GUARDIAN

1289

INCLUDING BPR

Refrigeration Control Units for Display Cabinets & Coldstore Coolers

- AKV10/20 electronic expansion valve control using temperature or temperature and pressure
- Liquid valve and Defrost control
- Hotgas, Trim heater & Fan control
- Suction valve & Lighting control
- Control-air temperature alarms
- Fan-fail & coldstore door alarms
- PT1000 or Thermistor probes
- Evaporating pressure control
- Multiple case control
- Local panel display and set-up
- Remote RS485 communications

Operation and Set-up Manual

GUARDIAN 1289 Refrigeration Controllers are mains-powered, universal, refrigeration temperature and defrost sequence controllers for supermarket display cases and coldrooms using liquid valve or AKV10/20 expansion valve control. A single KVQ evaporating pressure regulator or up to 4 AKV10 valves may be controlled using model 1289.

All models communicate with the GUARDIAN Autograph Terminal which provides remote central alarm monitoring, data recording and graphs.

Local temperature displays and modification of all defrost times, alarm and control settings is available when the unit is connected to the optional GUARDIAN SKD-9 Keyswitch display.

Contents

GETTING STARTED

Guardian Controllers provide refrigeration engineers with

- **ULTIMATE FLEXIBILITY**
- **ASSURED MONITORING**
- **RELIABLE ALARMS**

This manual provides refrigeration designers, installers, service mechanics and supermarket personnel with the necessary information to achieve the above objectives.

All users require to know a few basic facts about this controller before successfully starting to perform their design, commissioning, maintenance or operating functions.

a) All GUARDIAN controllers need to be set up with a unit model selection and other basic settings for setpoints, timers and addresses. All these settings need to be done using the SKD.9 Keyswitch Display, so the understanding of the button operation of this unit is essential.

b) The shorthand used in the following chapters for concisely expressing button pressing and selection sequences to do all this set-up needs to be understood.

c) Mains power input voltage and hardware switch and link option selections (if any are required) must correspond to the selected unit model configuration.

d) Since each controller can be configured in a number of different ways to perform flexible refrigeration control then an understanding of how to find out what unit model is currently selected, what it does and how it is connected, is also necessary.

SKD.9 KEYSWITCH DISPLAY OPERATION

GUARDIAN controllers require a SKD.9 Keyswitch Display unit to be plugged into the telephone jack socket in the controller before any settings can be changed.

The SKD.9 is connected to the GUARDIAN controller via a 6-core telephone cable.

The SKD.9 Keyswitch/Display comprises a plastic enclosure housing a PCB with four membrane pushbuttons, four LED displays and a 2-position Keyswitch.

next raise lower enter keyswitch
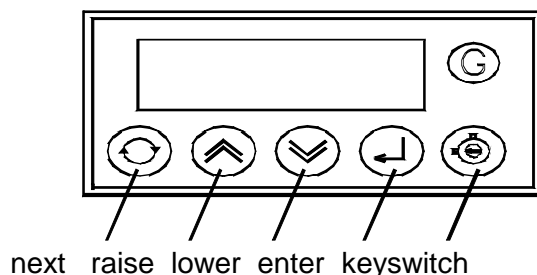
SKD.9 buttons have the following functions when pressed:-

@	**'next' button**	displays next value or menu selection in sequence.
∕	**'raise' button**	raises a menu settings value or menu item selection.
<	**'lower' button**	decreases a menu settings value or item selection.
?	**'accept' or 'enter' button**	accepts any alarm and is used for entering a menu

selection or settings value data entry

The two-position **keyswitch** may be used to toggle display case control status from OFF to FANS only and back to AUTO)

The Keyswitch is not used on any compressor controllers.

BUTTON OPERATION SHORTHAND

To assist in easy set-up of control setpoints, delays, timers and other configuration settings, the sequence of button presses and subsequent displays will be shown in this handbook as below:

ii) A button symbol means press that button
iii) A display box shows the result of the last button press on the SKD.9 display.

EXAMPLES

@	Auto	@	-OFF	?	-OFF	is shorthand for

Press '**next**' button which then displays AUTO
Press '**next**' button which then displays OFF
Then press '**enter**' button which changes the control mode to OFF and displays -OFF

@: @   Auto   ?

Press '**next**' repeatedly until **Auto** is displayed then press '**enter**'.

rEt=   =-17

means the display alternates between the value identifier tag and the latest value.

rEt=   =oc=   FAIL

means the display alternately flashes between the value identifier tag (return air temperature), the measured value (open circuit) and the alarm or trip message.

HARDWARE CONFIGURATION CHECKS

Prior to switching on the GUARDIAN controller check that the hardware unit is the correct type for the incoming mains voltage

When satisfied that the correct type of controller is available then the following checks should be made prior to controller installation or replacement

a) Ensure mains supply is wired correctly to the appropriate TERMINAL WIRING drawing for the model selected.
b) Ensure that any transducer selector switches specified on the TERMINAL WIRING diagram are in the correct state.
c) Ensure any shorting link selector pins specified on the TERMINAL WIRING diagram are correctly fitted.
d) Ensure that probes are wired to the terminal WIRING DIAGRAM and the correct type of Thermistor or pressure transducer probes are fitted.
e) The SKD.9 Keypad/display unit is fitted correctly in its 6-way telephone socket.
f) The RS485 highway connections (if required) are wired to the correct terminals and the screen drain wire is continuous to earth.

CONFIGURE UNIT MODEL, SYSTEM No & ADDRESS

Enter Passcode PP05 for normal changes

Before any permanent change of controller settings are made then the correct entry of the appropriate passcode is necessary.

Most normal system settings require entry of passcode PP05

```
@: @   SEt=      ?    PP00    / : /   PP05      ?
```

Press '**next**' repeatedly until **SEt** is displayed then press '**enter**'. **PP00** is displayed.
Press '**raise**' repeatedly until **PP05** is displayed and then press '**enter**'.

Select Unit Model

Always 1289 (1289c)

Select System No and Address

e.g. set-up unit for system 60 case 1 at address 180

Enter Passcode as button sequence as above

```
@: @   Uni t      ?
@: @   Sn01    / : /   Sn60      ?     Sn60
  @    Cn01      ?    Cn01
  @    A001    @: @   A180      ?     A180
@: @   End=      ?    =-26
```

RS485 Communications

When the correct system number, case/compressor number and highway address have been entered as above then the controller can communicate with the GUARDIAN AutoGraph Terminal PC for central alarm monitoring and temperature display. Control setpoints, defrost times and alarm limits may then be sent to the controller from the PC rather than using the SKD9 Keyswitch display. For further details see page 37

UNIT MODELS

Guardian controllers may be configured in a number of different ways dependent on unit model selection. Each unit model fulfils a different refrigeration temperature monitoring and control requirement. In order to perform the required refrigeration control then each model has different uses for the controller's input output signals. This section gives details of all the model variations available for the controller and the way to connect the wiring to the plant devices and measuring transducers.

Available Unit Models for the 1289

1289 LSoL   Standard liquid line solenoid valve control only.

1289 EEt   Electronic expansion valve using coil in and coil out temperatures

1289 EEP   Electronic expansion valve using coil out temperature and pressure

1289 BPR   Electronic back pressure regulation

1289 3SoL   Independent liquid solenoid and defrost control for up to 3 cases

The 1289 can also be selected to replace all variations of the following controllers for backwards compatibility with older models still in service:-

635

515

205

1287 *(See Page 50 IMPORTANT NOTICE)*

1085

975

GENERAL SPECIFICATION

Power   110 / 230 Vac 50 Hz 10VA
Operation   0 to 55ºC
Approx. dimensions
          board   Width 150 x length 193 x height 36mm.
          enclosure   Width 200 x length 250 x height 65mm.

1289Input/Output Signals

1289 Input/Output Signals

Analogue Inputs (Thermistor) -40 to +50°C (or PT1000 resistance thermometer)		
Cpt	1	Case or calculated product temperature Coil fitted here if PT1000
DEL	2	Discharge air temperature
rET	3	Return air temperature
Ei1	4	Evaporator inlet 1 temperature
Eo1	5	Evaporator outlet 1 temperature
Ei2	6	Evaporator inlet 2 temperature
Eo2	7	Evaporator outlet 2 temperature
Ei3	8	Evaporator inlet 3 temperature
Eo3	9	Evaporator outlet 3 temperature
PrES	10	Suction pressure (4-20ma, -1.0 ,24 bar)

Status Inputs (12vdc 10 ma per input)		
	1A	Coldstore Door contact
	1B	OFF for cleaning
	1C	FANS only
	1D	DEFROST request P/B

Alarm Trip Input (230vac only)		
	1E	Trim Heater fail/defrost request input
	1F	Fans c circuit fail/coldstore door
	1G	Fans b circuit fail
	1H	Fans a circuit fail

Relay output (5 Amp 230VAC n/o with suppressors)		
L	R1	Lighting control/1085 LSV (n/o)
d	R2	Defrost termination control (n/o)
h	R3	Trim/pan heater control (n/o)
F	R4	Fan control (n/o)

Solid State Relay outputs (230VAC 0.5 AMP)		
C	SSR5	SSR5 Liquid valve control (n/o)
	SSR6	SSR6 Coil-2 modulating valve (n/o)
	SSR7	SSR7 Coil-3 modulating valve / BPR Output to KVQ (n/o)
S	SSR8	SSR8 Suction valve control (n/o)

Status output (12vdc)		
		DEFROST request to other cases in stub (same terminal as defrost status input)
Communications		
		RS485 serial link at 9600 baud

1289 Termination Wiring

OPERATION

The SKD.9 Keyswitch display provides a display at the case or coldroom of:

Case or product temperature display.

Display of other temperatures by pressing 'next' $@$ button, the values displayed depend on the unit model selected.
Case cleaning operation using the keyswitch.
Passcode protected set-up of controller setpoints, timers and limits.
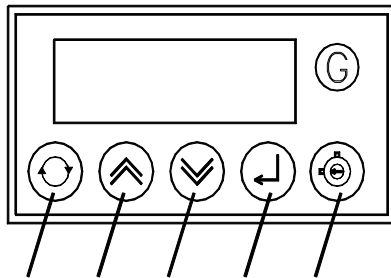
next   raise   lower   enter   keyswitch

CASE CLEANING OPERATION

FANS ONLY

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

Insert security Key into the keyswitch on the display unit.
Ensure key turned anti-clockwise   Turn key clockwise.
FAnS is now displayed and all control relays are switched off except for the fans relay.
                                                                    Turn key anti-clockwise.
Remove key until required for OFF selection.

OFF for cleaning

To switch from FANS mode to OFF prior to case cleaning:-
Insert security Key into the keyswitch on the display unit.
Ensure key turned anti-clockwise   Turn key clockwise.
The display unit now displays -OFF and all control relays are switched off.
                                                             Turn key anti-clockwise.
Remove key until required 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: -
Insert security Key into the keyswitch on the display unit.
Ensure key turned anti-clockwise   Turn key clockwise.
The display unit now displays the software version V1.0b followed by AUTO and then after a delay returns to the default temperature display.
                                                             Turn key anti-clockwise.
Remove key until required for the next case cleaning.

DISPLAY INDICATIONS

Temperature Displays

Repeated pressing of $@$ displays next channel identification with the temperature value for the channel. Repeated pressing of $@$ displays in sequence the points listed below

Identity	Temperature on display	
CPt=	Calculated product temperature (control if 'cpon')	
DEL=	Delivery air temperature	
rEt=	Return air (coldstore control)	
CdHF	**Control relay outputs**	
C	if Liquid control relay energised	- bar if not.
d	if Defrost relay energised	- bar if not.
H	if Hotgas/trim/pan Heater energised	- bar if not.
F	if Fan relay energised	- bar if not
Etnn	Elapse time (Defrost mode only) where nn = minutes into defrost	
SEt=	Go to Setup Mode when Enter pressed.	

Status Display

The controller reverts to the default display if no buttons have been pressed for 3 minutes and displays the calculated product temperature CPT which is derived from an adjustable ratio of the discharge and return air.

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

– dEF	While defrost is in progress
– Pd=	From end of defrost cycle until discharge air temperature is within alarm band after defrost is complete
– FAn	Selected for Fans Only prior to cleaning from local display or switch input
– OFF	Selected OFF for cleaning from local display or switch input
=PC= FAI L	RS485 communications to controller failure. Baud rate set at 9600 and PC is not communicating
1289 1289	Unit model operation selected -displayed on power on
8888 u2. OA	Software version displayed after power on
Auto	After power on or case OFF waiting for restart delay before opening liquid solenoid or AKV valve.

Alarm Indications

Alarms alternately flash with selected temperature channel during Default and Normal operation.   a, b, c, h, Hi, Lo, OC, SC, nF.

Alarms are not displayed during Setup operation.

All alarms are reset automatically when the fault has disappeared.

Blown fuse alarms

Blown fuse alarms are identified on serial display as follows:-

a	fan 1
b	fan 2
c	fan 3
h	trim heater(if Htr selected for relay 3)

All alarm trips are inhibited when fans only, case off or during defrosts.

Control Air alarms

Discharge (return) Air alarms are indicated on LED displays:

dEL=	=-13	=Hi =	Hi if discharge air temperature is above the control setpoint plus alarm diff. for longer than the guardtime.
dEL=	=-28	=Lo=	Lo discharge air temperature is below the setpoint minus alarm differential for longer than the guardtime.

Return air not discharge air alarms are given for Coldstores.

Temperature alarms are inhibited during defrost cycles and during case cleaning.

Guardtime count is reset each time the discharge air returns within limits.

Alarm states Hi, Lo are automatically reset when the discharge air returns within limits.

Probe Failure

dEL=   =OC=   FAI L   open circuit probes indicate OC instead of value

dEL=   =SC=   FAI L   short-circuit probes indicate SC instead of value

The liquid solenoid valve is closed on any failure of the control air probe.

PC FAIL

If GUARDIAN controllers have not received a RS485 command for 5 minutes then the 'PC FAIL' message is displayed indicating a PC communication failure.

=PC=   FAI L

If the controller is on a system which does not have a central PC alarm monitor then the PC FAIL message can be removed by selecting baud '**none**' using passcode 11.(see page 26) PC fail messages are also removed by selecting **ndad** or **nda** under unit settings.

USEFUL BUTTON SEQUENCES

The following button sequences should prove useful during normal service operation

Check Unit Model

@: @   SEt=   ?   PPO0   / : /   PPO5   ?

@: @   Uni t   ?   1289   This unit model is '1289(1289c)'
                        c

@: @   End=   ?   =-26

Select Stub, Case No and Address

e.g. set-up unit for system 60, case 1, at address 180

@: @   SEt=   ?   PPO0   / : /   PPO5   ?

@: @   Sn01   / : /   Sn60   ?   Sn60

@   Cn01   ?   Cn01

@   A001   / : /   A180   ?   A180

@: @   End=   ?   =-26

Cut-in Setpoint for Liquid Valve (c)

To change the cooling cut-in setpoint for the liquid valve the procedure is as follows if the old setpoint is -11 the new setpoint is -17

@: @   SEt=   ?   PPO0   / : /   PPO5   ?

@   CASE   ?   @   c- 11   / : /   c- 17   ?

@: @   End=   ?   The unit now controls to the new discharge air cut-in setpoint (-17).

Case FANS only

To switch to FANS ONLY prior to case cleaning an alternative procedure to using the keyswitch is as follows except for Coldstores, which may not be selected for FANS only.

```
@:@    SEt=    ?    PPOO   /:/    pp05    ?
  @    CASE    ?    @:@    FAnS    ?     -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 selected remotely via RS485 communication command.
The case is switched OFF by selecting OFF mode.
The case is switched back on by selecting Auto mode.
See also Keyswitch Fans Only selection page 11

Case OFF for Cleaning

To switch off a case / coldstore for cleaning an alternative procedure to using the keyswitch is as follows:-

```
@:@    SEt=    ?    PPOO   /:/    pp05    ?
  @    CASE    ?    @:@    OFF=    ?     -OFF
```

When the unit displays - OFF instead of the case temperature, all alarms, liquid valve control,trim heaters, defrost cycles and fan outputs are turned off.
OFF mode may be selected remotely via a switch input or a RS485 communication command.
The case is switched back on by selecting Auto mode.
See also Keyswitch Case OFF for cleaning selection page 11

Case AUTO Mode

To return a case/coldstore back into Auto after cleaning the procedure is as follows:-

```
@:@    SEt=    ?    PPOO   /:/    pp05    ?
  @    CASE    ?    @:@    Auto    ?     Auto
```

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.
To prevent overloading the compressor on restart after a total power fail or compressor fault the controllers start sequentially. The restart delay is automatically calculated using the stub number of the case.
When the restart delay is complete, the liquid valve returns to automatic control and the case temperature value is displayed.
See also Keyswitch Case AUTO after cleaning selection page 11

Initiate DEFROST

To initiate a manual defrost request the procedure is as follows:-

        @:@   SEt=   ?   PPOO   /:/   ppO5   ?
         @   CASE   ?   @:@   idEF   ?   -dEF

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 TYPE selection ie Off-Cycle, Hotgas Terminate, Hotgas Cycle, GdFr, or Coldstore.
DEF mode may be selected remotely via a RS485 communication command.
The defrost may be terminated (after draindown delay) by selecting Auto mode.

SETUP OPERATION

Setup operation lasts for a maximum of 5 minutes after being activated by pressing ?
with SEt on the display panel.
During set-up operation, alarms, temperature and defrost controls are inhibited.
If the correct passcode is not entered then set-up values may be displayed but any attempted changes are ignored.

SEt =   Press ?

PP00   Set passcode PP05, PP07, PP09 or PP11 by using ∕ the < and pushbuttons

PP05 ?   PP07 ?   PP09 ?   PP11 ?

PP11 menu page 26

PP09 menu page 23

PP07 menu page 22

PP05 Menu

Press @ to sequence through the Set-up selections

Press ? to accept the settings

Case	CASE	Change control mode or cooling setpoint
Defrost	dEFr	Defrost type, times and setting
Unit	Unit	Stub and case identity
Test	tESt	Toggle output relays Faulty valve check.
End	End =	Return to normal operation

CASE

CASE

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

| Cut-in setpoint for Liquid Valve | C=nn | nn = -40 to +40°C |

| Calculated Product Temperature | YYYY | CPon/CPoF select if control on CPT or discharge |

YYYY = CPon Control on CPT now on
CPoF Control on CPT now oFF
i.e. normal control on discharge
The controller can be selected to control on Calculated Product Temperature (CPT) instead of discharge air for all defrost types except 'Stor' if 'CPon' is selected.
Coldstores always control on return air.

| Mode selection | YYYY | |

yyyy = idEF Initiate defrost (only if in Auto)   page 15
FAnS Fans only prior to cleaning (not allowed for coldstore)   page 10
OFF Select case OFF for cleaning   page 14
Auto Return to Automatic control   page 10
These selections only operate when keyswitch selection for OFF or FAnS are not present.

dEFr

dEFr

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

| Defrost type | YYYY | |

YYYY = O-C Off-cycle defrost
HG-C Hotgas Cycle on differential
HG-t Hotgas terminate on discharge air
For all defrost selections on this model the fans and trim heaters defrost state can be selected during defrost as follows:-
Fnon/FnoF Fans on/oFFduring defrost
tron/troF Trim Heaters on/OFF during defrost

| Number of defrosts per day | dn=n | n = 0 to 6 |

| First defrost time T1 hours | 1h=n | n = 0 to 5 hrs |

| Delay 2nd defrost by n hours if dn=2 | d2dn | n = 0 to 9 hrs |

First defrost time T1 minutes	1tnn	nn = 0 to 59 min
Defrost period	dPnn	nn = 0 to 60 min
Defrost termination temperature (not Off-Cycle cases)	d=nn	nn = 0 to +40 °C
Defrost termination differential (for Hotgas Cycle cases only)	ddnn	nn = 1 to +10 °C

Unit

Uni t

Press @ to sequence through the Set-up selections

Press / or < to change the settings

Press ? to accept the settings

Model type selection	YYYY	1289 AKV10 or KVQ control 1287 Model with lighting & AKV10 control(retrofit) 1085 Case/coldroom controller(retrofit) 975 Case/coldroom controller(retrofit) 635 PT1000/thermistor AKV10+pressure
Control Type Selection	YYYY	

YYYY = LSOL Liquid solenoid valve control
EET   AKV10 using coil in & out temperatures
EEP   AKV10 using coil out temperature & pressure
BPR   KVQ control using air & coil temperatures

E Value, is the coil-in temperature at which 5°C above the AKV is allowed to resume automatic control after recovery from Defrost or Pulldown.
The E Value is therefore **relative** to the Pack Evaporating Temperature, and should **not** be set at the **Actual** Evaporating Temperature.

E Value,	E-nn	nn = -40 to 40°C, **Set to 10°C above the Plant Evaporating Temperature.**
Evaporating temperature differential	Ednn	nn= 5 to 20°C
Pressure transducer 20ma high range value	phnn	nn= 1 to 24 bar gauge
Pressure transducer 4ma low range	pL-n	n = -1 to 5 bar gauge
Gas type	yyyy	YYY = r22 or NH3 or 404a
Serial Display	SdY	Y = 9 or 8 where:- Sd9 is SKD9 serial display with keyswitch Sd8 is SKD8 serial display

Stub number	Snnn	nn = 1 to 80
Case number (normally 3 max.)	Cnnn	n = 1 to 4
Woodley MkV address number	Annn	nnn = 1 to 255
Control Relay 3	YYYY	

YYYY = Htr	Trim heater control
Hgas	Pack hotgas valve control input
3	Future use
Alr	Alarm unit (see page xx)

Invert Relay 3 Output	YYYY

YYYY=Pos	Relay 3 output Positive
YYYY=Neg	Relay 3 output Negative
	(For use when Relay 3 set to **Hgas** *remote input signal* and trim heaters still required to be on during refrigeration, then set to **Neg**)

Product Ratio%	Prnn	nn = 0 to 99
Temperature Probe Type	YYYY	tP2.2 tP2.0 PT1000
Digital Alarm Detection and Display	YYYY	

YYYY = ndad	No digital alarm display
nda	No digital alarms required
dad	Digital alarms displayed

tESt

Press @ to sequence through the relay selections

Repeatedly press ? to switch the relays on and off

LOFF	L=on	Relay R1 Lighting
dOFF	d=on	Relay R2 Defrost
hOFF	h=on	Relay R3 Trim / Pan Heater
FOFF	F=on	Relay R4 Fans
COFF	C=on	SSR5 Cooling Lsol/AKV
6OFF	6=on	SSR6 Coil 2 Modulating valve
7OFF	7=on	SSR7 Coil 3 Modulating valve/BPR
SOFF	S=on	SSR8 Suction Valve
9OFF	9=on	Output NOT USED

All outputs return to automatic control when SETUP is ended

End

Return from Setup to normal operation

PP07 Menu

Temperature number	n - AL	n = 1 to 9
		Press @ to select Temperature (1 to 9)
		Press ? to display for selected temperature:-
Alarm setpoint (SP) for temperature n	n - t t	tt = -40 to 40°C Change by / or < and then press ?

Alarm type selection   YYYY

	YYYY = hi	Goes into alarm above SP+Ad after Gt
	lo	Goes into alarm below SP-Ad after Gt
	both	Goes into alarm if hi or lo after Gt
	nonE	Never goes into alarm
	nF	Is not scanned and displays nF

Guardtime	9tnn	nn = 0 to 90 mins
Alarm Differential	Adnn	nn = 2 to 40 °C
Digital input d	d - AL	d = A to H Press @ to select digital input (A to H) Press ? to display for selected input:-

Digital alarm type selection   YYYY

	YYYY = on	Goes into alarm if input ON after Gt
	oFF	Goes into alarm if input OFF after Gt
	roFF	Future reset facility
	nonE	Never goes into alarm
Guardtime for input d	d - nn	nn = 0 to 90 mins Change by / or < and then press ?

Setup Functions (level 2) passcode 09

Normal FACTORY settings

PP09 Menu

Press $@$ to sequence through the Setup selections

Press $?$ to accept the settings

Real time clock	rtc=	Clock settings Page 23
System settings	SYSt	Times and alarms Page 24
End	End=	Return to normal operation Page 13

rtc

rtc=

Press $@$ to sequence through the Setup selections

Press $/$ or $<$ to change the settings

Press $?$ to accept the settings

Real clock time hours	rhnn	nn = 0 to 23 hrs
Real clock time minutes	rtnn	nn = 0 to 59 mins
Weekday	YYYY	YYYY = Sun/nnon/tuES/uued/thu/Fri/SAt
Day of Month	d=nn	nn = 1 to 31
Month	YYY=	Jan to dEC
Year	Y=nn	nn = 0 to 99

SYSt

SYSt

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Cooling differential for control	cd=n	n = 0 to 5° C
Defrost pumpdown delay time	Ptn. n	n.n = 0.0 to 9.9 min
Defrost draindown delay time	dtnn	nn = 1 to 20 min
Bypass valve delay after draindown	btn. n	n.n = 0.0 to 9.9 min
Liquid delay after suction	Ltn. n	n.n = 0.0 to 9.9 min
Defrost Fan delay time	Ftnn	nn = 0 to 20 min
Time on for suction valve pulsing during bypass period	tnn. n	n.n = 0.0 to 9.9 min
Time off for suction valve pulsing during bypass period	tFn. n	n.n = 0.0 to 9.9 min
Control air temp. alarm Guardtime	gtnn	nn = 0 to 99 min
Alarm differential control air	Adnn	nn = 2 to 40°C

Calculated defrost times - display only

Defrost T1 time hours	1hnn	nn = 0 to 23 hrs
Defrost T1 time minutes	1tnn	nn = 0 to 59 min
Defrost T2 time hours	2hnn	nn = 0 to 23 hrs
Defrost T2 time minutes	2tnn	nn = 0 to 59 min
	etc.	
Defrost T6 time hours	6hnn	nn = 0 to 23 hrs
Defrost T6 time minutes	6tnn	nn = 0 to 59 min

Setup Functions (level 2) passcode 09 - (continued)

LIGHTING SETUP

tcL1

tCL1

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

1Hnn	Sunday time on Hours	nn = 00 to 23
1nnn	Sunday time on minutes	nn = 00 to 59
1hnn	Sunday time off hours	nn = 00 to 23
1Fnn	Sunday time off minutes	nn = 00 to 59
2Hnn	Monday time on hours	nn = 00 to 23
2nnn	Monday time on minutes	nn = 00 to 59
2hnn	Monday time off hours	nn = 00 to 23
2Fnn	Monday time off minutes	nn = 00 to 59

etc. to

7Hnn	Saturday time on hours	nn = 00 to 23
7nnn	Saturday time on minutes	nn = 00 to 59
7hnn	Saturday time off hours	nn = 00 to 23
7Fnn	Saturday time off minutes	nn = 00 to 59

End

End=   Return to normal operation

Setup Functions (level 4) passcode 11

PP11 Menu

Press @ to sequence through the following PP11 menu selections:-
Press ? to select the displayed menu

Port	Por t	Serial communications port
	EEu=	Electronic expansion valve parameters
	LooP	Control PID loop parameters
	CooL	BPR ONLY Page 48
	dAnF	BPR ONLY Page 48
	retn	BPR ONLY Page 48
End	End=	Return to normal operation Page 13
Electronic Expansion Valve Parameters	EEu=	(Only if EET or EEP selected)
	YYYY = F-EE	Returns all parameters to default values below. F-EE RETURNS TO DEFAULTS
	C-EE	Allows values to be changed during commissioning. These parameters are for development purposes only and should NOT be changed.
Superheat High. Maximum superheat	SHnn	nn = 0 to 99°C
Superheat Low. Minimum superheat	SLn. n	n.n = 0.0 to 9.9°C
Superheat Alarm Limit at which superheat recovery is actioned	SAnn	nn = 0 to 99°C
Stable Band.	Sbn. n	nn = 0.0 to 9.9°C. Taken +/- about current superheat setpoint. Oscillations of superheat outside Sb cause increase in superheat towards SH. If superheat remains within Sb then superheat is reduced towards SL.(0 = function not active)
Stable band Delay time	Sdnn	nn = 0 to 99 mins Time after which Sb setpoint change is applied
Defrost Recovery Valve position	drnn	nn = 0 to 99%

Starting Output	Sonn	nn = 0 to 99% Valve position after power restart or thermostatic cycle of AKV10
Superheat Alarm Time OFF	tFnn	nn = 0 to 15 min Valve is shut for this time after superheat alarm before attempting recovery procedure
Superheat Alarm Time ON	tnnn	nn = 0 to 15 min Valve is open for this time after superheat alarm and TF time above whilst attempting recovery procedure

LOOP

LOOP

Press ◎ to sequence through the Setup selections
Press ⊗ or ⊗ to change the settings
Press ◌ to accept the settings

Change Settings	YYYY	Factory / Commissioning change Settings
	YYYY = F-LP	Returns all parameters to default values below. F-LP RETURNS TO DEFAULTS
	C-LP	Allows values to be changed during commissioning. These parameters are for development purposes only and should NOT be changed.
Proportional Gain	p=n. n	n.n = 0 to 9.9
Integral Gain	i n. nn	n.nn = 0.00 to 0.99
Differential Gain	d=n. n	n.n = 0.0 to 9.9
Bleed position	bLnn	nn = 0 to 99% Sets minimum valve position
Ramp rate	r =n. n	n.n = 0.0 to 9.9°C Sets rate of change of superheat from SH to SL
Integral Time	i tnn	nn = 0 to 99 mins Delayed time for loop integral action
Loop Period	Pdnn	nn = 0 to 99 secs
Coil Time	ctnn	nn = 0 to 99 mins Time delay to establish coil-in/coil-out temperatures before control action starts
Ramp Time	r tnn	nn = 0 to 99 secs Time at which ramp rate, r, is applied

Expansion Valve Setup

For coil temperature control 'EEt' the only parameter that requires setup is the 'E' term Value.
Set the E value to 10°C above the Plant Evaporating Temperature.
This is the coil-in temperature at which 5°C above the AKV is allowed to resume automatic control, after recovery from Defrost or Pulldown.
The E Value is therefore **relative** to the Pack Evaporating Temperature, but should **not** be set at the **Actual** Evaporating Temperature

Other parameters at their default values should provide adequate electronic expansion valve control.

If a particular case is not controlling efficiently then other parameters may be adjusted dependent on observed performance using passcode PP11.

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.

During restart or defrost recovery the valve is maintained at pre-set defrost or start-up open positions (dr=90% or So=80%) until the coil in temperature is below E +5)° C at which point the control mode switches to automatic.

If EET type is selected and the coil in temperature is reading 5° C above the E limit then the controller goes into superheat recovery mode.

If EEP type is selected and the saturated evaporating temperature reaches Ed°C above the E limit (plant evaporating setpoint) then the controller will close the valve until the plant can recover. This will help to protect compressors from overload and liquid flooding during fault conditions and. on recovery

Terminology
Under the Unit heading in PP05 the relevant settings are: -

E   Evaporating temperature of system.

Ed   Evaporating temperature differential(the temperature above system setpiont at which protective measures are taken).EEt is fixed at 5°C and will switch to superheat recovery mode where the valve will close for tF time then open for tn time to So value and maintains this cycle until Ed is restored to normal and superheat is stabilised.
Under EEp Ed is adjustable between 5 and20°C with a default of 10°C. If the set value is exceeded the valve will close until Ed is within limits again and will then go straight back into auto control.

Under the Port heading in PP11 the relevant settings are: -

EEu   Electronic expansion valve parameters which allows access to all control settings for the valve. The default setting is F-EE or factory settings which will be sufficient for most applications.C-EE can be selected which will allow the user to tailor the control to a specific application.

SH   Superheat high maximum value valve is allowed to control at.

SL   Superheat low minimum value valve is allowed to control at.

SA   Superheat alarm limit closes valve for tF period.

Sb   Stable band.If the superheat is maintained within this limit the valve will adjust the superheat control towards SL.If the superheat is not maintained within this limit the valve will adjust the superheat control towards SH.

Sd   Stable band delay.This is the time period over which superheat stability is assessed.

dr   Defrost recovery valve position.This is the % valve opening held for time ct.

So   Starting output.This is the valve % opening from power on or superheat recovery.

tF   Superheat alarm time off.This is the time duration the valve is closed after a superheat alarm.

tn   Superheat alarm time on.This is the time duration the valve is held open to enable recovery.The valve is opened to the % before the alarm occurred.

Under LOOP heading in PP11 the relevant settings are only accessed from the serial display:-

bL   Bleed position.This is the minimum % opening the valve will operate at below which it is fully closed.

Ct   Coil time.Time period valve is held at So or dr before switching to automatic mode.

Product Ratio

1289 controllers do not have not fitted links.

$Pr = 0$	If PR% = 0 then the return air value is displayed
$Pr99$	If PR% = 99 then the discharge air value is displayed
$Pr50$	If PR% = 50 then the mean of discharge and return air value is displayed

The Product Ratio PR = 88% is set-up as follows using passcode 5 under UNIT selection provided the 'not fitted link has been inserted.

```
@:@  SEt=    ?   PP00  /:/  pp05    ?
@:@  Unit    ?
@:@  Pr00  /:/  Pr88    ?    Pr88
```

By selecting CASE CPon, this calculated product temperature can be used for control instead of discharge air on all Defrost types except Coldstores.

Alarm Unit

The 1289/635 may be configured as a supermarket central alarm indicator and teledialler unit for systems using the Guardian GUARDIAN M Autograph Terminal.

The required Unit settings are:-

sn80   Stub number = 80

Cn-1   Case number = 1

A249   Unit address = 249

ALr.   Alarm selection for relay 3 (only if A = 249)

Any alarm detected and printed by the Autograph Terminal causes the alarm unit to be selected to AUTO which results in:-

Relay 2 (defrost)	Closes n/c contacts for 5 seconds to initiate an alarm via the store teledialler
Relay 3 (Heater)	Flashes the alarm lamp every half second until the ACCEPT pushbutton is pressed when it goes steady.
Relay 4 (fans)	Energises remote flashing beacon in store which stops when ACCEPT pushbutton is pressed.
Input 4 (heater fail)	is used for the ACCEPT pushbutton input.

Any new alarms cause the cycle to be repeated with a contact closure for the teledialler and a flashing alarm lamp and beacon.

The flashing or steady alarm lamp is extinguished when Function key F8 - Accept Alarms is pressed at the Autograph Terminal by switching the alarm unit into OFF mode.

The correct unit address 249 must be set-up for stub 80 on the Autograph Terminal to make the system function correctly.

Control

FIG.1   LIQUID VALVE CONTROL

```
                    discharge air temperature
         \                          ___/\
          \                      _/      \_
           \                    /          \
            \         c   ___/              \_              c  /| c=liquid cut-in
      ----------------x-------------------\-----------------x-------------------- ^
        \_     _/                          \_            _/   \_   differential cd øC
      .........x  ._/...........................x........._/.......x.................. v
         \_/                          c-cd  \___  /    c-cd   \
                                              \_/              \

      _____            __liquid valve__n/o____                    ___
             _____/                        _____/   _____
```
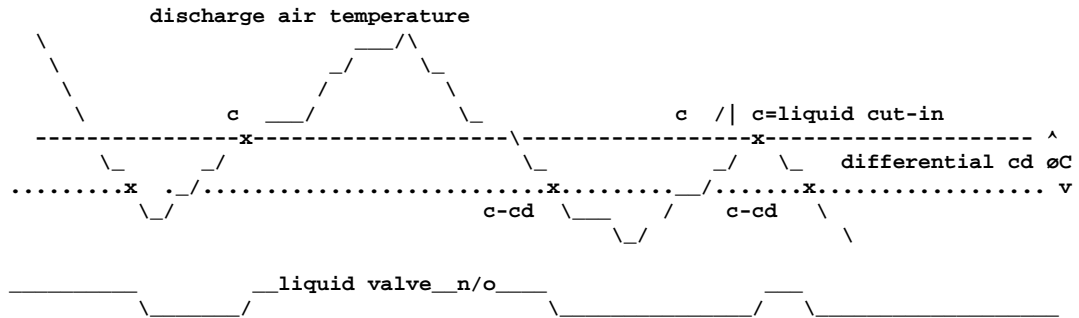
FIG.2   DEFROST CYCLE VALVE CONTROL

```
    discharge air temperature
                          ___/\
                       _/      \_
                      /          \
              d ___/                \_                              d /|    d = Defrost
Termination
             ------x----------------\----------------x-|---            ---------------
---- ^
               _/                      \_           _/   \_ dd = differential    |
            ../........................x.........__/.......x.................. v
            /                      d-dd \___ /      d-dd \
           /                             \_/              \
          /

     ___/  _                                                _____initiate
defrost_____
              _____defrost status input/output_____
       ____/
_____
    _____/                    _____
                                                          defrost   period    dP
_____
    _____/         _____              _____     _____               \____/
                                     _____n/o_____/                        \____/
_____
    _____                                  _____  defrost   valve(Hg-C)
_____
              \_____/     n/c             _____/     _____/
     ____/   _____                                _____
    ____/              Pt                   _____pumpdown      delay
period_____
     _____draindown      delay      period_____
                                                 _____/       dt
_____
     _____bypass      delay      period         ___
                                                    _____/bt
_____
     _____
_____
              _____suction valve__n/o_____/\/\/
     _____liquid    delay    period         _____
                                                    _____/    Lt
_____
     ___
_____
        _____liquid valve__n/o_____/
     _____fan delay period         _____
                                              _____/    Ft
_____
     _____
_____
              _____fans_(coldstore                                  or
FnOF)_____/
              _____pack hotgas valve _____
     _____/
_____}
```
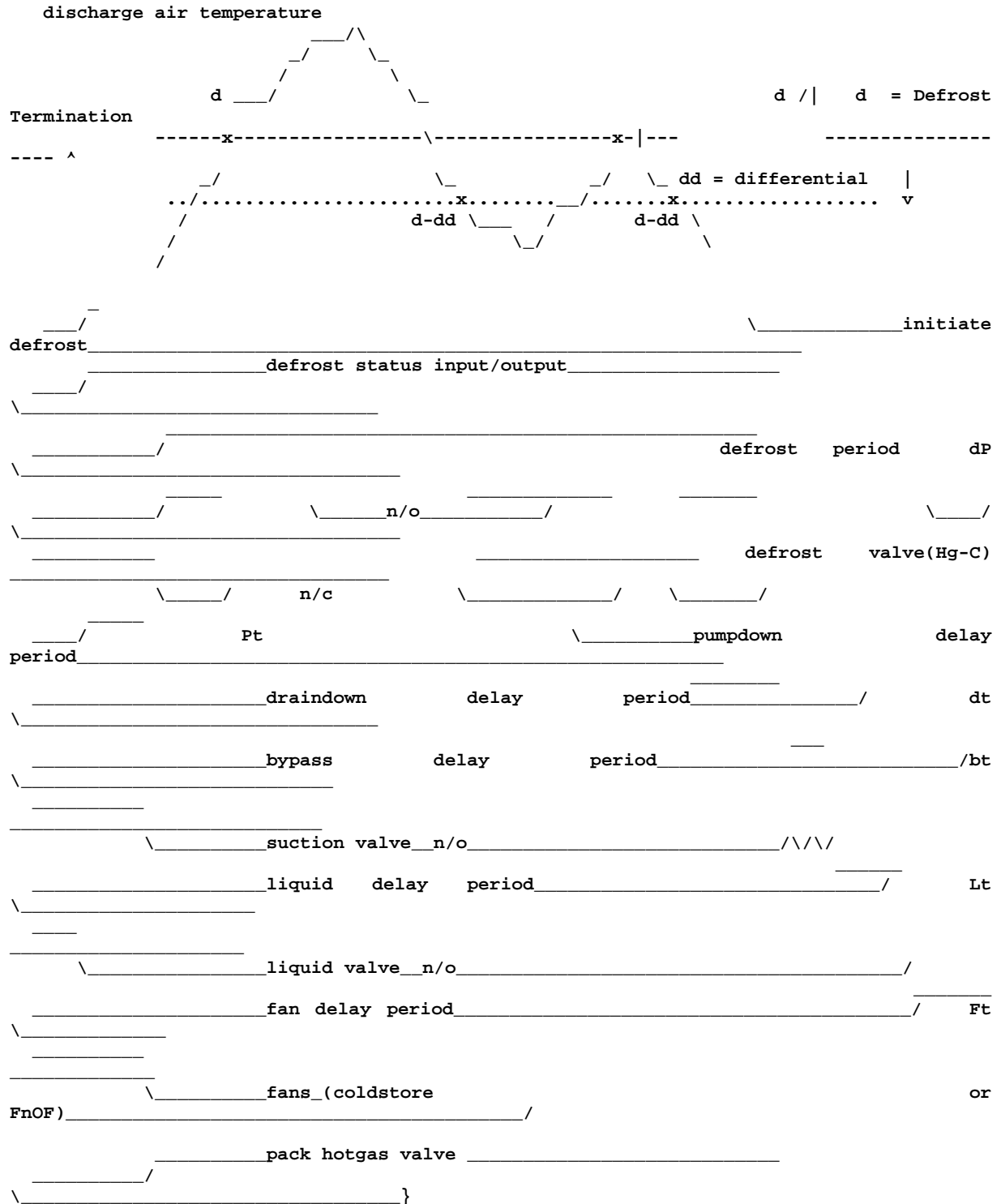
DEFROST CONTROLS

Hg-C - Hotgas Cycle

```
request
_____/_____
____

  **** PACK ****
                 _____hot gas_____
  Hotgas valve__/                                                    _____
shut_____
              _____
____open_____
  Suction valve_____shut_____/
                                            _open
  bypass                         valve_____/
_____

  **** CASE ****

_____run_____
___
  FANS-1,2,3

_____on_____
___
  Trim Heaters
          _____
____open_____
  LV              _____shut_____/
             _open_        __        _____     __
  HGV1    __shut__/                  \____/        _____/                \__/
_____
          .............. defrost time-1....... _____
  draindown                  _____/        dt
_____
                                         _____
  liquid         delay_____/        Lt
_____
```

Hg-t - Hotgas Terminate

```
request
_____/_____
___

  defrost status _____defrost any case in stub _____
  input/output__/                                                    \___stub
done_____

  PACK                 _____hot gas_____
  Hotgas                                                              valve__/
\___coolant_____
          _____
____open_____
  Suction valve_____shut_____/
                                                        open_____
 bypass   valve_____/          \_  _____
_____
                _____run_(_if
FnOn)_____
  FANS-1,2    \ ......stop ( if FnOF)..................................../
                _____on__(                                       if
trOn)_____
  Trim Heaters \.......off.( if trOF)......................../
          _____
____open_____
  LV1              _____shut_____/
                   _open_____
  HGV1                                                          __shut__/
_____         ..............
defrost time-1........................
terminate case 1    ...............................x
                                    _____
  draindown        delay          1_____/dt     1
_____
                                    _____
  liquid   delay  1                          _____/  Lt1
_____
          _____
____open_____
  LV2              _____shut_____/
                   _open_____
  HGV2                                                          __shut__/
_____
          .................. defrost time-2...........................
terminate case 2  ..........x
                                _____
  draindown                delay            2_____/                dt2
_____
                                    _____
  liquid   delay  2                          _____/  Lt2
_____
```

O-C Off-Cycle Defrost

```
request ____/_____

  PACK
  3-way valve - not used
                          run_____
  FANS 1,2
        _____                                        _____open_____
  LV1           _____shut_____/

  HGV1 __ not used
            .............. defrost time-1............. _____
  Liquid delay 1_____/ Lt1   _____

        _____                                        _____
  LV2           _____shut_____/

  HGV2 __ not used
            ................ defrost time-2....       _____
  Liquid delay2_____/Lt2   _____
```

Stor - Coldstore Defrost

(Similar to Hotgas terminate HG-T except FANS are switched off)
 Coldstores control the liquid valve on the return air probe and NOT on discharge probe.
Coldstores terminate defrost on probe 1and NOT on discharge probe.
Coldstore door input is monitored by **voltfree** contact TB7
Door closed = contact open
Door open = contact closed
Coldstores fans are switched off until fan delay is complete

```
  request ____/_____

        _____                                        _____on_____
  LIQUID        _____off_____/
                  _On_____
  DEFROST__off_____/                        _____
            .............. defrost time-1...............
                         _on_____
  Pan Heater_____/                                \_____off_____
                 _____
  pumpdown ___/  Pt _____

  terminate on probe 1
                                            ____
  draindown delay_____/ dt _____
                                            ____
  bypass delay _____/ bt _____
                                            ____
  Liquid delay _____/  Lt _____
                                            ____
  fan start delay _____/  Ft  _____
            _run_____                                   _____
  FANS-1        \__stop_____/
```
 (Probe 1 **MUST** be set as not fitted "nF" in PP07 1-AL)

COMMUNICATIONS

Communication facilities are available for interrogation of temperatures, status and modification / display of setpoints, limits and timeclock settings. All communication is via a daisy chain RS485 link which connects all GUARDIAN controllers units in series.

Communications commands and replies are checked for parity and block length and automatically re-transmit if errors are detected.

Each GUARDIAN controller has a unique unit number address UU/u which is used to select the appropriate unit for interrogation or modification.

> UU is stub no. 1-80
> u is case number 1-3.
> i.e. case 3 stub 56 has address 56/3
> and stub 45 has address 45/1

Some communication commands may use 'wildcard' stub number 99 and 'wildcard' case number 9 to access all stubs on the highway or all cases in a stub.

GUARDIAN controllers are inactive until they are addressed.

When the organisation of commands on the RS485 highway is under the control of a Woodley Mk V then GUARDIAN units only accept status requests which transmit case, discharge and return air temperatures and defrost status.

GUARDIAN Autograph or RM-256 Refrigeration Monitor Communication commands available are:-

a) Transmit Unit Status — which replies with command plus stub status & case temperature

b) Transmit Values — which replies with stub address plus latest signed temperature values, time, trip states, relay states and internal status

c) Transmit Setpoints — which replies with setpoints and limits. System Sn and unit Addresses Axxx may not be changed via the RS485 serial link

d) Receive setpoints with new setpoint values

e) Receive Time and Date with new hours and minutes, day, month and year for real time clock

f) Initiate/Terminate a hot gas or off-cycle defrost

g) ON auto / FANS only / case OFF selection for case cleaning

Setup / commissioning Parameters

PP05 Normal Menu Settings

		unit	ACTUAL settings	Default setting	Min.	Max.
CASE	Control probe CpoF=control on air off Cpon=control on product ratio(see unit menu) (not available on stor defrost)			CpoF	CpoF	
	Cut-in setpoint for Liquid valve 1	°C	*c*	c−25	c−40	c 40
	Mode Selection idEF FAnS OFF Auto			Auto		
DEFr	Defrost type O-C Hg-C Hg-t Stor					
	Number of defrosts per day		*dn*	dn 4	dn00	dn06
	First defrost time T1 hours	hrs	*1h*	1h01	1h00	1h05
	Delay 2nd defrost by n hours if dn=2	hrs	*d2d*	d2d0	d2d0	d2d9
	First defrost time T1 minutes	mins	*lt*	lt30	lt00	lt59
	Defrost period	mins	*dP*	dP15	dP02	dP60
	Defrost termination temp (not Off-Cycle cases)	°C	*d*	d 15	d 00	d 40
	Defrost termination differential (for Hotgas-Cycle cases only)	°C	*dd*	dd01	dd01	dd10
	Fans on/off during defrost Fnon/FnoF		*Fn*	Fnon	FnoF	
	Trim heaters on/off during defrost		*tr*	tron	troF	

		unit	ACTUAL settings	Default setting	Min.	Max.
Uni t	Model type selection 635 1085 1088 1080 975 1297 1289					
	Control type Selection LSoL EEt EEP (BPR Only with special EPROM)					
See Note E Value Page 18	**AKV auto control starting point (Coil-in) Set the E value to 10°C above the Plant Evaporating Temperature.**	°C	*E*	E –10	E –40	E 40
	Evaporating temp differential EEP adjustable (EEt fixed at 5)	°C	*Ed*	Ed10	Ed05	Ed20
	Pressure Transducer 20ma high range	bar.	*P*	P24	-1	50
	Pressure Transducer 4 ma low range	bar.	*P*	P-1	-1	50
	Gas type 404a r22 nh3			404a		
	Serial display		*Sd*	Sd9	Sd8	Sd9
	Stub number		*Sn*	Sn01	Sn 0	S255
	Case number (normally 3 max.)		*Cn*	Cn1	Cn 0	Cn 4
	Woodley MkV address number		*A*	A3	A 0	A255
	Control Relay 3 Htr HgAS			Htr		
	Invert Relay 3 Output (Hgas Input)			Pos	Pos	neg
	Temperature probe type			Pt	tP20	tP22
	Digital alarm detection and display			ndAd	ndAd	dAd

PP07 (level 3) Menu Settings

	unit	ACTUAL settings	Default setting	Min. setting	Max. setting
Temperature number 1 Alarm type Hi, Lo ,HiLo, nonE, nF		*1-AL*	**nF**	nF	Hi
Alarm Limits	°C	*1*	−40	−40	40
Temperature number 2 Alarm type Hi, Lo, HiLo, nonE, nF		*2-AL*	**HiLo**	nF	Hi
Alarm Limits	°C	*2*	−25	−40	40
Temperature number 3 Alarm type Hi, Lo, HiLo, nonE, nF		*3-AL*	**nonE**	nF	Hi
Alarm Limits	°C	*3*	−40	−40	40
Temperature number 4 Alarm type Hi, Lo, HiLo, nonE, nF		*4-AL*	**nonE**	nF	Hi
Alarm Limits	°C	*4*	−40	−40	40
Temperature number 5 Alarm type Hi, Lo, HiLo, nonE, nF		*5-AL*	**nonE**	nF	Hi
Alarm Limits	°C	*5*	−40	−40	40
Temperature number 6 Alarm type Hi, Lo, HiLo, nonE, nF		*6-AL*	**nF**	nF	Hi
Alarm Limits	°C	*6*	−40	−40	40
Temperature number 7 Alarm type Hi, Lo, HiLo, nonE, nF		*7-AL*	**nF**	nF	Hi
Alarm Limits	°C	*7*	−40	−40	40
Temperature number 8 Alarm type Hi, Lo, HiLo, nonE, nF		*8-AL*	**nF**	nF	Hi
Alarm Limits	°C	*8*	−40	−40	40
Temperature number 9 Alarm type Hi, Lo, HiLo, nonE, nF		*9-AL*	**nF**	nF	Hi
Alarm Limits	°C	*9*	−40	−40	40
Guardtime	mins	*gt*	gt 45	gt 00	gt 99
Alarm differential	°C	*Ad*	Ad 05	Ad 02	Ad 40
Digital input - A Alarm type		*A-AL*	nonE	on	nonE
Guardtime for input A	mins	*A*	00	00	99
Digital input - b Alarm type		*b-AL*	nonE	on	nonE
Guardtime for input b	mins	*b*	00	00	99
Digital input - c Alarm type		*c-AL*	nonE	on	nonE
Guardtime for input c	mins	*c*	00	00	99
Digital input - d Alarm type		*d-AL*	nonE	on	nonE
Guardtime for input d	mins	*d*	00	00	99
Digital input - E Alarm type		*E-AL*	nonE	on	nonE
Guardtime for input E	mins	*E*	00	00	99
Digital input - F Alarm type		*F-AL*	nonE	on	nonE
Guardtime for input F	mins	*F*	00	00	99
Digital input - g Alarm type		*g-AL*	nonE	on	nonE
Guardtime for input g	mins	*g*	00	00	99
Digital input - h Alarm type		*h-AL*	nonE	on	nonE
Guardtime for input h	mins	*h*	00	00	99

PP09 (level 2) Settings

		unit	ACTUAL settings	Default setting	Min. setting	Max. setting
rtc=	Real clock time hours	hrs	*rh*		rh00	rh23
	Real clock time minutes	mins	*rt*		rt00	rt59
	Weekday	day			Sun	SAt
	Day of Month	no.	*dn*		1	31
	Month					
	Year					
SYSt	Cooling differential for control **Cut-out (cd 0 = 1°C)**	°C	*cd*	cd 0	cd 0	cd 5
	Defrost start pumpdown delay time	min	*Pt*	Pt1.0	Pt0.0	Pt9.9
	Defrost end draindown delay time	min	*dt*	dt 01	dt 00	dt 10
	Bypass valve delay after draindown	min	*bt*	bt 0.2	bt 0.0	bt 9.9
	Liquid delay after suction	min	*Lt*	Lt1.0	Lt0.0	Lt9.9
	Defrost Fan delay time	min	*Ft*	Ft02	Ft00	Ft10
	Time on for suction valve pulsing during bypass period	min	*tn*	tn0.1	tn0.0	tn9.9
	Time off for suction valve pulsing during bypass period	min	*tF*	tF0.1	tF0.0	tF9.9
	Control air temp. alarm Guardtime	min	*gt*	gt45	gt00	gt99
	Alarm differential control air	°C	*Ad*	Ad05	Ad02	Ad40
	Defrost T1 time hours					
	Defrost T1 time minutes					
	Defrost T2 time hours					
	Defrost T2 time minutes					
	Defrost T3 time hours					
	Defrost T3 time minutes					
	Defrost T4 time hours					
	Defrost T4 time minutes					
	Defrost T5 time hours					
	Defrost T5 time minutes					
	Defrost T6 time hours					
	Defrost T6 time minutes					

PP09 (level 2) Settings Cont'd

tCL1

Sunday Time On Hours		*1H*	9	0	23
Sunday Time On Minutes		*1n*	30	0	59
Sunday Time Off Hours (1st Off time)		*1h*	16	0	23
Sunday Time Off Minutes (1st Off time)		*1F*	30	0	59
Monday Time On Hours		*2H*	7	0	23
Monday Time On Minutes		*2n*	30	0	59
Monday Time Off Hours		*2h*	22	0	23
Monday Time Off Minutes		*2F*	30	0	59
Tuesday Time On Hours		*3H*	7	0	23
Tuesday Time On Minutes		*3n*	30	0	59
Tuesday Time Off Hours		*3h*	22	0	23
Tuesday Time Off Minutes		*3F*	30	0	59
Wednesday Time On Hours		*4H*	7	0	23
Wednesday Time On Minutes		*4n*	30	0	59
Wednesday Time Off Hours		*4h*	22	0	23
Wednesday Time Off Minutes		*4F*	30	0	59
Thursday Time On Hours		*5H*	7	0	23
Thursday Time On Minutes		*5n*	30	0	59
Thursday Time Off Hours		*5h*	22	0	23
Thursday Time Off Minutes		*5F*	30	0	59
Friday Time On Hours		*6H*	7	0	23
Friday Time On Minutes		*6n*	30	0	59
Friday Time Off Hours		*6h*	22	0	23
Friday Time Off Minutes		*6F*	30	0	59
Saturday Time On Hours		*7H*	7	0	23
Saturday Time On Minutes		*7n*	00	0	59
Saturday Time Off Hours		*7h*	22	0	23
Saturday Time Off Minutes		*7F*	30	0	59
N.B. Set To 0Hrs/0Mins If NOT USED					
Sunday Time Off Hours (2nd Off time)		*8h*	0	0	23
Sunday Time Off Minutes (2nd Off time)		*8F*	0	0	59

PP11 (level 3) Settings

		unit	ACTUAL settings	Default setting	Min. setting	Max. setting
Port	Communications baud rate			9600	none	9600
EEu=	Electronic Expansion Valve Parameters F-EE=default settings . . C-EE=user defined	**EEu**		F-EE	C-EE	C-EE
	Superheat High. Maximum superheat	°C	*SH*	SH08	SH00	SH40
	Superheat Low. Minimum superheat	°C	*SL*	SL3	SL0	SL99
	Superheat Alarm Limit at which superheat recovery is actioned	°C	*SA*	SA1	SA0	SA40
	Stable Band.	°C	*Sb*	Sb1.0	Sb0.0	Sb9.9
	Stable band Delay time	min	*Sd*	Sd15	Sd00	Sd99
	Defrost Recovery Valve position	%	*dr*	dr90	dr00	dr99
	Starting Output	%	*So*	So80	So00	So99
	Superheat Alarm Time OFF	min	*tF*	tF01	tF00	tF15
	Superheat Alarm Time ON	min	*tn*	tn03	tn00	tn15
LOOP	Parameters F-LP=default settings . C-LP=user defined			F-LP	C-LP	C-LP
	Proportional Gain		*P*	30	0	255
	Integral Gain		*i*	1	0	255
	Differential Gain		*d*	0	0	255
	Bleed position	%	*bL*	bL10	bL00	bL99
	Ramp rate	°C	*r*	r 00	r 00	r 40
	Integral Time		*it*	it02	it00	it99
	Loop Period		*Pd*	Pd02	Pd00	Pd99
	Coil Time		*ct*	ct01	ct01	ct99
	Ramp Time		*rt*	rt12	rt00	rt99

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1289 Back Pressure Regulator

Caution, only available with dedicated EPROM (1289 BPR)

BPR Settings
WARNING, The following parameters are for chilled case products i.e. deli and fresh meat.
No adjustments should be to these settings without prior consultation with GUARDIAN.

BPR Set-up PP11

(Check with GUARDIAN before adjusting)

Cool

Discharge Air Control Loop		Actual	Default	Min	Max
p – – – Proportional Gain		P	10	0	255
I – – – Integral Gain		I	2	0	255
d – – – Differential Gain		d	0	0	255
S – – – Loop Period		S	5	0	99
r – – – Ramp rate		r	10	0	99

(Check with GUARDIAN before adjusting)

dAnF

KVQ Heatmotor Control Loop		Actual	Default	Min	Max
p – – – Proportional Gain		P	11	0	255
I – – – Integral Gain		I	4	0	255
d – – – Differential Gain		d	0	0	255
S – – – Loop Period		S	5	0	99
r – – – Ramp rate		r	5	0	99
o – – – Heatmotor Temp for fully **open °C** LOWEST EVAPORATING CONDITION	See Note 1	o	80	0	255
u – – – Heatmotor Temp for fully **closed °C** HIGHEST EVAPORATING CONDITION	See Note 1	u	105	0	255
t – – – TEST SETPOINT, manual setting for Heatmotor	See Note 2	t	0	0	255

Note 1, For Settings refer to Danfoss KVQ Bulletin for correct Refrigerant Pressure / Temperature Characteristics.
Note 2, No action when set to zero, CAUTION when setpoint entered control temperature will be maintained until a power restart or value set back to zero.

(Check with GUARDIAN before adjusting)

retn

	Return Air Control Loop	Actual	Default	Min	Max
p - - -	Proportional Gain	**P**	0	0	255
I - - -	Integral Gain	**I**	0	0	255
d - - -	Differential Gain	**d**	0	0	255
S - - -	Loop Period	**S**	0	0	99
r - - -	Ramp rate	**r**	0	0	99
n - - -	**% DISCHARGE AIR CONTROL**	**n**	100	0	100

1289 BPR Termination Wiring
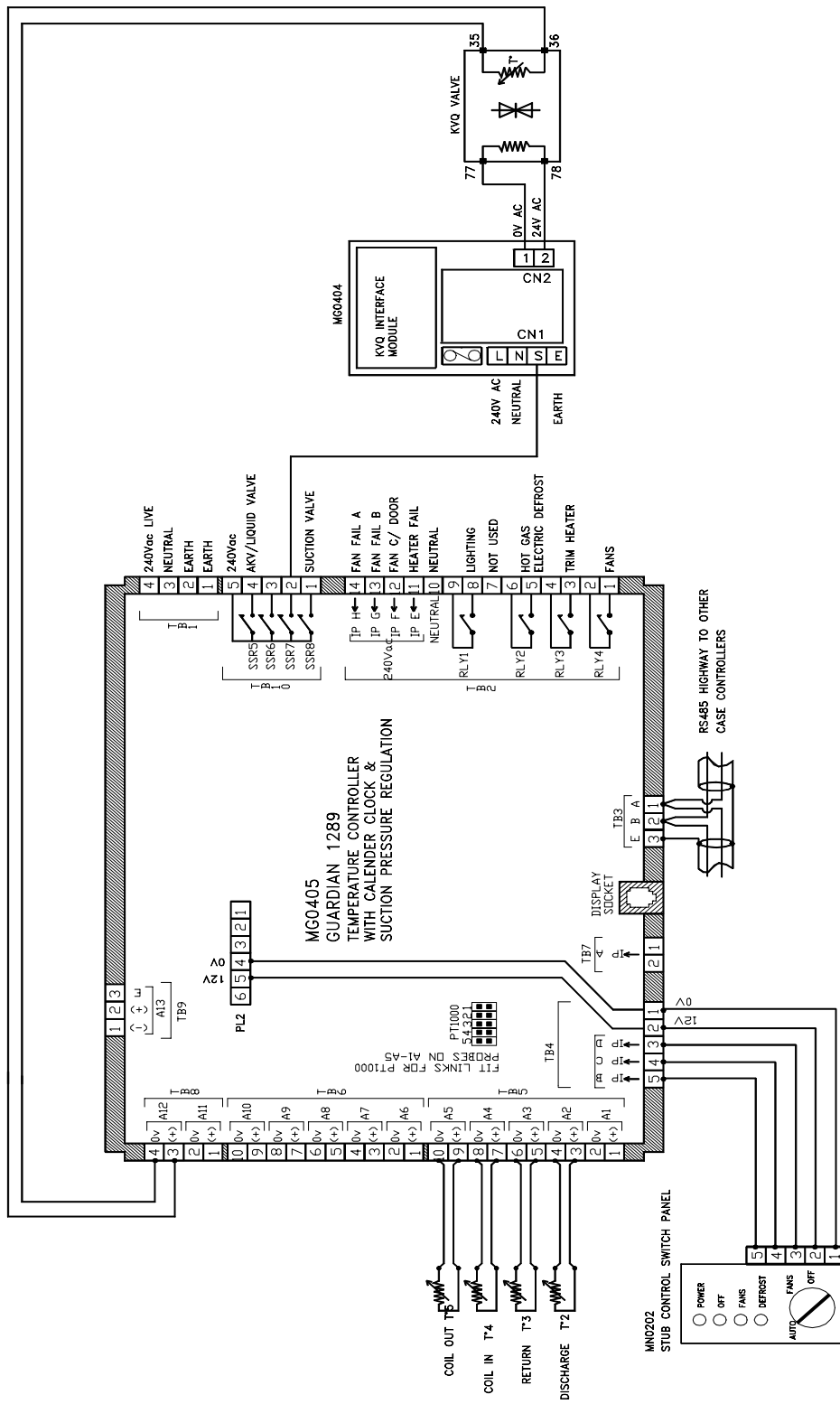
Quick Set-up for Controller LSOL

Case with Liquid Line Solenoid and TEV

PPO5

CAsE

Set CPOF Control on Air Off probe (Delivery)

Or

Set CPON Control on ratio of Air Off & Air On probes (Delivery & Return)

Set C-25 to temperature Control Set-point

dEFr

Set defrost type

Hg-t = defrost terminated by Air Off probe

Or

Hgt1 = defrost terminated by probe 1**(For use when fans set to OFF during defrost)**

Or

stor = Coldstore (fans off during defrost) defrost terminated by probe 1

dno4 Set number of defrosts required per day

1hOO Set time **Hour** of first defrost

1tOO Set time **Mins** of first defrost

dp3O Set time **duration** of defrost

d=10 Set temperature **Termination** of defrost

FnOn Set **Fans On** during defrost

Or

FnOf Set **Fans Off** during defrost **(Terminate on probe 1)**

trOn Set **Trim Heaters On** during defrost

Or

trOf Set **Trim Heaters Off** during defrost

Unit

    1289 Set **Controller Type**

    LsoL Set for **Liquid Line Solenoid**

    Sn01 Set for **System Number**

    Cn01 Set for **Case Number**

    A=01 Set for **Address Number**

    =pt= Set **PT1000 Probes (note 5 links on card must be fitted)**

Or

    tp22 Set **TP22 Probes (note 5 links on card must be removed)**

=End

The Controller is now ready to operate, all other settings should remain as set, only adjust other settings after consulting the main manual.

For all other configurations consult the main manual.

Quick Set-up for Controller AKV

Case with Electronic Expansion Valve AKV

PP05

CAsE

Set CPOF Control on Air Off probe (Delivery)

Or

Set CPON Control on ratio of Air Off & Air On probes (Delivery & Return)

Set C-25 to temperature Control Set-point

dEFr

Set defrost type

Hg-t = defrost terminated by air off probe

Or

Hgt1 = defrost terminated by probe 1**(For use when fans set to OFF during defrost)**

Or

stor = Coldstore (fans off during defrost) defrost terminated by
       probe 1

dno4 Set number of defrosts required per day

1h00 Set time **Hour** of first defrost

1t00 Set time **Mins** of first defrost

dp30 Set time **duration** of defrost

d=10 Set temperature **Termination** of defrost

FnOn   Set **Fans On** during defrost

Or

FnOf   Set **Fans Off** during defrost **(Terminate on probe 1)**

trOn   Set **Trim Heaters On** during defrost

Or

trOf   Set **Trim Heaters Off** during defrost

Unit

1289   Set **Controller Type**

EEt=   Set for **Electronic Expansion Valve with coil-in & coil-out probes**

E-10   Set value of **E**

> **Electronic Expansion Valve**
>
> **auto control starting point (Coil-in)**
>
> **Set the E value to 10°C above the Plant Evaporating Temperature.**

Sn01   Set for **System Number**

Cn01   Set for **Case Number**

A=01   Set for **Address Number**

=pt=   Set **PT1000 Probes (note 5 links on card must be fitted)**

Or

tp22   Set **TP22 Probes (note 5 links on card must be removed)**

=End

The Controller is now ready to operate, all other settings should remain as set, only adjust other settings after consulting the main manual.

For all other configurations consult the main manual

Set-up for 4 digital alarm input unit only

The following lists the adjustments required to a standard 1289 controller for it to act as a fault input board.

sEt pp05		Default settings	Alarm unit	DISPLAY	INPUT Terminal
dEfr					
dn04	Defrost number change to dn00	**dn04**	**dn00**	dn00	
uni t					
1289	1289/635 change to 1080	**1289**	**1080**	1080	
ndAd	ndad change to dad	**ndad**	**dad**	=dad	
End=					
sEt pp07					
2-AL	Hilo change to nf	**Hilo**	**nf**	=nf=	
3-AL	none change to nf	**none**	**nf**	=nf=	
4-AL	none change to nf	**none**	**nf**	=nf=	
5-AL	none change to nf	**none**	**nf**	=nf=	

e-AL	**SET AS REQUIRED**
	Alarm input oFF = alarm on negative input
	        on = alarm on positive input
	       none= No alarm
	       roFF= Future Use (Not Used)
		oFF		e===	TB2-11

F-AL	**SET AS REQUIRED**
	Alarm input oFF = alarm on negative input
	        on = alarm on positive input
	       none= No alarm
	       roFF= Future Use (Not Used)
		oFF		=f==	TB2-12

g-AL	**SET AS REQUIRED**
	Alarm input oFF = alarm on negative input
	        on = alarm on positive input
	       none= No alarm
	       roFF= Future Use (Not Used)
		oFF		==g=	TB2-13

h-AL	**SET AS REQUIRED**
	Alarm input oFF = alarm on negative input
	        on = alarm on positive input
	       none= No alarm
	       roFF= Future Use (Not Used)
		oFF		===h	TB2-14

Woodley Case Answer

e – AL	Case Answer 4	e===	TB2-11
F – AL	Case Answer 5	=f==	TB2-12
g – AL	Case Answer 6	==g=	TB2-13
h – AL	Case Answer 7	===h	TB2-14

1289 Termination

Important Notice

1287 Conversion to 1289

Guardian 1289/636 type controllers fitted as replacements to sites originally wired for 1287 type controllers.
BEFORE POWER IS APPLIED
A modification is required to the site wiring.
The NEUTRAL connection to TB10 pin 1 MUST BE REMOVED
FAILURE TO CARRY OUT THIS MODIFICATION WILL RESULT IN PERMANENT DAMAGE TO THE CONTROLLER.

GUARDIAN 1287 TERMINATIONS


```
Probe   Probe    Terminal   Point      4-20ma Pressure           Terminal  Name      Ref.
Ref     Name                Ref                        + 
** NB inputs A8,A9 **                                  -
are coldstore defrost                               -| |+
                                                   1 2
                                                        TB9                    _4_   230Vac LINE
                         A12       Link must be in if                         _3_   230Vac Neutral
gas level          _4_              probe not fitted                          _2_   EARTH
12                 _3_   A11      ; ; : : : : : : : : :         TB1----------- _1_   EARTH
gas reference      _2_ ---------TB8  10 9 8 7 6 5 4 3 2 1
11                 _1_                                                               230VAC
                   10_   A10                                                   _5_   liquid supply
                   _9_                                          SSR5 └o/o─     _4_   liquid/AKV-10 valve
Eo3 evap-3 outlet  _8_   A9                                                    _3   suction supply
9                  _7_               GUARDIAN 1287            SSR6 └o/o─        _2_   suction valve
Ei3 evap-3 inlet   _6_   A8                                  TB10-----------   _1_   suppressor neutral
8                  _5_ TB6         Temperature Controller
Eo2 evap-2 outlet  _4_   A7        with calendar clock                IH      14    Fan Fail     a
7                  _3_                                                IG      13    Fan Fail     b
Ei2 evap-2 inlet   _2_   A6        & electronic expansion (door shut=mains on) IF - 12    Fan c / door
6                  _1_              valve control        Defrost request or IE 11    Heater Fail
      even no's=0vdc                                             TB2----------- 10    suppressor neutral
Eo1 evap-2 outlet  10_   A5                                                    _9_   supply Lights/LV
5                  _9_                                          R1 └o/o─        _8_   Lighting/1085 LSV
Ei1 evap-1 inlet   _8_   A4                                        ┌o─o─        _7_   Hot gas valve n/c
4                  _7_                                          R2 │            _6_   supply common
RET return         _6_   A3        Plug PL1                        └o/o─        _5_   _Hotgas      n/o
3                  _5_              serial                                      _4_   heater supply
DEL delivery       _4_   A2        display      RS-485          R3 └o/o─        _3_   _Heater_____ n/o_
2                  _3_              connector Communications optional           _2_   Fans  supply
CPT case/Dc2       _2_   IB IC ID  IA   connector  SSR module   R4 └o/o─        _1_   _ Fans _ _ n/o _
1                  _1_ TB5  5 4 3 2 1  2 1  TB7    TB8  3 2 1 TB-3  connector
          TB4                          E B A
```

```
Stub sw. o─ Auto
          »o─ OFF                                   voltfree
          o──Fans───                                contact
          ┌─o o──defrost─                           ─o\o─         Plug PL2
0v        │ ──12vdc──                             coldstore door
          │   ──0vdc──                           closed=door open
                                                                                    last case
12v                                                                                
     ─o/o─ ►|        ■___A____ __bk_____ __bk_____ ___A__  to other    _100R■
 compressor         ■_B_XXXXXXXXX_we_____ we_XXXXXXXXXXXXXXX_ B__  ITC 1289/1085/975
   trip             ■_E_____drain wire_____ ____drain wire_____ E__  Controllers
                    From Woodley System 5
                    or Guardian Autograph Terminal
            RS485 communication cable - Beldon 8761 (STC PS1P22 041748X 500metre)   2-SSR  _5_  230vac supply
            (                         041747A 100metre)         o─ SSR7 └o/o─  _4_  Expansion Valve-2
                                                                o─           _3_  230vac supply
                                                        OPTIONAL o─ SSR8 └o/o─ _2_  expansion Valve-3
                    2-SSR Expansion Valve Module                 o─            _1_  solenoid neutral
```

```
        GUARDIAN 1289                     T   SSR5 ─/  5  240Vac
        TEMPERATURE CONTROLLER            B   SSR6 ─/  4  LIQUID/AKV-10 VALVE 1
        WITH CALENDER CLOCK &             1   SSR7 ─/  3  AKV-10 VALVE COIL 2
        ELECTRONIC EXPANSION VALVE CONTROL 0  SSR8 ─/  2  AKV-10 VALVE COIL 3
                                                          1  SUCTION VALVE
```

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