ems25+ and ems25advanced

18 February 2014

Firmware:U02 - n01 - ems25+

Firmware: U03 - n02 - ems25advanced

Elstat Electronics Ltd.

Astra Business Centre, Roman Way, Preston, Lancashire, PR2 5AP

+44 (0)161 2277200

www.elstatgroup.com

table of contents

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 ems25 series?

The ems25 series consists of the ems25, ems25^{+}, and ems25*advanced*. The ems25 series is designed as a compact alternative the ems55 series.

The ems25 series with the suitable accessories also provide the following functionality.

feature	description
user and diagnostic information	3-digit, 7-segment display (ems25^{+} and ems25*advanced* only) and push buttons that displays the product temperature and other information such as defrost or teach and alarm conditions. Also, enables end-users to cancel alarms and service technicians to run test routines.
product temperature	An appliance sensor measures temperature of the refrigeration compartment. ems controllers use the refrigeration temperature to manage the product temperature.
refrigeration system high temperature alarm	An optional condenser sensor measures the temperature of the refrigeration system. ems controllers use the temperature to alert to problems such as blocked condensers. ems25^{+} and ems25*advanced* only.
motion detection	A remote motion sensor enables ems controllers to detect activity when someone moves in front of the cooler.
door open detection	A door switch enables ems controllers to detect cooler activity when someone opens the cooler doors.

The ems25 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. ems25*advanced* only.
lights	ems controllers switch the cooler lights to save energy.

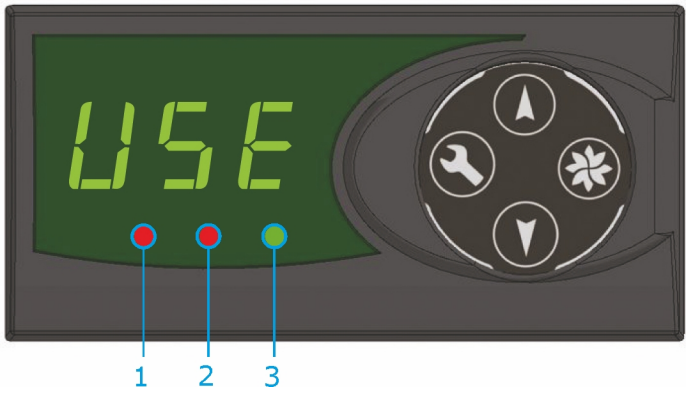
2.1 Water ingress – advisory information for FMEA analysis

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.

2.2 ems25^{+} and ems25*advanced* user interface

The user interface of the ems25^{+} and ems25*advanced* is as follows:



LED indicators:

	indicator	function	colour
1	saving temperature disable	**on** if the saving mode temperature is disabled. The controller maintains *ready mode* temperature at all times.	red
2	motion	**on** when motion is detected.	red
3	compressor	**on** when the compressor is running.	green

The ems controller buttons access the menu to view parameter values, reset the ems controller, and to run test routines.

Push buttons:

button	name	function
	defrost or teach	ems25*advanced*: starts a defrost cycle. ems25^{+}: sets the ems controller to the saving mode for up to one hour.
	set	selects menu options and scrolls through the parameters.
	up	increases the parameter values. ems25^{+}: Also, exits the teach saving mode.

button	name	function
	down	scrolls down menus, decreases parameter values, and cancels alarms.

2.3 environmental ratings

The table below details the general characteristics of the ems25 series.

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

2.4 ems25 series relay ratings

The table below details the relay ratings of ems25^{+} controllers.

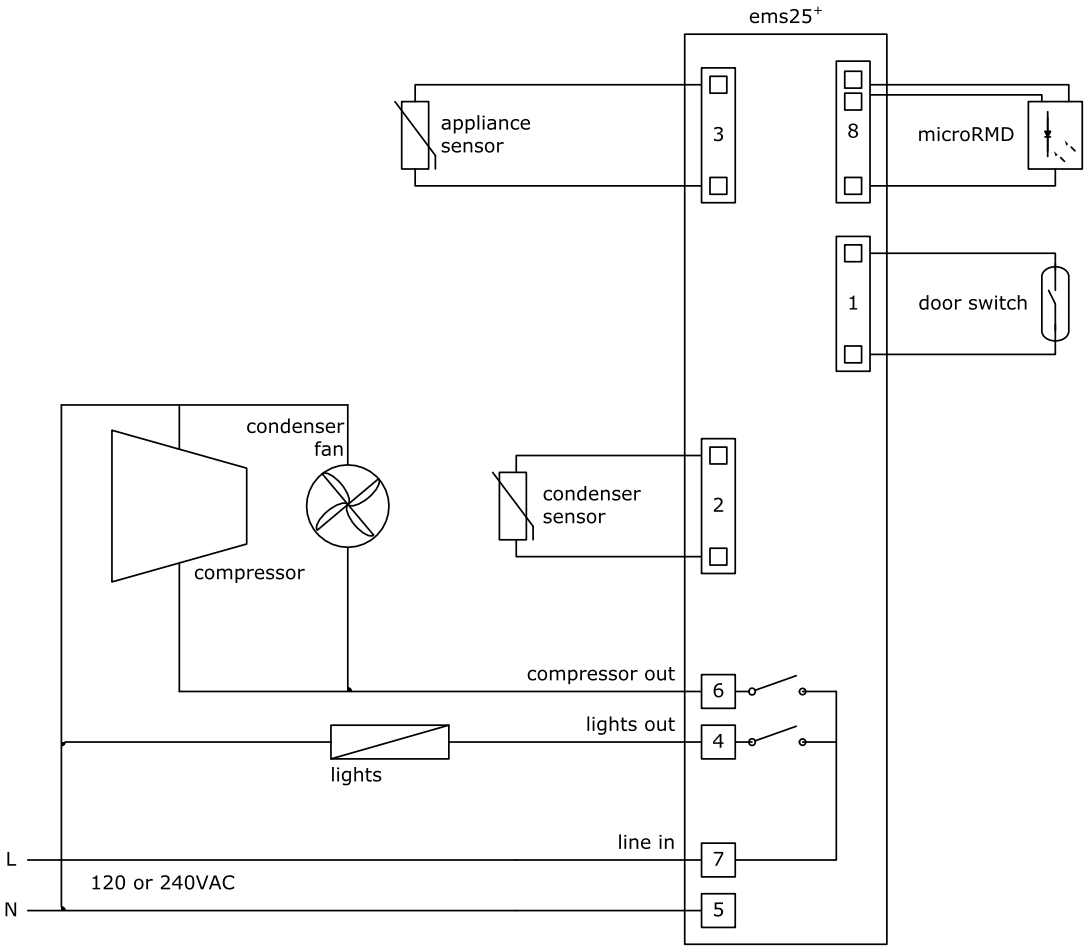
ems25^{+}	maximum IEC rating @100-240VAC	maximum UL ratings @ 120VAC
compressor	6(6)A, p.f. 0.6	6 FLA, 36 LRA
lights	2(2)A, p.f. 0.6	120VAC, 60Hz, 250W florescent
evaporator fan	not applicable	not applicable

The table below details the relay ratings of ems25*advanced* controllers.

ems25*advanced*	maximum IEC rating @100-240VAC	maximum UL ratings @ 120VAC
compressor	10(10)A, p.f. 0.6	not applicable
lights	2(2)A, p.f. 0.6	
evaporator fan	4(4)A, p.f. 0.6	

2.5 ems25^{+} wiring diagram

The wiring diagram for the ems25^{+}:



Drip loops must be made in all cables

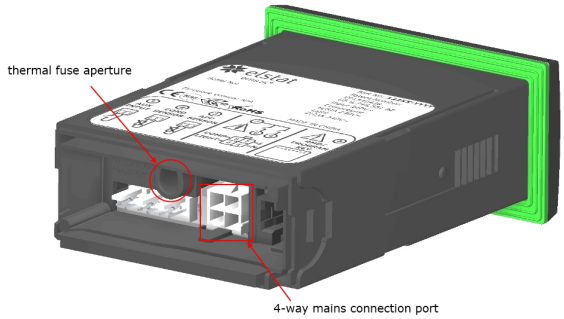
Note:

- For security, once fitted, the rear cover can only be removed using a tool, such as a small, flat bladed screwdriver.

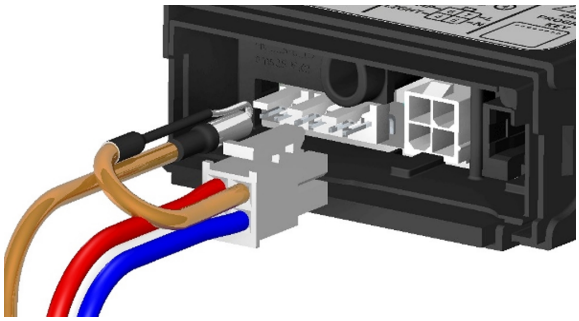
2.6 ems25 series thermal fuse (CQC only)

The ems25 and ems25^{+} housings are designed with an aperture for a thermal fuse to be located. The thermal fuse is a part of a main harness which is supplied by elstat.

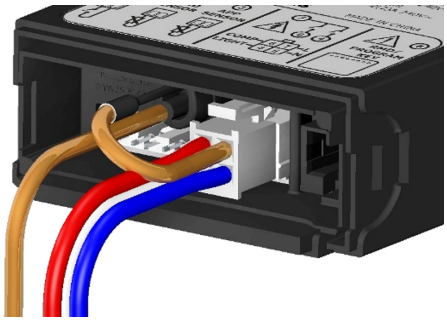
The location for the 4-way mains connector (harness) and thermal fuse are shown below:



Fit the connector into the port, and the thermal fuse into the aperture, ensuring that it is fully enclosed:



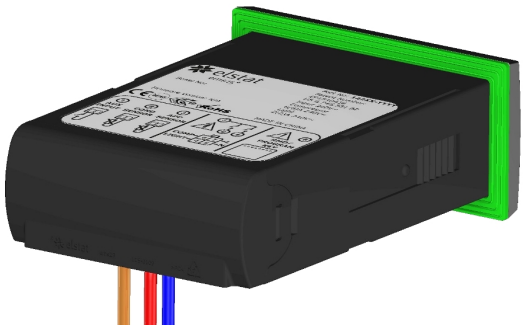
Make sure that the connector has 'clicked' into place and the connection is sound.
Check that the thermal fuse is fully protected within the aperture.



The aperture has been designed specifically for the thermal fuse supplied by elstat.

- **Do not** use the aperture for any other purpose.

Connect all remaining sensors, door switches (optional) and the microRMD.



All cables must exit vertically, as shown above

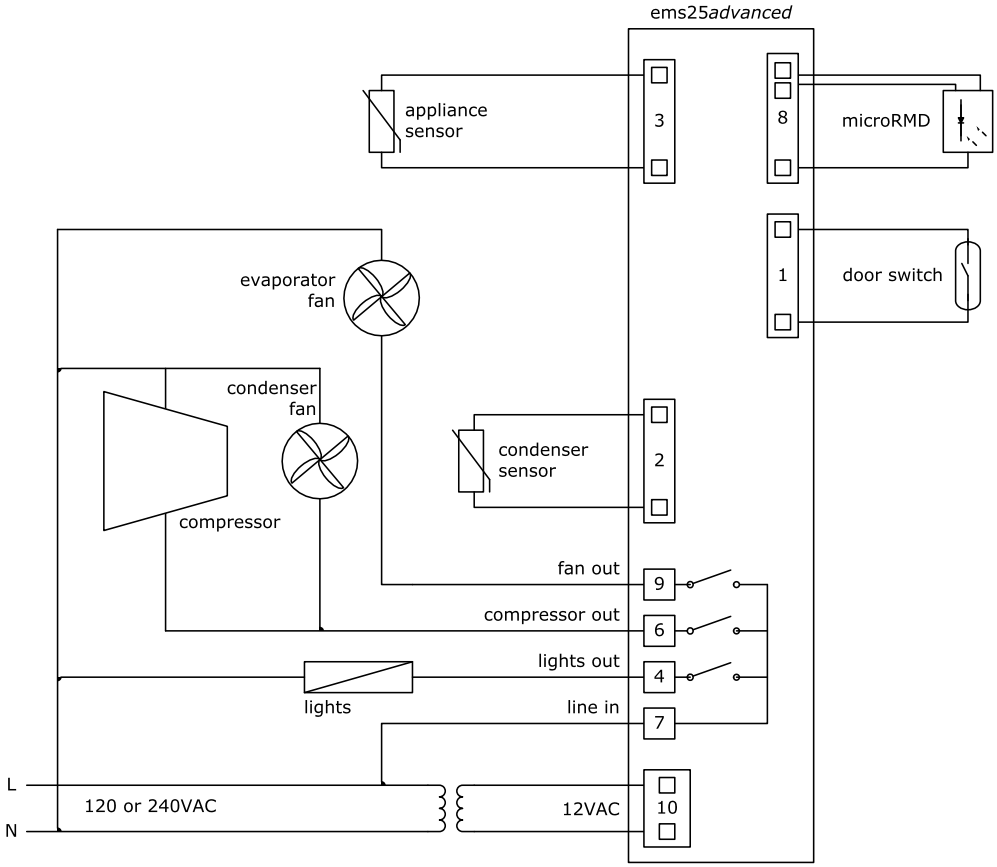
Drip loops must be made in all cables

Note:

- For security, once fitted, the rear cover can only be removed using a tool, such as a small, flat bladed screwdriver.

2.7 ems25*advanced* wiring diagram

The wiring diagram for the ems25*advanced*:



Drip loops must be made in all cables

Note:

- For security, once fitted, the rear cover can only be removed using a tool, such as a small, flat bladed screwdriver.

2.8 how to mount ems25 series controllers

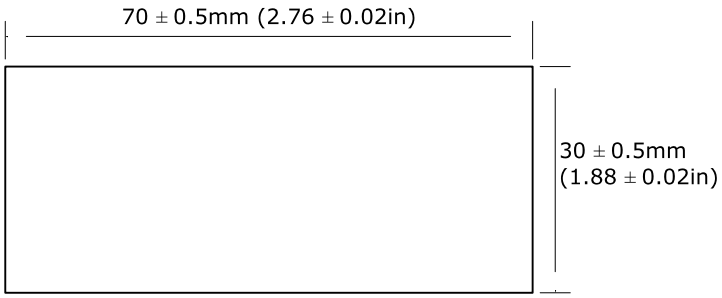
ems25 series controllers have an IP (Ingress Protection) rating of IP45. That is, the ems controller has protection against water jets. An appropriate level of protection must be given for the effects of water ingress due to water jetting, condensation, product spillage, and so on.

Before beginning installation, remove all protective film from between the rear seals of the controller. The seals are malleable, to ensure a water resistant seal around cables and prevent water ingress.

Caution

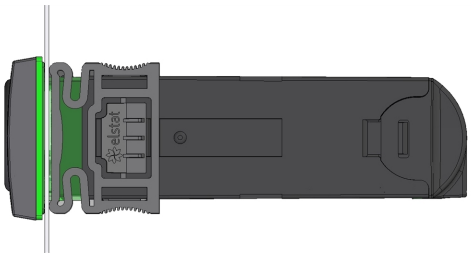
- The ems25 series controllers must not be exposed to temperatures greater than 55°C (131°F) or lower than 0°C (32°F).

ems25 series controllers are designed for panel mounting. The panel aperture dimensions are shown below.



To mount an ems25 series controller, insert the ems controller into the aperture as shown in the following example.

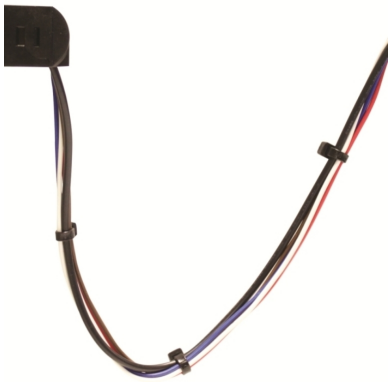
Then, secure the ems controller into position using the supplied display side-clips as shown below.



Note:

- Decorative trim kits are supplied separately.
- See "ems decorative trims" on page 84
- The large decorative trim kits are screwed into place.

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.



Caution:

- Cable routing looms must not be secured to hot pipes or vibrating components.
  Secure cable routing looms with clips where ever possible.
- For security, once fitted, the rear cover can only be removed using a tool, such as a small, flat bladed screw driver.

3 temperature input ranges

The table below shows the temperature input ranges of the ems25 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 (Not used with R744 coolers)	50°C to 125°C +/- 5.0°C	122°F to 257°F +/- 10°F

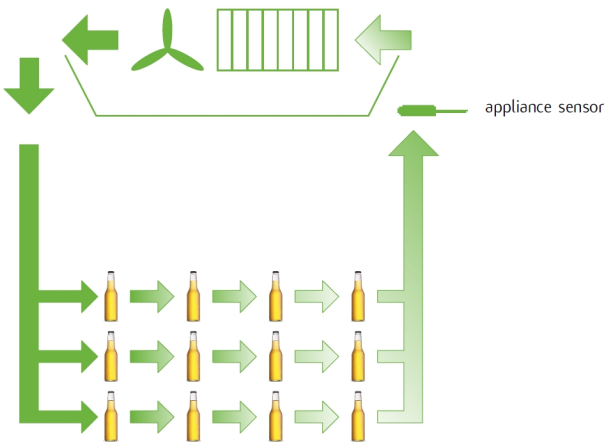
Note:

- The NTC 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.

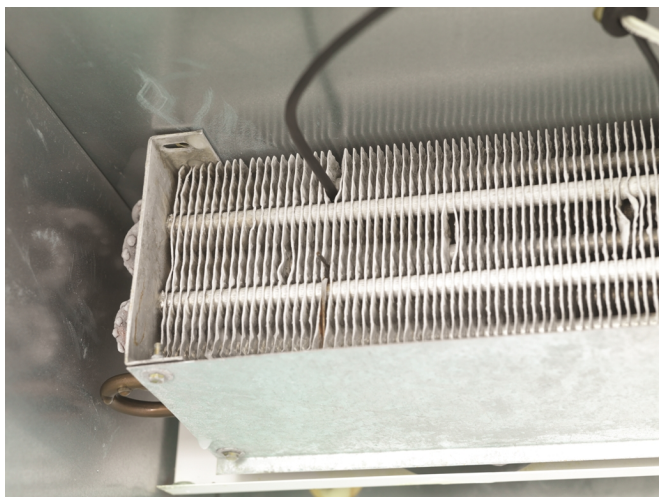
To help place the appliance sensor, the parameter calibration 1 (**CA1**) defines an offset temperature.

- See "calibration 1 (CA1)" on page 68

3.2 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.

3.3 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.

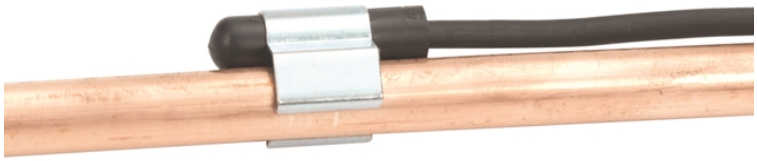
3.3.1 condenser sensor

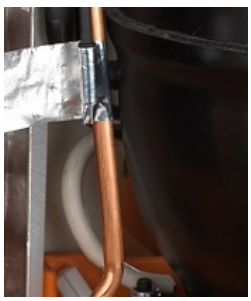
ems controllers can generate alarms if the refrigeration system temperature rises too high.
The value of the high temperature is set by measuring the refrigeration system temperature, when the condenser is approximately 75% blocked. The temperature is then set as the value of the condenser high temperature (**Ht**) parameter.

- See "condenser high temperature (Ht)" on page 73

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

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

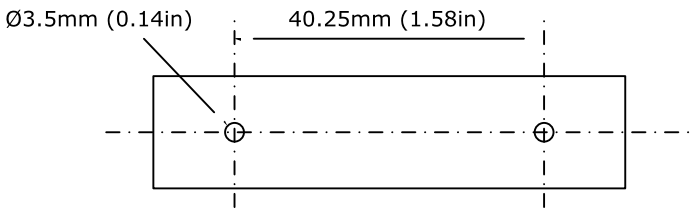
Door switches are usually mounted with the door switch on the cooler and the activator on the door.
Door switches and activators must be fixed using counter sunk screws or bolts with the following characteristics:

- 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 ($0.37lb_f ft$).

Caution:

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

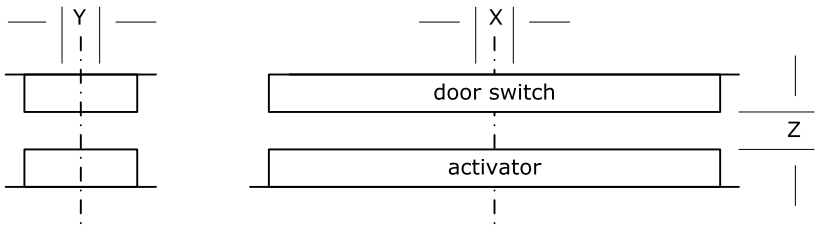


The alignment of the door switch and activator is critical for the correct operation of the door switch. The following table details alignment tolerances.

	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

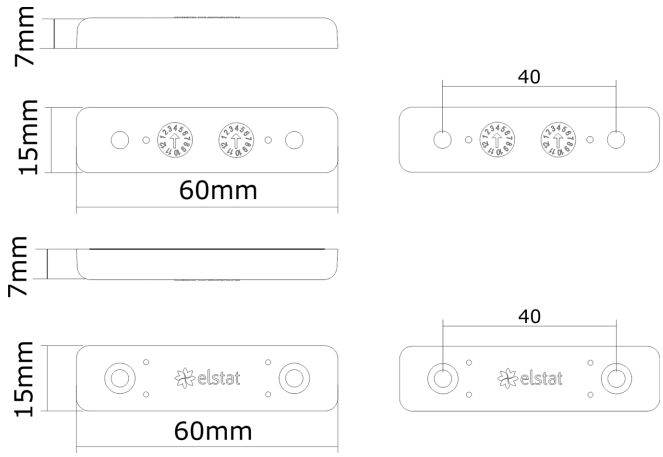
Door switches are usually mounted with the door switch on the cooler and the activator on the door. Door switches and activators must be fixed using counter sunk screws or bolts with the following characteristics:

- 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$_f$ft).

Caution:

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

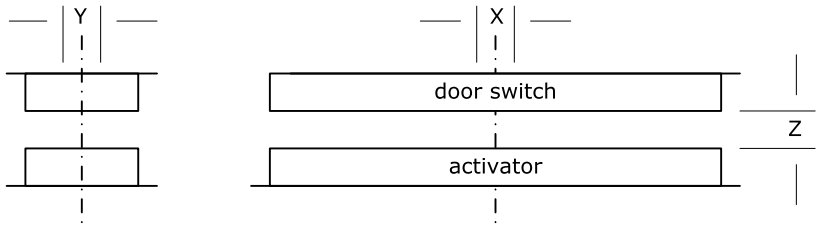


The alignment of the door switch and activator is critical for the correct operation of the door switch. The table below details the alignment tolerances.

	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.
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.

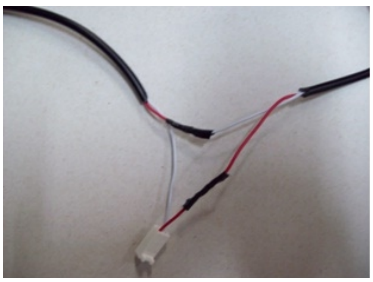
4.3 how to mount door switches on double-door coolers

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.



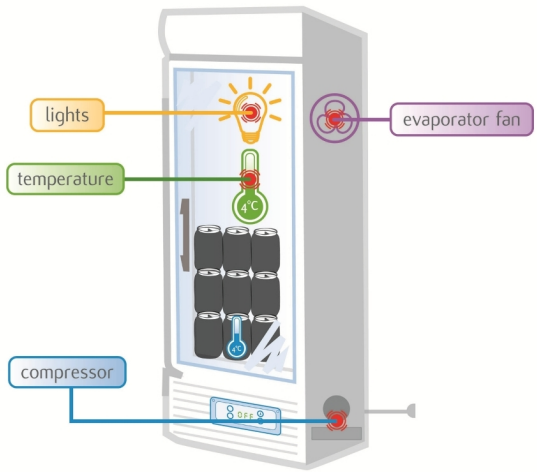
5 ems controllers functionality

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 68

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

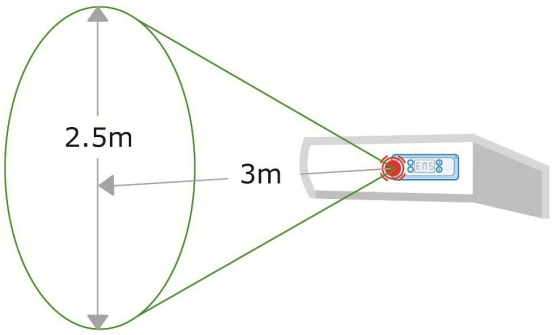
- See "Celsius or Fahrenheit (CF)" on page 69

5.2 activity

ems controllers measure the activity to determine when outlets are open. Activity is people opening the door of the cooler to get products and people passing in front of the cooler.

- ems controllers use a door switch to detect people opening the cooler door.
- ems controllers use a motion sensor to detect people moving in front of the cooler. The motion sensor is a passive infrared device.

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

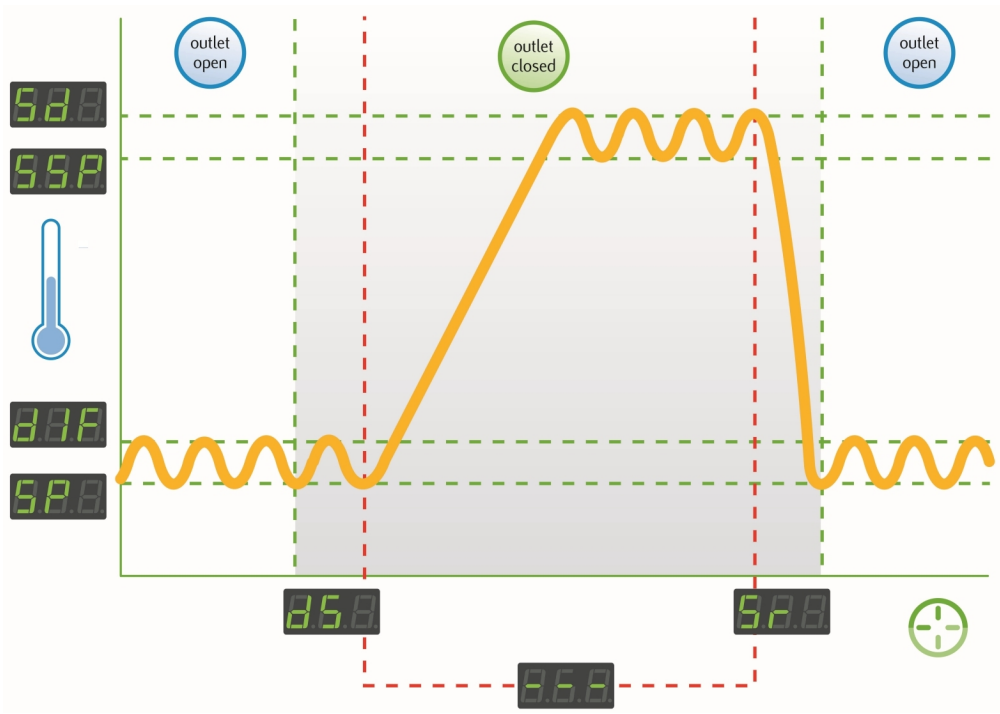


Note: ems controllers must be able to detect activity to work correctly. Therefore, blocking the view of the motion sensor with, for example, a box of soft drinks could result in the ems controller thinking that the outlet is closed.

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.

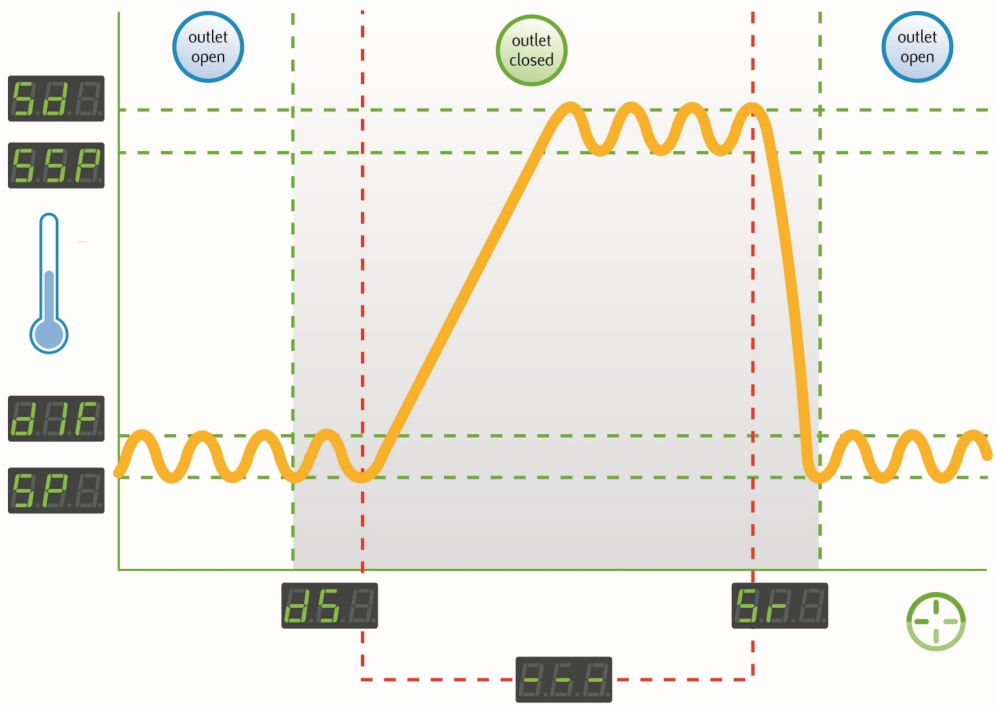
At the end of the *ready mode*, ems controllers switch to the *saving mode*. However, the delay to saving (**dS**) parameter can delay the switch to the saving mode. The delay helps ensure that, for example, the ems controller remains in the *ready mode* during periods without activity immediately prior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

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

- See "display stability (d2)" on page 69
- See "differential (dIF)" on page 70
- See "display (dIS)" on page 71
- See "delay to saving (dS)" on page 71
- See "set point (SPC or SPF)" on page 76

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*:

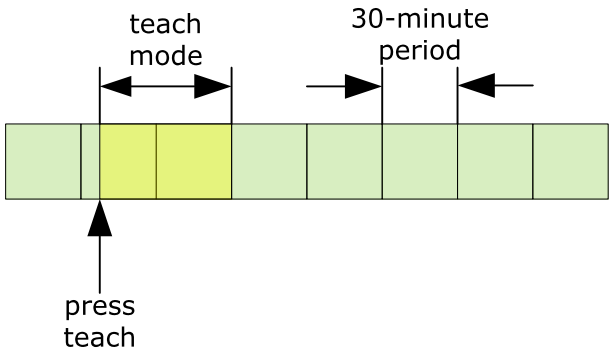
- See "saving temperature disable (PEr)" on page 74
- See "saving differential (Sd)" on page 75
- See "saving restart period (Sr)" on page 76
- See "saving set point (SSP)" on page 76

5.5 teach

Note: ems25 and ems25^{+} only.

The teach function enables outlet operators to manually set the controller to the saving mode. Teach aims to stop outlet operators switching off coolers.

Teach switches ems controllers to the saving mode for up to one hour (two 30-minutes of the self-learning matrix). If teach is initiated midway through a 30-minute period. Teach will be time left within the current 30-minute period plus the following 30 minute period. Therefore, the teach period ranges from approximately 31 minutes to the 60 minutes.



On entering the teach mode, ems controllers stop cooling by not running the compressor allowing the product to start to rise towards the saving mode temperature. At the end of the one hour period, ems controllers return to the saving mode or ready mode as defined by the self-learning matrix.

During the one-hour teach period, the motion sensor input is disabled and the controller does not detect motion. Therefore, any movement in front of the cooler will not result in ems controllers switching the cooler lights on. However, opening the cooler door or pressing the up button returns the controller to the ready or saving mode as defined by the self-learning matrix.

The teach function does not directly affect the self-learning matrix. However, as the motion sensor is disabled, ems controllers will register periods without activity. Therefore, if the teach is pressed at the same time the following week, ems controllers will automatically switch to the saving mode for this period.

5.6 teach

Note: ems25 and ems25^{+} only.

The teach function enables outlet operators to manually set the ems controller to the saving mode.

Note:

- Elstat recommends that outlet operators do not manually switch ems controllers to the saving mode. This functionality aims to stop outlet operators switching off coolers.

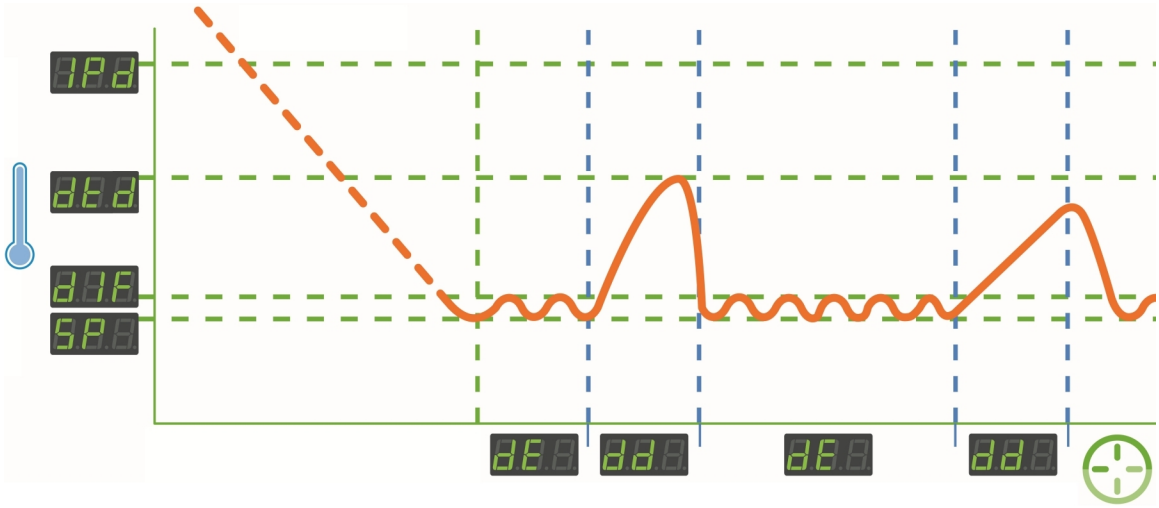
To manually set the ems controller to the saving mode, press the teach button and hold for 5 seconds.

To bring the cooler out of the saving mode during a teach period, press the up button and hold for 5 seconds.

5.7 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 (**dtd**).

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

- See "defrost duration (dd)" on page 70
- See "defrost interval (dE)" on page 70
- See "defrost termination temperature (dtd)" on page 71

5.8 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 (**dtt**) 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 (**dtt**) 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 70
- See "freeze-up protection (dtt)" on page 72

5.9 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 ems55*advanced* 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 69
- See "differential (dIF)" on page 70
- See "compressor rest time (rt)" on page 75
- See "set point (SPC or SPF)" on page 76
- See "saving set point (SSP)" on page 76

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

5.10 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 67
- See "lights delay (Ld)" on page 74

5.11 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 68

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* whist 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 74

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:

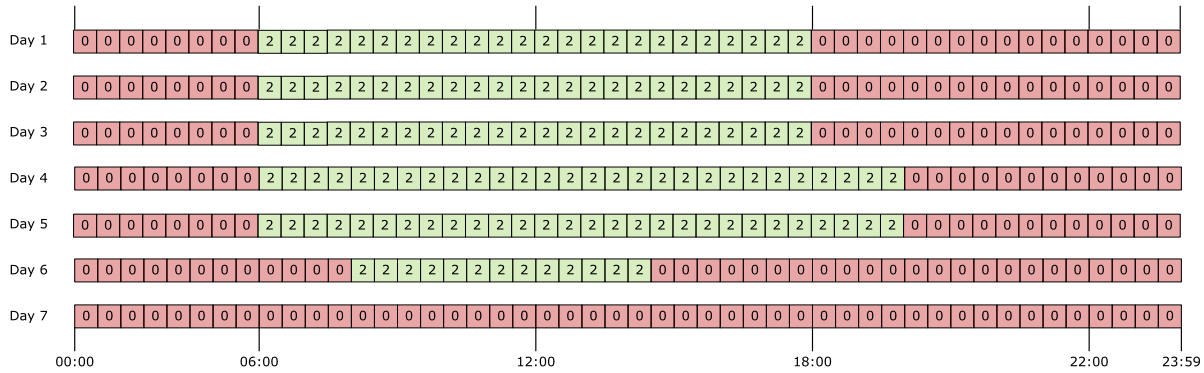
- 0 indicates no activity: ems controllers normally run in the *saving mode*.
- 1 indicates a change in activity: ems controllers run in the *ready mode*.
- 2 indicates activity: ems controller run in the *ready mode*.

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:

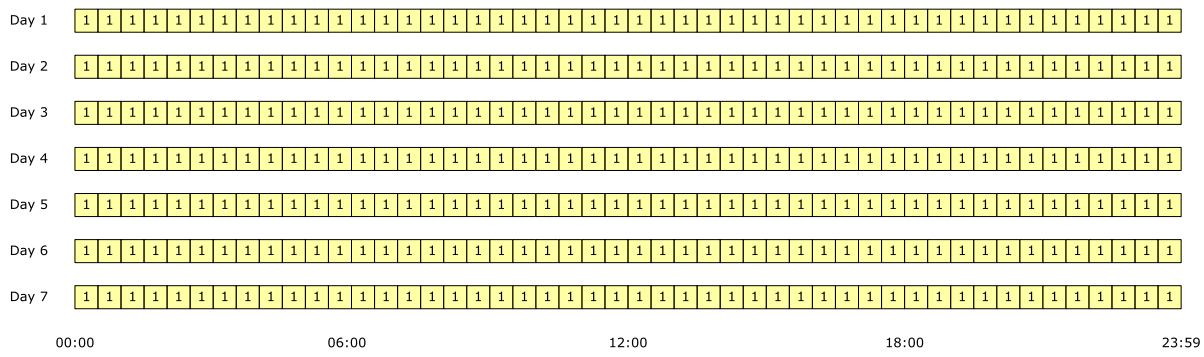
- The self-learning matrix starts the moment the ems controller is first switched on and is not synchronized with calendar days. However, the diagram below starts at 00:00 on Day 1 for clarity.



6.2 how a 7-day learning period works

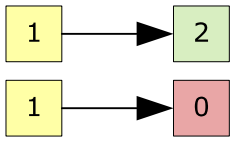
ems controllers with a seven day learning period, **LP** set to 1, run in the *ready mode* for 7 days (7 x 24 hours), whilst the ems controller learns the outlet activity pattern such as opening and closing times.

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 update the self-learning matrix depending on how much activity is detected in each 30 minute period as follows:

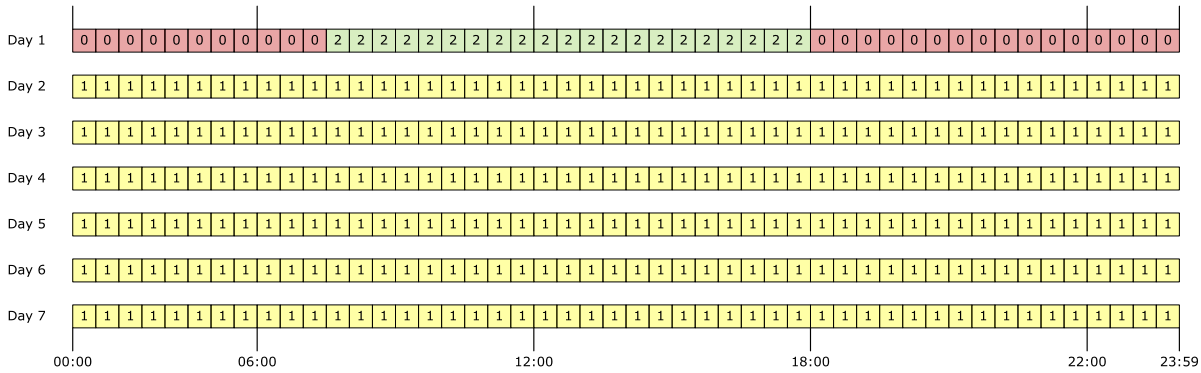
- if the ems controller detects activity during a 30 minute period, the ems controller changes the state from monitor (1) to ready (2)
- if the ems controller does not detect activity, the ems controllers changes the state from monitor (1) to saving (0).



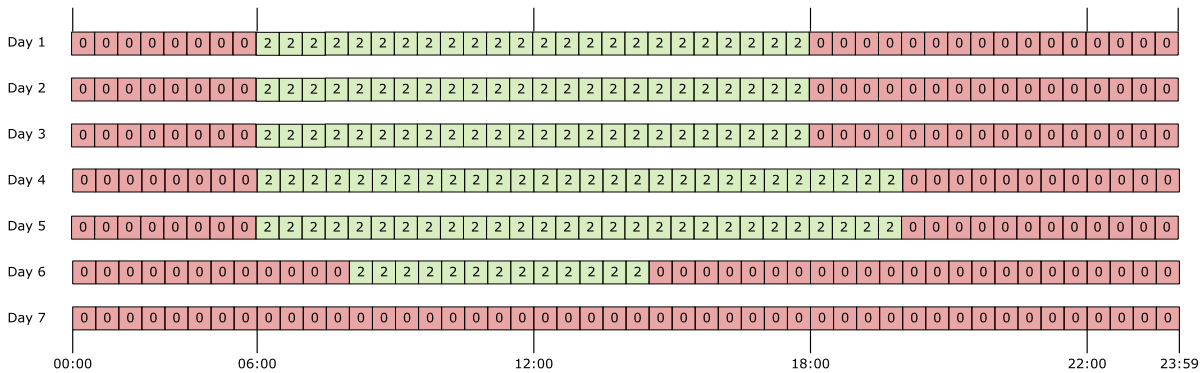
Note:

- The amount of activity required to change the state from monitor (1) to ready (2)depends on the setting of the activity frequency (**AF**) parameter.

Therefore, at the end of day 1 (first 24 hours), the ems controller has set all the 30 minutes to ready (2) or saving (0) depending the outlet activity pattern as shown in the following example matrix:



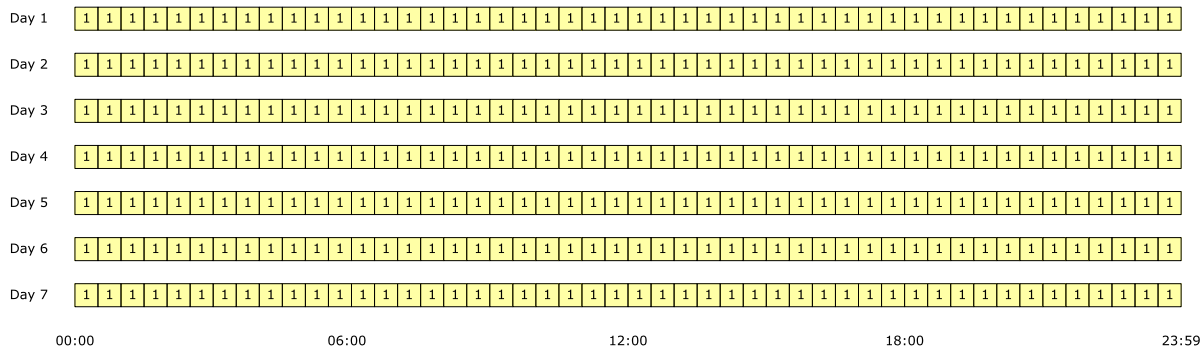
The ems controller then continues to run in the *ready mode* for the remainder of the 7 day learning period whilst updating the self-learning matrix.
At the end of the 7 day learning period, the ems controller has a complete self-learning matrix as shown in the following example matrix:



6.3 how a 1-day learning period works

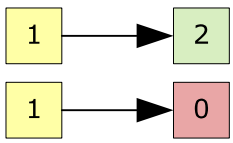
ems controllers with a one day learning period, **LP** set to 0, run in the *ready mode* for 1 day, (24 hours), whilst the ems controller learns the outlet activity pattern such as opening and closing times.

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 update the self-learning matrix depending on how much activity is detected in each 30 minute period as follows:

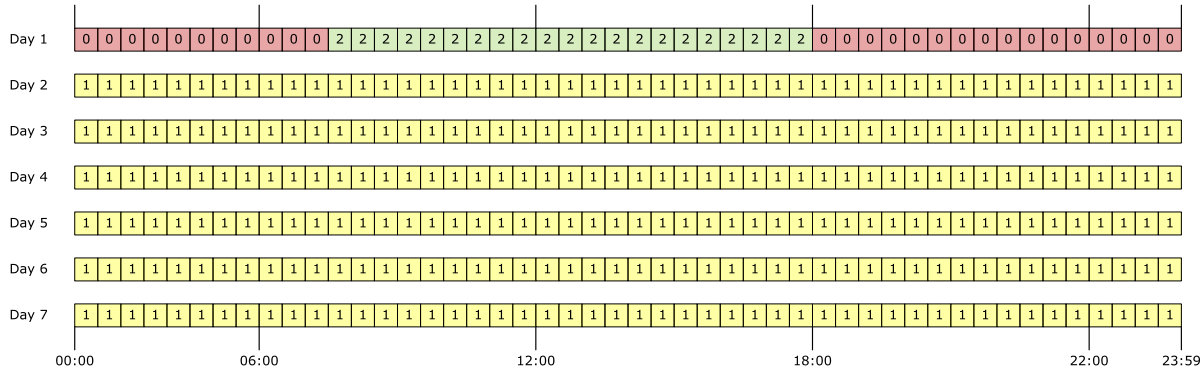
- if the ems controller detects activity during a 30 minute period, the ems controller changes the state from monitor (1) to ready (2)
- if the ems controller does not detect activity, the ems controllers changes the state from monitor (1) to saving (0).



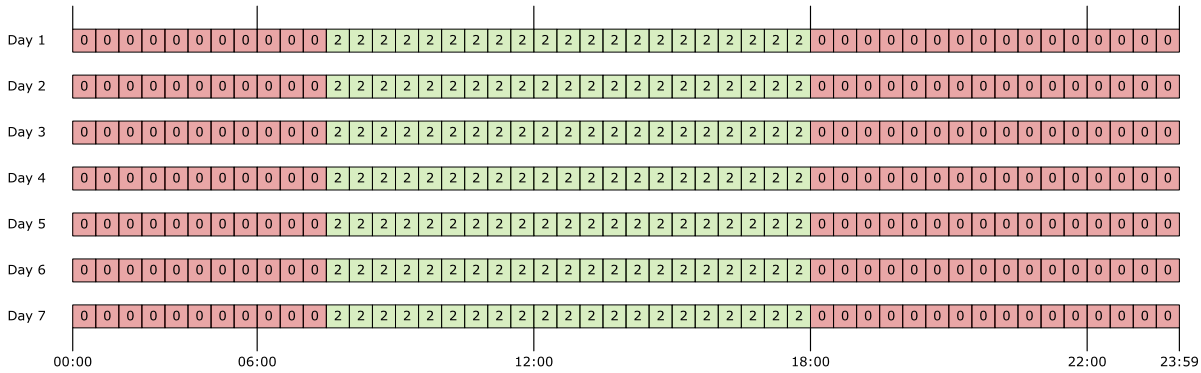
Note:

- The amount of activity required to change the state from monitor (1) to ready (2) depends on the setting of the activity frequency (**AF**) parameter.

Therefore, at the end of day 1, (first 24 hours), the ems controller has set all the 30 minutes to ready (2) or saving (0) depending the outlet activity pattern as shown in the example matrix:

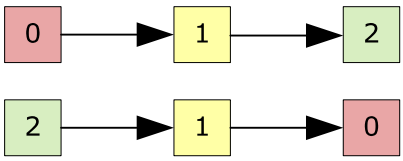


ems controllers then copy the pattern learnt from day 1 to the *remaining six days* of the self-learning matrix, as shown in the following example matrix:

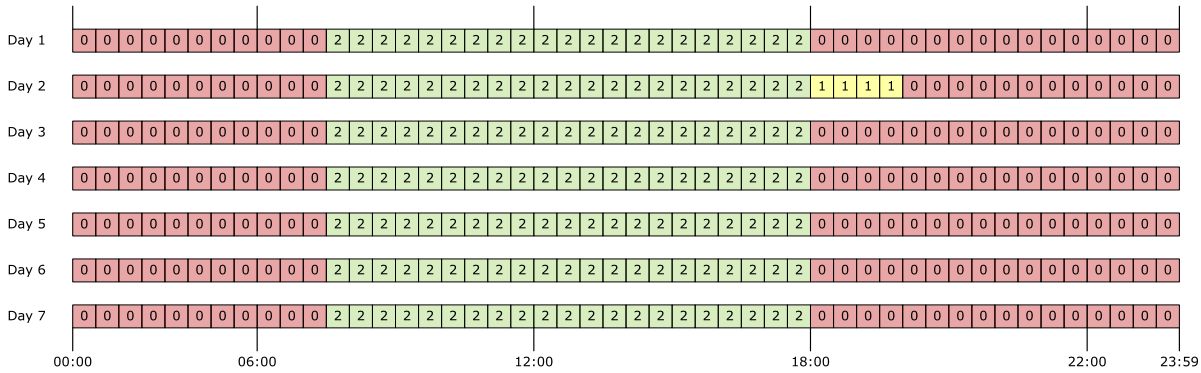


ems controllers with a one day learning period start switching to the *saving mode* on the second day, (second 24 hours), if there are sufficient saving (0) periods.
ems controller then continue to update the self-learning matrix as follows:

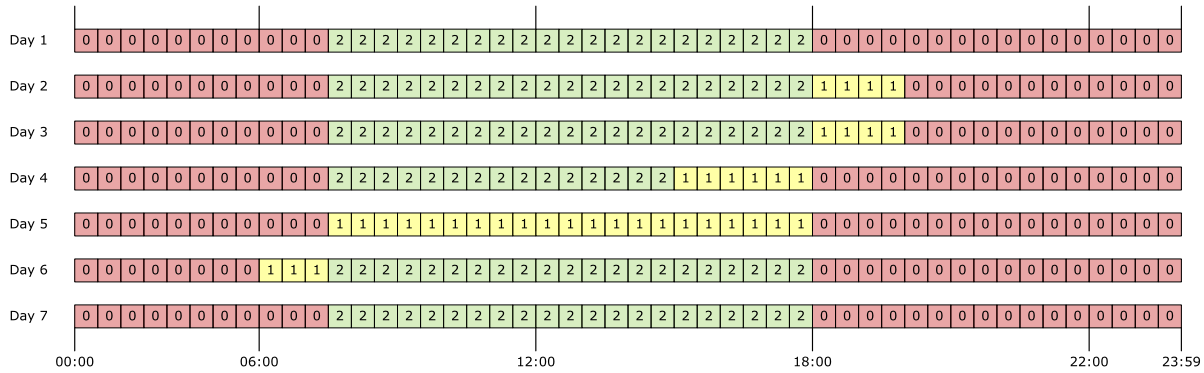
- For periods set to ready (2), if no activity is detected change to monitor (1). Otherwise, keep the period set to ready (2).
- For periods set to saving (0), if activity is detected change to monitor (1). Otherwise, keep the period set to monitor (0).



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.



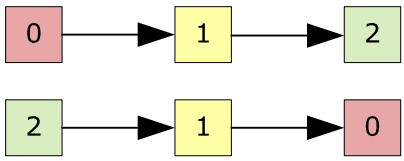
At the end of week 1, the ems controller has updated the self-learning matrix for the outlet activity pattern as shown below. Note that differences for activity patterns learnt on day 2 take two weeks to be implemented. Therefore, 1 day learning periods are recommended only for outlets with regular patterns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



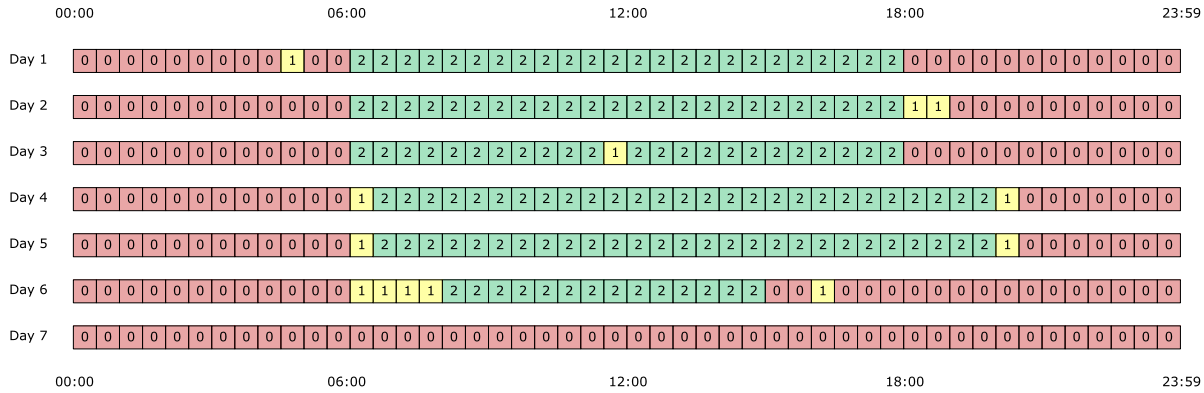
6.4 how the self-learning matrix updates after the learning period

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:

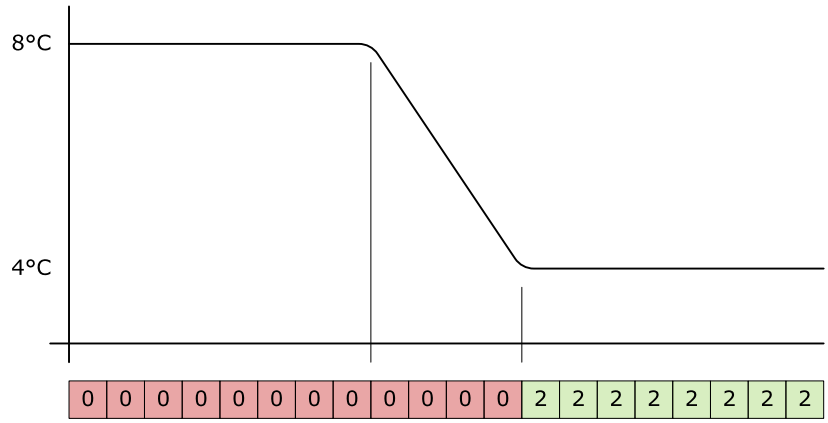
- If activity occurs in a saving period (0), such as a motion detection or a door opening, the ems controller switches the cooler lights **on** and sets the period to monitor (1).
  However, the ems controller does not start the compressor to cool the product.

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

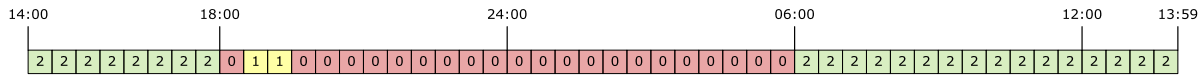
from the *saving mode* temperature.
A typical saving restart period is 120 minutes.

Whist in the *saving mode*, the ems controller must look ahead in the self-learning matrix for a ready period by the time defined by the saving restart period (**Sr**). For example, the ems controller looks 2 hours ahead.
If the ems controller detects an ready period, the ems controller starts to lower the product temperature, as shown below.



The ems controller switches to the *saving mode* if there are no ready periods within the next 2 hours as defined by the saving restart time (**Sr**).
The ems controller ignores periods of inactivity if the time to the next active period is less than the saving restart time.

For example, the diagram below shows a period of inactivity, saving (0) at 18:00 followed by two monitor (1) periods. In this instance, the ems controller would ignore the saving (0) at 18:00 and switch to the saving mode at 19:30.



Note:

- ems controllers always run in the *ready mode* for periods in the self-learning matrix that are set to 1 (monitor) or 2 (ready).

In the following example matrix, the ems controller will start to cool by the saving restart period before the ready period (2), run in the ready mode for 30 minutes, and then switch to the *saving mode* (assuming no delay to saving **ds**parameter is in operation).

For more information about the parameters used:

- See "delay to saving (dS)" on page 71
- See "saving restart period (Sr)" on page 76

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 *saving mode*. The marketing mode (**Ar**) keeps the lights on for the duration of the *saving mode*.

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 access the menu

Access the ems controller menu 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.

The table below describes the ems controller menus. Use the **down** button to scroll through the menu.

menu	display	description
parameter list		Displays the parameters and the parameter values.
test routine		Enters the test routine that tests the relays, temperature sensors, door switch, and motion sensor.
faults		Displays the last three faults (alarms). See "how to view the last three alarms (FLt)" on page 43
half reset		Clears the self-learning matrix. See "how to perform a half reset (Hr)" on page 42

full reset		elstat use only.
data dump		elstat use only.

7.5 how to view the ems25^{+} parameter settings (PS)

View the parameter settings to check the values of the parameters 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 **set** button pressed to scroll through the parameter settings.

	See "Celsius or Fahrenheit (CF)" on page 69		See "defrost duration (dd)" on page 70
 	See "set point (SPC or SPF)" on page 76		See "display stability (d2)" on page 69
	See "differential (dIF)" on page 70		See "buzzer enable (b0)" on page 68
	See "calibration 1 (CA1)" on page 68		See "buzzer duration (b1)" on page 68
	See "saving set point (SSP)" on page 76		See "alarm delay (Ad)" on page 66
	See "saving differential (Sd)" on page 75		See "activity frequency (AF)" on page 67
	See "freeze-up protection (dtt)" on page 72		See "motion sensor enable (Sn)" on page 75

	See "defrost termination temperature (dtd)" on page 71		See "saving temperature disable (PEr)" on page 74
	See "compressor rest time (rt)" on page 75		See "learning period (LP)" on page 74
	See "delay to saving (dS)" on page 71		See "display (dIS)" on page 71
	See "lights delay (Ld)" on page 74		See "marketing mode (Ar)" on page 67
	See "saving restart period (Sr)" on page 76		
	See "refrigeration system failure (Ct)" on page 69		
	See "defrost interval (dE)" on page 70		

7.6 how to view the ems25*advanced* parameter settings (PS)

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 **set** button pressed to scroll through the parameter settings.

	See "Celsius or Fahrenheit (CF)" on page 69		See "defrost interval (dE)" on page 70
	See "set point (SPC or SPF)" on page 76		See "defrost duration (dd)" on page 70

			
	See "differential (dIF)" on page 70		See "fan cycle on (FCO)" on page 72
	See "calibration 1 (CA1)" on page 68		See "fan cycle off (FCF)" on page 72
	See "saving set point (SSP)" on page 76		See "display stability (d2)" on page 69
	See "saving differential (Sd)" on page 75		See "buzzer enable (b0)" on page 68
	See "freeze-up protection (dtt)" on page 72		See "buzzer duration (b1)" on page 68
	See "fan set point (FSP)" on page 73		See "alarm delay (Ad)" on page 66
	See "condenser high temperature (Ht)" on page 73		See "activity frequency (AF)" on page 67
	See "defrost termination temperature (dtd)" on page 71		See "motion sensor enable (Sn)" on page 75
	See "compressor rest time (rt)" on page 75		See "saving temperature disable (PEr)" on page 74
	See "delay to saving (dS)" on page 71		See "learning period (LP)" on page 74
	See "lights delay (Ld)" on page 74		See "display (dIS)" on page 71
	See "saving restart period (Sr)" on page 76		See "marketing mode (Ar)" on page 67
	See "refrigeration system failure (Ct)" on page 69		

7.7 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.

7.8 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.

7.9 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.

7.10 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.

7.11 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

display	statistic	description prior to July 2012	description post July 2012
	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 hour periods). Note that the average is moving average.	Total number of motion counts since first powered up or last full reset
	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 = Stanby temperature disable is switched on.	No changes

8 troubleshooting

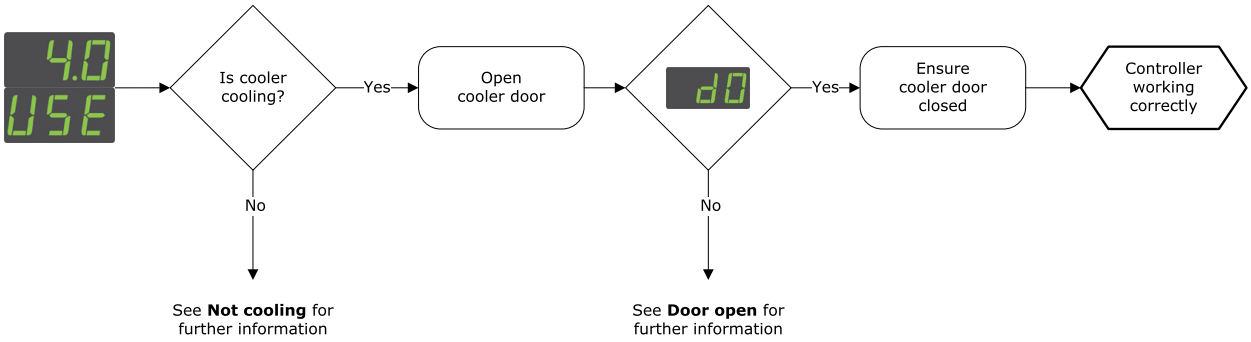
The following table shows the display for alarm conditions. ems controllers can be programmed to sound a buzzer with alarm conditions.

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 71

8.2 how to troubleshoot condenser high temperature (Ht) alarms

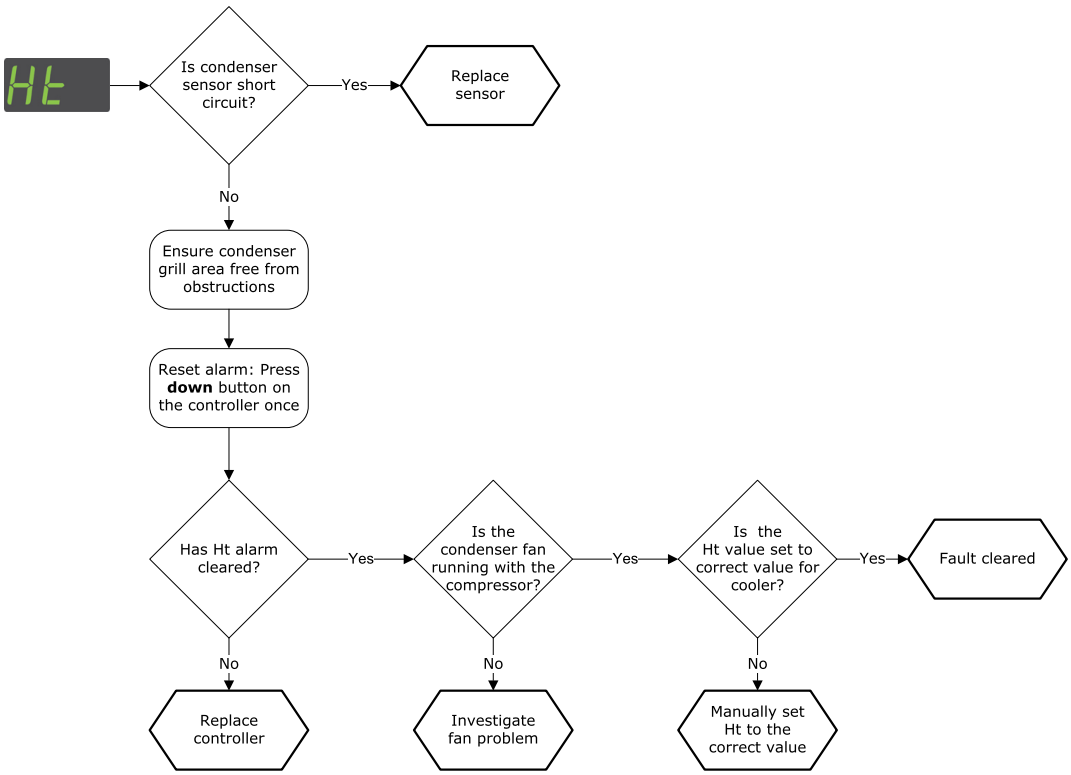
Condenser high temperature (Ht) alert to problems with the refrigeration system such as a blocked condenser or faulty condenser fan.

Note: this alarm is not applicable with CO2 coolers and the ems55*advanced* CO2.

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

- See "condenser high temperature (Ht)" on page 73

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



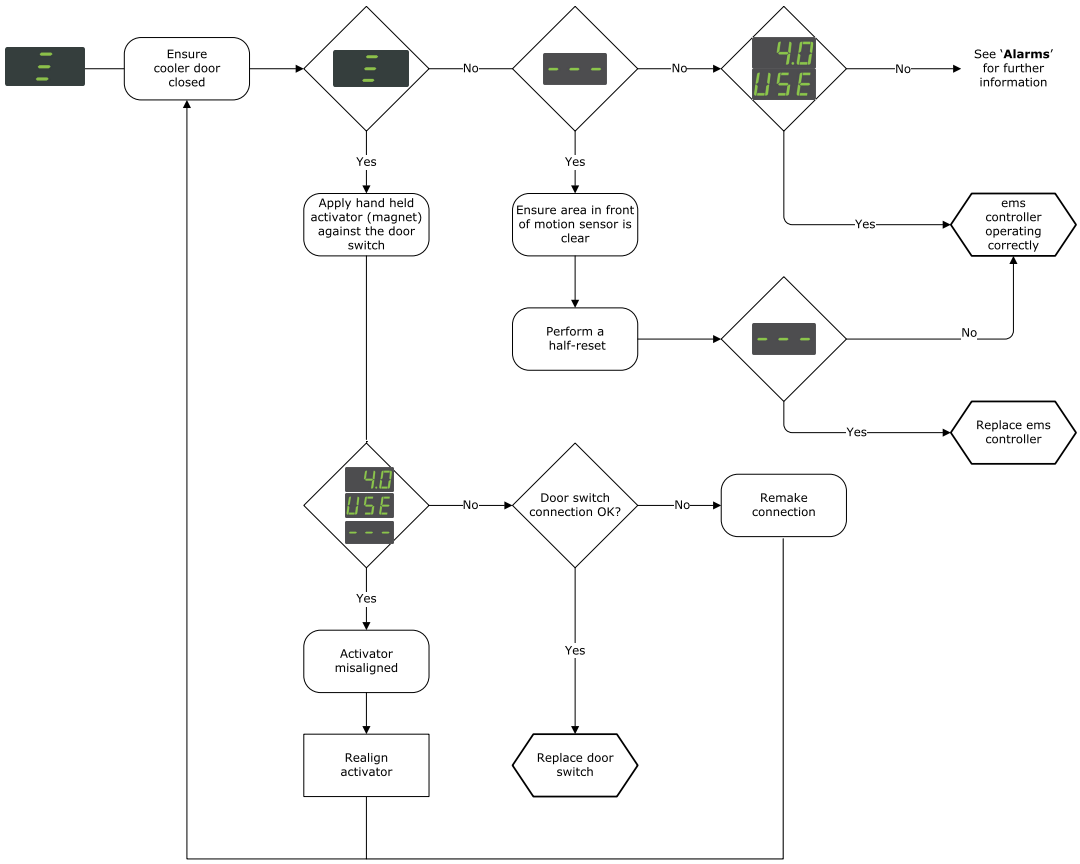
8.3 how to troubleshoot door alarms (door switch fitted)

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 66

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



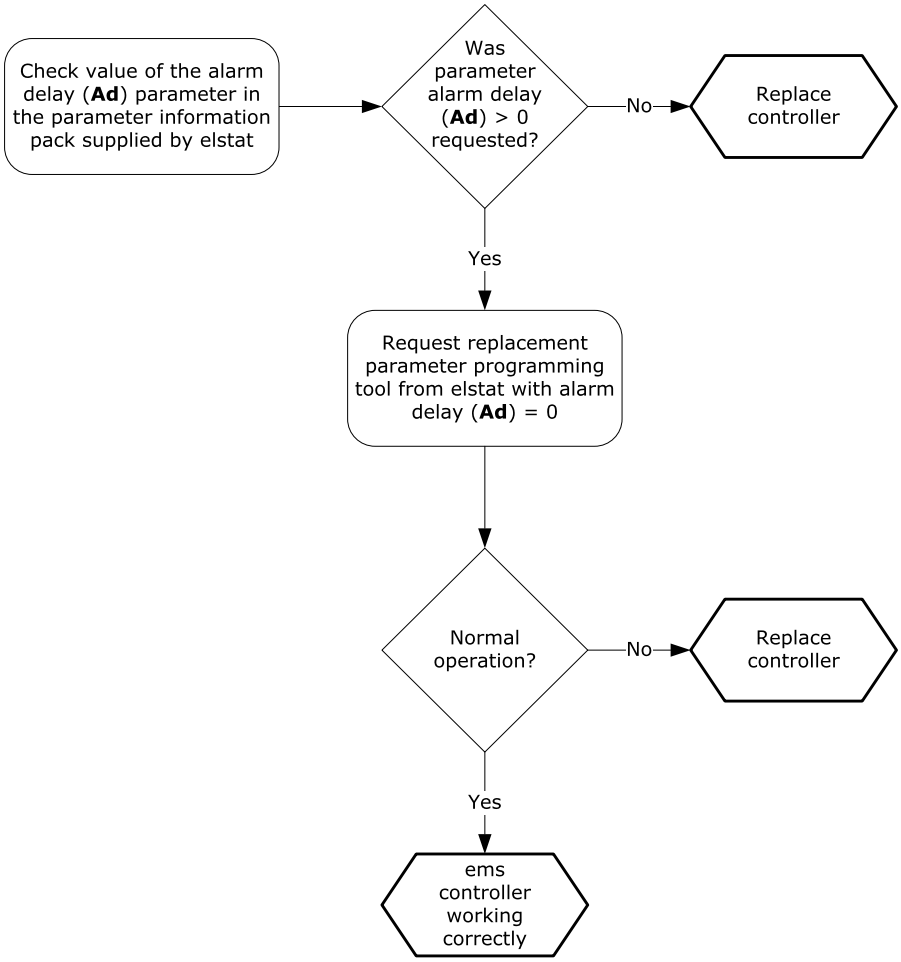
8.4 how to troubleshoot door alarms (no door switch fitted)

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 66

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.

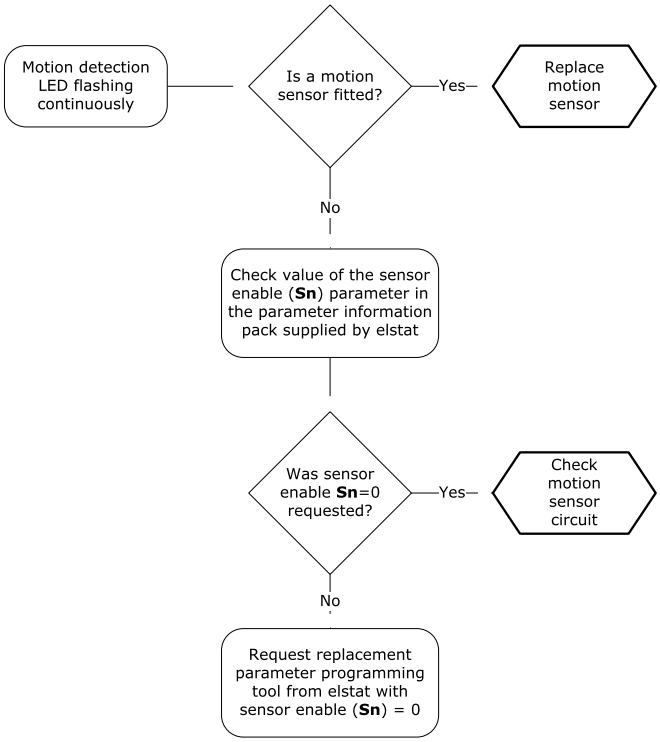
Note:

- 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 75

Follow the chart to troubleshoot problems with the motion sensor.



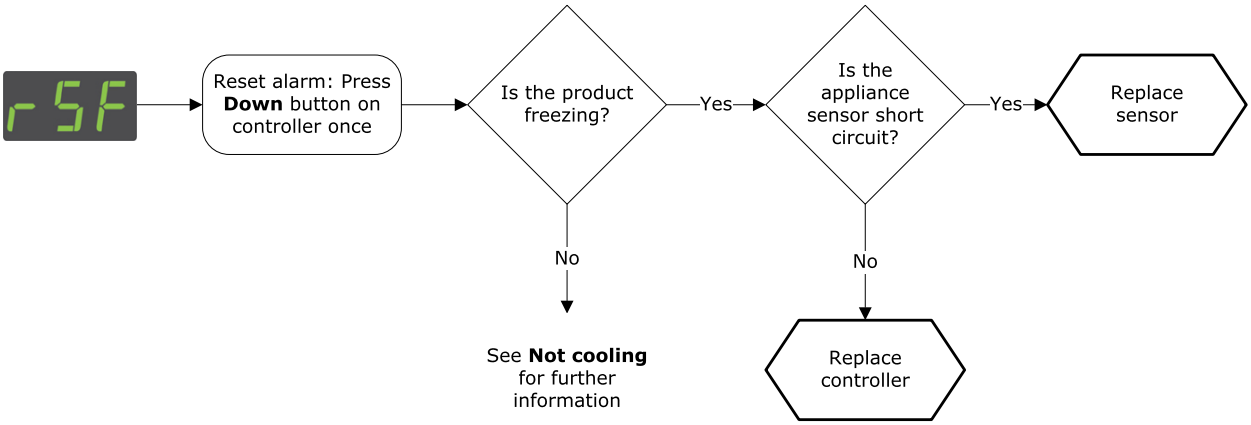
8.6 how to troubleshoot refrigeration system failure (rSF) alarms

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 69
- See "set point (SPC or SPF)" on page 76

Follow the chart to troubleshoot refrigeration system failures.



8.7 how to troubleshoot temperature sensor alarms

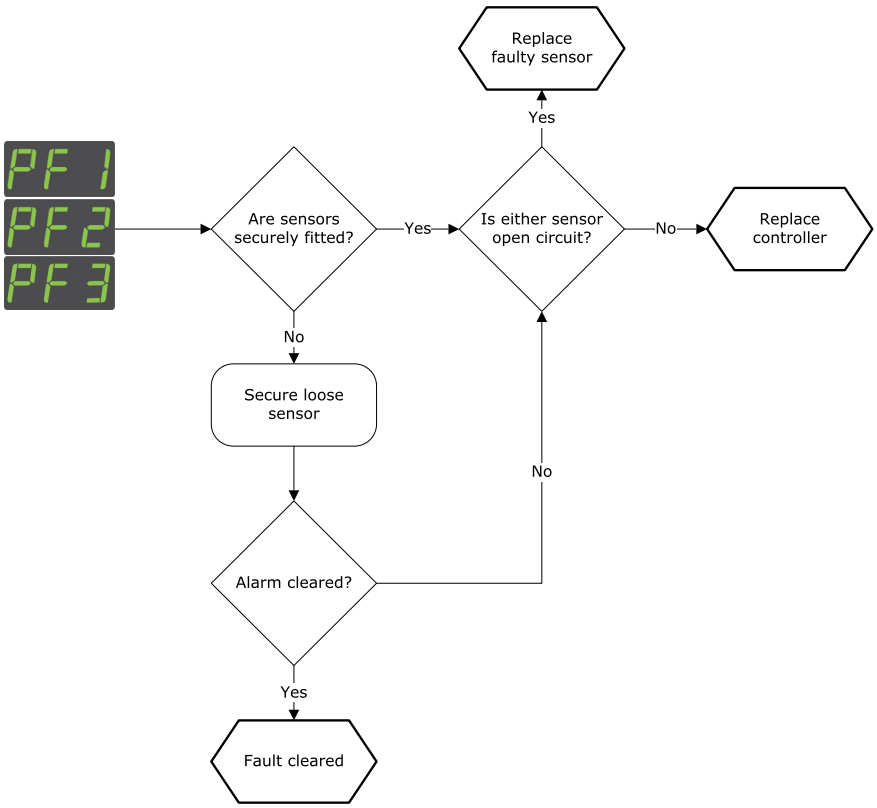
ems controllers manage sensor failures as follows:

- **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: ems55*advanced* 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:

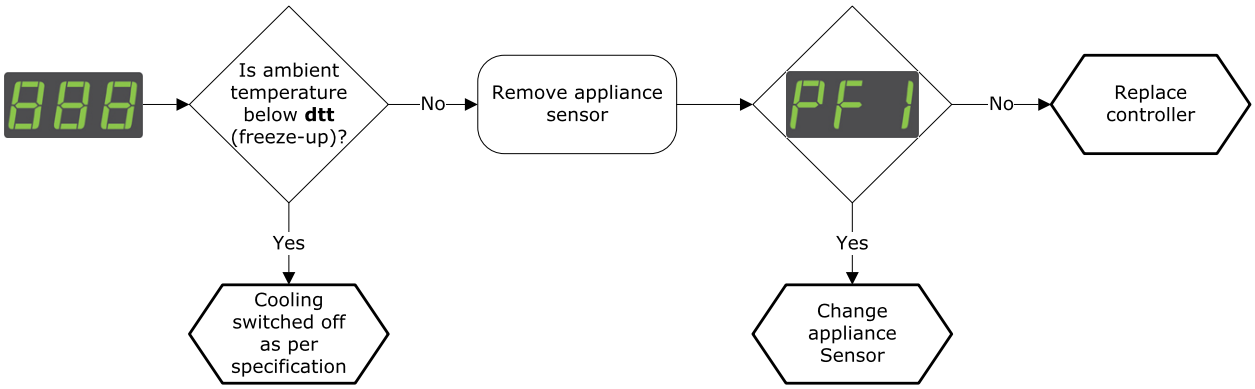
- See "how to run the test routine (tst)" on page 40

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.

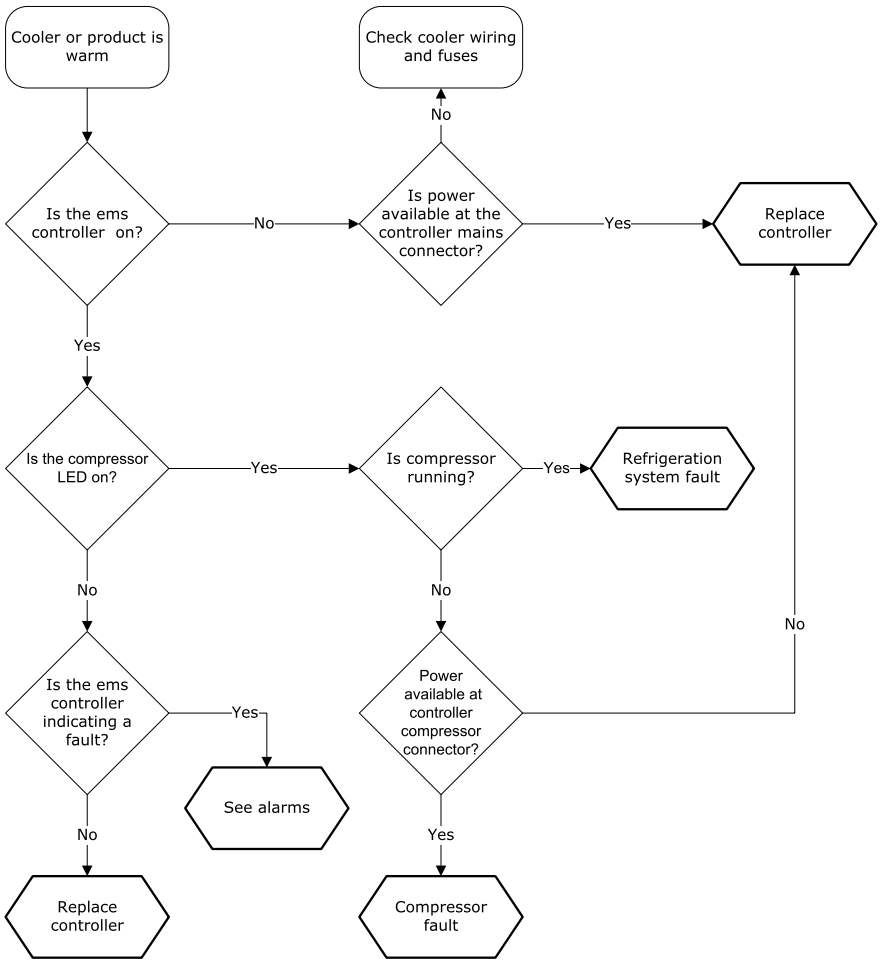


For information about the freeze-up protection **(dtt)** parameter:

- See "freeze-up protection (dtt)" on page 72

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
ems25*advanced*	EMS25ADV-CCCC-NNNNN-XXXXX
ems55*advanced*	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*advanced* with firmware version E52 F07. 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*advanced* with firmware version E52 F07. Displayed after *manually* 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:

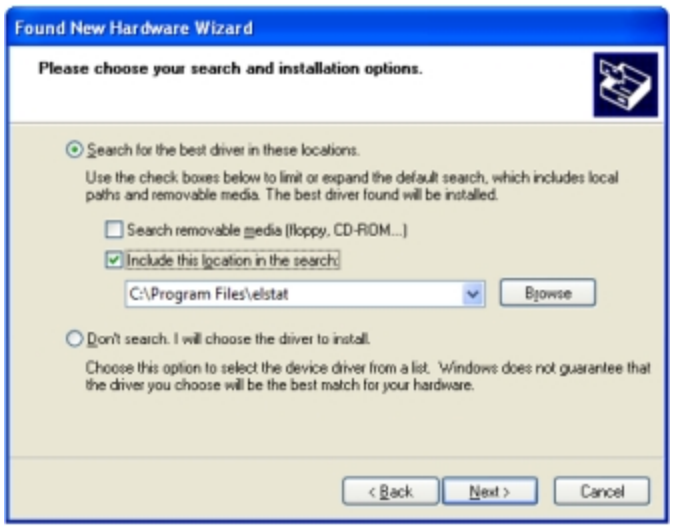
- Windows 7 and Windows Vista: Drivers install automatically by connecting the USB docking cradle

For Windows XP, install the drivers as follows:

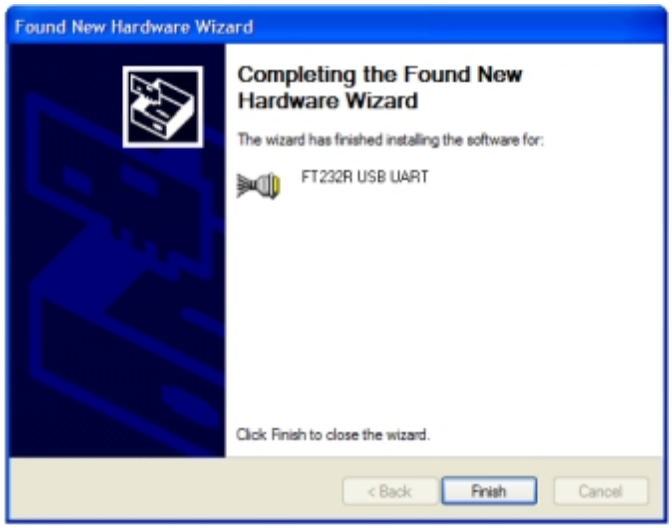
1. Extract the ZIP file CDM20808.zip- from the files supplied by elstat which contain the Windows drivers for Windows XP - and save into a suitable location.
   For example, C:\Program Files\elstat\drivers.
2. Insert the USB docking cradle into a spare USB port and ensure that the Windows New Hardware 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.



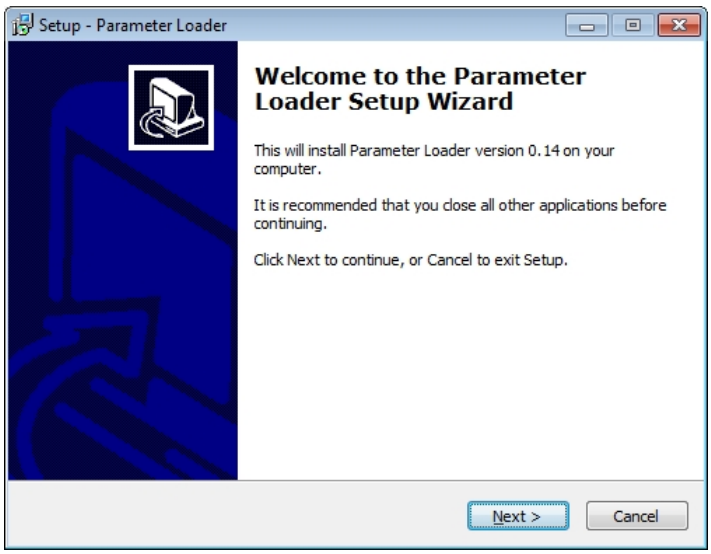
6. Once completed, click **Finish** to close the wizard.



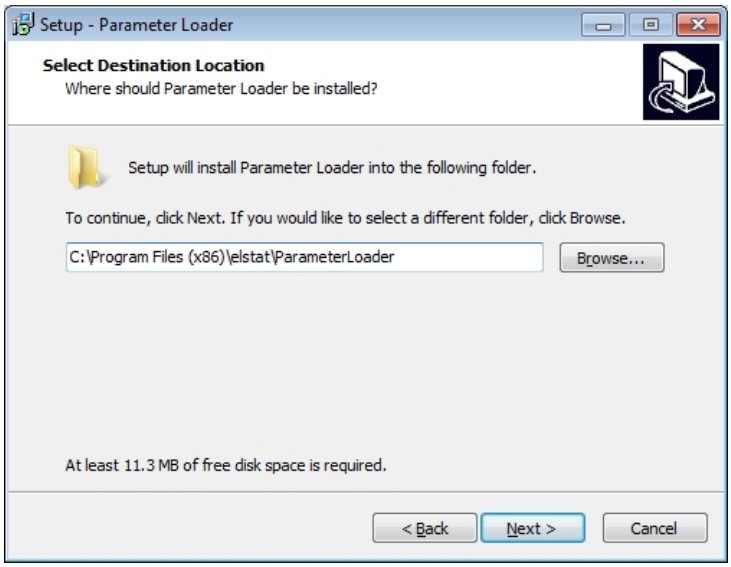
9.5 how to install the parameter loader

Install the parameter loader as follows:

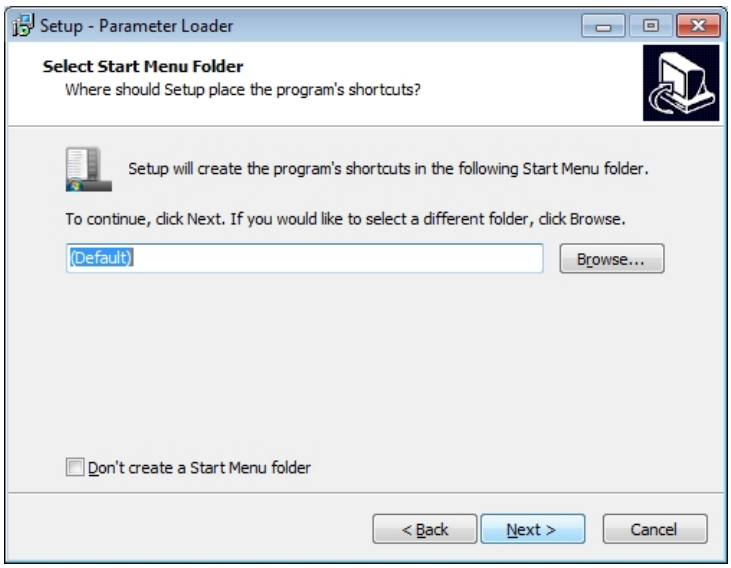
1. Copy the file Setup_ParameterLoader_Rx.x.exe, from the file - where Rx.x is the parameter loader version - to a suitable location on the local computer.
   Double-click the file Setup_ParameterLoader_Rx.x.exe to start in the setup wizard.
2. Click **Next** to start the installation wizard.



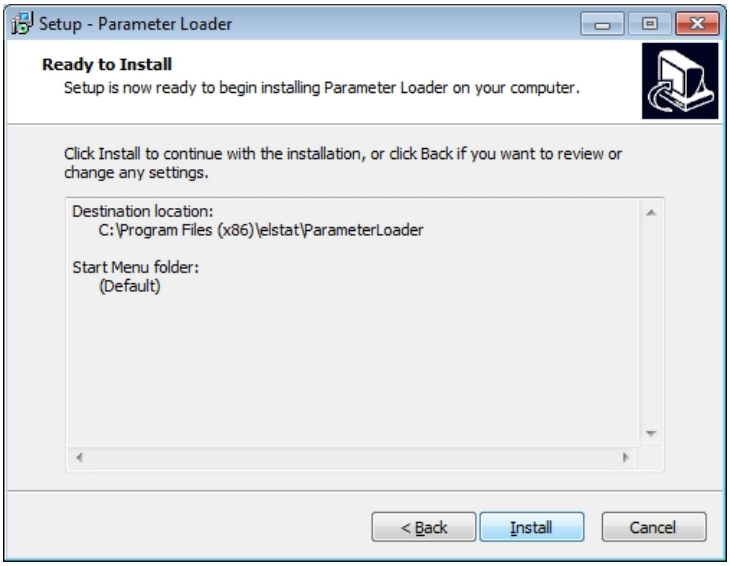
3. Select the destination location.
   Click **Next** to use the default location or click **Browse** to define a different location and then click **Next**.



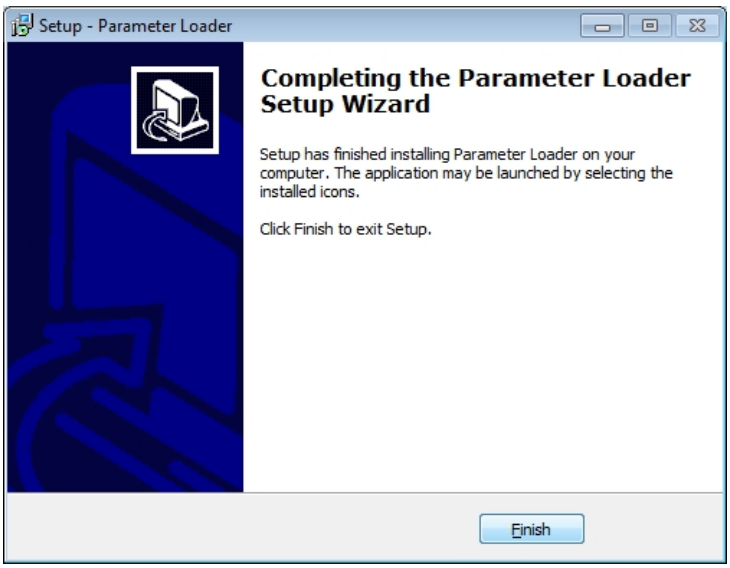
4. Select the **Start** menu folder.
   Click **Next** to use the default folder or click **Browse** to define a different folder and then click **Next**.



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



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

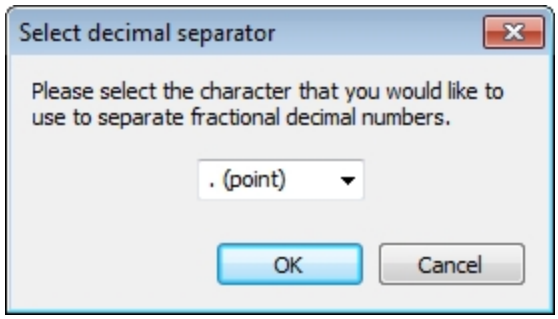


9.6 how to start the parameter loader

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:

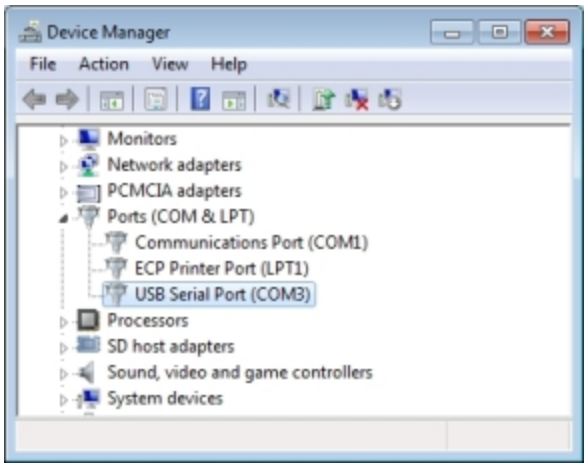
- Windows Vista and Windows 7 locate and install the drivers automatically. However, on Windows XP, install the drivers manually as described:
  - See "how to install the drivers on Windows XP" on page 55

Finally, define the COM port of the docking cradle.

9.8 how to configure the COM port

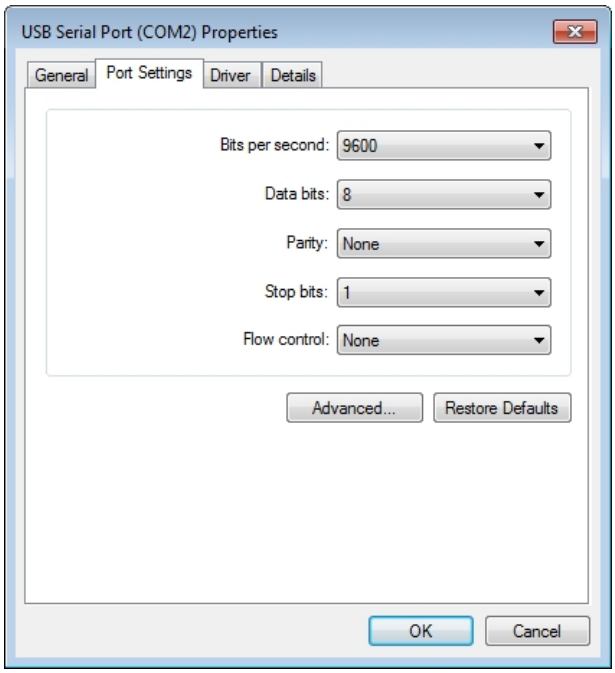
Configure the COM port as follows:

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.

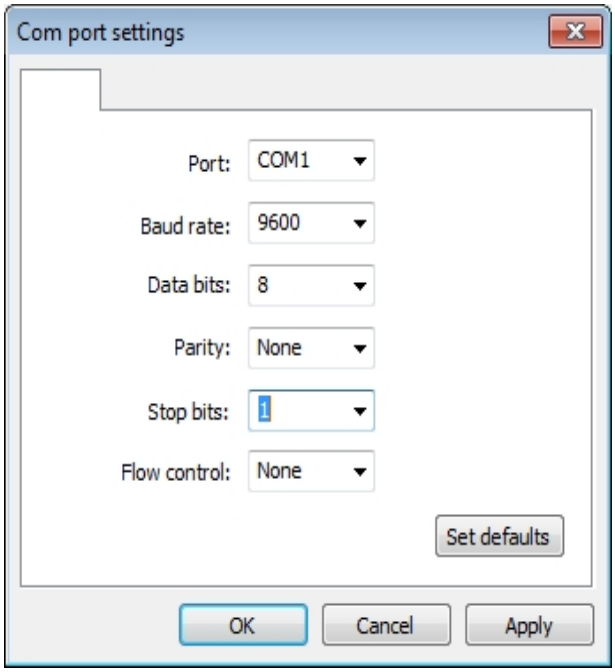


3. Check the COM port allocated to the USB docking cradle (USB Serial Port).
   For example, in the diagram above, COM3 has been allocated.

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:

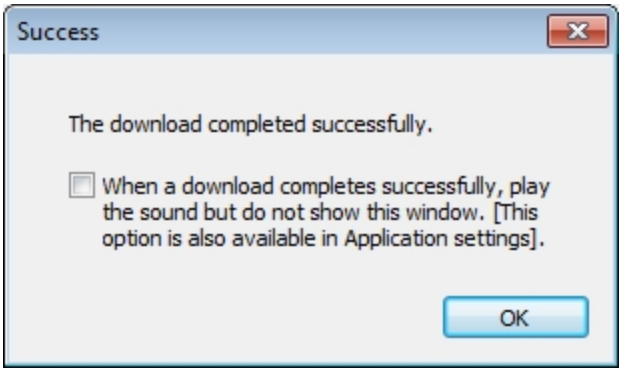
1. Extract the ZIP file from the folder which contains the parameter information pack and the parameter settings to a suitable location. For example, C:\Program Files\elstat.
2. Start the parameter loader as follows:
   - Click **Parameter Loader** in the **Start** menu.
   - Double-click the file ParameterLoader.exe.
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 ems55*advanced* with firmware version E52 F07. 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*advanced* with firmware version E52 F07. Displayed after *manually* 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).

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.



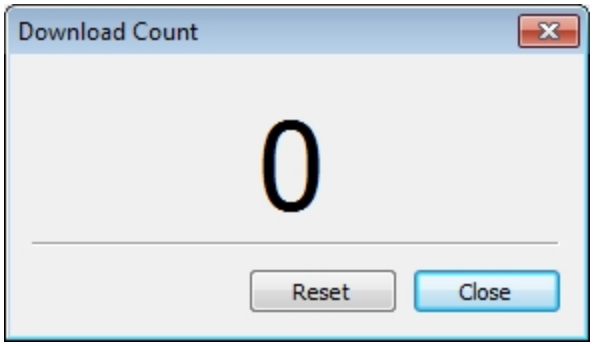
8. Remove the parameter programming tool from the USB docking cradle.

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.

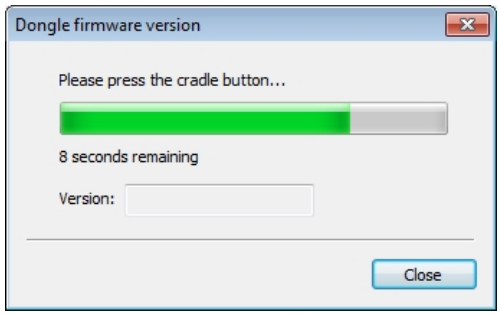
Note:The download counter window must be displayed to count.



9.11 how to view the 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.



3. Press and hold the button ^ on the USB docking cradle and then check that the version is displayed.

9.12 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.
	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**) *Not used on CO2 (R744) coolers*

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 (**dtd**) 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 (**dtt**) 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 temperature setting rules

For correct operation, the parameters that define the temperatures must not create conflicting conditions. For example, as the ems controller aims to keep the ready mode temperature between the set point (**SP**) temperature and the set point (**SP**) plus differential (**dIF**) temperature, the freeze-up protection (**dtt**) temperature must be lower than the set point (**SP**) temperature. Otherwise, the ems controller would activate freeze-up protection under normal operating conditions.

Rules for the temperature settings:

- **IPd** must be higher than **SSP** + **Sd**.
- **IPd** must be higher than **dtd**.
- **dtd** must be higher than **SP** + **dIF**.
- **SSP** must be higher than **SP** + **dIF**.
- **dtt** must be lower than **SP**.

10.4 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)

10.5 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.

10.6 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 coolers lights will remain **on** during *saving mode*.
considerations	Does not affect saving temperature. Made available to ems55*advanced* **GDC** firmware from June 2012. Not used with **OFC** firmware.
range	00 (off) or 01 (on)
global default	00 (off)

10.7 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)

10.8 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

10.9 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)

10.10 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 tem-

	perature 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 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

10.15 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)

10.16 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)

10.17 delay to saving (dS)

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

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

10.18 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 22ºC (23 to 71ºF)
global default	9.0ºC (48ºF) ems75sz: 15.0ºC (59ºF)

10.19 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 10ºC (5 to 50ºF)
global default	0.0ºC (32ºF) ems75sz: -6.0°C (21°F)

10.20 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

10.21 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

10.22 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 or the ems25^{+}
range	01 to 30°C (33 to 86°F)
global default	15°C (59°F)

10.23 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.

10.24 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 (**dtd**) temperature.
range	0.0 to 30ºC (32 to 86ºF)
global default	20ºC (68ºF)

10.25 lights delay (Ld)

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

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

10.26 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)

10.27 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 *ready mode* 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)

10.28 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

10.29 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 *saving mode*.
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)

10.30 motion sensor enable (Sn)

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

display	
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)

10.31 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 (**dtt**) 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)

10.32 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 *saving mode* 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

10.33 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 annexe I UL information

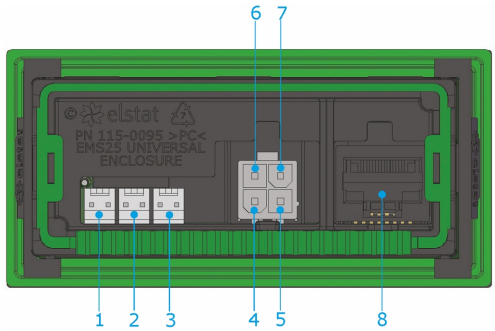
Note:

- This annexe applies to ems25+ controllers, 120VAC only

electrical ratings		
inputs		
control input item	**input rating**	**terminals**
supply	120VAC, 3VA, 50/60Hz	(L) line in (7) (N) neutral (5)
temperature sensor input	5Vdc, Limited Energy Circuit, 15W or less (class 2)	appliance sensor (3)
door / sensor input	5Vdc, Limited Energy Circuit, 15W or less (class 2)	condenser sensor (2)
auxiliary input	5Vdc, Limited Energy Circuit, 15W or less (class 2)	door switch (1)

outputs					
model	**type**	**rating**	**load type**	**cycles**	**terminal**
all models	compressor relay (K3)	6FLA / 36LRA 120VAC	motor	100K	(L) line in (7) compressor (6)
all models	lights relay (K2)	120VAC 250W	ballast	6K	(L) line in (7) lights (4)

11.1 ems25+ rear view (input reference)



1. door switch
2. condenser sensor
3. appliance sensor
4. lights out
5. neutral
6. compressor out
7. line in
8. microRMD **and** parameter programming port

11.2 additional information

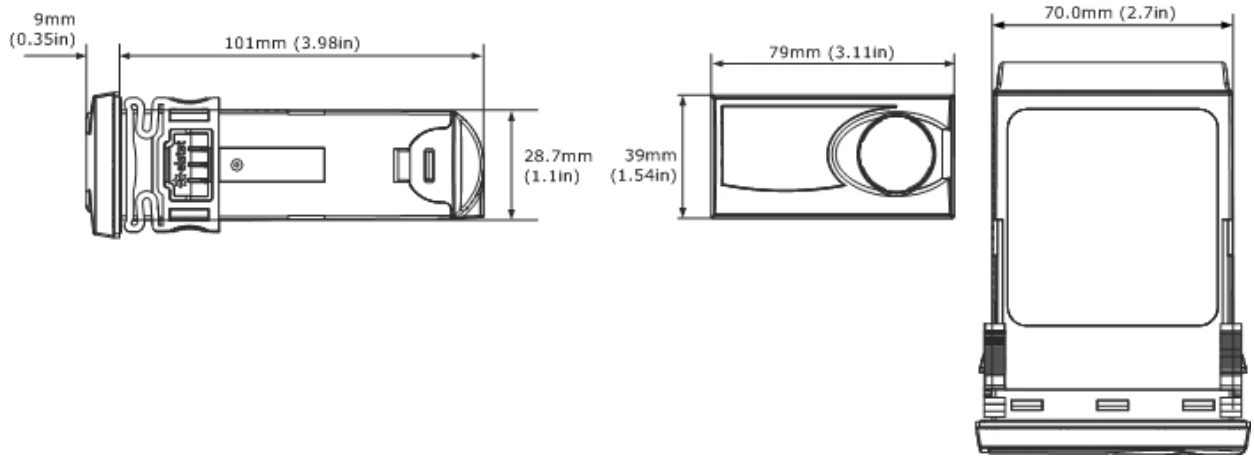
The purpose of this control is classified as: Operational Control

The type of construction is: Integrated Control

maximum ambient operating temperature	55°C (131°F)
overvoltage category	II
pollution degree	2
software class	A
type 1 action	
rated impulse	1500V
elstat UL approvals	
UL 60730-1	CSA E 60730-1
UL 60730-2-9	CSA E 60730-2-9
UL reference : E325501	www.ul.com

12 technical data ems25+

12.1 dimensional drawings:



Decorative trim kits **must** be ordered with ems25+ controllers

12.2 controller relays:

ems25+	maximum IEC rating @100-240VAC	maximum UL ratings @ 120VAC
compressor	6(6)A, p.f. 0.6	6 FLA, 36 LRA
lights	2(2)A, p.f. 0.6	120VAC, 60Hz, 250W florescent
evaporator fan	not applicable	not applicable

12.3 temperature sensors:

sensor	input range (^{O}C)	input range (^{O}F)
appliance sensor	-10^{O}C to 23.3^{O}C +/- 0.5^{O}C	14^{O}F to 74^{O}F +/- 1^{O}C
gas cooler sensor	-10^{O}C to 23.3^{O}C +/- 5^{O}C	122^{O}F to 257^{O}F +/- 10^{O}F

12.4 environmental ratings:

characteristic	value
IP (Ingress Protection):	
• controller	IPX5
maximum ambient temperature	55^{O}C (131^{O}F)

12.5 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	
	GB14536.1-2008 GB14536.10-2008
China Quality Certification	

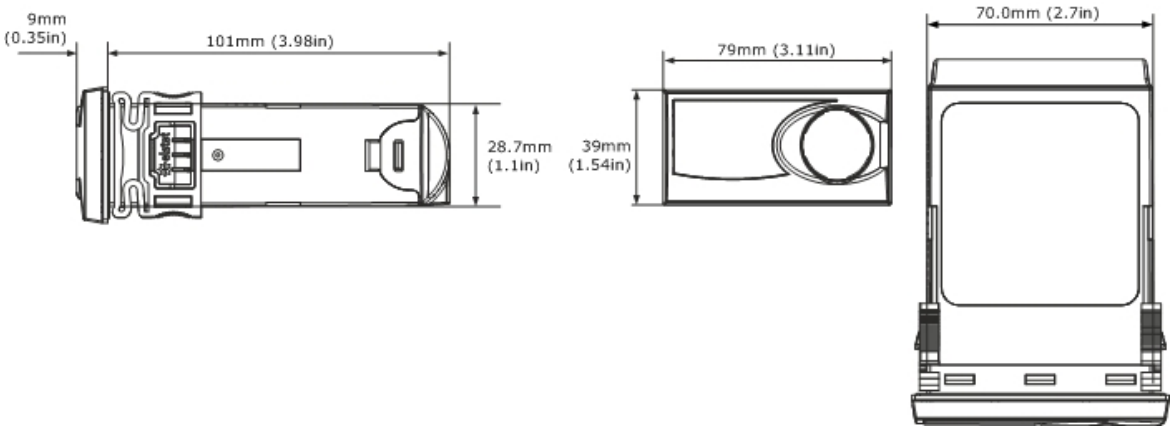
Please note:

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

13 technical data ems25*advanced*

Technical data for the ems25*advanced*.

Dimensional drawings:



Decorative trim kits **must** be ordered with ems25*advanced* controllers

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 (^{O}C)**	**input range (^{O}F)**
appliance sensor	-10^{O}C to 23.3^{O}C +/- 0.5^{O}C	14^{O}F to 74^{O}F +/- 1^{O}C
condenser sensor	-10^{O}C to 23.3^{O}C +/- 5^{O}C	122^{O}F to 257^{O}F +/- 10^{O}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	

Please note:

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

14 ems decorative trims

Decorative trim kits are supplied **separately** from ems25 series controllers in order to allow for custom installation.

Note:

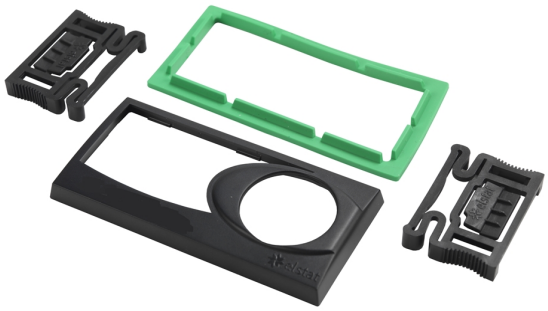
- Ensure that a matching quantity of decorative trims are ordered with controllers.

Two kit sizes are available - small and large - in three varieties as described in this section.

14.1 small decorative trim kit

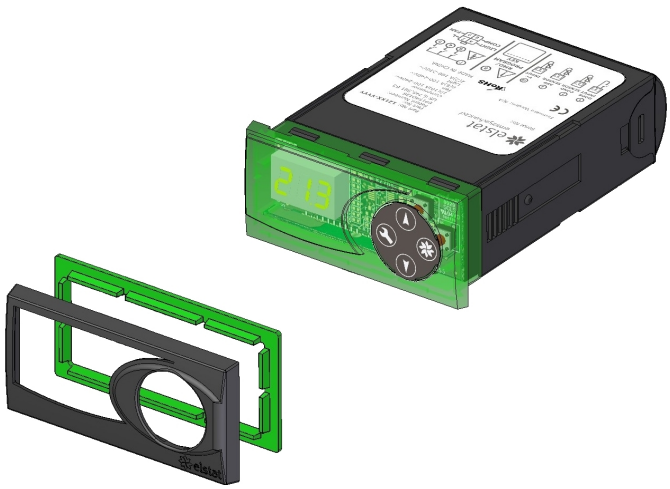
Available in black and black with *'The Coca-Cola Company'* branding.

The small decorative trim kit consists of a small decorative trim, a green gasket and two side clips, as illustrated:

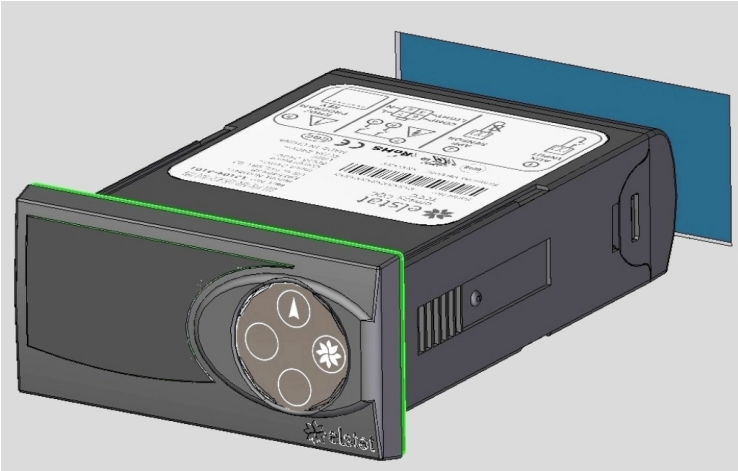


14.2 fitting the small decorative trim kit

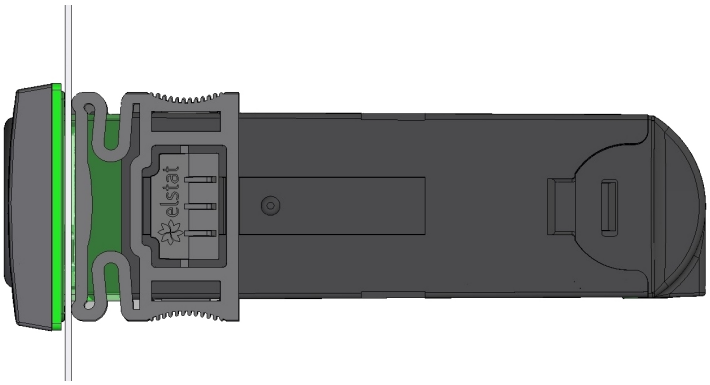
1. Fit the small decorative trim and gasket to the controller as shown:



2. Insert the controller into the cooler aperture as shown in the example:



3. Use the supplied side clips to secure the controller into position as shown:



Note:

- The side clips hold the controller in position, make sure that the fit is not loose.

14.3 large decorative trim kits

Available in black and black with *'The Coca-Cola Company'* branding.

There are two large decorative trim styles available:

- a large decorative trim with a motion sensor - no requirement for a remote motion sensor kit

- a large decorative trim without a motion sensor - for use with a remote motion sensor kit

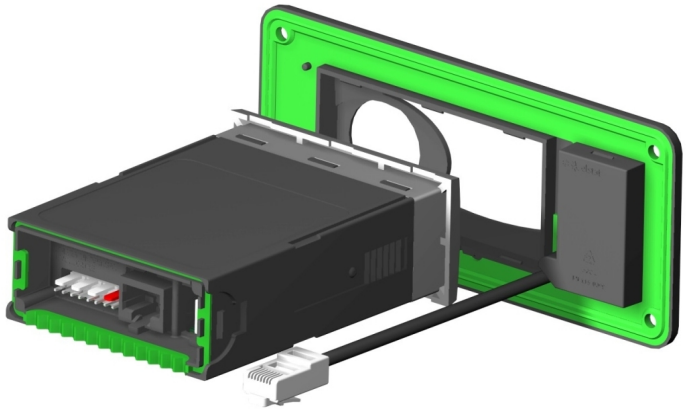
These kits allow the ems25 series to be installed into an aperture for an ems55 series controller.
Once fitted, the decorative trim kit can be screwed into place.

Note:

- No side clips are supplied with large decorative trim kits

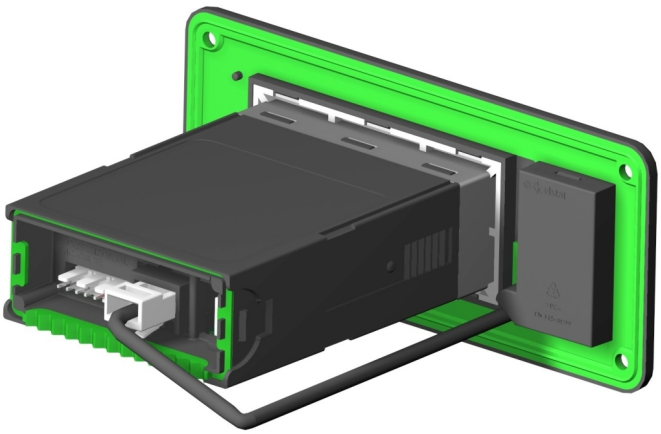
14.4 fitting the large decorative trim - with remote motion sensor

1. Push the controller into the rear of the decorative trim until the controller locks securely into place:



The rear cover of the controller must be removed to access the RJ45 connection port.

2. Connect the motion sensor cable - RJ45 connector - to the rear of the controller:

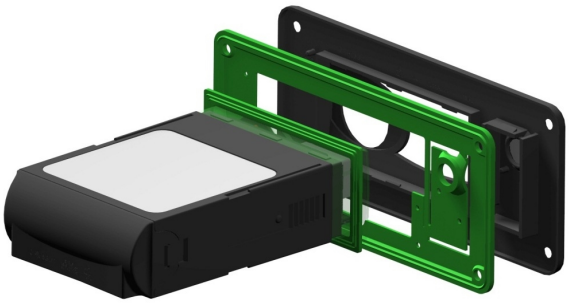


The motion sensor cable is a short length, please take care not damage the motion sensor housing while fitting.

3. Fit the controller and make the electrical connections.

14.5 fitting the large decorative trim - without motion sensor

1. Push the controller into the rear of the decorative trim until the controller locks securely into place:



2. Fit the controller and make the electrical connections.

Elstat Electronics Limited (elstat) makes no representations or warranties about the accuracy, completeness, or suitability for any purpose of the information published in this document. The information contained in this document may contain technical inaccuracies or typographical errors. All liability of elstat howsoever arising for any such inaccuracies or errors or for any infringement of third party intellectual property rights is expressly excluded to the fullest extent permitted by law.

No license is granted by implication or otherwise under any patent or patent rights of elstat or any third party. Any specifications mentioned in this publication are subject to change without notice. This document supersedes and replaces all information previously supplied.

Neither elstat nor any of its directors, employees or other representatives will be liable for loss or damage arising out of or in connection with the use of this document. This is a comprehensive limitation of liability that applies to all damages of any kind, including (without limitation) compensatory, direct, indirect or consequential damages, loss of data, income or profit, loss of or damage to property and claims of third parties.

Notwithstanding the foregoing, none of the exclusions and limitations mentioned above are intended to limit any rights you may have as a consumer under local law or other statutory rights which may not be excluded nor in any way to exclude or limit e=E-Elstat's liability to you for death or personal injury resulting from our negligence or that of our employees or agents.

The elstat logo is a registered trademark of elstat.