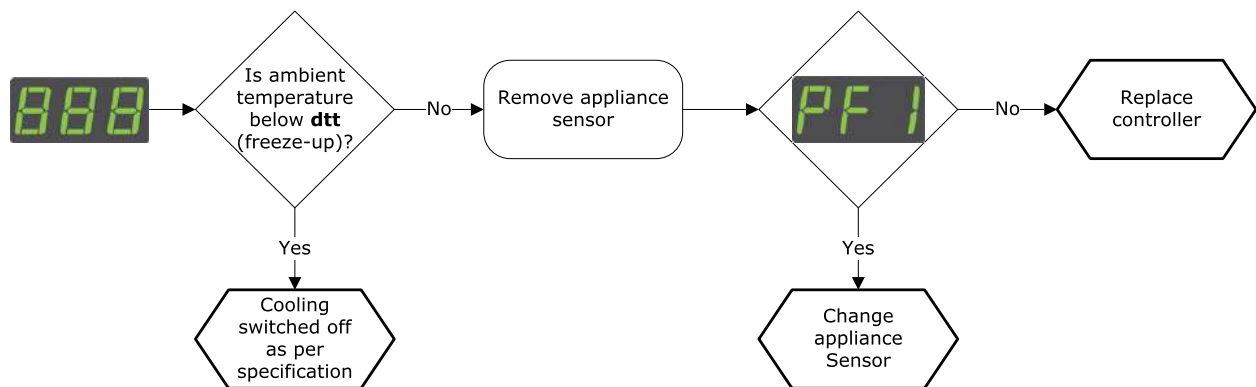
- See "how to run the test routine (tst)" on page 40

Follow the chart to troubleshoot problems with the appliance sensor, condenser sensor, evaporator sensor or gas cooler sensor.



8.8 how to troubleshoot problems with freeze-up protection (888)

Problems with freeze-up protection may occur if the ambient temperature falls below 0°C (32°F) or if the appliance sensor fails.

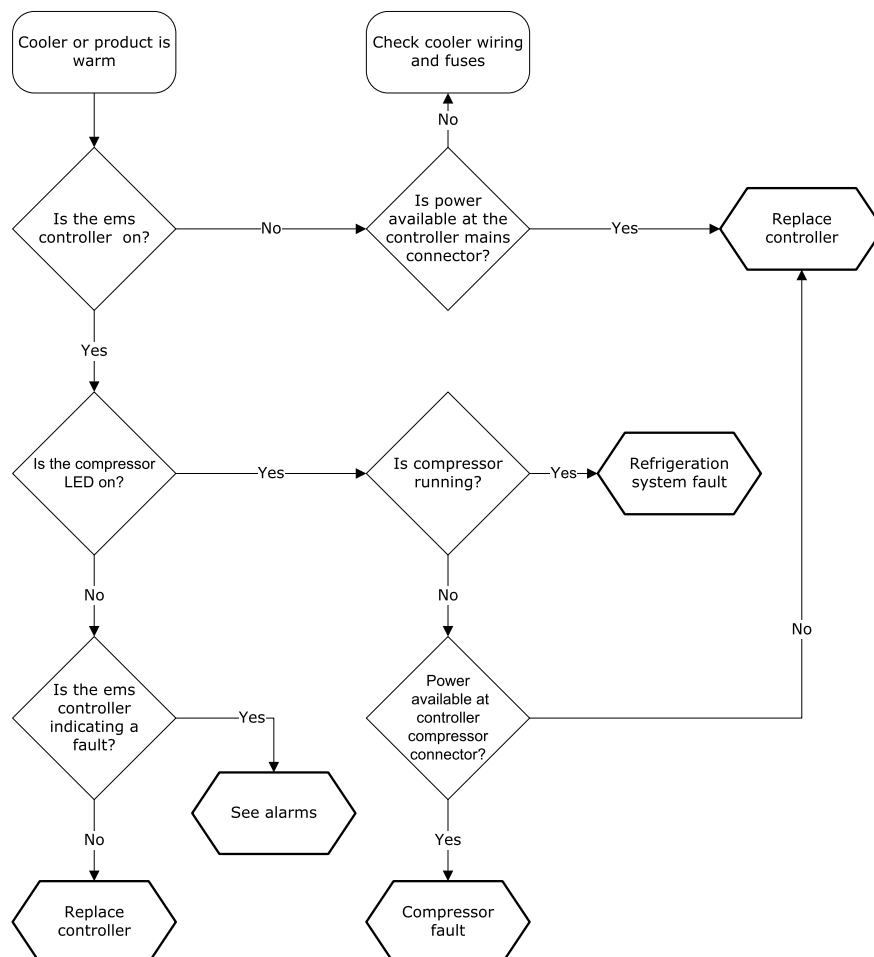


For information about the freeze-up protection (**dtb**) parameter:

- See "freeze-up protection (dtb)" on page 74

8.9 how to troubleshoot not cooling problems

Follow the chart below to troubleshoot problems of the cooler not cooling, i.e. the cooler or product is warm.



9 elstat parameter loader

The elstat parameter loader loads the parameter settings defined in XML files to the parameter programming tool (dongle).

The parameter programming tool (dongle) connects to the parameter loader using a USB docking cradle and COM port on a host computer.



The following specification of computer is required for operation:

- Windows XP, Windows Vista, or Windows 7
- 2 MB of disk space.

9.1 what are the XML files?

The XML files are supplied from elstat and include parameter information about each XML file.

The XML files contain the parameter settings to be downloaded to the ems controller, and the checksum values. Parameters and their values determine how the ems controller operates the cooler.

XML files cannot be manually edited.

If an operator or engineer tries to edit an XML file, the parameter loader displays a message stating the XML file is *not valid*.

The table below details the naming conventions of the XML file names for ems controllers.

ems controller	XML file name
ems25	EMS25BAS-CCCC-NNNNN-XXXXX
ems25 ⁺	EMS25PLUS-CCCC-NNNNN-XXXXX
ems25advanced	EMS25ADV-CCCC-NNNNN-XXXXX
ems55advanced	EMS55ADV-CCCC-NNNNN-XXXXX
ems75vr and ems75vri	EMS75VR-CCCC-NNNNN-XXXXX
ems75sz	EMS75SZ-CCCC-NNNNN-XXXXX

Where:

- CCCC is the cooler type.
The cooler types are **GDC** (glass door cooler), **OFC** (open front cooler), and **VEND** (vending machine).
- NNNNN is a unique five-digit identification number.
- XXXXX is information supplied on the completed the parameter request form.
For example, the cooler type, manufacturer, region, and so on.
This is specific to individual coolers.

9.2 what are checksums?

Checksums identify the firmware and parameter set of ems controllers.
 ems controllers display the checksum in the power on sequence and after a reboot.

The parameter information pack details the expected checksum for the specified ems controller and parameter set. After loading the parameter settings from an XML file, the parameter loader also displays the checksums.

The checksums displayed on the parameter loader are as follows:

CRC-A	Checksum of the XML file. For elstat reference purposes only.
CRC-B	Checksum displayed on an ems55 <i>advanced</i> with firmware version <u>E52 F07</u> . Displayed when rebooting the ems controller following download of the parameter settings with the parameter programming tool (dongle).
CRC-C	Checksum displayed on an ems55 <i>advanced</i> with firmware version <u>E52 F07</u> . Displayed after <i>manually</i> scrolling through the parameter list, following download of the parameter settings with the parameter programming tool (dongle).
CRC-D	Checksum displayed on all other ems controllers following download of the parameter settings with the parameter programming tool (dongle).

9.3 parameter programming accessories

The items required to program the parameter programming tool (dongle) are as follows:

USB docking cradle	
parameter programming tool (dongle) - yellow	
elstat files supplied with parameter programming tool	ZIP files containing the following: • elstat parameter loader. • Setup program. • drivers for Windows XP.
elstat files supplied on completion of the parameter request form	ZIP file containing the following: • Parameter information (PI), which is a PDF file that details the

parameter settings.

- XML file with parameter settings.

9.4 how to install the drivers on Windows XP

Please note:

- Windows 7 and Windows Vista: Drivers install automatically by connecting the USB docking cradle

For Windows XP, install the drivers as follows:

1. Extract the ZIP file CDM20808.zip- from the files supplied by elstat which contain the Windows drivers for Windows XP - and save into a suitable location.
For example, C:\Program Files\elstat\drivers.
2. Insert the USB docking cradle into a spare USB port and ensure that the **Windows New Hardware Found** wizard starts automatically.
3. Select **No, not this time** as shown below.



4. Select **Install from a list or specific location (Advanced)** and then click **Next**.



5. Click **Browse** and select the folder where the drivers were saved. For example, C:\Program Files\elstat\drivers. Click **Next** and wait while the wizard searches and downloads the drivers.



6. Once completed, click **Finish** to close the wizard.



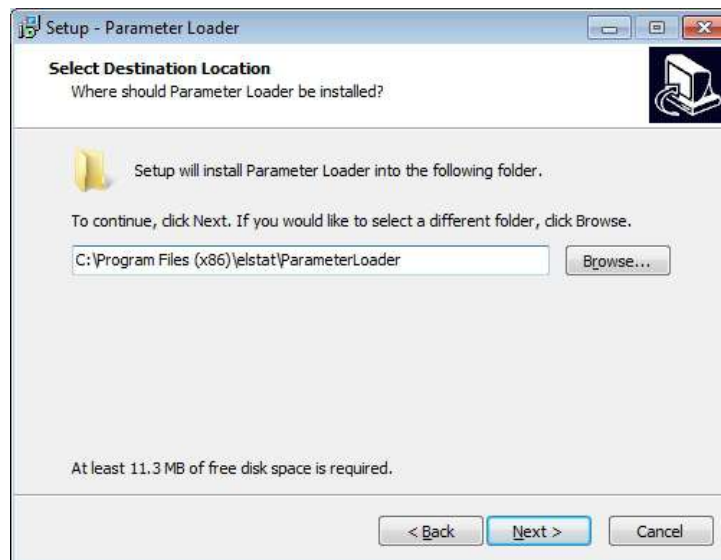
9.5 how to install the parameter loader

Install the parameter loader as follows:

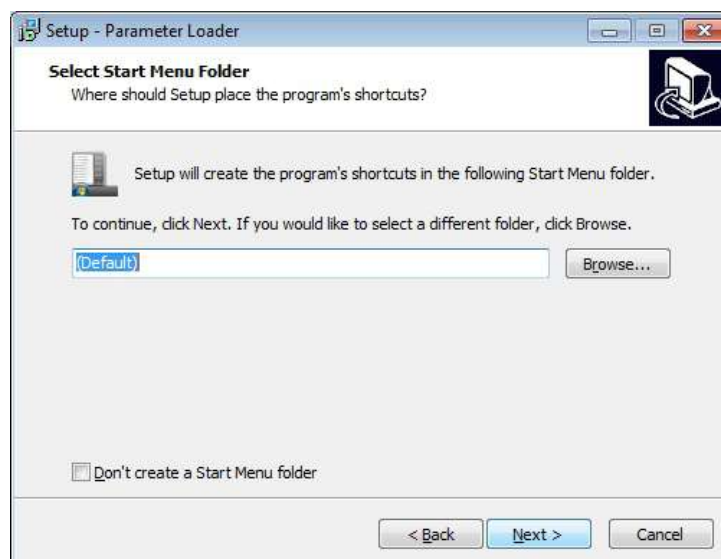
1. Copy the file Setup_ParameterLoader_Rx.x.exe, from the file - where Rx.x is the parameter loader version - to a suitable location on the local computer.
Double-click the file Setup_ParameterLoader_Rx.x.exe to start in the setup wizard.
2. Click **Next** to start the installation wizard.



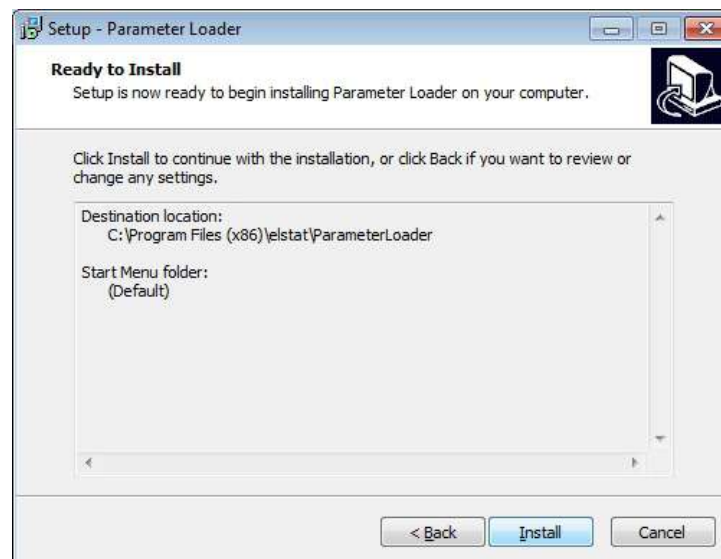
3. Select the destination location.
Click **Next** to use the default location or click **Browse** to define a different location and then click **Next**.



4. Select the **Start** menu folder.
Click **Next** to use the default folder or click **Browse** to define a different folder and then click **Next**.



5. Confirm that the setup information is correct.
Click **Install**.



6. Click **Finish** to complete the installation of the parameter loader.

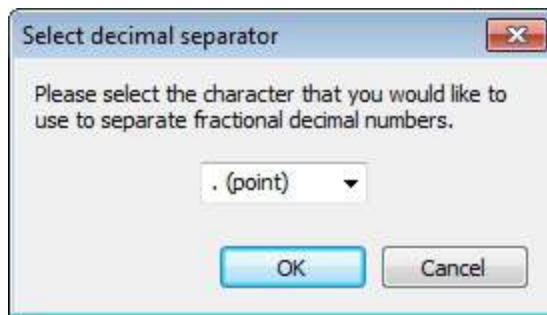


9.6 how to start the parameter loader

Start the parameter loader as follows:

- Click **Parameter Loader** in the **Start** menu.
- Double-click the file **ParameterLoader.exe** located in, for example, the folder **C:\elstat\ParameterLoader**.

Note: On starting the parameter loader for the first time, the dialog box below appears prompting for the fractional separator. Select **.(point)** or **,(comma)** according to the decimal format in your region.



9.7 how to connect the docking cradle

To set up the docking cradle, extract the drivers from the file.
Insert the docking cradle into a spare USB port to install the Windows drivers.

Please note:

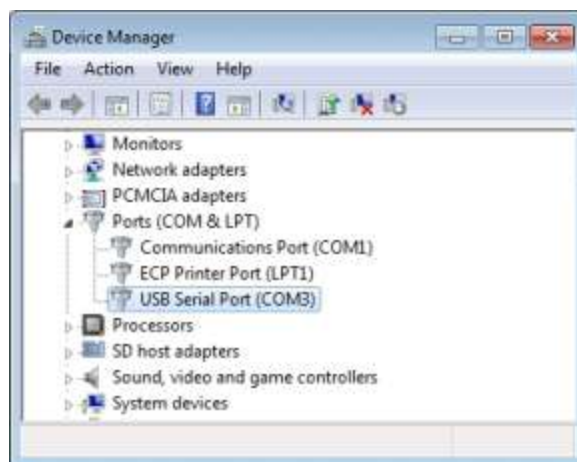
- Windows Vista and Windows 7 locate and install the drivers automatically. However, on Windows XP, install the drivers manually as described:
 - See "how to install the drivers on Windows XP" on page 55

Finally, define the COM port of the docking cradle.

9.8 how to configure the COM port

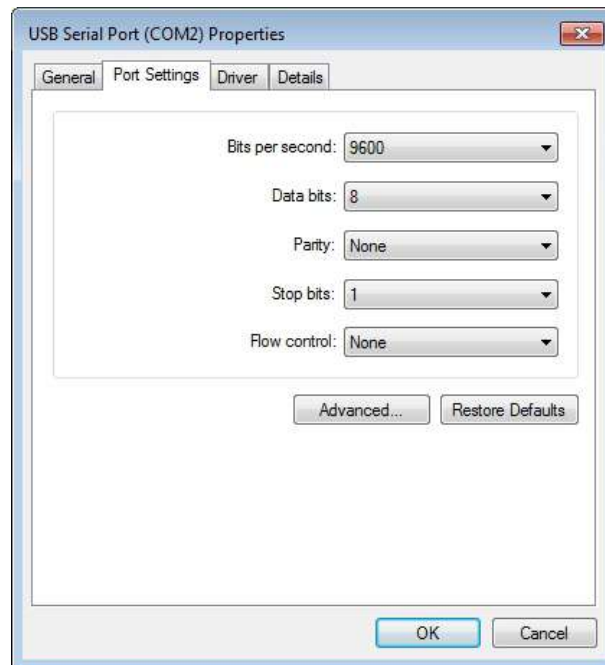
Configure the COM port as follows:

1. Start the parameter loader as follows:
 - Click **Parameter Loader** in the **Start** menu.
 - Double-click the file ParameterLoader.exe.
2. Click the **Start** menu, select **Control panel > System Device Manager > Ports (COM & LPT)** as shown below.

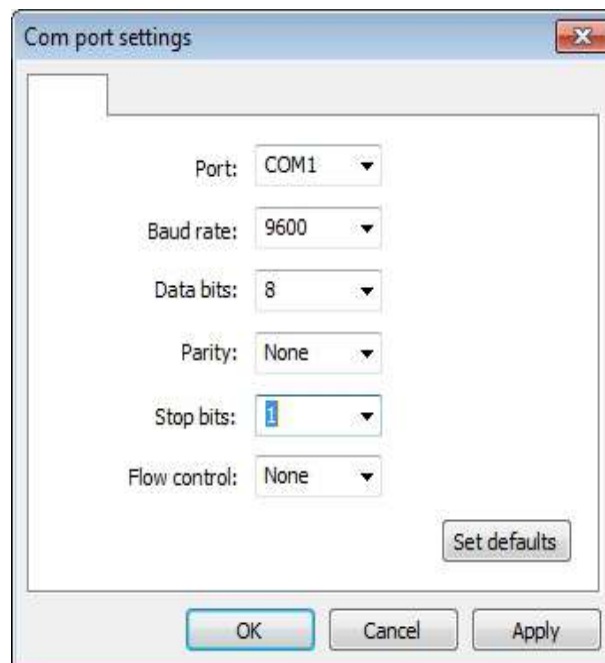


3. Check the COM port allocated to the USB docking cradle (USB Serial Port).
For example, in the diagram above, COM3 has been allocated.

Double-click the USB serial port and make a note of the port settings, as shown below.



4. On the parameter loader, click the **Edit Com port settings** to display the dialog box below.



5. Set the parameters to the values of the USB serial port of the local computer. For example:

parameter	value
COM port	COM port allocated to the cradle. For example, 3.
Baud rate	9600
Data bits	8
Parity	None
Stop bits	1
Flow control	None

6. Click **OK**.

9.9 how to load the parameter settings

Use the parameter loader to load the parameter settings to the parameter programming tool (dongle) as follows:

1. Extract the ZIP file from the folder which contains the parameter information pack and the parameter settings to a suitable location. For example, C:\Program Files\elstat.
2. Start the parameter loader as follows:
 - Click **Parameter Loader** in the **Start** menu.
 - Double-click the file ParameterLoader.exe.
3. Insert the parameter programming tool into the docking cradle, as shown below.

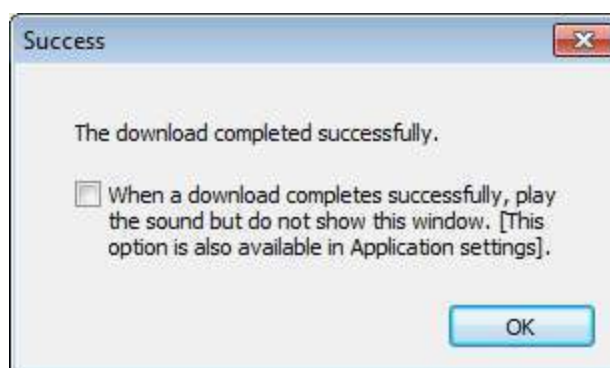


4. Click **Load XML** and browse to the location of the extracted file and then select the XML file with the parameter settings. For example, select the XML file C:\Program Files\elstat\EMS25PLUS-GDC-12312-NNNN.xml.
5. Ensure that the parameter values displayed on the parameter loader are correct, as stated in the parameter information pack. The parameter loader also displays the name of the XML name.
6. Make a note of the appropriate checksums on the parameter loader as detailed in the following table.
 - To help service engineers, mark the appropriate checksum on the identification tag of the parameter programming tool (dongle).

CRC-A	Checksum of the XML file. For elstat reference purposes only.
CRC-B	Checksum displayed on an <i>ems55advanced</i> with firmware version <u>E52 F07</u> . Displayed when rebooting the ems controller following download of the parameter settings with the parameter programming tool (dongle).

CRC-C	Checksum displayed on an <i>ems55advanced</i> with firmware version <u>E52 F07</u> . Displayed after <i>manually</i> scrolling through the parameter list, following download of the parameter settings with the parameter programming tool (dongle).
CRC-D	Checksum displayed on all other <i>ems</i> controllers following download of the parameter settings with the parameter programming tool (dongle).

7. Press and hold the button **^** on the USB docking cradle and then check that the message below appears after a short delay and click OK.
 If the transfer was unsuccessful, check all connections and settings and repeat the procedure.
 If the error persists, this indicates a malfunction of the equipment.



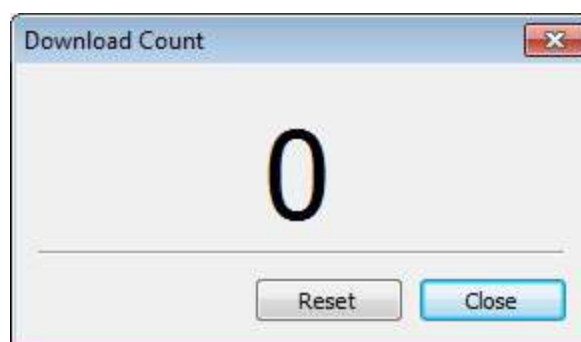
8. Remove the parameter programming tool from the USB docking cradle.

9.10 how to view the download counter

When programming a large quantity of parameter programming tools (dongles), a display counter can be viewed.

To view the download counter, click **Tools > Download counter**.

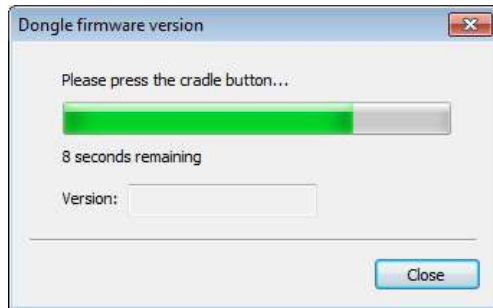
Note: The download counter window must be displayed to count.



9.11 how to view version of the parameter programming tool (dongle)

View the version of a parameter programming tool (dongle) as follows:

1. Insert the parameter programming tool (dongle) into the USB docking cradle.
2. Click **Tools > Get dongle version** to display the dialog below.



- Press and hold the button $\wedge$ on the USB docking cradle and then check that the version is displayed.

9.12 how to configure the parameter loader

Configure the application settings to set the fractional number separator and the option to display the download completed successfully window.

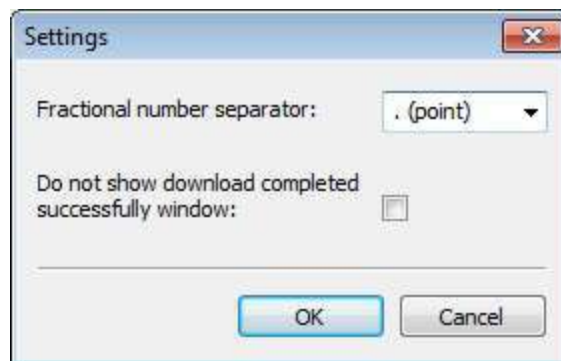
To configure the parameter loader settings, click the menu **Edit > Application settings** to show the dialog below.

Fractional number settings:

- Select .(point) or ,(comma) according to the decimal format in your region.

Do not show download completed successfully window:

- Check this option to stop the down completed successfully window appearing after each successful download.



9.13 display codes for parameter downloads

The table below shows the display when downloading parameters to the controller.

display	description
	The parameter programming tool (dongle) is connected.
	The parameter download is in progress.
	The parameters were download but are out of range.

display	description
	The parameters were not downloaded.

The ems controller will reboot and display the checksum following successful parameter downloads.

10 parameter reference

The parameter reference lists all the parameters alphabetically and describes each parameter in full. The parameters are also listed in the following groups:

- function: groups the parameters by functionality such as product temperature, defrost, and so on.
- owners: groups the parameters by organization, such as OEM, responsible for defining the parameter values.

The parameter values vary between different cooler types, cooler characteristics, operating environments, brand requirements, and operational preferences.

Parameter settings are defined by customers - OEMs, Bottlers and Brands - using an XML request form, and supplied in the relevant parameter information (PI) provided by elstat.

10.1 parameters by function

The table below details the parameters grouped by function.

temperature	Celsius or Fahrenheit (CF) set point (SP) and differential (dIF) saving set point (SSP) and saving differential (Sd) saving temperature disable (PEr) appliance sensor: calibration 1 (CA1)
operation	saving restart (Sr) delay to saving mode (dS) freeze-up protection (dtT) compressor rest time (rt)
defrost	defrost method (dF) and defrost termination method (dtF) defrost interval (dE) and defrost duration (dd) defrost activation temperature (ddt) and defrost termination temperature (dtD) defrost heater (dHr) evaporator sensor: calibration 2 (CA2)
self-learning	learning period (LP) and activity frequency (AF)
display	display (dIS) and display stability (d2)
lights	light delay (Ld) and marketing mode (Ar)
evaporator fan	fan set point (FSP) fan cycle on (FCO) and fan cycle off (FCF)
alarms	alarm delay (Ad) buzzer enable (b0) and buzzer duration (b1) refrigeration system failure (Ct) condenser high temperature (Ht) <i>Not used on CO2 (R744) coolers</i>

Note:

- Some parameters are not included with certain controllers. Please refer to the to User Guide to confirm which parameter set the controller has available.

10.2 parameter by owners

The parameter owners are usually defined as performance, design, and operational parameters with different organizations being responsible for each set.

performance (brand)	set point (SP) and differential (dIF) saving set point (SSP) and saving differential (Sd) saving restart (Sr)
design (OEMs)	defrost method (dF) and defrost termination method (dtF) defrost interval (dE) and defrost duration (dd) defrost activation temperature (ddt) and defrost termination temperature (dttd) defrost heater (dHr) compressor rest time (rt) fan cycle on (FCO) and fan cycle off (FCF) calibration 1 (CA1) and calibration 2 (CA2)
operation (operators)	Celsius or Fahrenheit (CF) saving temperature disable (PEr) freeze-up protection (dt) delay to saving mode (dS) learning period (LP) and activity frequency (AF) display (dIS) and display stability (d2) light delay (Ld) and marketing mode (Ar) fan set point (FSP) alarm delay (Ad), buzzer enable (b0) and buzzer duration (b1) refrigeration system failure (Ct) condenser high temperature (Ht)

10.3 alarm delay (Ad)

The table below details the alarm delay (**Ad**) parameter.

display	
description	Defines the maximum time the cooler door can be open before sounding the alarm buzzer.
considerations	If disabled, the door switch is also disabled. The ems controller does not detect door openings, therefore, the ems controller does not: • update the self-learning matrix for door activity. • manage the evaporator fan management for door activity. • sound door alarms if the door is left open.
range	00 to 30 minutes
global default	00 (disabled)

10.4 activity frequency (AF)

The table below details the activity frequency (**AF**) parameter.

display	
description	Defines the minimum number of door openings or motion counts to indicate an active 30 minute period in the self-learning matrix, as described below. The activity frequency applies across all 30 minute periods within the self-learning matrix, not to individual 30 minute periods.
considerations	See below.
range	See below
global default	00 (low frequency)

The table below describes the values for activity frequency (**AF**).

value	name	description
00	low frequency	1 door opening or 1 motion count
01	medium frequency	1 door opening or 3 motion counts
02	high frequency	2 door openings or 6 motion counts
03	automatic	The ems controller runs continuously for 48 hours in the ready mode. After 48 hours, the ems controller sets the value of the activity frequency to 0, 1, or 2.

Note:

- If **AF** is set to 3, the ems controller must run continuously for 48 hours to set the value of the activity frequency. If power is lost during the 48 hour period, the ems controller restarts the 48 hour period. The ems controller must complete the 48 hour period to determine the activity frequency before starting the 1-day or 7-day learning period.

10.5 marketing mode (Ar)

The table below details the marketing mode (**Ar**) parameter.

display	
description	Sets the cooler lights to remain on at all times for display purposes. The cooler lights will remain on during <i>saving mode</i> .
considerations	Does not affect saving temperature. Made available to ems55advanced GDC firmware from June 2012. Not used with OFC firmware.
range	00 (off) or 01 (on)
global default	00 (off)

10.6 buzzer enable (b0)

The table below detail the buzzer enable (**b0**) parameter.

display	
description	Enables or disables a warning buzzer for alarm conditions. Door open alarms always sound the warning buzzer.
considerations	Following alarm conditions trigger the buzzer: • refrigeration system failure (rSF) • sensor failure (PF1, PF2, and PF3). • gas cooler high temperature alarm • CO2 lock out alarm Door alarms sound the buzzer as standard.
range	00 (disabled) or 01 (enabled)
global default	01 (enabled)

10.7 buzzer duration (b1)

The table below details the buzzer duration (**b1**) parameter.

display	
description	Defines the duration of the buzzer for door open alarm conditions. If the door remains open after the buzzer duration (b1), the ems controller switches off the compressor.
considerations	The ems controller switches off the compressor after the duration defined by alarm delay (Ad) + buzzer duration (b1).
range	1 to 254 seconds
global default	60 seconds

10.8 calibration 1 (CA1)

The table below details the calibration 1 (**CA1**) parameter.

display	
description	Calibrates or adds an offset to temperatures measured by the appliance sensor.
considerations	Applied to all temperatures measured on the appliance sensor.
range	-9.9 to 9.9°C (-18 to 18°F)
global default	0.0°C (0°F)

10.9 calibration 2 (CA2)

The table below details the calibration (**CA2**) parameter.

display	
description	Calibrates or adds an offset to temperatures measured by the evaporator sensor. The offset helps the positioning of the evaporator sensor.
considerations	Applied to all temperatures measured on the evaporator sensor. Used only with <u>sub zero</u> and <u>OFC</u> firmware. Not available on GDC firmware.
range	-9.9 to 9.9°C (-18 to 18°F)
global default	0.0°C (0°F)

10.10 Celsius or Fahrenheit (CF)

The table below details the Celsius or Fahrenheit parameter (**CF**).

display	
description	Option to set the ems controller to Celsius (°C) or Fahrenheit (°F).
considerations	• A global reset sets ems controllers using Fahrenheit (°F) to Celsius (°C). • Applies to all temperature settings and values.
range	00 (°C) or 01 (°F)
global default	00 (°C)

10.11 refrigeration system failure (Ct)

The table below details the refrigeration system failure (**Ct**) parameter.

display	
description	Defines the maximum continuous runtime of the compressor without reaching the set point (SP) temperature. If the set point (SP) temperature is not reached within this time, the ems controller switches off the compressor and activates the refrigeration system (rSF) alarm.
considerations	None
range	00 to 100 hours
global default	72 hours

10.12 display stability (d2)

The table below details the display stability (**d2**) parameter.

display	
description	Defines the rate of change of the displayed temperature. Limiting the rate of change provides a dampening effect so as not to concern users should the air temperature rise quickly due to a door opening. Increasing the value for the display stability (d2) slows the rate of change of the displayed temperature.
considerations	Use the global default value for normal operation.
range	1 to 254
global default	2

10.13 defrost duration (dd)

The table below details the defrost duration (**dd**) parameter.

display	
description	Defines the maximum time of a defrost cycle.
considerations	If icing up occurs, review the values of the defrost parameters.
range	1 to 199 minutes
global default	15 minutes

10.14 defrost activation temperature (ddt)

The table below details the defrost activation temperature (**ddt**) parameter.

display	
description	Defines the temperature measured on the evaporator sensor that activates an off-cycle defrost. The defrost activation temperature minimizes the risk of evaporator icing up.
considerations	Defrost method (df) must be set to 1 to start defrost cycles on the defrost activation temperature. Used only with <u>sub zero</u> and <u>OFC</u> firmware. Not available on GDC firmware.
range	-30 to 5°C (-22 to 41°F)
global default	-6°C (21°F) ems75sz: -15°C (5°F)

10.15 defrost interval (dE)

The table below details the defrost interval (**dE**) parameter.

display	
description	Defines the period between the end of defrost cycle and beginning of the next defrost cycle. A time-based defrost cycle helps improve evaporator efficiency.
considerations	- In the event of power loss, the defrost duration (dE) is not maintained. The defrost interval is reset. - If icing up occurs, review the values of the defrost parameters.
range	0 to 199 hours
global default	06 hours

10.16 defrost method (dF)

The table below details the defrost method (**dF**) parameter.

display	
description	Provides the option for a time-based or temperature-based defrost cycle.
considerations	Used only with <u>sub zero</u> and <u>OFC</u> firmware. Not available on GDC firmware.
range	00 (time-based) or 01 (temperature-based)
global default	00 (time-based)

10.17 differential (dIF)

The table below details the differential (**dIF**) parameter.

display	
description	Defines the compressor cut-in temperature when added to the set point (SPC or SPF) temperature during the ready mode.
considerations	If the differential (dIF) is set too low, for example, less than 2.0°C the compressor may cycle on the minimum compressor rest time (rt).
range	0.0 to 9.9°C (0 to 18°F)
global default	4.0°C (7°F) ems75sz: 3.0°C (5°F)

10.18 display (dIS)

The table below details the display (**dIS**) parameter.

display	
---------	---

description	Defines whether the ems controller displays the temperature 3.0 , or the word USE during the ready mode. ems controllers always display alarms.
considerations	None
range	00 (USE) or 01 (temperature)
global default	01 (temperature)

10.19 delay to saving (dS)

The table below details the delay to saving (**dS**) parameter.

display	
description	Defines the delay in switching to the <i>saving mode</i> from <i>ready mode</i> . The delay starts at the end of the last active 30 minute period of the <i>ready mode</i> .
considerations	Must be set in multiples of 30 minutes.
range	0 to 120 minutes (in multiples of 30 minutes)
global default	00 (no delay)

10.20 defrost termination temperature (dtd)

The table below details the defrost temperature duration (**dtd**) parameter.

display	
description	Defines the temperature to end the defrost cycle. Ending defrost cycles on temperature minimizes the duration of defrost cycles. The temperature is measured as follows: • OFC and sub-zero coolers: the temperature is measured on the evaporator sensor. • GDC coolers: the temperature is measured on the appliance sensor.
considerations	• Must be set above the set point (SP) plus differential (dIF) temperature. • Must be set below IPd. • If icing up occurs, review the values of the defrost parameters.
range	1 to 30°C (33 to 86°F) ems75sz: -5 to 22°C (23 to 71°F)
global default	9.0°C (48°F) ems75sz: 15.0°C (59°F)

10.21 defrost termination method (dtF)

The table below details the defrost termination method (**dtF**) parameter.

display	
description	Provides the option to end a defrost cycle as follows: - on the defrost duration (dd) only - on defrost duration (dd) or defrost termination temperature (dtD). If the defrost termination method (dtF) is set to use the defrost duration (dd) or the defrost termination temperature (dtD), the ems controller ends the defrost cycle on the first to occur.
considerations	Defrost method (dF) must be set to 0 Used only with <u>sub zero</u> and <u>OFC</u> firmware. Not available on GDC firmware.
range	00 (time[dd]) or 01 (time[dd] or temperature[dtD])
global default	01 (time or temperature)

10.22 Maximum defrost on demand time (dtO)

The table below details the maximum defrost on demand time (**dtO**) parameter.

Display	
Description	Maximum defrost on demand time is the maximum time of a temperature based defrost cycle.
Considerations	Available only with the ems55 series using OFC (<i>Open Front Cooler</i>) firmware. This parameter may not appear in all firmware versions.
Range	10 to 120 minutes
Global default	30 minutes

10.23 freeze-up protection (dtt)

The table below details the freeze-up protection (**dtt**) parameter.

display	
description	Defines the temperature to stop further cooling to prevent freeze-up due to low temperature.
considerations	Must be set below the set point (SP) temperature.
range	-15 to 10°C (5 to 50°F)
global default	0.0°C (32°F) ems75sz: -6.0°C (21°F)

10.24 fan cycle off (FCF)

The table below details the fan cycle off (**FCF**) parameter.

display	
description	Defines the inactive period of the evaporator fan while the compressor is switched off.
considerations	Fan cycle is the fan cycle on (FCO) time + the fan cycle off (FCF) time. Not used on the ems25 ⁺
range	1 to 30 minutes
global default	1 minute ems75sz: 20 minutes

10.25 fan cycle on (FCO)

The table below details the fan cycle on (**FCO**) parameter.

display	
description	Defines the active period of the evaporator fan while the compressor is switched off.
considerations	Fan cycle is the fan cycle on (FCO) time + the fan cycle off (FCF) time. Not used on the ems25 ⁺
range	1 to 30 minutes
global default	30 minutes ems75sz: 5 minutes

10.26 fan set point (FSP)

The table below details the fan set point (**FSP**) parameter.

display	
description	Prevents excessive condensation on the evaporator in environments where warm, and presumed humid, air is present by operating the evaporator fan. If the fan set point (FSP) temperature is exceeded, the evaporator fan running continuously even if the door is opened. On reaching set point (SP) temperature, the evaporator fan switches off during door openings.
considerations	Not related to fan cycle on (FCO) or fan cycle off (FCF). Not used with OFC firmware <u>or</u> the ems25 ⁺
range	01 to 30°C (33 to 86°F)
global default	15°C (59°F)

10.27 high voltage (HI)

The table below details the high voltage (**HI**) parameter.

display	
description	Defines the maximum voltage allowed before switching off the compressor. The high voltage (HI) values are approximations and <u>not</u> actual voltage readings (see table below).
considerations	1. Must not be used with an external voltage stabiliser 2. Must only be used with an elstat supplied transformer 3. Only used with <i>ems55advanced</i> and <i>ems55Radvanced</i>
range	180 to 250 (not Vac)
global default	250 (disabled)

100V line		110-120V line		220-240V line	
voltage	HI	voltage	HI	voltage	HI
110	180	139	180	230	190
114	185	142	185	235	195
118	190	145	190	240	200
122	195	148	195	245	205
				250	210
				255	215
				260	220
note: Voltage measurement is accurate to $\pm 10\%$.				265	225

Caution:

- High voltage protection is not calibrated and actual performance can be influenced by several factors. Therefore, total protection cannot be guaranteed.

10.28 condenser high temperature (Ht)

The table below details the condenser high temperature (**Ht**) parameter.

display	
description	Defines the maximum temperature measured in the refrigeration system by monitoring the condenser sensor. On reaching the condenser high temperature (Ht), the ems controller disables the compressor and activates an alarm.
considerations	1. Is not used with CO₂ (R744) coolers.

	2. Requires a condenser sensor. 3. To set the condenser high temperature (Ht), measure the refrigeration system temperature when the condenser is 75% blocked. 4. To disable, set below 50°C or 122°F.
range	0.0 to 125°C (32 to 257°F)
global default	0.0°C (32°F) - disabled.

10.29 uninterrupted pull down (IPd)

The table below details the uninterrupted pull down (**IPd**) parameter.

display	
description	Defines the temperature that if exceeded starts an uninterrupted pull down, i.e. the ems controller switches on the compressor and runs the compressor continuously until the product reaches the set point (SP) temperature. During this time, defrost cycles do not occur.
considerations	Must be set as follows: • Above the saving set point (SSP) plus saving differential (Sd) temperature. • Above the defrost termination (dttd) temperature.
range	0.0 to 30°C (32 to 86°F)
global default	20°C (68°F)

10.30 lights delay (Ld)

The table below details the lights delay (**Ld**) parameter.

display	
description	Defines the delay to switch off the cooler lights after the ems controller switches to the <i>saving mode</i> .
considerations	Must be set in multiples of 30.
range	0 to 120 minutes
global default	00 (no delay)

10.31 low voltage (LO)

The table below details the low voltage (**LO**) parameter.

display	
description	Defines the minimum voltage allowed before switching off the compressor. The low voltage (LO) values are approximations and <u>not</u> actual voltage readings (see table below).
considerations	1. Must not be used with an external voltage stabiliser

	2. Must only be used with an elstat supplied transformer 3. Only used with <i>ems55advanced</i> and <i>ems55Radvanced</i>
range	90 to 160 (not Vac)
global default	90 (disabled)

100V line		110-120V line		220-240V line	
voltage	LO	voltage	LO	voltage	LO
79	120	95	120	173	130
81	125	98	125	178	135
84	130	100	130	182	140
87	135	103	135	187	145
90	140	106	140	192	150
				197	155
Note: Voltage measurement is accurate to $\pm 10\%$.				203	160

Caution:

- Low voltage protection is not calibrated and actual performance can be influenced by several factors. Therefore, total protection cannot be guaranteed.

10.32 learning period (LP)

The table below details the learning period (**LP**) parameter.

display	
description	Defines whether the ems controller uses a 1-day or a 7-day learning period.
considerations	None
range	00 (1 day) or 01 (7 days)
global default	00 (1 day)

10.33 saving temperature disable (PEr)

The table below details the saving temperature disable (**PEr**) parameter.

display	
description	Disables the saving mode temperature so that the ems controller maintains the <i>ready mode</i> temperature at all times. Disabling the saving mode temperature does not affect the light functionality.

considerations	None
range	00 (off) or 01 (on)
global default	00 (off)

10.34 compressor rest time (rt)

The table below details the compressor rest time (**rt**) parameter.

display	
description	Defines the minimum time between compressor cycles. The compressor rest time ensures that the pressures in the refrigeration system have time to equalize during compressor off-cycles. The compressor rest time (rt) helps to avoid the following: • passing peak current through the windings of the compressor motor • switching off the system on the thermal overload protection • short cycling of the system.
considerations	If set too low, the compressor rest time may cycle on the set point (SP) and differential (dIF) temperatures or the saving set point (SSP) and saving differential (Sd) temperatures.
range	1 to 30 minutes
global default	3 minutes

10.35 saving differential (Sd)

The table below details the saving differential (**Sd**) parameter.

display	
description	Defines the compressor cut-in temperature, when added to the saving set point (SSP) temperature, during the <i>saving mode</i> .
considerations	If the saving differential (Sd) is set too low, for example less than 2.0°C, the compressor may cycle on the minimum compressor rest time (rt).
range	0.0 to 9.9°C (0 to 18°F)
global default	4.0°C (7°F) ems75sz: 3.0°C (5°F)

10.36 motion sensor enable (Sn)

The table below details the motion sensor enable (**Sn**) parameter.

display	
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description	Enables the input from the motion sensor.
considerations	Must be disabled if a motion sensor is not fitted.
range	00 (disabled) or 01 (enabled)
global default	01 (enabled)

10.37 set point (SPC or SPF)

The table below details the set point (**SPC** or **SPF**) parameter.

display	 
description	Defines the compressor cut-out temperature during the ready mode. The set point (SP) temperature is the lowest measured temperature under normal operating conditions. The set point is displayed as SPC (set point Celsius) or SPF (set point Fahrenheit) depending on whether the ems controller is set to use Celsius or Fahrenheit.
considerations	Must be above the freeze-up protection (dtf) temperature.
range	-9.9 to 9.9°C (14 to 50°F)
global default	3.0°C (37°F) ems75sz: -3.0°C (27°F)

10.38 saving restart period (Sr)

The table below details the saving restart period (**Sr**) parameter.

display	
description	Defines the maximum time allocated to reach the set point (SP) temperature from the <i>saving mode</i> temperature.
considerations	- Set and verified by OEMs through the test protocol to ensure that product temperatures are within specification when outlets open. - Must be set in multiples of 30 minutes.
range	0 to 240 minutes (in multiples of 30 minutes)
global default	120 minutes

10.39 saving set point (SSP)

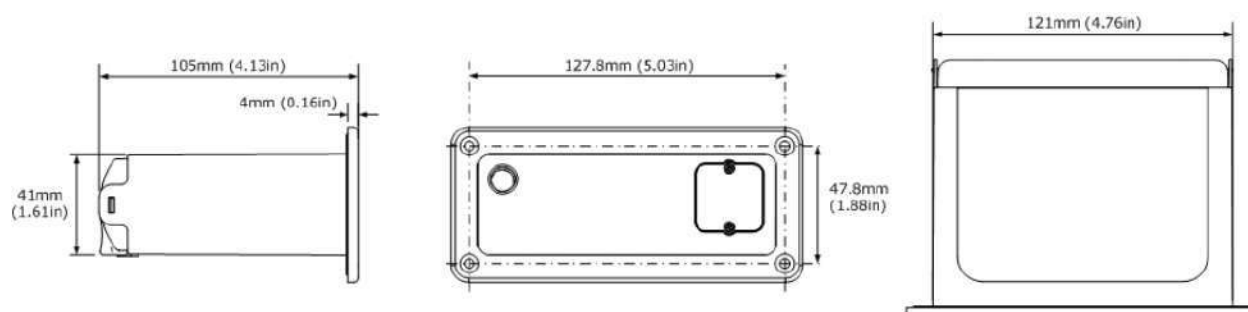
The table below details the saving set point (**SSP**) parameter.

display	
description	Defines the compressor cut-out temperature during the saving mode.
considerations	Must be set above the set point (SP) plus differential (dIF) temperature.
range	0.0 to 9.9°C (32 to 50°F) ems75sz: -9.9 to 9.9°C (14 to 50°F)
global default	all except ems75sz: 7.0°C (45°F) ems75sz: 3.0°C (37°F)

11 technical data *ems55advanced*

Technical data for the *ems55advanced* and *ems55Radvanced*.

Dimensional drawings:



Controller relays:

relay	IEC 60730 rating @ 100-120VAC and 220-240VAC 50/60Hz
compressor	10 (10) A, p.f. 0.6
light	4 (4) A, p.f. 0.6
evaporator fan	4 (4) A, p.f. 0.6

Temperature sensors:

sensor	input range (°C)	input range (°F)
appliance sensor	-10°C to 23.3°C +/- 0.5°C	14°F to 74°F +/- 1°C
condenser sensor	-10°C to 23.3°C +/- 5°C	122°F to 257°F +/- 10°F

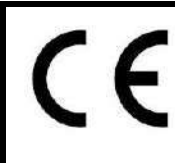
Environmental ratings:

characteristic	value
IP (Ingress Protection):	
• controller	IPX5
maximum ambient temperature	55°C (131°F)

Product approvals:

	EN60730-1 EN60730-2-9
European Norms Electrical Certification	
	IEC60730-1 IEC60730-2-9 Glow wire: IEC60335-1
International Electrotechnical Commission	
	UL 60730-1 / CSA E60730-1 UL 60730-2-9 / CSA E60730-2-9
North America (including Canada) only - UL mark. Component recognition mark	

Please note:

	CE (Conformité Européene / European Conformity)
Replaces:	
	RoHS (Restriction of Hazardous Substances)
On controller labelling as of January 2013	

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