GC-E636

Ethernet Case Controller

Refrigeration Control Unit for Supermarket Display Cabinets & Coldrooms

- Ethernet SNMP communications
- Expansion valve control using temperature or optional pressure
- Cooling valve and Defrost control
- Trim/Pan heater & Fan control
- Automatic scheduled lighting control
- Air off and Air on temperature alarms
- Fan fuse fail, Trim fuse fail & Cold room door alarms
- PT1000 probes
- Local LED-4 panel display of status and product temperature
- Optional Service Key Fobs with case cleaning and setup buttons
- Optional 4-20ma pressure input
- Optional RS485 communications
- Optional battery backed Real time clock

Operation and Set-up Manual

GUARDIAN GC-E636 controllers combine temperature, lighting and defrost control of a single supermarket display case or cold room with Ethernet SNMP protocol communication facilities as required by the Tesco SIIMS network.
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CONTENTS

Getting Started

Overview

GUARDIAN GC-E636 Controllers are mains-powered, refrigeration temperature and defrost sequence controllers for supermarket display cases and coldrooms.
The controller communicates using Ethernet SNMP protocol with the Guardian 'Consultant' Refrigeration Terminal and the Tesco SIIMS system.
Both systems provide central alarm monitoring, editing of parameter settings, data recording and graph display facilities.

The default temperature or case operating mode for the case is displayed locally on a separate four digit LED-4 display unit connected to the controller by a 3 metre display lead .

The optional SKF-1 (Service Key Fob) 1-button unit may be plugged into the LED-4 display to select case cleaning modes FANS Only, STOP and Auto.

The optional SKF-3 (Service Key Fob) 3-button unit may be plugged into the LED-4 display to select case cleaning modes and case temperature values plus editing of control setpoints and defrost settings.

The GC-E636 controller has all the refrigeration facilities of its well proven 636 predecessor including energy saving automatic lighting control.
The controller has improved energy saving algorithms for its Electronic Expansion Valve (EEV) control and now allows pulsing of the trim heaters for energy conservation.

The GC-E636 hardware has been designed to be easily interchangeable with the Danfoss EKC514B controller . (seepage 5)
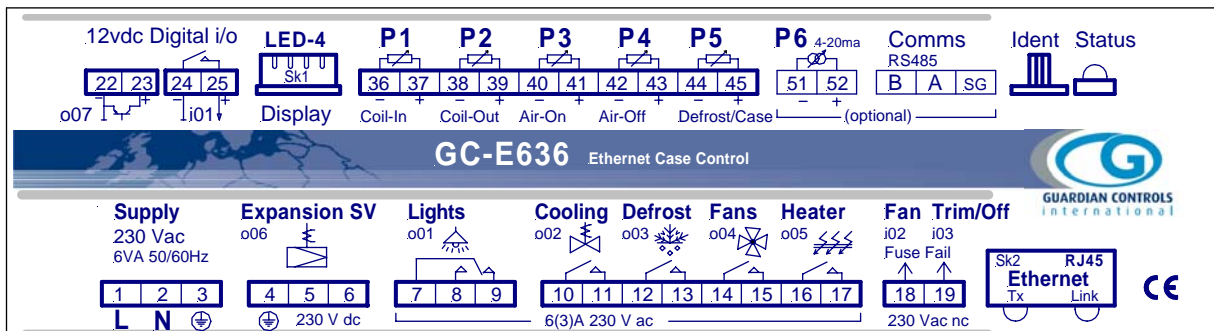
Communications

When the correct system number has been entered then the controller can communicate with the GUARDIAN 'Consultant' Refrigeration Terminal for central alarm monitoring and temperature display.
Control setpoints, defrost times and alarm limits may then be sent to the controller from the 'Consultant' rather than using the setup facilities at the case using the SKF-3 Service Key Fob unit.
Commissioned parameters for the case can be locked on the 'Consultant' to inhibit any settings being changed at the case using the SKF-3 Service Key Fob button unit.

HARDWARE

GC-E636 General Specification

GC-636	Case Control			SKF-3	Service Key Fob	
Power	6 VA	(excluding ESV valve)		Key Fob buttons	3	
	230vac	50/60HZ		User	Service engineer	
Operation	0 to 55 °C			Cable length	0.75M	
Dimensions				Functions	Case cleaning	
length	155 m				Values and alarms display	
width	110 mm	(including connectors)			Settings change & display	
height off rail	55 mm			SKF-1	Service Key Fob	
Mounting	DIN rail			Key Fob buttons	1	
Terminals	2-part	screw clamp		Cable length	0.15M	
Fuses				User	IST (In-store Technician)	
F110 - Controller	20 x 5 mm	250V 250mA - T (Inner fuse)		Functions	Case cleaning	
F100 - ESV Valve	20 x 5 mm	250V 1A - T (outer fuse)				
LED-4	Display			Display Leads		
LED digits	4			LED-4 standard	3M	
Type	7-segment, decimal point			LED-4 optional	6M	
size	14mm					
cutout hole size	29 x 71mm					
Approvals	CE					

Flash Reprograming

The flash memory of the controller can be reprogrammed remotely using the Ethernet connection.

Status LED

The Green Status LED indicates controller power is healthy
It flashes off briefly every communication TX response.

Ident button

When pressed during normal controller operation, the '**Ident'** Button is used to remotely identify a particular case with suspect identity. - flashes Power LED regularly until System Number identity is re-setup from the Consultant Refrigeration Terminal..

Real Time Clock

The controller real time clock is used to schedule lighting and defrost times.
The standard internal clock relies on network communications to keep correct time.
On power up the controller time and date are zero. The controller requests the correct time and weekday from the network server. The controller will keep this time updated whilst it is running.
If the controller fails to update the correct time and date because the network server is not available then the time and weekday default to midnight on Sunday.
Correct time and date may be entered using the SKF-3 service Key Fob button unit
The time and date are lost every time the controller is powered off.
For controllers not connected to an IP network, a plug-in option is available to have a battery-backed real time clock which generates the correct time even after being powered off. (See below)

Optional Battery Backed Real Time Clock

For controllers not connected to an IP network, this plug-in option provides a battery-backed real time clock which generates the correct time even after being powered off.

Optional RS485 Communications and P6 4-20ma input

A plug-in option **RS485 module** provides communications at 19200 baud for a RS485 Modbus or WS5 protocols.
A plug-in option **P6 Suction Pressure** (**4-20ma)** provides a pressure transducer input (-1 to 8 barg)

GC-E636 Input/Output Signals

terminal			ident	error	unit	Signal Name	State
L	N	E				Supply 230Vac 6VA 50/60 Hz	
1	2	3	Status	LED Off		Mains input supply	
-	+					Analogue Inputs -40°C to +50°C (PT1000 resistance thermometer)	
36	37		P01	E01	°C	P1 Evaporator coil inlet temperature	(If Fitted)
38	39		P02	E02	°C	P2 Evaporator coil outlet temperature	(If Fitted)
40	41		P03	E03	°C	P3 Air ON temperature	
42	43		P04	E04	°C	P4 Air OFF temperature	
44	45		P05	E05	°C	P5 Defrost Termination/Case temperature	(If Fitted)
-	+					Analogue Input 4-20ma -1 to 8 barg	
46	47		P06	E06	barg	P6 Optional suction Pressure in barg	(If Fitted)
c	n/o	n/c				Relay output (5 Amp 230VAC with suppressors)	
7	8	9	o01		c/o	Lighting Relay state	(0=OFF 1=On)
10	11		o02		n/o	Cooling Relay state (TEV control)	(0=OFF 1=On)
12	13		o03		n/o	Defrost Relay state	(0=OFF 1=On)
14	15		o04		n/o	Fans Relay state	(0=OFF 1=On)
16	17		o05		n/o	Trim /Pan Heater Relay state	(0=OFF 1=On)
						Solid State relay pulse output (230Vdc 0.5 AMP)	
4	5	6	o06		%	ESV Expansion Solenoid valve position %	0-100%
-	+					Status Output (12vdc 10 ma)	
22	23		o07			Digital Output o07 state (alarm)	(0=OFF 1=On)
-	+					Status Input (contact loop 5 ma)	
24	25		i01	A01		Digital Input i01 (Coldroom Door) state	(0=Closed=ok 1=Open=alarm)
	230v					Alarm Trip Input (230vac only)	
	18		i02	A02		input i02 state -Fan fuse supply	(0=Fail 1=OK)
	19		i03	A03		input i03 state-(Heater Fuse supply)	(0=Fail 1=OK)
Sk1	GE636					LED-4 Display Socket	
Sk1	LED-4				4way	Used for 3.5 metre 3-core LED-4 display lead	
				A00		Communications	
Sk2	E636				RJ45	Ethernet SNMP protocol	
A	B	E			3-way	Optional RS485 Modbus @19200baud Comms	
						Ident Pushbutton	
						Used to remotely identify a particular case with suspect identity. - flashes power LED regularly until System Number identity is re-setup.	
						Status LED indicator	
						Green LED indicates controller power is healthy. Flashes briefly every comms TX response	
						FUSES	
		FUSE 1	(outer)			DANFOSS ESV 10 Valve Supply Output	
		FUSE 2	(inner)			Controller Mains supply	
						LED-4 Display unit (cutout hole size compatible with Danfos)	
						4-segment LED display with sockets for lead to GC-E636 and SKF-3 button unit	
SK1	LED-4				3-way	3 metre 3-core lead to GC-E636 compatible with Danfoss display lead for EKC	6 metre lead option available
						SKF-3 Service Keyfob	
Sk2	LED-4				2-way	0.75 metre 2-core lead	
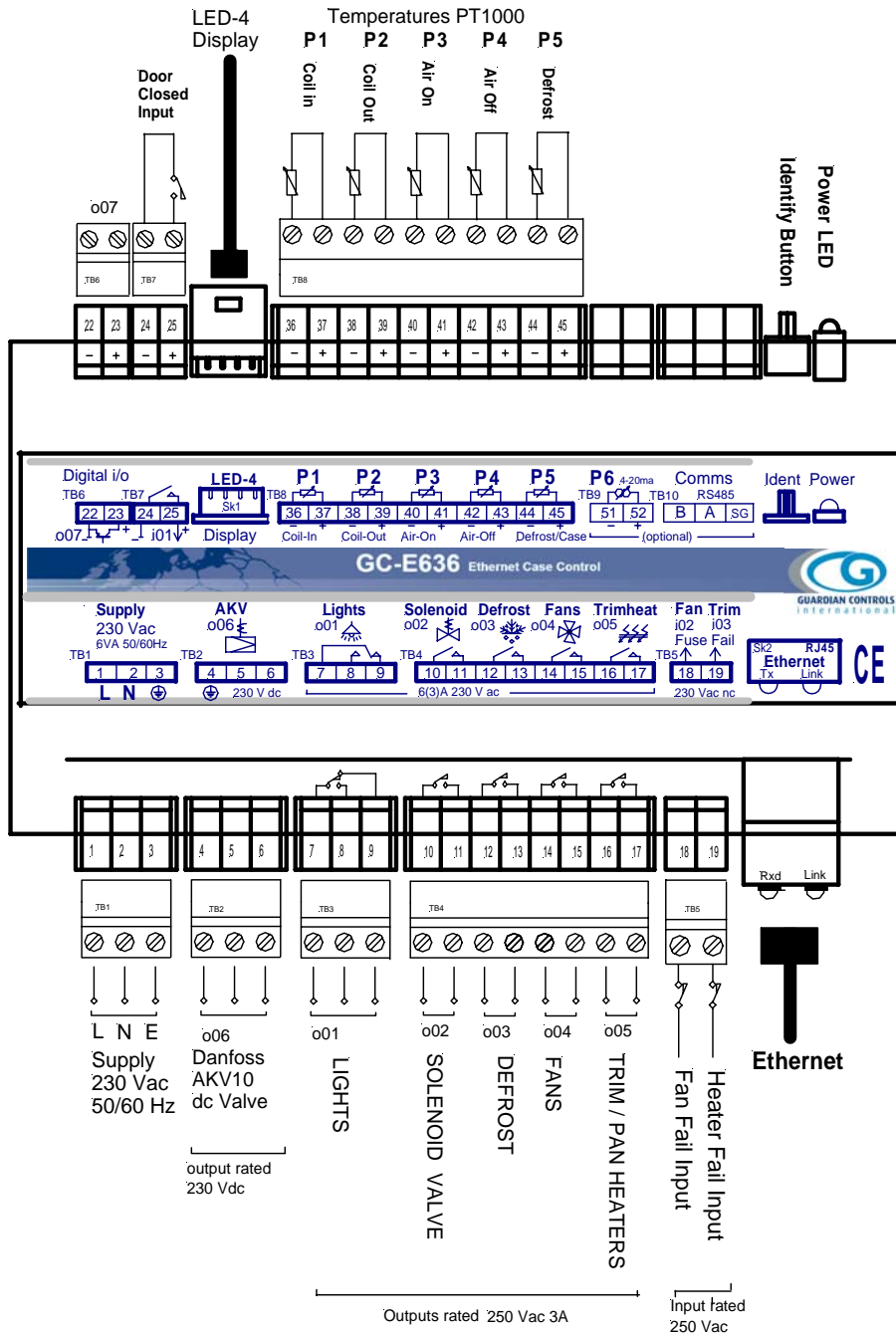
IMPORTANT NOTICE   Expansion Solenoid Valve Connection

1. **The valve control connection (valve head or controller terminals)
    MUST ALWAYS be made or unmade with the CONTROLLER POWERED OFF**

2. **The Valve control output MUST NEVER be energised without the coil being fitted to a valve
    body.**

*Failure to observe the above precautions may result in controller and or coil / valve
damage and will not be considered under warranty.*

Compatibility with EKC 514B

The GC-E636 case controller has been designed to be easily interchangeable with the
Danfoss EKC 514B controller. (see page **Error! Bookmark not defined.**)

Mechanical

Both units are rail mounted and have the same width when 2-part terminal connectors are plugged in.
The length of the GC-E636 is slightly shorter than the EKC 514B
The LED-4 display fits into the same fascia cut out hole and uses the same specification display lead and interconnection plugs as Danfoss.

Electrical

Input Output

All power input and output connectors have the same size connectors, the same terminal number designations and the same electrical and refrigeration functions. This ensures a simple interchange of controller type without affecting power wiring or wiring documentation.
The GC-E636 provides ESV valve control at 250Vdc.
The GC-E636 has two mains inputs (fan fuse and heater fuse fail) on its mains input 2-way connector TB5.
Internal setup facilities enable it to accommodate a 230vac cooling input on terminal 19 if so required.
Low voltage Digital inputs and outputs also have compatible connectors and terminal numbers.

Temperature Probes

Pt1000 Temperature probes P1 to P5 are in the same order and have the same terminal numbers and functions as S1 to S5 on the EKC 514B. However, in order to reduce service problems with probe connectors, temperature probes are connected to the GC-E636 via robust 2-part screw clamp connectors.

Ethernet RJ45 Connector

The Ethernet RJ45 connector is in the same relative position on both controllers.

The GC-E636 has various additional plug-in options (see page Real Time ClockReal Time Clock) not available on the Danfoss EKC514B.

Control

The GC-E636 controller provides all the control and display functions of its well proven GC 636 predecessor.

Setup

The GC-E636 controller may be easily setup at the case fascia by plugging the SKF-3 Service Key Fob button unit directly into the LED-4 display. It is not necessary to swop the display or first gain access to the controller in order to plug in the setup unit.

Real Time Clock

Defrost and lighting schedules operate in real time from the internal GC-E636 clock.
On power up the clock defaults to midnight on Sunday.
The clock relies on a network connection to a server to keep its time updated and synchronised.
For cases with no network connection, the battery backed real time clock option should be used.

Fuse Fail Alarms

The GC-E636 provides two mains inputs that are normally connected to fused supplies feeding the Fans and Trim Heater. An alarm can be generated when either of these supplies is not present due to a blown fuse. The Trim Heater input can be re-designated as a 'Stop' input if required.

DISPLAY OPERATION

LED-4 DISPLAY

GUARDIAN GC-E636 controllers are normally supplied with a **LED-4** Display unit and a display lead.
The LED-4 is mounted on the case fascia and connected to the GC-E636 controller by a 3.5 metre 3-core lead display lead. The LED-4 Display is a plastic enclosure housing a PCB with four LED displays and a socket for the SKF-3 setup unit.
The LED-4 normally displays the calculated product temperature for the case.(see page 10)

LED-4   **-2.3**   0.75M   0.15M

Service Key Fob

SKF-3   SKF-1
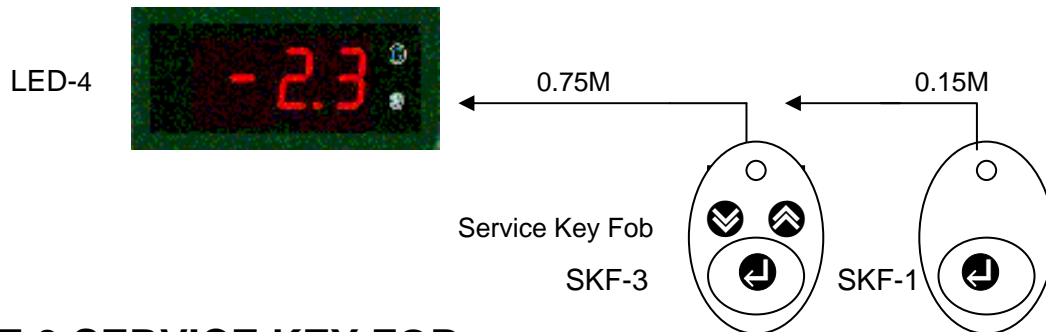
SKF-3 SERVICE KEY FOB

The SKF-3 Service Key Fob provides 3 buttons for authorised access of the controller at the case for:-
a)   Local display of measured values, case status, alarms and faults.
b)   Local Command actions for case cleaning and test.
c)   Local modification of control settings.
Temperature probe values and controller parameter settings can be displayed or changed locally at the case after the SKF-3 unit has been plugged into the LED-4. Socket.
The buttons which have the following functions

⊗   **'up' button**   goes to next display or parameter selection in sequence

or increases a parameter setting data value.

Pressing ⊗   on the default display t1 steps in sequence through all Commands and Measured Values of temperature

⊗   **'down' button**   goes to the previous display or parameter selection

or decreases a parameter setting data value.
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⊕   **'select / enter' button**   selects a parameter for changing or enters the new

mode or parameter data value.

Pressing ⊕ on the flashing default display t1 shows the first active **Error or Alarm**.

⊗⊗ Default settings on Power up   When ⊗ ⊗ are pressed and held during the power up sequence, the controller returns to the default settings which are suitable for a meat or dairy case.

SKF-1 SERVICE KEY FOB

The SKF-1 Service Key Fob provides a button at the case for case cleaning:- .
⊕   **'case clean' button**   each button press sequences the case cleaning modes.

Auto   -FAn   StoP

DEFAULT DISPLAY

When the SKF-3 unit is not connected or no SKF-3 buttons have been pressed for 3 minutes then the controller reverts to the Default display of the LED-4 to the calculated product temperature **t1**.

Calculated Product Temperatures

There are two different values of calculated product temperature:-
a)   the default display temperature value **t1** is displayed on the LED-4 at the case as an indication of the core temperature of the product within the case.
      This value is derived from an adjustable ratio **c05 Display % of P4 Air OFF** compared to the P3 Air ON temperature.

        e.g.   if P3= +5C, P4= -5C, c05=60%, t1= -1C
      (Case normally have c05=50%, Blighline Meat cases c05=25%, coldstores c05=0%)

b)   When selected for co3=06 (CPT) , the control temperature value **t2** is compared to the cutout setpoint **c01** and used to control the cooling. This value is derived from an adjustable ratio **c04 Control % of P4 Air OFF** when compared to the P3 Air ON temperature.

      (Case normally have c04=100%, Blighline Meat cases c04=25%, coldstores c04=0%)

If either probe is faulty then 100% of the working probe is used.

Product Temperature display

        -15.6   Calculated Product Temperature in degrees Centigrade
                                       Uses c5 Display % of P4 Air OFF compared to P3 Air ON

Case Status Display

The default display t1 is replaced by a status message if any of the following conditions occur.

8888	display segment check after power on restart
1000	Software version displayed after power on or selecting Auto after StoP
E636	GC-E636 ethernet case or coldstore controller after power on restart
84A2	Last 4 digits of MAC address for Controller
Auto	After power on or case OFF waiting for restart delay before opening liquid solenoid or ESV valve.
■■■9	Countdown of remaining power up delay timer in seconds before automatic control is started after power on,
-FAn	If unit selected Fans only for case cleaning
StoP	If unit selected StoP for case cleaning
-dEF	displayed during Defrost
-Pd■	Pull Down - displayed from end of defrost cycle until Air OFF temperature is within alarm band after defrost is complete
FAIL	Displayed instead of default Calculated product temperature t1 when probes Air On P3, Air Off P4 are both faulty

The display flashes whenever an Error or an Alarm is detected.

With the SKF-3 plugged in,
Alarms
a)   Pressing ⏎ on the flashing default display t1 shows the first active Error or Alarm.
b)   Repeatedly pressing ⊗ steps in sequence through all other active Alarms and Errors present.

Commands and measured values
a)   Repeatedly pressing ⊗ on the default display t1 steps in sequence through all Commands and Measured Values of temperature.

ALARM DISPLAYS

The Default Temperature value **t1** flashes when a probe error or alarm is present.
Alarms may be investigated by using the SKF-3 plugged into the LED-4.
Pressing ⏎ on the default display **t1** followed by ⊗ allows all faults or alarms that are present to be viewed in the sequence as below.
The liquid solenoid /ESV valve is closed on failure of the control air probe.
Temperature alarms are inhibited during and after defrost cycles and during case cleaning.
Alarm Guardtime count is reset each time the Control air returns within limits.
Alarm states are automatically reset when the control air returns within limits.
Alarms are not displayed during Setup operation.
All error messages are reset automatically when the fault has disappeared.
If the controller is on a system which does not have a central PC alarm monitor then
the **E00** communications message can be inhibited by selecting
        setting **u4=0** , i.e. Communications protocol = **'none'**

Alarm and Error messages

Possible messages are as follows:-

	`-05.6`	flash	
		⏎	Press ⏎ to view list of error or alarm messages present
		⊗	Press ⊗ to view next message (if held down -stops when 'End' is displayed)
		⊗	Press ⊗ to view previous message (if held down -stops when 'End' is displayed)
		`E00`	Error -no communications to controller for more than 5 minutes
		`E01`	Error Probe P1
		`E02`	Error Probe P2
		`E03`	Error Probe P3
		`E04`	Error Probe P4
		`E05`	Error Probe P5
		`E06`	Error Probe P6
		`A03`	P3 Air-on Temperature High Alarm (-7C well cases only)
		`A04`	P4 Air-off Temperature High Alarm Tesco spec (frozen -18C, meat & dairy 3C , produce 5C)
		`A13`	P3 Air-on Temperature Low Alarm
		`A14`	P4 Air-off Temperature Low Alarm
		`A17`	t3 Superheat Temperature Low Alarm (warning only)
		`A21`	Digital Input 1 Alarm
		`A22`	Digital Input 2 Fan Fuse fail Alarm
		`A23`	Digital Input 3 Trim Fuse fail Alarm
		`End`	Press ⏎ to exit alarm display and return to default display **t1**

There are three ways to end ALARM display mode and return to default case display
    a)
            `E04`   ⊗»⊗   `End`   ⏎   `-05.6`   is shorthand for:-

        Hold down the '**up**' ⊗ button to quickly sequence through the ALARM list until **End** identifier is displayed. Press ⏎ to end ALARM mode and return to default display **t1**.
    b)   ALARM display mode is automatically ended 3 minutes after the last button press.
    c)   Remove SKF-3 from LED-4 socket which immediately causes the case to revert back to default display **t1** and Auto control.

Remove SKF-3 from LED-4 socket until required again to view temperatures, change settings or subsequent case cleaning operations.

COMMANDS & MEASURED VALUES DISPLAY

Identifier	Value	error	Units	Description
	-17.9	flash	°C	**Default display t1** of Calculated Product Temperature **°C**
	⌃			Press ⌃ to view next command or identity / value (if held down -stops when 'End' is displayed)
	⌄			Press ⌄ to view previous command or value(if not default **t1**) (if held down -stops when 'End' is displayed)
				COMMANDS
SEt				Press ⏎ to enter parameter setup mode
tESt				Press ⏎ to enter Output Relay and ESV % Test mode
Auto				Press ⏎ to return to AUTO control after case cleaning
FAnS				Press ⏎ to go to Fans only mode prior to case cleaning
StoP				Press ⏎ to go to StoP mode for case cleaning
rdEF				Press ⏎ to initiate a manual defrost
				PROBE MEASURED VALUES
P1	-32.1	E01	°C	P1 Evaporator coil inlet probe temperature (If Fitted, skip if not)
P2	-02.3	E02	°C	P2 Evaporator coil outlet probe temperature (If Fitted,skip if not)
P3	-12.0	E03	°C	P3 Air ON probe temperature
P4	-23.6	E04	°C	P4 Air OFF probe temperature
P5	FAiL	E05	°C	P5 Defrost Termination probe temperature (If Fitted, skip if not)
				CALCULATED VALUES
t1	-17.9		°C	Control % of P4 Air OFF - CPT control Temperature -
t2	-23.6		°C	Calculated Display % of P4 Air OFF temperature
t3	7.4		°K	Superheat temperature
t4	7.9		°K	Superheat control setpoint
t5	nn			Control State sequence number. nn (see next page)
t6	79		mins	Defrost elapsed duration (mins)
				CONTROL RELAYS & INPUTS
o01	1			Lighting Relay state (0=OFF, 1=On)
o02	1			Cooling Relay state (0=OFF, 1=On)
o03	0			Defrost Relay state (0=OFF, 1=On)
o04	1			Fans Relay state (0=OFF, 1=On)
o05	1			Trim Heater Relay state (0=OFF, 1=On)
o06	79		%	ESV Expansion Solenoid Valve position %
o07	0			Digital Output o07 state (0=OFF, 1=On)
i01	0	A21		Digital Input i01 state (0=OFF, 1=On)
i02	1	A22		Mains input i02 state (0=OFF, 1=On=Fan fuse ok)
i03	1	A23		Mains input i03 state state (0=OFF, 1=On=Trim Fuse ok)
End				Press⏎ to exit value display and return to default display **t1**

There are three ways to end VALUES display mode and return to default case display **t1**

a)

         o04 ⌄»⌄ End ⏎ -15.6   is shorthand for:-

Hold down the '**up**' ⌃ button to quickly sequence through the VALUES list until **End** identifier is displayed. Press ⏎ to end VALUES mode and return to default display **t1**.

b)   VALUES display mode is automatically ended 3 minutes after the last button press

c)   Default temperature **t1** is displayed when the SKF-3 is removed from the LED-4 socket.

Control State sequence no. **(Not available this software issue)**

Identifier	Default Display	Seq. No.	Description
`oS`			**Control State sequence no. (0-99)** Indicates the control state of the controller as follows
			Startup
`Auto`	`1`	After power on or case OFF waiting for restart delay before opening liquid solenoid or ESV valve.
`Auto`	`2`	Waiting for defrost clock to be updated if u04=1
			Manual
`StoP`	`10`	If unit selected StoP for case cleaning
`-FAn`	`11`	If unit selected Fans only for case cleaning
			Thermostat
`-17-`	`20`	Cooling valve on -above setpoint
`-17-`	`21`	Cooling valve off -setpoint satisfied
			Superheat
	`30`	Superheat recovery valve 0% (coil-in >setpoint)
	`31`	Superheat startup recovery valve h5% (coil-in >setpoint)
	`32`	Superheat defrost recovery valve h6% (coil-in >setpoint)
	`33`	Superheat control valve above alarm limit
	`34`	Superheat control valve at h6% (defrost %)
	`35`	Superheat control valve at h3% (bleed%)
	`36`	Superheat control valve X% (normal control above cooling setpoint)
	`37`	Superheat control valve X% (normal control below cooling setpoint)
	`39`	Superheat control valve Y% superheat at max limit h1
			Defrosting
`-deF`	`41`	Defrosting Waiting for Pump down delay
`-deF`	`42`	Defrosting waiting for time terminate
`-deF`	`43`	Defrosting waiting for temperature termination
`-deF`	`44`	Defrosting waiting for draindown delay
`-deF`	`45`	Defrosting waiting for fan delay
`-Pd-`	`46`	Displayed from end of defrost cycle until Air OFF temperature is within alarm band after defrost is complete

COMMANDS

CASE CLEANING OPERATIONS

FANS ONLY

To switch from normal automatic control mode to FANS ONLY prior to case cleaning:-

Plug SKF-3 into LED-4 setup socket

-15.6   ⌃≫⌃   **FanS**   ⏱   **-Fan**   is shorthand for :-

Keep pressing **'up'** ⌃ button until **Fans** displayed

Then press **'enter'** ⏱ button which changes the control mode to Fans only and displays **-Fan**

When the unit displays -FAn instead of the case temperature, all alarms, liquid valve control, trim heaters and defrost cycles are turned off but the fans are kept running.

FANS mode may be also selected remotely via a communication command.

The case is switched StoP by selecting StoP mode.

The case is switched back on by selecting Auto mode

Remove SKF-3 from LED-4 socket until required again for OFF or Auto selection.

STOP for CLEANING

To switch from FANS mode to STOP prior to case cleaning:-

Plug SKF-3 into LED-4 setup socket

-Fan   ⌃≫⌃   **StoP**   ⏱   **StoP**   is shorthand for:-

Keep pressing **'up'** ⌃ button until **StoP** displayed

Then press **'enter'** ⏱ button which changes the control mode from Fans only to Stop mode and displays **StoP**

When the unit displays **StoP** instead of the case temperature, all alarms, liquid valve control, trim heaters, defrost cycles and fan outputs are turned off.

StoP mode may be also selected remotely via a switch input or a communication command.

The case is switched back on by selecting **Auto** mode.

Remove SKF-3 from LED-4 socket until required again for Auto selection after cleaning is complete. The case is now safe for cleaning.

AUTO control after cleaning

To switch from -OFF mode to AUTO after case cleaning:-
Plug SKF-3 into LED-4 setup socket

StoP   ⌃≫⌃   **Auto**   ⏱   **-15.6**   is shorthand for:-

Keep pressing **'up'** ⌃   button until displays **Auto**

Then press **'enter'** ⏱ button which changes the control mode from **StoP** mode to **Auto** and displays calculated product temperature.

When the unit displays **Auto** instead of the case temperature, all alarms are allowed and fan outputs are turned on. Time scheduled defrosts are restarted immediately if required.

Liquid valve control is inhibited until the restart delay timer has finished.

When the restart delay is complete, the liquid valve returns to automatic control and the case temperature value **t1** is displayed.

Remove SKF-3 from LED-4 socket until required again to view temperatures, change settings or subsequent case cleaning operations.

FORCE MANUAL DEFROST

To force a manual defrost

Plug SKF-3 into LED-4 setup socket

- 15.6   ⚌≫⚌   **. dEF**   🕘   **- dEF**   is shorthand for:-

Keep pressing **''up'** ⚌ button until **idEF** displayed.
Then press **'enter'** 🕘 button which changes the control mode from Auto into **Defrost** mode.
When the unit displays **-dEF** instead of the case temperature, all alarms and liquid valve control are turned off.
The defrost cycle performed is dependent on the DEFROST setup of parameter d1 to d11
-dEF mode may be also selected remotely via a communication command.
The defrost may be terminated (after draindown delay) by selecting Auto mode.

Remove SKF-3 from LED-4 socket until required again to view temperatures, change settings or subsequent case cleaning operations.

TEST OUTPUTS

To test control outputs and Expansion Solenoid Valve manually:-
Plug SKF-3 into LED-4 setup socket

-15.6   ⊗»⊗   **tESt**   ⏲ | **o01** | is shorthand for:-

Keep pressing '**up**' ⊗ button until LED-4 displays **tESt**
Then press '**enter**' ⏲ button which changes the control mode from Auto into **TEST** mode.
When in Test Mode, all alarms, liquid valve control, trim heaters, defrost cycles, lighting and fan outputs are turned off. The first relay selection identity **o01** (lights) is displayed

                                                   - - - alternating - -   - - - alternating - -
o01   ⊗»⊗   **o04**   pause   **o04**   ▮▮▮1   ⏲ **o04**   ▮▮▮0   is shorthand for:-

Keep pressing '**up**' ⊗ or '**down**' ⊗ buttons until identity displayed is the required output for test. eg **o04** Fans relay .
After a pause, the latest state of the selected output alternating with its identity is displayed e.g. **o04** state = **1**
Then press '**enter**' ⏲ button which toggles the state of the selected output.
e.g. **o04** state is now = **0**
The new state of the output i.e. 0=de-energised, 1= energised, is shown on the display.
Press '**up**' ⊗ or '**down**' ⊗ buttons until the identity of the next output for **tESt** is displayed and then repeat as above.

Identifier	Value	Units	TEST RELAY & VALVE OUTPUTS
		⊗	Press ⊗ to view next output and value. (if held down -stops when 'End' is displayed)
alternating	alternating	⊗	Press ⊗ to view previous output and value. (if held down -stops when 'End' is displayed)
		⏲	Press ⏲ to toggle displayed output state on and off.
o01	▮▮▮1		Lighting Relay state (0=OFF 1=On)
o02	▮▮▮1		Cooling Relay state (0=OFF 1=On)
o03	▮▮▮0		Defrost Relay state (0=OFF 1=On)
o04	▮▮▮1		Fans Relay state (0=OFF 1=On)
o05	▮▮▮1		Trim Heater Relay state (0=OFF 1=On)
o06	▮▮▮1		Expansion Solenoid Valve position @100%
o07	▮▮▮0		Digital Output o7 state (0=OFF 1=On)
o10	▮▮▮1		All Outputs On except defrost, ESV @100%
End		⏲	Press ⏲ to exit and return to default display **t1**
			TEST ends automatically 3 minutes after the last button press. All outputs resume automatic control when TEST is ended.

There are three ways to end Test mode and return to default case display
a)

                 o04   ⊗»⊗   **End**   ⏲   **-15.6**   is shorthand for:-

Hold down the '**up**' ⊗ button to quickly sequence through the TEST identifier list until **End** identifier is displayed. Press ⏲ to end TEST mode and return to default display **t1**.

d)   Test is automatically ended 3 minutes after the last button press.
e)   Remove SKF-3 from LED-4 socket which immediately causes the case to revert back to default display **t1** and Auto control.

Remove SKF-3 from LED-4 socket until required again to view temperatures, change settings or subsequent case cleaning operations.

SETUP

Controller settings can be changed locally at the case by using the SKF-3 unit plugged into the LED-4 in order to select Setup mode.

SETUP OPERATION

Setup mode operation lasts for a maximum of 3 minutes after which time it automatically ends setup mode and reverts to the default case display **t1**.

Enter Setup Mode

To enter setup mode
Plug SKF-3 into LED-4 setup socket

- - -alternating - -

-ı̄5.6 ⊗   **5Et■** ⊕ **cØ1■   ■■-3**   is shorthand for:-

> With default case temperature(-15.6C) on display, press **'up'** ⊗ button and **SEt** is displayed. Then press **'enter'** ⊕ button which changes the control mode to Setup mode and displays the first cooling setpoint indentifier **c01**. Alternating with its value

Select and Change Setting Value

To select the parameter and enter the new value

		- - -alternating - -			- - alternating -		- - -alternating - -	

⊗»⊗ **cØ3■** pause   **cØ3■   ■■61** ⊕ **cØ3■   ■■61** ⊗»⊗   **cØ3■   ■■68** ⊕

                                            winking   **winking**

> Using the ⊗ and ⊗ pushbuttons, sequence through the setup identifier list until the required identifier is displayed e.g. **c03**.
> After a pause the latest value of the selected parameter is displayed alternating with its identity. e.g. **c03** value **61** . Pressing ⊗ or ⊗ displays adjacent identifiers in the setup list.
> Press ⊕ button if this is the setting value to be changed.
> When in change setting mode the value being changed winks and alternates with its identifier.
> Press ⊗ and ⊗ until new winking value is correct eg **c03** value raised to **68.**
> **P**ress ⊕ to accept new setting value.
> Holding ⊗ or ⊗ quickly reaches the maximum or minimum range limit for the setting, which is immediately followed by **■ESc** . No further change happens until the next button press.
> **Press ⊕ on ■ESc to exit from setting change mode without changing the value**.
> Press ⊗ or ⊗ to continue editing the value and then press ⊕ to accept new setting value.
> Using the ⊗ and ⊗ pushbuttons, repeat the above procedure to view or change other parameter values.

The list of settings which can be changed at the case is given on page 18

End Setup Mode

There are three ways to end setup mode and return to default case display **t1**
a)   - - -alternating - -

           cØ5■   ■■61 ⊗»⊗   **End■**   ⊕   **-ı̄5.6**   is shorthand for:-

> Hold down the '**up**' ⊗ button to quickly sequence through the through the SETUP identifier list until **End** identifier is displayed then press **'enter'** ⊕ button

b)   Setup is automatically ended 3 minutes after the last button press.
c)   Remove SKF-3 from LED-4 socket which immediately causes the case to revert back to default display **t1** and Auto control.

Remove SKF-3 from LED-4 socket until required again to view temperatures, change settings or perform case cleaning operations.

LED4	LIST OF SETTINGS AT CASE		Min.	Max.	Default (Dairy)
	CONTROL				
c01	Cooling Cut-out setpoint for cooling control	°C	-40.0	40.0	-3.0
c02	Cooling deadband for cooling control (cutin=cutout+db)	C	0.0	4.0	1.0
c03	Control Input Probe (3=P3,4=P4,5=P5, 6=CPT)		3	6	6
c04	Control % P4 Air OFF (case c04 =100% coldstore =0%)		0	100	100
c05	Display % P4 Air OFF (case c05=50%, coldstore =0%)		0	100	50
c06	Thermostat Control Type (0=OFF,1= ESV 2= TEV)		0	2	2should be 1
c07	Lighting Control Mode for o01 0=Lights N/C , 1= Lights N/O; 2= remote 3= standard schedule ,		0	3	3
c08	Lighting relay wiring. 0=Lighting N/C , 1=Lighting N/O		0	1	0
c09	Trim Heater Pulse %		25	100	70
	DEFROST				
d01	Defrost termination probe 1 to 5=P1 to P5; 6=time only	°C	1	6	4
d02	Defrost termination Temperature	°C	00	40	10
d03	Defrost duration	mins	02	60	45
d04	Defrost schedule Automatic (0=no 1=yes)		0	1	1
d05	Fans on during defrost 0=no, 1=yes		0	1	1
d06	Heater on during defrost 0=no, 1=yes, 2=coldstore		0	2	0
d07	Pumpdown delay time At Defrost Start,	mins	0	60	0
d08	Draindown period at the end of Defrost Period before opening Cooling Valve .	mins	0	60	5
d09	Fan delay time after Cooling Valves Open	mins	0	60	5
d10	Fan delay terminate on P5 Defrost (0= not used)	°C	-10	10	0
d11	Number of defrosts per day		00	12	6
dt1	First Defrost time dt1 (0000= inhibit all defrosts)	time	0000	2359	0000
dt2-dt12	Defrost times dt2 to dt(d03) (12 max) Only displays active times dependent on number of defrosts per day d11 eg dt1 to dt6 for default case	time	0000	2359	0000
	ESV Superheat				
h01	Superheat High. Maximum	°C	00	25	12
h02	Superheat Low. Minimum	°C	00	10	03
	ALARMS				
A01	di01Door input Guardtime	Minutes	0	60	5
A02	di01Doort input use (contact) (0=None, 1=Door alarms when input open, 2=Door alarms when input closed, 3=Stop input)		0	3	0
A03	di02 input use -Fan Fuse (230vac) (0=None, 1=Alarm when input open, 2=Alarm when input closed,		0	2	1
A04	di03 input use -Heater fuse (230vac) (0=None, 1=Alarm when input open, 2=Alarm when input closed, 3=stop input)		0	3	1
A05	P1 Coil In Temperature in Use (1=Yes 0= No)		0	1	1
A06	P2 Coil Out Temperature in Use (1=Yes 0= No)		0	1	1
A07	P5 Defrost Temperature in Use (1=Yes 0= No)		0	1	0
A08	Air Off High alarm limit	°C	-40	40	3
A09	Air On high alarm limit	°C	-40	40	40
A10	Alarm delay	Minutes	0	99	10
A11	Defrost/Pulldown Alarm delay	Minutes	0	130	75

	UNIT				
u01	System No./ Modbus Slave Address		01	255	0
u02	PackNo.1=LT1,2=LT2,…6=LT6, 7=Cond 8=INT, 11=HT1, 12=HT2 ..19=HT9.		0	99	0
u03	Power on delay	minutes	0	9.9	0
u04	Wait for clock update for defrost before start		0	1	0
u05	NOT USED-----REMOVE Communications Protocol 0=none, 1=Ethernet SNMP,2 =RS485 MODBUS 3=RS485 WS5		0	3	1
u06	Real Time Clock Hours Minutes		0000	2359	0000
U07	Real Time Clock Weekday 1=sun;7=sat		1	7	2
u08	MAC Address - **READ ONLY**		ONLY		READ

CONTROL

Manual Modes

Stop Mode

When selected to Stop mode for case cleaning, all alarms are ignored and all control relays are de-energised. The case should be electrically fully isolated prior to case cleaning.
For command selection STOP for CLEANING see page 14.

Fans Only Mode

When selected to Fans only mode for case cleaning, all alarms are ignored and all control relays are de-energised except for the fans relay which is permanently energised whilst in fans only mode .
For command selection FANS ONLY see page 14.

Force Defrost Mode

A manual request for a forced defrost can be initiated by command selection as described
in FORCE MANUAL DEFROST page 15.
 A normal defrost cycle is immediately initiated.
 When the defrost cycle is complete, cooling control and defrost control return to automatic.

Test Outputs Mode

When selected to Test Outputs mode, all alarms are ignored and all control relays are de-energised except for the relay which is being toggled for test.
All outputs resume automatic control when Test Outputs mode is ended.
For command selection see TEST OUTPUTS page 16

Relay Outputs

o01 Lights

The lights relay o01 has changeover contacts.
The contact state N/C or N/O used is specified in **c08**.where
          Co8=0 Lights on N/C   when lights connected to terminal 9
          Co8=1 Lights on N/O   when lights connected to terminal 8
The lighting modes available for selection are
Lights permanently on, permanently off, controlled remotely or controlled by the real time clock schedule.
For standard store opening times the lighting mode of control is setup in **c07** where
          c07=0=Lights OFF - lights permanently **OFF.**
          c07=1=Lights ON - lights permanently **ONn**
          c07=2=Remote Control - lights controlled by remote communications
                  when in 2=Remote then a 15min watchdog sets lights ON if no updates detected.

c07=3= standard schedule

Mon - Thur	on 07:00 off 23:00
Fri -	on 07:00 off 00:00
Sat -	on 0700 off 22:15
Sun -	on 09:45 off 16:15

After power restart, if real time clock is not updated or setup then lights are forced on automatically.
On power up the clock defaults to midnight on Sunday.

o02 Liquid Solenoid Valve

The relay output is always energised and the valve open except when:-
I)   The selected control input probe **c03** or **c03=6** and the Control % of P4 Air Off temperature **t2** is below
          the cutout temperature setpoint **c01**
II)   A defrost is in progress.
III)   The controller is in Stop mode
IV)   The controller is in Fans only mode
V)   The controller is in Test Output mode.
A timing diagram is given in FIG.1   page 23

o03 Defrost

The Defrost relay is only operational during the defrost cycle.
The relay is energised after the pumpdown delay **d07.**
The relay is de-energised when the defrost probe selected in **d01** exceeds the defrost termination
temperature **d02** or at the end of the defrost duration period **d03.**
The relay may be toggled on and off in Test Outputs mode.
Timing diagrams are given in

Defrost Control Timing page 23
Defrost schedules may be easily setup by specifying the number of defrosts/day **d11**, the time of the first
defrost **dt1** and setting Defrost Schedule Automatic **d04=1=yes**.
If non standard defrost times are required then **d04=0.**
If **d04=0** then **dt2** to **dt'n'** are displayed after **dt1** and defrost times can be changed as required.
                    ('n' =value of d03=number of defrosts/ day)

o04 Fans

The Fan relay output is always energised except when
i)   a defrost is in progress and Fans On during defrost **d07=0** has been selected. (ie Fans OFF
          during defrost)
ii)   The controller is in Stop mode
iii)   The controller is in Test Output mode

o05 Trim/Pan Heaters

The Trim/Pan heater relay output is always energised and heaters ON except when:-
i)   The Heater output is being periodically pulsed on and off to conserve energy.
          The heater is on for only **c08=70%** every **c09=10 minute period** and the relay is de-energised for
          the remainder of the time.
          These parameters cannot be adjusted from the SKF-3.
ii)   a defrost is in progress and Heaters On during defrost **d06=0** has been selected. (ie heaters OFF
          during defrost)
iii)   The output is selected for Cold room and is only energised during defrost
iv)   The controller is in Stop mode
v)   The controller is in Fans only mode
vi)   The controller is in Test Output mode

ESV Expansion Solenoid Valve

o06 ESV Control

The 230vdc ESV Electronic Expansion Solenoid Valve is allowed to resume automatic control, after recovery from Defrost or Pulldown when the coil-in temperature is below the cut-out setpoint.

During restart or defrost recovery the valve is maintained at preset defrost (90%) or start-up (80%) open positions until the coil in temperature is below the cut-out setpoint, at which point the superheat control mode switches to automatic.

During normal superheat control operation, if the coil in temperature goes above the cut-out setpoint then the controller goes into superheat recovery mode.

In Superheat recovery mode the ESV valve is cycled on and off to attempt to establish a valid superheat temperature for control.
The valve will close for superheat time off and then open for superheat time on as specified by the starting/recoverey valve position % value. This cycle is maintained until the coil-in temperature is below the cut-out setpoint, at which point normal control is restored and superheat is stabilised.
On probe fail the valve is forced to 60 % to attempt to keep the case running ???

ESV Setup

Superheat parameters at their default values should provide adequate electronic expansion valve control. The only settings that can be changed at the case are Superheat maximum **h01**, and superheat minimum **h02**

If a particular case is not controlling efficiently then other parameters may be adjusted from the 'Consultant' Refrigeration Terminal dependent on observed performance.

Expansion valve sizing should give observed valve open % averages between 40% and 60%. to allow sufficient capacity for peak demands such as defrost recovery and initial starting where refrigerant demand may exceed normal cooling by a factor of 2 and as much as 4 on certain low temperature applications.

Terminology

LED-4 ident	SETTINGS SUPERHEAT		SKD-9 REF	Default	Min.	Max.
h01	Superheat High. Maximum is the maximum value the valve is allowed to control at.	°C	SH	10	00	40
h02	Superheat Low. Minimum is the minimum value the valve is allowed to control at.	°C	SL	03	00	99
h03	Superheat Minimum Opening This is the minimum % opening the valve will operate at and below which it is fully closed	%	bl	00	00	99
h04	Superheat Alarm Level at which superheat recovery is actioned. Superheat alarm (low) limit closes valve for a period.	°C	SA	01	00	40
h05	Starting Recovery Valve Position This is the valve % opening from power on or superheat recovery.	%	So	80	00	99
h06	Defrost Recovery Valve position This is the % valve opening held for time dt.	%	dr	90	00	99
h07	Superheat Recovery Time ON This is the time duration the valve is held open to enable recovery. The valve is opened to the valve % value before the alarm occurred.	mins	tn	01	00	15
h08	Superheat Recovery Time OFF This is the time duration the valve is closed at the onset of a superheat alarm.	mins	tF	01	00	15
h09	Superheat Proportional Gain		P	255	00	255
h10	Superheat Integral Gain		I	255	00	255
h11	Superheat Differential Gain		d	255	255	255
h12	Superheat Control Loop Period	secs	Pd	02	00	99

	Maximum Evaporating temperature. Coil In temperature at which valve will go into recovery mode.	°C	E	0	-40	40

Control Timing

FIG.1   Liquid Valve Control

```
            Air OFF temperature P4
     \                   ___/\
      \                 _/    \_
       \         c01+c02   ___/        \                         /\
        \                                                       / | cutin=c01+c02
     ----------------x--------------------\----------------x-------------------- ^
        \_     _/                          \_             _/   \_  differential c02 °K
     .........x  ._/.............................x........__/...... .x.................. v
          \_/                   c01          \___  / c01        \ c01=liquid cut-out
                                                \_/                 \

     _____         __liquid valve__n/o____               ___
              _____/                        _____/   _____
```
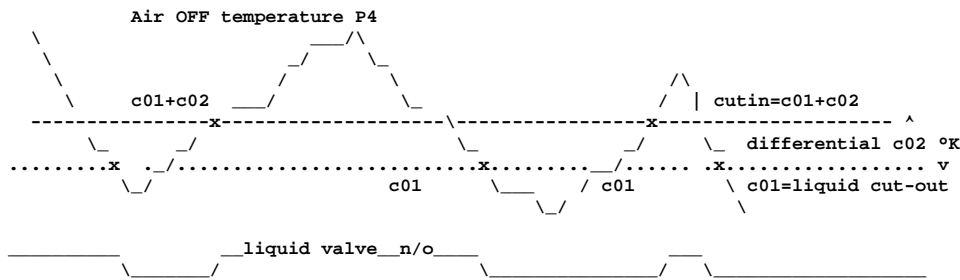
Defrost Control Timing

Case Defrost - Terminate on P4 Air off

d01=4   cases terminate defrost on probe on **P4 Air OFF** probe.
d05=1   case fans are normally **ON** during defrost.
d06=1   Trim Heater normally **ON** during defrost
c01=4   Cases control the liquid valve on **P4 Air OFF** probe
c04=100%   Control % of **P4=100%** for Cases

```
  request ____/_____

                                                    ____on_____
         _____                                    /
  LIQUID         _____off_____/
                 On_____
  DEFROST__off_____/                    _____
                ............d04 defrost duration .........
         _____
  pumpdown ___/  d08 _____

  terminate on probe P4 Air Off. . . . . . . .
                                        _____
  draindown delay_____/d09           _____
                                                         _____
  fan start delay _____/  d10      _____

              _____run_(_if d06=1)_____
  FANS           \ ......stop ( if d06=0)........................ ............/
              _____on__( if d07=1)_____
  Trim Heaters \.......off.( if d07=0)   ........................./
```

Fan delay Termination

 P5 Defrost goes below fan terminate temperature **(d10)**. . . . . .>

```
                                                       _____
  fan start delay _____/  d10      _____

         _____                                            _____
   FANS        _____stop ( if d05=0)_____/
```

Case Off-Cycle Defrost

d01=6   Off cycle cases normally terminate **on time**.
d05=1   case fans are normally **ON** during defrost.
d06=1   Trim Heater are normally **ON** during defrost
c01=4   Cases control the liquid valve on **P4 Air OFF** probe
c04=100%   Control % of **P4=100%** for Cases

```
request ____/_____
         _____                                                ____on_____
LIQUID        _____off_____/
              .      .....d03 defrost duration ........…>
         _____
pumpdown ___/  d07 _____


                                                 _____
draindown delay_____/d08      _____
                                                                _____
fan start delay _____/  d09 _____

                  _____run_(_if d05=1)_____
FANS          \ ......stop ( if d05=0)................................./
                  _____on__( if d06=1)_____
Trim Heaters \.......off.( if d06=0)   ......................./
```

Coldstore Defrost

d01=5   Coldstores terminate defrost on probe **P5 Defrost Coil** and NOT on P4 Air OFF probe.
d05=0   Coldstore fans are **OFF** during defrost.
d06=2   Coldstore Pan Heaters are only **ON** during defrost
c01=3   Coldstores control the liquid valve on **P3 Air ON** probe and NOT on P4 Air OFF probe
c04=0%   Control % of P4=0 for Coldstores
o04   Coldstores fans are switched off until fan delay **d09** is complete.
o05   Pan Heater for coldstore - only switched on during defrost
i01   Coldstore door input is monitored by **volt-free** contact **i01**
                           Door closed = contact open; Door open = contact closed

```
request ___/_____
         ____                                                ____on_____
Solenoid      _____off_____/
                    On_____
DEFROST__off _____/                          _____
              .............. defrost duration d03........…>
                  _on_____
Pan Heater _____/                                  \_____off_____
         ____
pumpdown ___/  d07_____

terminate on probe P5 Defrost Coil . . . . ...>
                                           _____
draindown delay_____/ d08        _____
                                                              _____
fan start delay _____/  d09  _____
  _run_____                                            _____
FANS          \__stop____d06=0_____/
```

COMMUNICATIONS

Communication facilities are available for remote interrogation of temperatures, status and modification / display of setpoints, limits and timeclock settings.
Communication is via an Ethernet Link using TCP/IP SNMP protocol.
An option is available to provide RS485 using MODBUS RTU at 19600 baud.

Each GUARDIAN controller has a unique system number or MAC address which is used to select the appropriate unit for interrogation or modification.
RS485 option systems use system number as Modbus address
GUARDIAN controllers are inactive until they are addressed.

GUARDIAN 'Consultant' or SIIMS proxy server SNMP communications provide:-

a) GET latest temperature values, unit status, alarm and relay states and internal status

d) GET/SEND setpoints and other settings values

e) SEND Time and Date with new hours and minutes, week day for real time clock

f) SEND remote command to Initiate or Terminate a defrost

g) SEND remote command to change case mode selection for case cleaning Auto / FANSonly / Stop

Typical 'Consultant' Mimic for GC-E636 Case
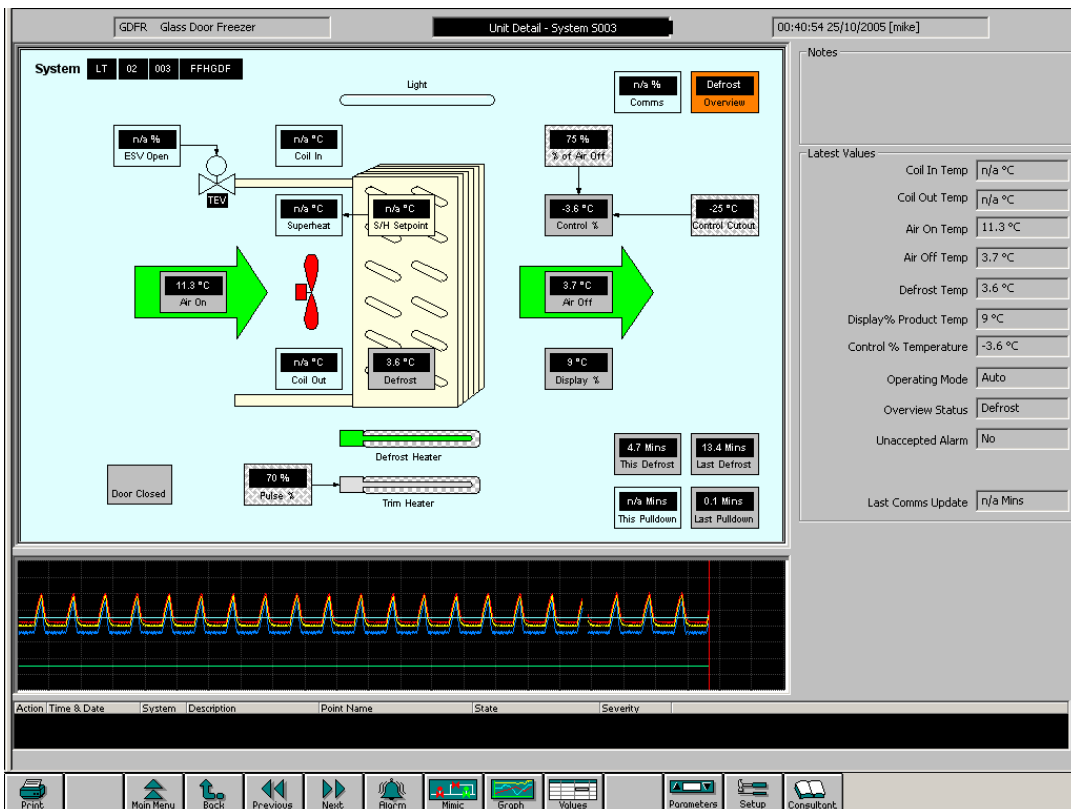
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DANFOSS EQUIVALENT MENU SETTINGS

EKC 514B	LED4	LIST OF SETTINGS AT CASE		SKD-9 REF	Default (Dairy)	Min.	Max.
		CONTROL					
SP	c01	Cooling Cut-out setpoint for cooling control	°C	c	-3	-40	40
r01	c02	Cooling deadband for cooling control (cutin=cutout+db)	C	db	1.0	0.0	4.0
--	c03	Control Input Probe (3=P3,4=P4,5=P5, 6=CPT)			6	3	6
r15	c04	Control % P4 Air OFF (case c04 =100% coldstore =0%)			100	0	100
o17	c05	Display % P4 Air OFF (case c05=50%, coldstore =0%)		Pr	50	0	100
r14	c06	Thermostat Control Type (0=OFF,1=ESV 2=TEV)	same	LSoL	2	0	1
o38	c07	Lighting Control Mode for o01 0=Lights N/C , 1= Lights N/O; 2= remote control, 3=standard schedule			3	0	3
---	c08	Lighting relay wiring. 0=Lighting N/C , 1=Lighting N/O					
o41	c09	Trim Heater Pulse %	%		70	25	100
		DEFROST					
d10	d01	Defrost termination probe 1 to 5=P1 to P5; 6=time only Danfoss0=S4,1=S5,2=time only	°C	d	4	1	6
d02	d02	Defrost termination Temperature	°C	dt	10	00	40
d04	d03	Defrost duration	mins	dP	45	02	60
--	d04	Defrost schedule Automatic (0=no 1=yes)			1	0	1
d09	d05	Fans on during defrost 0=no, 1=yes		Fnon	1	0	1
--	d06	Heater on during defrost 0=no, 1=yes, 2=coldstore		Hton	0	0	2
--	d07	Pumpdown delay time At Defrost Start,	mins	Pt	0	0	60
d06	d08	Draindown period at the end of Defrost Period before opening Cooling Valve .	mins	Lt	5	0	60
d07	d09	Fan delay time after Cooling Valves Open	mins	Ft	5	0	60
--	d10	Fan delay terminate on P5 Defrost (0= not used)	°C		0	-10	10
24/ d03	d11	Number of defrosts per day		dn	6	00	12
d05	dt1	First Defrost time dt1 (0000= inhibit all defrosts)	time		0000	0000	2359
--	dt2-dt12	Defrost times dt2 to dt(d03) (12 max) Only displays active times dependent on number of defrosts per day d11 eg dt1 to dt6 for default case	time	1h	0000	0000	2359
		ESV Superheat					
n09	h01	Superheat High. Maximum	°C	SH	12	00	25
	h02	Superheat Low. Minimum	°C	SL	03	00	10
		ALARMS					
	A01	di01Door input Guardtime	Minutes		5	0	60
	A02	di01Doort input use (contact) (0=None,1=Door n/c,2=Door n/o, 3=Stop input)			0	0	3
--	A03	di02 input use -Fan Fuse (230vac) (0=None, 1=Alarm N/C, 2=Alarm N/0,			1	0	2
--	A04	di03 input use -Heater fuse (230vac (0=None, 1=Alarm N/C, 2=Alarm N/0, 3=stop input)			1	0	3
--	A05	P1 Coil In Temperature in Use (1=Yes 0= No)		A4nf	1	0	1
--	A06	P2 Coil Out Temperature in Use (1=Yes 0= No)		A5nf	1	0	1
--	A07	P5 Defrost Temperature in Use (1=Yes 0= No)		A1nf	0	0	1
A13	A08	Air Off High alarm limit	°C		3	-40	43
A20	A09	Air On high alarm limit	°C		40	-40	40
A03	A10	Alarm delay	Minutes		10	0	99
A12	A11	Defrost/Pulldown Alarm delay	Minutes		75	0	130
Unit Settings					Default	Min.	Max.
o03	u01	System No./ Modbus Slave Address		A	0	01	255
--	u02	PackNo.1=LT1,2=LT2,…6=LT6, 7=Cond 8=INT, 11=HT1,12=HT2 ..19=HT9.			0	0	99
o01	u03	Power on delay	minutes		0	0	9.9

--	u04	Wait for clock update for defrost before start			0	0	1
--	u05	NOT USED-----REMOVE any functions Communications Protocol 0=none, 1=Ethernet SNMP,2 =RS485 MODBUS 3=RS485		baud	0	0	0
--	u06	Real Time Clock Hours Minutes		rtc	0000	0000	2359
--	U07	Real Time Clock Weekday 1=sun;7=sat		rtc	2	1	7
--	u08	MAC Address - **READ ONLY**			READ	ONLY	

Temperature Alarm Settings

CASES	AIR OFF HIGH limit	AIR ON HIGH limit	DEFROST INTERLOCK GAS	DEFROST INTERLOCK ELECTRIC	Alarm delay
	°C	°C	minutes	minutes	minutes
LT Product	100% P4				
Ice Cream	-18		60	90	10
Frozen Food	-18		60	90	10
Frozen Meat	-18		60	90	10
Frozen Fish	-18		60	90	10
Well case		-7			10
HT Product	100% P4				
Fresh Meat	3		45	75	10
Provisions	3		45	75	10
Fresh Fish	3		45	75	10
Meat Based Dairy	3		45	75	10
Milk Based Dairy	3		45	75	10
Produce / Cold Salad	3 5 eanan		45	75	10
Coldrooms					
Frozen	-18		60	90	30
Fresh Meat	4 3 eanan		45	90	30
Butter Fats / Produce	6		45	90	30
Produce (Old Stores)	10		45	90	30
Door alarm					5 ??? warning