

EMS Controller

Model:	EMS-55 Advanced with motion detector
OEM part number:	10132-6002
SKOPE part number:	ELZ10251
Voltage:	12 Volt AC <15W SELV
Maximum switch capacity per CB report ratings: (230VAC)	Compressor: 10 (10)A , p.f. 0.6 Fan relay: 4 (4)A , p.f. 0.6 Light relay: 500W fluorescent lamps
Nominal rating compressor relay:	30 Amp at 277 VAC 1 HP at 125 V a.c.
Temp input ranges:	Appliance: -15°C to +23.5°C Condenser: +50°C to +125°C
Accuracy:	Appliance sensor +/- 0.5°C Condenser sensor +/- 5°C
Resolution:	0.1°C
LED display:	15mm 7 segment LED (green)
Temperature sensors:	Thermistor (NTC) -35°C to +125°C
Transformer:	240 - 12 VAC
Maximum ambient operating temperature:	55°C
IP rating (according to IEC 60529):	Front IP: 45 Rear IP: 24

Servicing Tools Tools required for servicing may consist of the following:

- Screwdriver with Pozidriv PZ1 and PZ2 bit
- Slotted screwdriver
- Small slotted screwdriver (for electrical connectors)

2 EMS Controller

EMS Controller Operations

Introduction The Energy Management System (EMS) Advanced controller is visible on the front panel and is mounted within the cassette electrics box on the front of the refrigeration cassette.

The EMS Advanced controller detects variable business hours and switches the chiller to active mode approximately three hours prior to opening, and then changes to stand-by mode approximately half an hour after close of business. While in the economical stand-by mode the cabinet lights turn off, the fans cycle on and off and the chiller operates at a higher internal temperature.

IMPORTANT

The EMS Advanced controller must only be adjusted by an authorised service agent.



Figure 1: EMS Advanced controller

Firmware The firmware version is displayed on the digital display when the EMS Advanced controller is powered up. See the table below for current firmware versions:

Date range	Firmware version
Pre Sept 2012	U01-r02
From Sept 2012	U01-n01

Some differences exist between the two firmware versions. These differences are noted throughout this chapter where applicable and are summarised in ELSTAT firmware release notes.

Faceplate Because the controller plays such an important role, it's helpful to know the parts of the faceplate you will use.

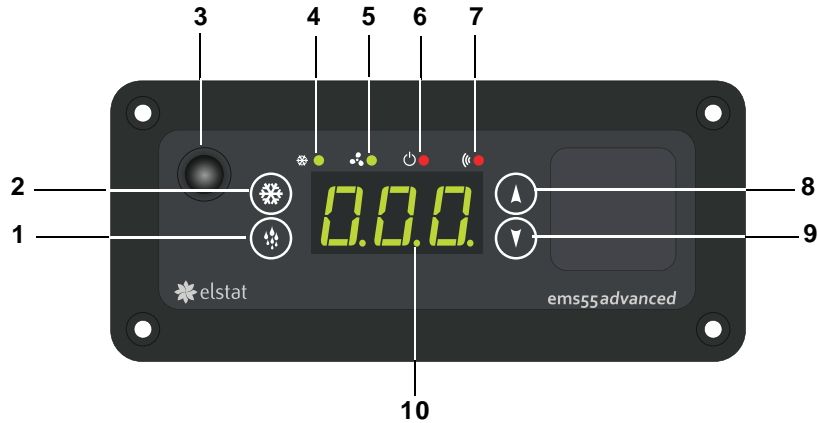












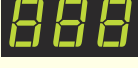



Figure 2: EMS Advanced controller faceplate

No.	Item	Description
1		Defrost button. Manually activates an additional defrost cycle, and used to program the controller. The first automatic defrost occurs six hours after the first off-cycle.
2		Set button. Used to program the controller.
3		Infrared motion sensor. It detects activity within five metres around the front of the chiller, and feeds the data to the EMS advanced controller.
4		LED for the compressor light – green when compressor on.
5		LED for the evaporator fan – green when evaporator fan on.
6		LED indicating perishable mode – red when on. Normal condition should be lit because the chiller is factory set for perishable product, which are high risk foods likely to support the growth of harmful bacteria. Perishable mode requires more energy. When chilling non-perishable product, perishable mode can be turned off to save energy.
7		LED linked to the motion sensor and flashes red when there is activity around the chiller, but otherwise off.
8		Up button. Used to program the controller and cancel rSF and Ht alarms.
9		Down button. Used to program the controller.
10		Digital display of cabinet temperature or messages (see next page for details). The temperature is what the sensor inside the chiller detects, and not necessarily the product temperature. However, they may be very close depending on how the controller is set to sense temperature. When the chiller is in stand-by mode, the controller displays three (- - -) bars. This should not be displayed during normal business hours.

Messages and Alarms

The following table explains messages that the EMS Advanced controller displays and related alarms. Alarms signal unexpected operational changes in the chiller and stop when you disconnect the chiller from the power supply at the isolating switch. Refer to the diagnostic charts starting on page 59 for assistance with alarm diagnostics.

Display	Description
	When the chiller is in stand-by mode, the EMS Advanced controller displays three bars. This should not be displayed during normal business hours. When the chiller becomes operational, the display changes to the temperature (see previous page).
	Defrost cycle in progress.
	Door Open. The EMS Advanced controller detects an open door through a door switch in the door, and has found one open.
	The door has been open for 2-3 minutes. An alarm sounds, but stops when the door closes again.
	If the door remains open for longer than 3 minutes, such as when loading product, the alarm stops and the EMS Advanced controller turns off the compressor. The compressor starts again when the door closes.
	High Temperature. The refrigeration system has overheated, and an alarm sounds. The EMS Advanced controller turns off the system to avoid damage. Possible causes and solutions for refrigeration system overheating could be: <ul style="list-style-type: none"> ■ Blocked condenser - clean the condenser. ■ Inadequate ventilation around chiller - ensure cabinet is spaced off wall by upstand. ■ Faulty condenser fan - replace if necessary (see page 43). ■ High ambient temperature - ensure chiller is operating in correct environment (see "Specifications" on page 5).
	Appliance Probe Failure. The appliance temperature sensor in the cabinet or condenser is disconnected or has failed, and an alarm sounds.
	Condenser Probe Failure. The condenser temperature sensor in the cabinet or condenser has failed, and an alarm sounds.
	Firmware version U01-r02: Faceplate displays PF2 and the compressor stops. Firmware version U01 n01: Faceplate alternates between PF2 and cabinet temperature, and compressor keeps cycling.
	Refrigeration System Failure. There is a refrigeration system failure, and the controller turns it off to avoid damage. An alarm sounds when the system does not reach the preset temperature within 72 hours.
	Problem downloading parameters.
	Supply High. The voltage from the main supply is too high, and an alarm sounds. The controller turns off the electrical motors, continuously monitors the voltage level, and restores power as soon as the voltage returns to a safe level.
	Freeze up protection. The cabinet temperature is too low. The compressor stops running and the evaporator fans run continuously until the cabinet temperature reaches an acceptable level as defined by the parameter settings.
	Supply Low. The voltage from the main supply is too low, and an alarm sounds. The controller turns off the electrical motors, continuously monitors the voltage level, and restores power as soon as the voltage returns to an appropriate level.

Running the Chiller

Function Operation of the EMS Advanced controller is determined by the parameter settings (detailed on page 14), and by information gathered via the motion sensor and door switch (see page 11).

The EMS Advanced electronic controller runs the chiller according to an automatically learned seven day schedule. The seven day schedule is split into 30 minute time periods which are identified as either active, monitor or stand-by periods. The EMS Advanced controller uses the information in these time periods to determine when the chiller should run in active or stand-by mode. The schedule is constantly updated with information collected by the motion sensor.

Initial Start-up When the chiller is initially started, the schedule is empty and the chiller is run according to the **AF** and **LP** parameters.

If **AF** = 3, the chiller operates in active mode for 48 hours while monitoring traffic density via the motion sensor and door door switch. After this 48 hour period it automatically changes the **AF** parameter to 0, 1 or 2 according to traffic monitored during the 48 hour period. If the **AF** parameter is initially preset to 0, 1 or 2, the EMS Advanced controller skips the initial 48 hour activity monitoring period and uses the preset value (0, 1 or 2).

During the following seven days, operation is determined by the **LP** parameter setting. If **LP** = 0, the chiller will switch between active and standby mode based on information gathered during the first 24 hours. If **LP** is set to 1, the chiller will run in active mode continuously for the seven days while learning and preparing a schedule for normal operation. After the initial start-up period, the EMS Advanced controller starts operating based on the schedule it has learned while continually updating the schedule when any change in the actual traffic usage patterns is detected.

Note: If the EMS Advanced controller is not powered for a 72 hour period, a half reset will be performed automatically. This will clear the schedule and the controller will enter the initial start-up period when next powered up.

Normal Operation During normal operation, the chiller continually reviews data and updates the schedule with any activity changes. If no activity is detected by the motion sensor door and door switch during an active time period, the EMS Advanced controller will flag that period and monitor it in seven days time (when that time period is reached again in the schedule). If it confirms that this time period is inactive it will change it from a monitor period to a standby time period in the schedule. **Note:** The chiller will only operate in standby mode if the confirmed standby period is longer than parameters **dS** + **Sr**.

If activity is detected during a stand-by time period the lights will immediately switch on and stay on for up to 30 minutes (the remainder of that 30 minute time period). The EMS Advanced controller will temporarily flag that period and monitor it in seven days time. The following week it will ensure that the product is at the required sales temperature and operate in normal operational mode for that period. If there is activity during that same period it will change the status of that period to an active period. If it sees no activity during that period it will change it back to a stand-by period.

Relocation When moving the chiller to a location with different traffic density or different opening/closing hours, a half reset can be performed to reset the seven day schedule (see page 12). This allows the EMS Advanced controller to re-establish the opening/closing hours and alter the chiller operation more quickly than if it was left to learn the new schedule without a half reset. The

AF parameter setting can also be automatically reconfigured by setting **AF** = 3 in the parameter menu (see page 14).

Motion Sensor & Door Switch

The motion sensor detects activity in front of the chiller and feeds the data to the EMS Advanced controller. It is located on the faceplate of the controller and is visible on the front panel.

The motion sensor can be switched on and off via the **Sn** parameter (see page 14) (firmware U01 n01 only).

The chiller is fitted with a door switch below the door. The door switch tells the EMS Advanced controller how often the door is opened. A small magnet in the door frame activates the switch.

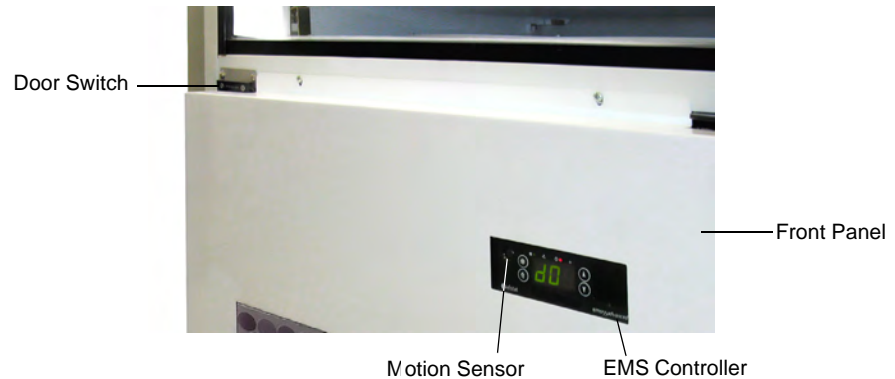


Figure 3: EMS controller door switch and motion sensor

Evaporator Fans

The EMS Advanced controller runs the fans and lights in a manner that conserves energy. Specifically they:

- Turn off when the door is opened, even when the compressor is running, so that cold air does not escape and warm air is not drawn in.
- Run continuously during an uninterrupted pull-down (initial cooling of product) even if the doors are opened.
- Remain off 3-4 minutes after the refrigeration unit is plugged in again after maintenance.

Condenser Fan

The condenser fan runs during compressor on-cycles and stops during compressor off-cycles. **Note:** Cassettes manufactured prior to June 2013 may include a condenser fan reverse function.

Temperature Probes

Two temperature probes feed data to the EMS Advanced controller - the control probe and condenser probe.

The control probe controls the chiller temperature and provides chiller temperature data for the EMS Advanced controller to display.

The condenser probe activates the over temperature refrigeration system cut-out if the refrigeration unit overheats. If activated the EMS Advanced controller will display alarm code **Ht** (see "Messages and Alarms" on page 9 for more information).

Defrost Cycles

The defrost cycle activation is determined by the **dE**, **df** and **dtf** parameter settings (see page 14). The EMS Advanced controller displays **dEF** during the defrost cycle.

Note: On EMS Advanced controllers with U01 n01 firmware, the defrost interval timer (dE) is reset when the EMS Advanced controller is reset. This will delay the time until next defrost and could cause an ice-up.

Lighting

Sign and interior lights are on during active mode, and off during standby mode.

Programming the EMS Controller

Menu Entry The EMS Advanced controller menu can only be accessed by entering a special and unique sequence.

To access the controller menu

1. Press and hold the **set** button, **PAS** appears on the display.
2. Release the **set** button.
3. Press the **set** button four times.
4. Press the **up** button once.
5. Press the **down** button twice.
6. Press the **defrost** button twice, **PS** appears on the display.
7. Either:
Press the **down** button to enter the main menu.

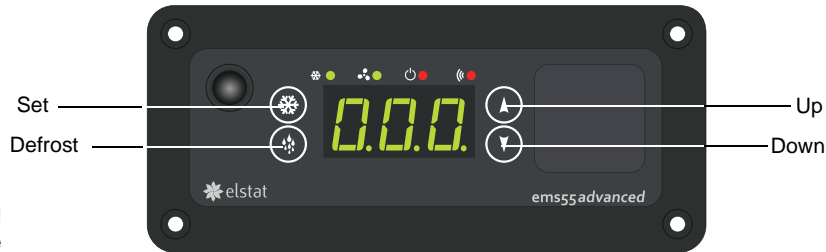


Figure 4: EMS Advanced controller faceplate

- The **down** button scrolls through the available menu
- The **set** button enters the sub menu
- Pressing the **down** button at **FR** exits the menu
- If no input after eight seconds the EMS exits the menu

Clearing Data from Memory (Half Reset) It is sometimes necessary to erase learned business patterns, traffic density counters and statistics. A half reset can be performed when the cooler is in standby mode during outlet opening hours to clear the learnt matrix.

To reset the controller

1. Follow above instructions to enter the controller menu.
2. Press the **down** button to navigate to **Hr** (half reset).
3. Press the **set** button to select **Hr**.
4. Enter password.

Note: Half reset requires the standard password, which is the special and unique sequence used to enter the menu (see “Menu Entry” above). Full reset requires the standard password plus a restricted password.

Full Reset A full reset should only be used as a last resort. It will reset all parameters to the global default settings and could cause damage to the refrigeration unit. To enquire about performing a full reset, contact SKOPE.

Reviewing Data Occasionally it is necessary to review data the EMS Advanced controller collects, such as for diagnostic purposes.

To view data

1. Press the **up** and **down** buttons simultaneously to start the controller scrolling through the data and displaying values. It displays each value for about 20 seconds so that you can write it down.
2. Once finished it returns to its standard status.

The following table explains the statistics.

Statistic	Display	Reporting period	Data reporting description
Average temperature	At	24 Hours	Continuously calculated from the highest and lowest registered temperature and updated with every update of these two values.
Lowest registered temperature	L0	24 Hours	At the end of the 24 hour period data from the last hour is erased, and is replaced by data from the latest hour.
Highest registered temperature	HI	24 Hours	At the end of the 24 hour period data from the last hour is erased, and is replaced by data from the latest hour.
Number of door openings	dC	7 Days	On the 7th day, the first day is erased and the current day is added to the count, which means that the count represents the last 7 days plus the current day or part thereof. The display shows the count as follows: 1-999 door openings: The display shows 1 to 999. 1000 - 99,999 door openings: The display shows 1.0 for 1000 to 1049, 1.1 for 1050 to 1099, 1.2 etc.
Number of shoppers	Cnt	7 Days	As per door opening counts above.
Activity frequency	AF	0, 1, 2, or 3 displayed	Traffic density settings. 0 = Low, 1 = Medium, 2 = High, 3 = Auto
Compressor cycles	CC	24 Hours	A running total of cycles that the compressor has completed. A cycle consists of it turning on and off after the set point has been reached.
Compressor running hours	CH	Running total	A running total unless a factory reset is done, which erases ALL data in the controller. When a half reset is performed in the field, the compressor running hours remain but all other statistical values are erased. The total maximum count is 99,999.
Perishable mode	PEr	OFF or On displayed	Normal condition should be on because the chiller is factory set for perishable product. Changing it to off enables non-perishable mode and greater energy savings.

Parameters Only an authorised service agent should change parameters.

To access the parameter menu

1. Enter the controller menu (see page 12) and navigate to the parameter menu. **PS** will show on the display.



2. Press the **set** button to enter the parameter menu and view the first parameter.
3. Press and hold the **set** button to scroll through the parameter menu.
4. Release the **set** button when the required parameter appears on the display.

Note: EMS Advanced controllers with U01 n01 firmware will reboot when exiting the parameter menu.

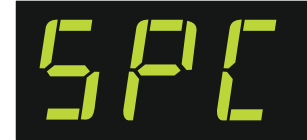
The following table describes SKOPE settings for Program 292.

Display	Skope Setting	Units	Range		Description
			Min	Max	
CF	0	Units	0	1	Display degree (0 = °C or 1 = °F)
SPC	1	°C	-9.9	9.9	Set Point
dIF	3	°C	0	9.9	Differential
CA/CA1	0	°C	-9.9	9.9	Calibration Sensor (cabinet sensor)
SSP	5	°C	0	9.9	Standby setpoint
Sd	4	°C	0	9.9	Standby differential
IPd	24	°C	0	30	Uninterrupted pull-down activation temp.
dt	0	°C	-15	10	Activation temperature for freeze-up protection
dt/dtd	10	°C	1	25	Defrost termination temperature
FSP	1	°C	1	30	Fan setpoint
Ht	75	°C	0	130	High temp activation value (0 = Disabled)
rt	3	Mins	1	30	Compressor rest time
dS	30	Mins	0	120	Delay for stand-by
Ld	60	Mins	0	120	Light switch off delay
Sr	180	Mins	0	240	Standby restart period
Ct	72	Hours	0	100	Refrigeration system failure time elapse
dE	4	Hours	0	199	Defrost interval times
dd	15	Mins	1	199	Defrost duration
FCO	30	Mins	0	30	Evaporator fan cycle 'on' time (0 = Disabled)
FCF	1	Mins	0	30	Evaporator fan cycle 'off' time (0 = Disabled)
d2	5	Units	1	120	Display stability
HI	225	Units	90	250	Over voltage protection (250 = Disabled)
LO	150	Units	90	250	Under voltage protection (90 = Disabled)
b0	1	Units	0	1	Buzzer disable / enable (0 = Off or 1 = On)
b1	60	Secs	1	254	Buzzer sounding time per alarm
Ad	2	Mins	0	30	Alarm delay (0 = Disabled)
AF	0	Units	0	3	Activity frequency (0 = Low ~ 3 = Auto)
PEr	1	Units	0	1	Standby or Perishable Temperature Mode (0 = Off or 1 = On)
LP	0	Units	0	1	Learning period (0 = Short or 1 = Long)
dIS	1	Units	0	1	Display Type (0 = Temp or 1 = Use)
Ar	0	Units	0	1	Marketing Mode (0 = Off or 1 = On) (U01 n01 firmware only)
Sn	1	Units	0	1	Motion Sensor Enable (0 = Off or 1 = On) (U01 n01 firmware only)

Temperature Setpoint The chiller temperature setpoint is factory set at 1°C. If necessary the standard setting can be adjusted between -9.9°C and +9.9°C. SKOPE do not recommend that the setpoint be changed unless it is absolutely necessary, and then only by small increments at a time.

To adjust the setpoint

1. Access the parameter menu and navigate to the setpoint parameter **SPC** (see page 14).



2. Press the **up** and **down** button to change the value.
3. Once the desired setting is flashing on the display, leave the controller for 20-30 seconds to save the setting.

Perishable Mode The chiller has the ability to operate in either perishable mode or non-perishable mode. When in perishable mode the ☺ symbol on the electronic controller faceplate is lit red, when in non-perishable mode the ☺ symbol is not lit.

Perishable mode is for use with perishable products such as dairy or food products. When in perishable mode the chiller temperature is kept constantly cool at all times. During standby periods the lights switch off and the fans cycle on and off. Perishable mode must be used when perishable product is being stored inside the chiller.

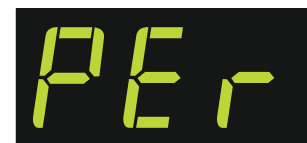
IMPORTANT

Ensure perishable mode is used when perishable product is being stored inside the chiller.

Non-perishable mode is for use with non-perishable products such as carbonated drinks and water. When in non-perishable mode, the chiller temperature is moderated, the lights switch off and the fans cycle on and off during standby periods resulting in maximum energy savings. Follow the steps below to change between perishable and non-perishable mode.

To change between perishable and non-perishable mode

1. Access the parameter menu and navigate to the perishable mode parameter **PEr** (see page 14).



2. Push the **down** button to change between perishable and non-perishable mode:

0 = Non-perishable mode
1 = Perishable mode

3. Once the desired setting is flashing on the display, leave the controller for 20-30 seconds to save the setting.

Marketing Mode Firmware U01 n01 only. Marketing mode can be switched on and off via the **Ar** parameter (see page 14). When on, the lights stay on at all times (including during stand-by periods). When off, the lights will be on during active periods and off during standby periods.

Test Routine Function

The test routine function can be used as a diagnostic tool to determine possible faults. It has the ability to test the following:

- Function buttons - tests the four faceplate buttons (firmware U01-r02 only).
- Controller output relays - tests the compressor, light and fan relays, and disables all relays.
- Controller inputs - tests probes and door door switch.
- Motion sensor - tests motion sensor.

Cycle through each of the tests mentioned above to reach the required test (e.g. to reach the analogue input test, steps 1 to 6 must be completed sequentially).

To use the test routine function

1. In the controller menu (see page 12), scroll to **tSt** and press the **set** button. **888** will be displayed.

2. Press the **set** button to enable the function buttons test. **1.0** will be displayed (firmware U01-r02 only).

Test 1: Function buttons test

Button	Description	Display Output
Set	Tests the set button	1.0
Up	Tests the up button	3.0
Down	Tests the down button	2.0
Defrost	Tests the defrost button	4.0

3. Press the **set** and **def** buttons to change to the relay test. **rEL** will be displayed.

4. Press the **down** button to enable the relay test.

Test 2: Relay test

Button	Description	Display Output
Set	Activates the compressor relay. The compressor should activate if connected.	Compressor LED lit. Display shows CP
Up	Activates the light relay. The lights in the cabinet should come on if activated.	Display shows Lit
Down	Activates the fan relay. The fan(s) should activate if connected.	Fan LED lit. Display shows FAn
Defrost	Disables all relays. Any active relays (compressor, lights, fans) and associated LEDs should deactivate.	Display shows OFF

5. Press the **set** and **def** buttons to change to the analogue input test. **AnA** will be displayed.

Continued over page

6. Press the **up** button to enable the analogue input test.

Button	Description	Display Output
Set	No function	N/A
Up	Displays current appliance temperature.	Temperature value
Down	Indicates state of connected door switch.	dO = Open CLO = Closed
Defrost	Displays current condenser temperature.	Temperature value

Test 3: Analogue
input test

7. Press the **set** and **def** buttons to change to the motion sensor test.
Pir will be displayed.

8. Press the **def** button to enable the motion sensor test.

Test 4: Motion
sensor test

Move your arm or hand from side to side 300mm away from the motion sensor.
The display will show incremental counts.

9. Press the **set** and **def** buttons to exit the test routine function menu.
The controller will reboot after exiting the menu.