FOSTER
REFRIGERATOR

SERVICE MANUAL

SSD 90 Controller with SMD 12 Display

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Contents

	Page
1. Introduction	2
2. User Guidelines	3
3. Operating Instructions	3 to 5
4. Set Up Mode	5
5. Parameter Definitions	6 to 8
6. Electrical Connections	8 to 9
7. Parameter Settings	10 to 11
8. Alarms and Warnings	12 to 13
9. **Typical Display Indications**	13
10. Wiring Diagrams	14 to 15

1. Introduction

The controllers is available in two types:

i) A high temperature version used on refrigeration cabinets, wine and drinks display products where the storage temperature is typically at or above 1°C and the defrost required is an off cycle type.

ii) A low temperature version used on freezer and sandwich make up tables where the storage temperature is typically below -1°C or the defrost mode is to be either hot gas or electric.

High Temperature Controller

The complete high temperature controller has the Foster part number 00-554987.

The high temperature controller system is made up of three component parts the Power Supply Unit (PSU), a display and an air temperature probe. The PSU is the component that determines the temperature range and the type of control the system can operate within. The PSU has the LAE part code SSD90A10E-C. This has one relay to operate the switching of the compressor, all of the mains electrical connections for outputs, and a connection for the display and air probe. The operating software is also held in this component, pre-set with standard operating parameters (which will need adjustment to suit Foster applications). The PSU needs to be connected to the SMD12RU20 display by a ribbon cable. Finally an air probe is required. This is a standard KTY81-121 type with the LAE part code ST1K35C1.

Low temperature controller.

The complete low temperature controller has the Foster part number 00-554988.

The low temperature controller system is made up of four component parts the Power Supply Unit (PSU), a display, air and evaporator temperature probes. The PSU is the component which determines the temperature range and the type of control the system can operate within. The low temperature version PSU has the LAE part code SSD90B30E-C. This has three relays to operate the switching of the compressor, evaporator fans and defrost supplies. There are also all of the mains electrical connections for outputs, a connection for the display, and connection ports for the air and evaporator probes. The operating software is contained in the PSU, which is pre-set with standard operating parameters (which will need adjustment to suit Foster applications). The PSU needs to be connected to a SMD12RU20 display by a ribbon cable as with the high temperature version above. The air probe is the same as the high temperature version - a standard KTY81-121 type with the LAE part code ST1K35C1. In addition the evaporator probe is a similar type with the LAE part code ST1K35C2.

General Details

The Power Supply Unit (PSU) is usually located in the condensing system area. The appropriate model of PSU should be used for the application depending upon temperature operating range and the type of defrosts required. Wiring connections to the PSU should be made in accordance with the model wiring diagrams. The mains cables to the PSU should be secured behind the cable-clamping bar provided. If a door switch is to be fitted this should be attached using the green connecting plug that is supplied. The operating parameters for the controllers are contained in the PSU, however any adjustment is carried out using the display.

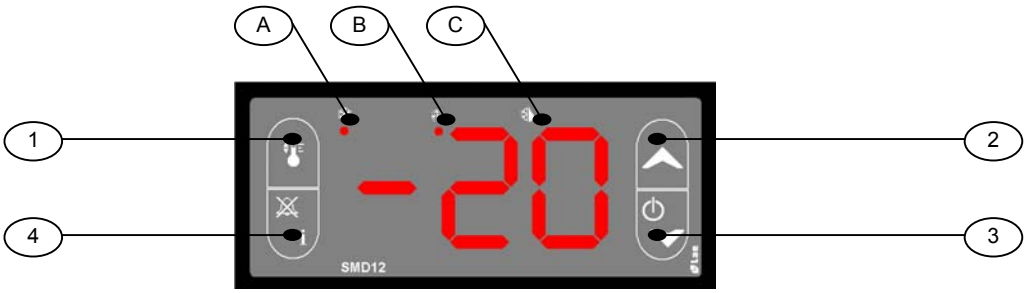
The probes are connected to the PSU using the appropriate ports for the probe position. The probes supplied with these controllers are both light grey, however to assist in identification each probe is marked 10cm from its end with either T1 or T2 and its LAE part number and the probe type;
T1 = the air temperature probe.
T2 = the evaporator temperature probe.

The display is connected to the PSU by a 2 metre, 10 way ribbon cable. This cable is fitted with an indexed plug at its end. It is important that this plug is correctly fitted in the socket of the PSU and the cable supporting bar located securely.

2. User Guidelines

The display consists of three 7-segment red LED's with output function indicator. Beside the numerical display are four operating buttons (two on each side). The general arrangement is given below:

For simplicity of description in this document the buttons and indicators on the display unit will be designated as shown below:



SMD 12 Display

Function Indicators:

A - Compressor Relay Energised.

B - Evaporator Fan Relay Energised.

C - Defrost Relay Energised.

Operating Buttons:

1 - Temperature Set Button

2 - Increment Button

3 - Standby / Decrement Button

4 - Information / Mute Button

3. Operating Instructions

When mains power is supplied to the controller it will carry out a self-test function. This lasts approximately 3 seconds, and during this time the display will show a single dash in the centre ' – '. The display will then show the internal air temperature (measured by probe T1). If this temperature is not with-in the pre-set range the controller will activate the refrigeration system.

The temperature measured by the evaporator coil probe (T2) can be viewed by pressing and releasing button 3 three times – the display will show 't2'. By pressing and holding button 3 the evaporator temperature will be displayed. When button 3 is released the display will temporarily show 't3'. After a short period (about 3 seconds) the display will return to showing the internal air temperature.

Note:
This function is only available when the evaporator probe is fitted, therefore only on the low temperature models fitted with the PSU SSD90B30E-C. If the evaporator temperature of a high temperature model is viewed the display will show '-51'; which is the default probe failed value. The same thing will happen if button 3 is pressed to view the value of 't3'.

During normal operation the controller will automatically cause the refrigeration system to perform defrost routines at set intervals. The methods and operation of these defrosts are detailed later in this document.

If mains electrical power is removed from the controller with the unit operational, the refrigeration system will cease. When mains power is re-connected the controller will then cause the system to re-start. However, if the controller is set to 'Stand-by' mode when the mains fails, on re-connection the controller will return to the 'Stand-by' mode.

To Switch Unit Off

i) Press and release button 3 — The controller will display '---', the condensing system will stop.

*This function is only available if parameter 'oFF' is set to 'YES'. On replacement controllers this function is available as the default value, however as part of the Foster test procedure this parameter is set to 'no' and thus the controller does operate in this manner.

To Switch Unit On

i) Press and release button 3 — The controller will display the air temperature as measured by TI. If this is not within the pre-set parameter values the condensing system will start.

*This function is only available if parameter 'oFF' is set to 'YES'. On replacement controllers this function is available as the default value, however as part of the Foster test procedure this parameter is set to 'no' and thus the controller does operate in this manner.

To Check Storage Temperature Setting

i) Press button 1 — The display will show the temperature setpoint while button 1 is being pressed.

To Increase Low Point of Storage Temperature (Operating Temperature Raised)

i) Press and hold button 1 — The display will show the temperature setpoint.
ii) Press button 2 — The display value will increment. Repeat step ii) until required value is shown.
iii) Release button 1 — The controller will display the air temperature as measured by T1. If this is not within the new parameter value the condensing system will start.

To Reduce Low Point of Storage Temperature (Operating Temperature Lowered*)*

i) Press and hold button 1 — The display will show the temperature setpoint.
ii) Press button 3 — The display value will decrement. Repeat step ii) until required value is shown.
iii) Release button 1 — The controller will display the air temperature as measured by T1. If this is not within the new parameter value the condensing system will start.

To Initiate a Manual Defrost

i) Press and release button 4 — The display will show 'df'.
ii) Press and hold button 4 — The display flash 'df'.
iii) Press and release button 2 — The controller will commence a defrost routine. The appropriate function indicators will be illuminated. The display will show 'dEF'.

Ancillary Functions

The controller has the ability to carry out some additional functions, which may be of use to servicing personnel. It should be noted however that these functions may only be available where the correct hardware and parameter set-up is used, and even then may not be available on all Foster models.

Viewing Evaporator Probe Temperature (Where Fitted)

This function allows the temperature being measured by the evaporator probe to be viewed. This is achieved by pressing button 4 (display will show 'dF'), press button 2 twice (display shows 't1' then 't2'), press and hold button 4 (display shows evaporator probe temperature). Upon releasing button 4 the display will show 't3', however after 10 seconds the display will revert to internal air temperature and will function in the 'Normal Operating Mode'.

Viewing Condenser Probe Temperature (Not Fitted)

This function allows the temperature being measured by the condenser probe to be viewed. This is achieved by pressing button 4 (display will show 'dF'), press button 2 three times (display shows 't1', 't2' then 't3'), press and hold button 4 (display shows condenser probe temperature). Upon releasing button 4 the display will show 'Pc', however after 10 seconds the display will revert to internal air temperature and will function in the 'Normal Operating Mode'.

Condenser Fan Control (Not Fitted)

This function allows the refrigeration system to avoid an excessive condensing pressure drop if it is operating in a relatively low ambient temperature. Temperature control takes place by comparing the temperature of the probe ('t3') with the parameter 'cFt' threshold. When the temperature goes higher than this point the condensing fans cut

in, and visa versa. Obviously this control is only active if the relevant probe has been fitted and enabled (i.e. 't3' = 'YES').

Defrost Routine

The controller initiates defrost routines automatically using a pre-determined time based cycle, or they can be initiated manually. The number of defrosts that occur in any one 24 hour period is determined by Parameter 'dFr' – the defrost frequency per day. The number of defrosts per day can be varied from 24 to none. The defrost period is operated from an internal clock, which is based upon a counter system. If the cabinet is put into standby mode or has the power removed the built in counter is reset to zero. Similarly, if a manual defrost is initiated the count will be reset to zero, and subsequent automatic defrosts will then continue at the set interval.

Dependant upon the application, the defrost will vary in type (hot gas, electric or off cycle), and duration. The type of defrost performed will be determined by the setting of parameter 'dtY'. Based on the application, the selection of the type of defrost will operate as follows:

If 'dtY' is set to 'oFF' an Off Cycle defrost will occur. At initiation the evaporator fans will continue to run (even if the doors are opened), however the condensing unit will stop. The period of the defrost will be determined by the value set in parameter 'dto' the Defrost End Time as there is typically no evaporator probe fitted on high temperature models to end the defrost on temperature beforehand. There is no Drain Down Time (parameter 'drn') as the standard value on high temperature models for this parameter is '0'.

If 'dtY' is set to 'ELE' an Electric defrost will occur. These are typically used on negative temperature remote or under mount condensing system applications. At initiation only the defrost relay will be energised, therefore the condensing unit and evaporator fans will stop. The period of defrost will be determined by the value set in parameter 'dto' the Defrost End Time. However an evaporator probe is also usually fitted (parameter 't2' is set to 'YES'), so the defrost may be ended once the evaporator coil has reached the Defrost End Temperature as determined by parameter 'dLi'. The defrost will therefore end either on time or temperature depending on which occurs first. Following this a Drain Down period will occur - the length of which is determined by parameter 'drn'. The final stage of this type of defrost is the Recovery Period, which is where the evaporator is allowed to cool before the fans restart. This is controlled by the evaporator coil temperature being reduced to the value of parameter 'Fdd' – the Evaporator Fan Re-start Temperature.

If 'dtY' is set to 'gAS' a Hot Gas defrost will occur. This mode is usually used on integrated negative temperature models. At initiation both the compressor and the defrost relay will be energised, the evaporator fans will cease. The period of defrost will be determined by the value set in parameter 'dto' the Defrost End Time, however an evaporator probe is usually fitted (parameter 't2' is set to 'YES'). This means that the defrost may be ended once the evaporator coil has reached the Defrost End Temperature as determined by parameter 'dLi'. The defrost will therefore end either on time or temperature depending on which occurs first. Following this a Drain Down Time will occur. The length of this is determined by parameter 'drn'. The final stage of this type of defrost is the Recovery Period, which is where the condenser is allowed to cool before the fans restart. This is controlled by the evaporator coil temperature being reduced to the value of parameter 'Fdd' – the Evaporator Fan Re-start Temperature.
At initiation of a defrost, either automatic or manual the display will show 'dEF' (when parameter 'ddY' is greater than '01' – if '00' is set the display will always show internal air temperature as measured by probe T1). With a value for 'ddY' being set at '01', 'deF' will remain on the display for 1 minute from the end of defrost – having occured either by time or temperature. By increasing the value of 'ddY', 'deF' will remain on the display for the appropriate time beyond the end of defrost.

A defrost can be initiated manually if required. The procedure for this is detailed in the 'User Functions' section, but the defrost operation and display will be the same as for an automatic defrost. Should a manual defrost be initiated the automatic defrost clock will be reset, and therefore subsequent defrosts will follow at the normal time interval.

4. Set Up Mode

The standard parameter settings can be accessed and adjusted by carrying out the following procedure, starting from the 'normal operating mode':

i)	Press button 4 five times	The display will show 'Pc'.
ii)	Press and hold button 4	The display will show '00'.
iii)	Press button 2	The value displayed will increase. Release button 2 when the display shows '47'. (If the display goes past '47', use button 3 to decrement the value).
iv)	Release button 4	The display will show 'SPL'.
v)	Press button 2	Display will cycle through parameters. To cycle backwards press button 3.
vi)	Press and hold button 1	Display will show selected parameter value. To increment value press button 2. To decrement value press button 3.
vii)	Release button 1	New parameter will be saved and the display will show the next parameter.

Follow points vi) and vii) to adjust any other parameters required.

When all adjustments have been made the 'Set Up' mode can be exited by pressing button 4.

Alternatively if no buttons are pressed for 30 seconds the controller will automatically revert to 'normal operating mode' having saved any changes made.

5. Parameter Definitions

SPL **Minimum Temperature Set Point (°C).**
The minimum value that the temperature set point can be adjusted down to in the operator functions. Minimum selectable value –40°C. Maximum selectable value is the value entered in parameter 'SPh'.

SPh **Maximum Temperature Set Point (°C).**
The maximum value that the temperature set point can be adjusted up to in the operator functions. Maximum selectable value 250°C. Minimum selectable value is the value entered in parameter 'SPL'.

SP **Actual Temperature Set Point (°C).**
The standard (default) internal air temperature to be achieved before the condensing unit switches off.

hYS **Thermostat Hysteresis (°K).**
Allowable temperature increase from Temperature Set Point before switching on refrigeration system.
-30 to –01 – Used for heating control.
00 – Excludes the thermostat, condensing system output falls low, system does not run.
01 to 30 – Used for cooling control.

dFr **Defrost Frequency / 24Hrs.**
The number of Defrosts performed in a 24-hour period.
Range 0 (no defrosts occur) to 24 (1 defrost cycle in every hour).

dLi **Defrost Termination Temperature (°C).**
The temperature at which the defrost relay is de-energised to stop a defrost routine. This can only be used if an evaporator probe is fitted and enabled ('t2' – 'yES'), otherwise the defrost will terminate on time ('dTO'). Range 01 to 70.

dtO **Defrost Termination Time (mins.).**
The period of time that the defrost relay will be energised. On models with no evaporator probe this is the only method of causing a defrost to cease. On models with an evaporator probe this acts as a probe fail back up. Once the time set has elapsed the defrost will cease – independent of whether an evaporator probe is fitted or not. Range 01 to 120.

dtY **Defrost Type.**
Identifies the type of defrost cycle to be performed.
oFF = off cycle defrost. ELE = electric heater defrost. gAS = hot gas defrost.

drn **Drain Down Time (mins.).**
The period of time following the defrost termination (either by temperature; 'dLi', or time 'dtO') that is allowed for 'ice melt water' to drain from the evaporator coil before the condensing system restarts.
00 - No drain down time. 01 to 30 - Drain down period.

ddY **Defrost Display Time (mins).**
During a defrost routine the display will usually show 'DEF' (if the value of 'ddY' is greater than '0'). The value set for 'ddy' will determine in minutes how long 'DEF' is displayed from the start of the defrost routine.
00 = Air temperature displayed throughout defrost cycle.
01 - 60 = 'DEF' displayed from start of defrost routine for length of value set.

FPc **Evaporator Fan Proportional Control (°C).**
Determines the evaporator fan-operating mode. Selecting 0 will cause the evaporator fan to run continuously (excepting door switch operation). Selecting a value greater than 0 will cause the evaporator fans to be turned on simultaneously with the compressor, but the fan will continue to run after the compressor has stopped for a time proportional to its run time. Each unit of 'FPc' is equivalent to 20% of run time. 0 = Continuous operation. 01 to 05 = Cycle on / off with compressor proportionally.

Fdd **Fan Delay Temperature (°C).**
The temperature the evaporator coil must reach following a defrost before the evaporator fans are allowed to re-start. Only active if an evaporator probe is fitted ('t2' = YES). Range –10°C to +10°C.

AtL **Low-Alarm Temperature Differential (°C).**
The temperature at which the alarm will sound (after the appropriate delay period) to warn that the measured temperature value is too low. As this value is a differential it will move automatically, so adjusting the low alarm temperature when the set point is adjusted. ('SP' + 'AtL' for period set in 'Atd' = 'LO' Alarm Warning). Range 0°C to –25°C. Value of '0' excludes the Low Temperature Alarm.

Ath **High-Alarm Temperature Differential (°C).**
The temperature at which the alarm will sound (after the appropriate delay period) to warn that the measured temperature value is too high. As this value is a differential it will move automatically, so

adjusting the high alarm temperature when the set point is adjusted. ('SP' + 'HYS' + 'Ath' for period set in 'Atd' = 'Hi' Alarm Warning). Range 0°C to 25°C. Value of '0' excludes the High Temperature Alarm.

Atd **Temperature Alarm Delay (mins.):**
The delay period between a temperature alarm condition occurring and the internal siren sounding with the appropriate LED alarm message appearing.
00 = Instantaneous audible alarm. 01 to 120 = Period of delay (min.).

AdO **Door Alarm Delay (mins.).**
The delay (if any) following the door being opened before the door open alarm sounds. Therefore if the door switch parameter (dS) is set to 'YES', and the door alarm delay (Add) is set to 5 minutes, the door open alarm will sound 5 minutes after the door was first opened.
00 = Instantaneous door alarm. 01 to 120 = Delay before alarm sounds (min.).

Acc **Condenser Clean Interval Warning.**
Determines the time interval between condenser clean warnings.
00 = Excludes Condenser Clean Warning. 01 to 120 = Interval period in weeks.

Act **Condenser Alarm Temperature (°C).**
When the condenser temperature exceeds the value selected in 'Act', the alarm is sounded and an overpressure message is displayed. This facility is only available when parameter 't3' is set to 'YES'.
This function is not a standard function on Foster products. Range 0°C to 250°C.

cSd **Compressor Safety Stop Delay (mins.).**
Determines the minimum time the condensing system must be off before it is able to re-start.
00 = No minimum time off. 01 to 30 = Period of condensing time off.

cFt **Condenser Fan Temperature (°C).**
When the condenser temperature exceeds the value selected in 'cFt' the condenser fan is switched on. This facility is only available when parameter 't3' is set to 'YES', and a different type of PSU is used with an independent condenser fan relay (not standard to Foster). Range –40°C to 250°C.

cRt **Compressor Rest Time (mins.).**
Determines the minimum time the compressor must be off before it is able to re-start.
00 = No minimum time off. 01 to 30 = Period of condensing time off.

cdc **Condenser Duty Cycle at T1 Failure.**
Determines; in 10 percent increments, the amount of time the condensing system will run and rest should the air probe (T1) fail in any given 10 minute period (i.e. with 'cdc' set to 05, the condensing system will run for 5 minutes, then switch off for 5 minutes). Range 0 (Condenser Duty Cycle would be inactive) to 10 (Condensing system would be operating constantly).

oFF **Stand-by Function Operation.**
Determines whether the 'Stand-by' button (bottom right – No.3) operates. During the standby mode the display shows 'oFF' and all the relays are de-energised. When the 'Stand-by' button is pressed 'normal' operation will commence. Range 'YES' (Stand-by function operates) – 'no' (Stand-by function does not operate).

dS **Door Switch:**
Determines if a door switch is fitted or not, and consequently dictates whether the Evaporator Fan relay is controlled by the door switch. If active, the Evaporator Fan relay would be de-energised (therefore off) when the door is opened. Also determines if the Door Open Alarm functions are enabled.
no = No door switch fitted. YES = Door switch fitted.

Ldo **Door Controlled Lights:**
Determines if internally fitted lights controlled by a separate relay are switched with door opening.
This function is not enabled as a standard feature on Foster products.
no = Door controlled lights disabled YES = Door controlled lights enabled.

t2 **Evaporator (T2) Probe.**
Identifies whether an Evaporator Probe is fitted – dependent upon model.
no = No Evaporator Probe fitted. YES = Evaporator Probe fitted.

t3 **Condenser (T3) Probe.**
Identifies whether a Condenser Probe is fitted.
no = No Condenser Probe fitted. YES = Condenser Probe fitted.

ScL **Centigrade / Fahrenheit Selection.**
Selection of the operating display between Centigrade and Fahrenheit. If the 'ScL' parameter is adjusted then parameters 'SPL', 'SPh', 'SP', 'DLI', 'FDD', 'Act', 'cFt' which relate to absolute temperatures, and

parameters ‘HYS’, ‘AtL’, ‘AtH’ relating to differential temperatures must also be re-configured imperatively. Range °C or °F.

oS1 **Air Temperature Probe (T1) Offset (°K).**
Allows the air probe and LED temperature display (and hence the operating characteristics) to be adjusted up or down to allow for system variations and tolerances. Range –15°C to +15°C.

oS2 **Evaporator Temperature Probe (T2) Offset (°K).**
Allows the evaporator probe value to be offset, thus changing the operating characteristics relating to the defrost routine. Range –15°C to +15°C.

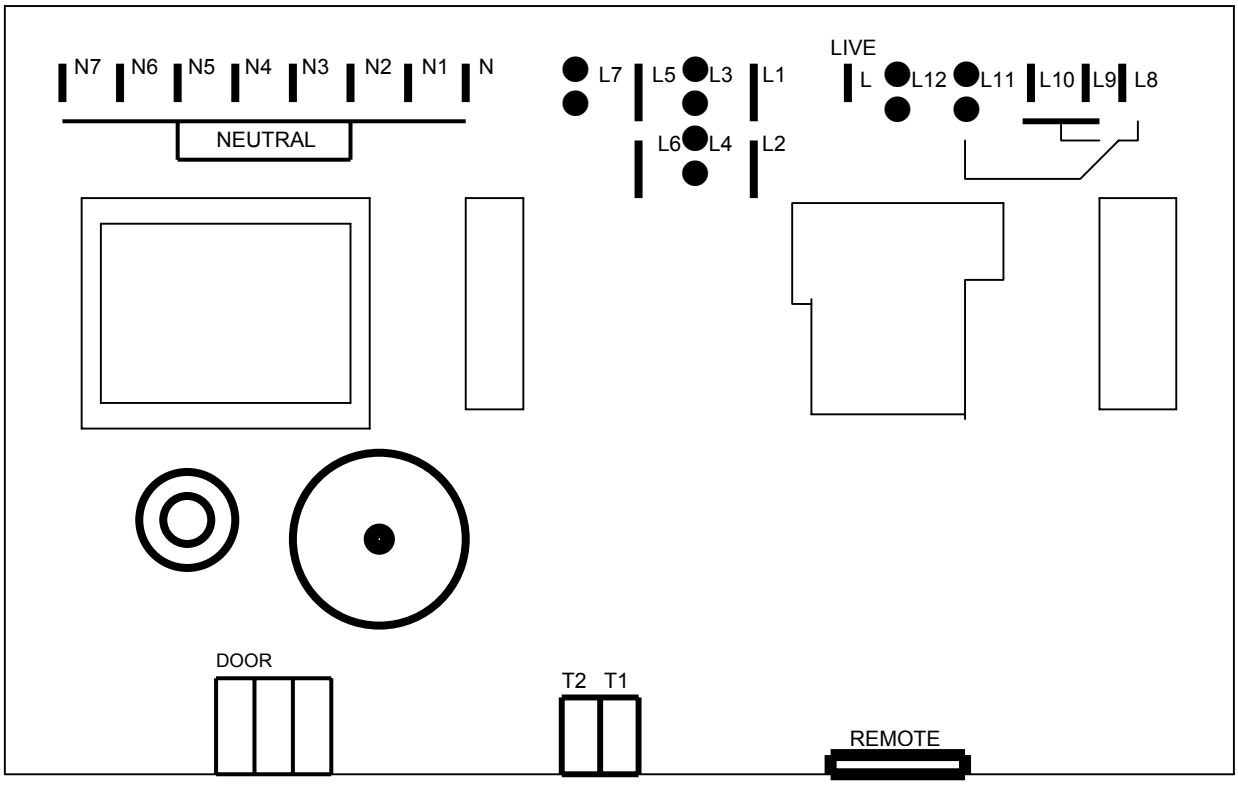
oS3 **Condenser Temperature Probe (T3) Offset (°K).**
Allows the condenser probe value to be offset. Range –15°C to +15°C.

SiM **Display Slowdown.**
Controls the thermal mass volume simulated by the controller and displayed on the fascia. The greater the value the greater the resulting slow down. The controlling functions continue to operate directly on the actual air temperature.
00 = Instantaneous air temperature displayed.
01 to 100 = Thermal mass simulation / slow down rate.

Adr **Address.**
The controller peripheral number. This is only necessary when controllers are liked via a network to a computer management and data recording system. Range 00 to 255.

6. Electrical Connections.

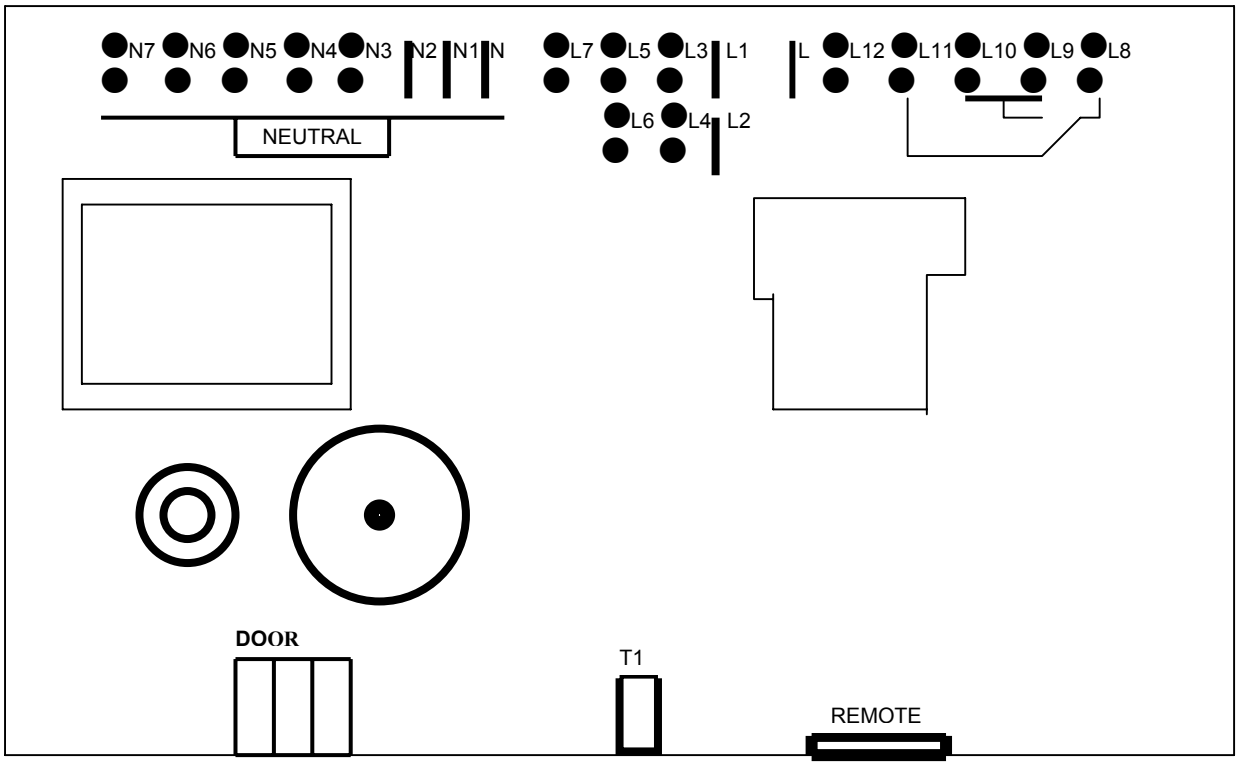
Low Temperature Controller part number 00-554988.



Connections

L= Live Feed. L1 = Condensing Unit. L2 = Mullion Heater. L5 = Evaporator Fan/s. L6 = Drain Line Heater
L8 = Vaporiser Heater (optional). L9 and L10 = Solenoid Valve.
N = Neutral Feed. N 1 to 7 = Neutrals

High Temperature Controller part number 00-554987.



Connections

L = Live Feed, Fan/s, Lights (if fitted). L1 = Mullion Heaters (optional), Vaporiser Tray Heater (optional).
L2 = Condensing Unit.
N = Neutral Feed. N1 and N2 = Neutrals.

7. Parameter Settings

Standard parameter settings for the high temperature SSD90A10E-C, part No 00-554987, controller.

Item	Display	Parameter:	Min:		Max	Standard Settings	BM Range	HR 220 U	PS 220 HU	HR 220 UG	HR 220 UF	GR/L/F 1/ 2 HP
1	**SPL**	Minimum Temperature Setting (°C)	**-40**		**SPh**	**-03**	**06**	**02**	**01**	**02**	**-01**	**01**
2	**SPh**	Maximum Temperature Setting (°C)	**SPL**		**250**	**05**	**10**	**05**	**05**	**05**	**01**	**05**
3	**SP**	Actual Temperature Setting (°C)	**SPL**		**SPh**	**01**	**06**	**03**	**01**	**03**	**-01**	**01**
4	**hYS**	Thermostat Hysteresis (°K)	**-30**		**30**	**03**	**04**	**02**	**03**	**02**	**02**	**03**
5	**dFr**	Defrost Frequency (/24hr)	**0**		**24**	**04**	**04**	**04**	**04**	**04**	**02**	**04**
6	**dLi**	Defrost End Temperature (°C)	**0**		**70**	**15**	**10**	**10**	**30**	**10**	**10**	**10**
7	**dto**	Defrost End Time (mins)	**1**		**120**	**20**	**15**	**15**	**30**	**15**	**20**	**15**
8	**dty**	Defrost Type (Off Cycle, Electric, Hot	**oFF**	**ELE**	**gAS**	**oFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
9	**drn**	Drain Down Period (mins)	**0**		**30**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
10	**ddY**	Defrost Display Time (mins)	**0**		**60**	**15**	**15**	**15**	**30**	**15**	**15**	**15**
11	**FPc**	Evaporator Fan Proportional Control	**0**		**5**	**02**	**00**	**00**	**00**	**00**	**00**	**00**
12	**Fdd**	Evap. Fan Re-start Temperature (°C)	**-40**		**70**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
13	**AtL**	Low Temp. Alarm Differential (°K)	**-25**		**0**	**-04**	**-02**	**-02**	**-02**	**-02**	**-02**	**-02**
14	**Ath**	High Temp. Alarm Differential (°K)	**0**		**25**	**04**	**06**	**06**	**06**	**06**	**04**	**06**
15	**Atd**	Temperature Alarm Delay (mins)	**0**		**120**	**60**	**60**	**60**	**60**	**60**	**90**	**60**
16	**Ado**	Door Alarm Delay (mins)	**0**		**120**	**05**	**05**	**05**	**05**	**05**	**05**	**05**
17	**Acc**	Condenser Cleaning Period (wks)	**0**		**120**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
18	**Act**	Condenser Alarm Temperature (°C)	**0**		**250**	**70**	**00**	**00**	**00**	**00**	**00**	**00**
19	**cSd**	Compressor Safety Stop Delay (mins)	**0**		**30**	**05**	**00**	**00**	**00**	**00**	**00**	**00**
20	**cFt**	Condenser Fan Temperature (°C)	**-40**		**250**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
21	**crt**	Compressor Rest Time (mins)	**0**		**30**	**03**	**00**	**00**	**00**	**00**	**00**	**00**
22	**cdc**	Cooling Cycle at T1 Failure (x10%)	**0**		**10**	**05**	**07**	**07**	**07**	**07**	**07**	**07**
23	**oFF**	Stand-by Function Operation	**YES**		**no**	**YES**	**no**	**no**	**no**	**no**	**no**	**no**
24	**dS**	Door Switch Operation	**YES**		**no**	**no**	**no**	**no**	**no**	**no**	**no**	**no**
25	**ldo**	Door Controlled Lights	**YES**		**no**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
26	**t2**	Evaporator Probe (T2) Enabled	**YES**		**no**	**no**	**no**	**no**	**no**	**no**	**no**	**no**
27	**t3**	Condenser Probe (T3) Enabled	**YES**		**no**	**no**	**no**	**no**	**no**	**no**	**no**	**no**
28	**ScL**	Centigrade / Fahrenheit Selection	**°c**		**°F**	**°c**	**°C**	**°C**	**°C**	**°C**	**°C**	**°C**
29	**oS1**	Air Probe (T1) Offset (°K)	**-15**		**15**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
30	**oS2**	Evaporator Probe (T2) Offset (°K)	**-15**		**15**	**00**	**00**	**00**	**00**	**00**	**00**	**00**

31	**oS3**	Condenser Probe (T3) Offset (°K)	**-15**		**15**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
32	**SiM**	Display Slowdown	**0**		**100**	**02**	**00**	**00**	**00**	**00**	**00**	**00**
33	**Adr**	Peripheral System Address	**0**		**255**	**01**	**01**	**01**	**01**	**01**	**01**	**01**

Standard parameter settings for the low temperature SSD90A30E-C, part No 00-554988, controller.

Item	Display	Parameter:	Min		Max	Standard Settings	DR 16 / 24 VE	PMC Range	SM 315 U	UBC 2/2 M	HR 220 ADUM	PS 220 LU	LR 220 ADU
1	**SPL**	Minimum Temperature Setting (°C)	**-40**		**SPh**	**-25**	**-05**	**00**	**01**	**-3**	**-03**	**-23**	**-23**
2	**SPh**	Maximum Temperature Setting (°C)	**SPL**		**250**	**-15**	**03**	**05**	**05**	**-1**	**05**	**-15**	**-15**
3	**SP**	Actual Temperature Setting (°C)	**SPL**		**SPh**	**-21**	**-04**	**01**	**01**	**-2**	**-02**	**-21**	**-21**
4	**hYS**	Thermostat Hysteresis (°K)	**-30**		**30**	**03**	**02**	**03**	**03**	**2**	**02**	**03**	**03**
5	**dFr**	Defrost Frequency (/24hr)	**0**		**24**	**04**	**04**	**04**	**04**	**04**	**04**	**04**	**04**
6	**dLi**	Defrost End Temperature (°C)	**0**		**70**	**15**	**30**	**30**	**30**	**30**	**25**	**20**	**20**
7	**dto**	Defrost End Time (mins)	**1**		**120**	**20**	**05**	**15**	**08**	**05**	**08**	**08**	**08**
8	**dty**	Defrost Type (Off Cycle, Electric, Hot	**oFF**	**ELE**	**gAS**	**ELE**	**gAS**	**gAS**	**gAS**	**gAS**	**gAS**	**gAS**	**gAS**
9	**drn**	Drain Down Period (mins)	**0**		**30**	**03**	**03**	**01**	**01**	**01**	**01**	**03**	**03**
10	**ddY**	Defrost Display Time (mins)	**0**		**60**	**05**	**15**	**05**	**05**	**05**	**05**	**05**	**05**
11	**FPc**	Evaporator Fan Proportional Control	**0**		**5**	**00**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
12	**Fdd**	Evap. Fan Re-start Temperature (°C)	**-40**		**70**	**-03**	**00**	**00**	**04**	**00**	**04**	**00**	**00**
13	**AtL**	Low Temp. Alarm Differential (°K)	**-25**		**0**	**-04**	**-03**	**-03**	**-02**	**-02**	**-02**	**-03**	**-03**
14	**Ath**	High Temp. Alarm Differential (°K)	**0**		**25**	**04**	**05**	**05**	**05**	**05**	**05**	**05**	**05**
15	**Atd**	Temperature Alarm Delay (mins)	**0**		**120**	**60**	**30**	**60**	**60**	**60**	**60**	**60**	**60**
16	**Ado**	Door Alarm Delay (mins)	**0**		**120**	**05**	**05**	**05**	**05**	**05**	**05**	**05**	**05**
17	**Acc**	Condenser Cleaning Period (weeks)	**0**		**120**	**00**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
18	**Act**	Condenser Alarm Temperature (°C)	**0**		**250**	**70**	**70**	**70**	**70**	**70**	**70**	**70**	**70**
19	**cSd**	Compressor Safety Stop Delay (mins)	**0**		**30**	**05**	**00**	**05**	**05**	**05**	**00**	**00**	**00**
20	**cFt**	Condenser Fan Temperature (°C)	**-40**		**250**	**25**	**00**	**25**	**25**	**25**	**00**	**00**	**00**
21	**crt**	Compressor Rest Time (mins)	**0**		**30**	**03**	**03**	**00**	**00**	**00**	**00**	**00**	**00**
22	**cdc**	Cooling Cycle at T1 Failure (x10%)	**0**		**10**	**05**	**07**	**07**	**07**	**07**	**07**	**07**	**07**
23	**oFF**	Stand-by Function Operation	**YES**		**no**	**YES**	**No**	**no**	**no**	**no**	**no**	**no**	**no**
24	**dS**	Door Switch Operation	**YES**		**no**	**no**	**No**	**no**	**no**	**no**	**no**	**no**	**no**
25	**ldo**	Door Controlled Lights	**YES**		**no**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
26	**t2**	Evaporator Probe (T2) Enabled	**YES**		**no**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
27	**t3**	Condenser Probe (T3) Enabled	**YES**		**no**	**no**	**No**	**no**	**no**	**no**	**no**	**no**	**no**
28	**ScL**	Centigrade / Fahrenheit Selection	**°c**		**°F**	**°c**	**°C**	**°C**	**°C**	**°C**	**°C**	**°C**	**°C**
29	**oS1**	Air Probe (T1) Offset (°K)	**-15**		**15**	**00**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
30	**oS2**	Evaporator Probe (T2) Offset (°K)	**-15**		**15**	**00**	**00**	**00**	**00**	**00**	**00**	**00**	**00**
31	**oS3**	Condenser Probe (T3) Offset (°K)	**-15**		**15**	**00**	**00**	**00**	**00**	**00**	**00**	**00**	**00**

32	**SiM**	Display Slowdown	**0**		**100**	**03**	**03**	**00**	**00**	**00**	**00**	**00**	**00**
33	**Adr**	Peripheral System Address	**0**		**255**	**01**	**01**	**01**	**01**	**01**	**01**	**01**	**01**

NOTE: For PMC remote units change parameter (6) dLi to 15, and parameter (8) dty to OFF.

8. Alarms and Warnings:

High Temperature Alarm

The 'High Temperature Alarm' will occur if the internal air temperature measured by the air probe (T1) increases above the Set Point ('SP') plus the Hysteresis value '('HYS')', plus the High Temperature Alarm Differential ('AtH'). This value (or greater) must then be maintained for a period of time equal to the 'Alarm Delay' parameter setting ('Atd'). If a High Temperature Alarm occurs the audible alarm will sound and the display will flash the message 'HI'. By pressing the Alarm Mute button (button 4), the alarm will be silenced, however the flashing message remains on the display. If the alarm conditions remain for a further hour the alarm will automatically resound for 20 seconds. This routine will continue until the alarm is cleared by the rectification of the problem. If power is removed and restored to the controller the controller will be reset. This will mean that if the problem persists the alarm will return after the period determined by parameter 'Atd'.

Note: During the defrost cycle the High Temperature Alarm is excluded.

Low Temperature Alarm

The 'Low Temperature Alarm' will occur if the internal air temperature measured by the air probe (T1) falls below the Set Point ('SP') plus the Low Temperature Alarm Differential ('AtL'), and is maintained for a period of time equal to the 'Alarm Delay' parameter setting ('Atd'). If a Low Temperature Alarm occurs the audible alarm will sound and the display will flash the message 'Lo'.
Pressing the Alarm Mute button (button 4), the siren will be silenced, however the flashing message remains on the display. If the alarm conditions remain for a further hour the alarm will automatically resound for 20 seconds. This routine will continue until the alarm is cleared by the rectification of the problem, or as with the 'HI' alarm above.

Door Open Alarm

This alarm will only be operational if parameter 'dS' is set to 'YES', that is that a door switch is fitted and the function is enabled (not standard on Foster product fitted with this controller). When the door is opened the door switch goes 'open circuit'. This immediately causes the Evaporator Fan relay to de-energise, and hence the fans to stop. The condensing unit will continue to operate until the period of time set in the 'Door Open Delay' parameter 'Ado'. Once this time has elapsed the condensing system relay will de-energise and the door open alarm message 'do' will be displayed and the alarm siren will sound. The 'Door Open Alarm' can be muted (permanently) by pressing the alarm mute button (button 4). The alarm can be silenced and reset by shutting the door. Shutting the door will also cause the refrigeration system to restart in the normal operating mode.

Condenser Clean Warning

This warning will only be operational if parameter 'Acc' is set to '01' or above; that is the warning function is enabled (not standard on Foster product fitted with this controller). If parameter 'Acc' is set to 00 the warning is disabled and will not occur. The value set in parameter 'Acc' relates to the interval period in weeks between the condenser clean warning being given. If a Condenser Clean warning occurs the audible alarm will sound and the display will flash the message 'cLn'. Pressing the Alarm Mute button (button 4), the siren will be permanently silenced, however the flashing message remains on the display. To reset the condenser clean timer and display; once the condenser has been cleaned, press and hold button 3, press button 4, release all buttons.

Air Temperature Probe Failure

This alarm is caused by a failure of the internal air probe (T1). The air probe is a fundamental part of all refrigerated products, and therefore if the air probe fails the LED display will flash 'E1'. An audible alarm will also sound. By pressing button 4 the siren will be silenced, however the flashing message remains on the display. If the alarm conditions remain for a further hour the alarm will automatically resound for 20 seconds. This routine will continue until the alarm is cleared by the rectification of the problem – in this case the replacement of the air probe. The effects of this probe failing on the operation of the system will be that the refrigeration system will operate on a duty cycle basis only, as determined by parameter 'CdC'. Defrosts will occur as normal. The internal air temperature will not be able to be viewed. Although not a critical failure it is important that the problem is noticed and rectified as soon as practicable. There is no Alarm Delay with this failure.

Evaporator Temperature Probe Failure

This alarm is caused by a failure of the evaporator probe (T2). The evaporator probe must have been enabled by setting parameter 't2' to 'YES'. If the evaporator probe fails the LED display will flash 'E2', and an audible alarm will sound. By pressing button 4 the siren will be silenced, however the flashing message remains on the display. If the alarm conditions remain for a further hour the alarm will automatically resound for 20 seconds. This routine will

continue until the alarm is cleared by the rectification of the problem – in this case the replacement of the evaporator probe. The effects of this probe failing on the operation of the system will be that defrost termination will only take place on time, not temperature (also the fan delay temperature will not operate). The evaporator probe temperature will not be able to be viewed. There is no Alarm Delay with this failure.

Condenser Temperature Probe Failure (Not Fitted as Standard to Foster Products)

This alarm is caused by a failure of the evaporator probe (T3) (not standard on Foster product fitted with this controller). The condenser probe must have been enabled by setting parameter 't3' to 'YES'. If the condenser probe fails the LED display will flash 'E3', and an audible alarm will sound. By pressing button 4 the siren will be silenced, however the flashing message remains on the display. If the alarm conditions remain for a further hour the alarm will automatically resound for 20 seconds. This routine will continue until the alarm is cleared by the rectification of the problem – in this case the replacement of the condenser probe. The effects of this probe failing on the operation of the system will not detect a high condensing temperature and will not cause the condensing system to stop if the temperature rises above the threshold set in parameter 'Act'. The condenser probe temperature will not be able to be viewed. There is no Alarm Delay with this failure.

High Condenser Temperature Alarm (Not Enabled as Standard to Foster Products)

This alarm is caused by excessive condenser temperature measured by probe T3. Therefore for this function to operate probe T3 must be fitted parameter 't3' set to 'YES'. If the condenser probe senses the temperature to have equalled or exceed the value set in parameter 'Act' the LED display will flash 'cHI', and an audible alarm will sound. By pressing button 4 the siren will be silenced, however the flashing message remains on the display. If the alarm condition remains for a further hour the alarm will automatically resound for 20 seconds. This routine will continue until the alarm is cleared by the rectification of the problem. There is no Alarm Delay with this failure.
Associated to this function there is a safety stop facility. By setting parameter 'cSd' to a value greater than 0, if the condenser temperature remains over the 'Act' threshold for longer than the time 'cSd' then the compressor will be stopped. The compressor automatically cuts back in when the temperature is equal to 'Act' –10°C. This function is signalled on the display by the flashing of the compressor run icon (A).

Typical Display Indications:

Self Test
Shown during first three seconds following power being applied.

Parameter Access Code Menu
Menu icon displayed prior to entering the Parameter Set Up mode

Parameter Access Code Number
Value required to be entered to gain access to parameters (47).

High Temperature Alarm
Indication when internal air temperature is above

Normal Operating Display
Shows air temperature, and function indicators for compressor and fans.

Manual Defrost Menu
Menu icon displayed prior to initiating a manual defrost.

Stand By Mode
Mains power available but unit not operating. (Not a standard setting).

Low Temperature Alarm
Indication when internal air temperature is below pre-set levels.

Defrost Indication
Displayed throughout defrost routine. Shows function indications.

Air Probe Failure
Indicates internal air temperature probe (T1) has failed.

Evaporator Probe Failure
Indicates evaporator temperature probe (T2) has failed. (Dependant upon model).

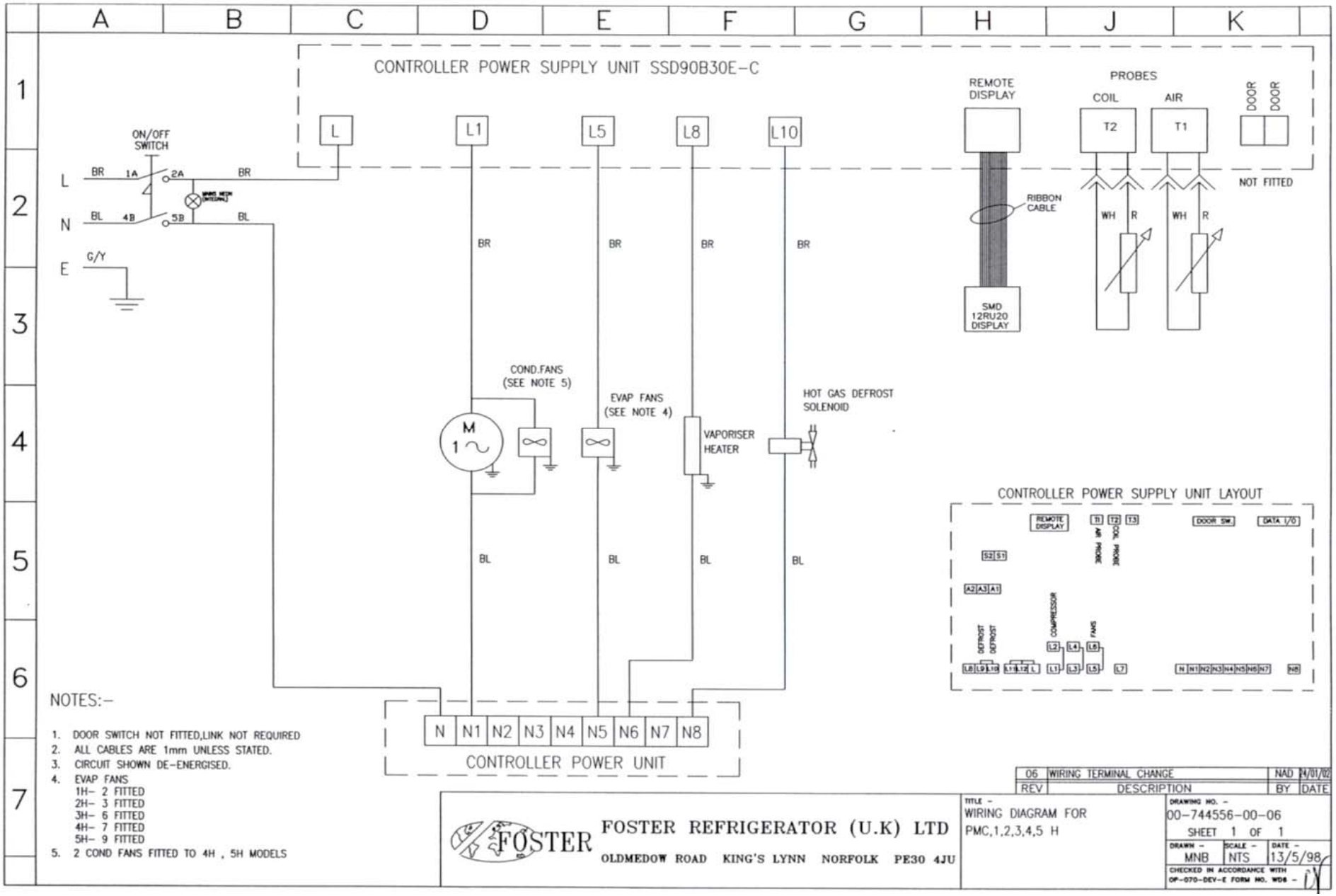
Door Open Alarm Indication
Display shown in the event of door being left open. (Not a standard setting).

Condenser Temperature High
Indicates extreme operating conditions or refrigeration fault. (Not a standard setting).

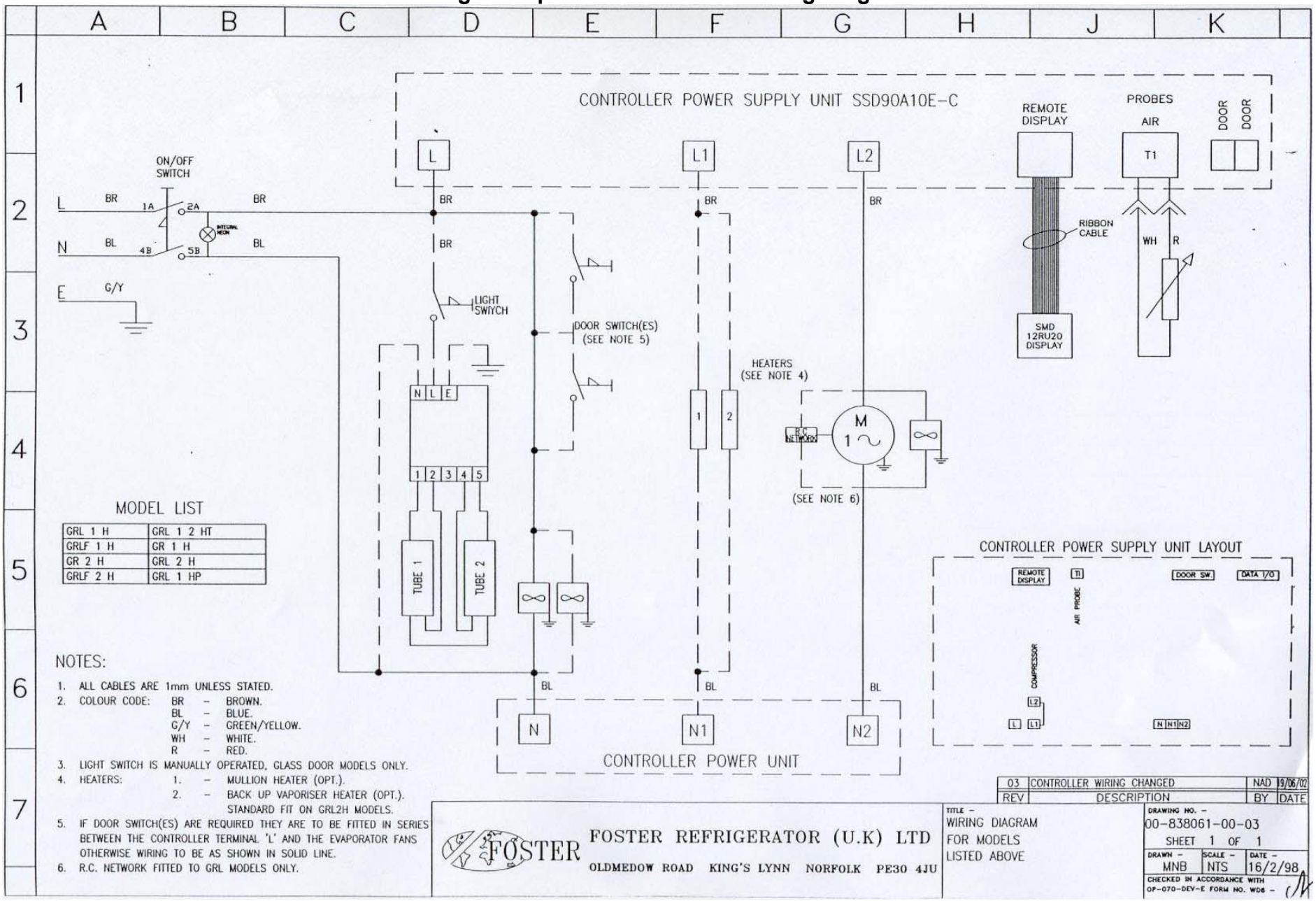
Condenser Clean Due

Indicates that condenser clean period has elapsed. (Not a standard setting).

10. Low Temperature Controller Wiring Diagram



10. High Temperature Controller Wiring Diagram.



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