GUARDIAN

RCU-14

Refrigeration Control Unit
for Display Cabinets & Coldstores

- AKV-10/20 expansion valve evaporator control
- Liquid solenoid valve control for 6 off-cycle defrost cases
- Hot Gas/Electric Defrost control of 3 display cases or one cooler
- Refrigeration temperature monitor
- Fan-fail and coldstore door alarms
- Humidity, suction, heater and fan control
- Local panel value display and setup remote
- RS485 communications

Operation and Setup Manual

The GUARDIAN RCU-14 Refrigeration Controller is a rail-mounted, mains-powered, flexible, refrigeration temperature and defrost sequence controller for up to six off-cycle defrost supermarket display cases or a single coldstore evaporator or blast freezer.
Controls cater for normal liquid solenoid valves and AKV10 expansion valve.

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

The RCU-14 communicates with a GUARDIAN Autograph Terminal which provides remote central alarm monitoring, data recording, graphs and setting changes via a RS485 serial link.

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Getting Started

Guardian Controllers provide refrigeration engineers with

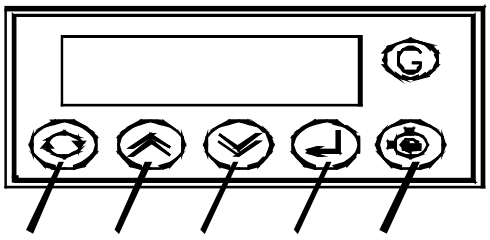
- **ULTIMATE FLEXIBILITY**
- **ASSURED MONITORING**
- **RELIABLE ALARMS**

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 setup 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.



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 HVAC or compressor controllers.

BUTTON OPERATION SHORTHAND

To assist in easy setup 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'.**

Suct 48b

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

diSc =oC= FAIL

means the display alternately flashes between the value identifier tag (discharge 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

Models with **BLUE** labels and suffix '**L' (LOW VOLTAGE)** operate at **24vac**
Models with **BLACK** labels and no suffix **(NORMAL 230vac)** operate at **230vac**

230vac MAINS SUPPLY WILL DAMAGE A BLUE LABEL CONTROLLER !!!
A BLACK label controller will not work with a 24vac supply

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

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

Enter Passcode PP05 as button sequence above

@:@ Unit ? SALE /:/ HUAC ? HUAC

Press **'next'** repeatedly until **Unit** is displayed and then press **'enter'**
Display shows unit model currently selected which may be wrong.
Press **'raise'** repeatedly until correct model is displayed (e.g. ru14) and then press **'enter'** which causes the display to wink briefly and display the new unit model selection(e.g. ru14)

Select System No and Address

e.g. setup unit for system 60 case 1 at address 180

Enter Passcode as button sequence as above

@:@ Unit ?
@:@ 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 36

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 (RCU-14)

The RCU14 can be configured for control of

a) 'EVAP' used for industrial coldstores with pumpdown.
b) 'COND ' used for conditioning room control.
c) 'bLAS' used for blast freezer control.
d) 'hunC' used for humidity conrol.

The RCU14 can be configured for control or monitoring

a) '3dEF' used for 3 case sections with separate setpoints & defrost start times.
b) '6OC' used to alarm monitor six independent case temperatures

GENERAL SPECIFICATION

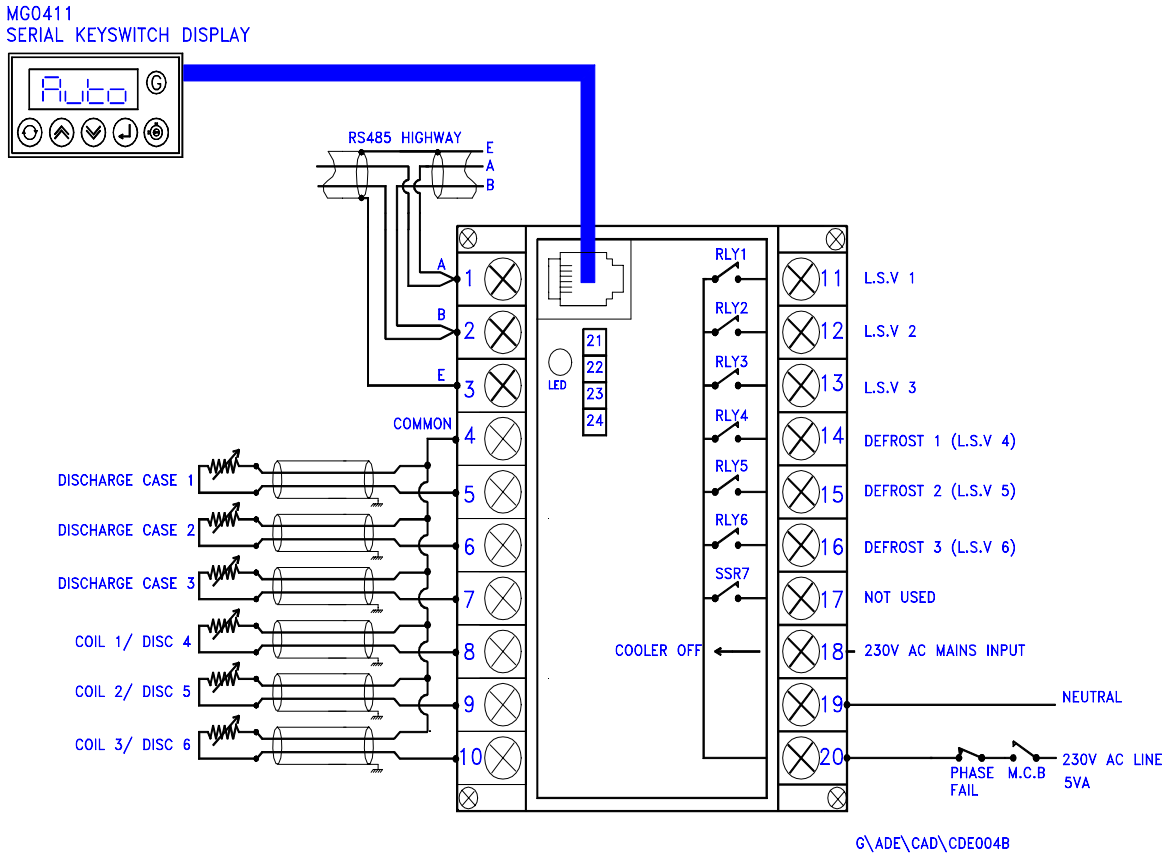
Power	110 / 230 Vac 50 hz 10VA
Operation	0 to 55ºC
Approx. dimensions	Width 70 x length 100 x height off rail 110mm.

The RCU-14 controller is housed in a DIN rail mounting enclosure with 20 screw clamp connectors.

RCU-14 '3DEF' and '6OC' Input/Output Signals

3dEF	6OC	3dEF	6OC
Analogue Input			
T1	T1	Discharge Case 1 Temp	Discharge Case 1 Temp
T2	T2	Discharge Case 2 Temp	Discharge Case 2 Temp
T3	T3	Discharge Case 3 Temp	Discharge Case 3 Temp
T4	T4	Coil Case 1Temp	Discharge Case 4 Temp
T5	T5	Coil Case 2 Temp	Discharge Case 5 Temp
T6	T6	Coil Case 3 Temp	Discharge Case 6 Temp
Mains input			
1	1	Cooler OFF	
Relay Outputs (5 amp 24VAC) n/o with suppressers			
R1	R1	Liquid Solenoid valve 1	Liquid Solenoid valve 1
R2	R2	Liquid Solenoid valve 2	Liquid Solenoid valve 2
R3	R3	Liquid Solenoid valve 3	Liquid Solenoid valve 3
R4	R4	Defrost 1	Liquid Solenoid valve 4
R5	R5	Defrost 2	Liquid Solenoid valve 5
R6	R6	Defrost 3	Liquid Solenoid valve 6
SSR7	SSR7	Not used	Not used

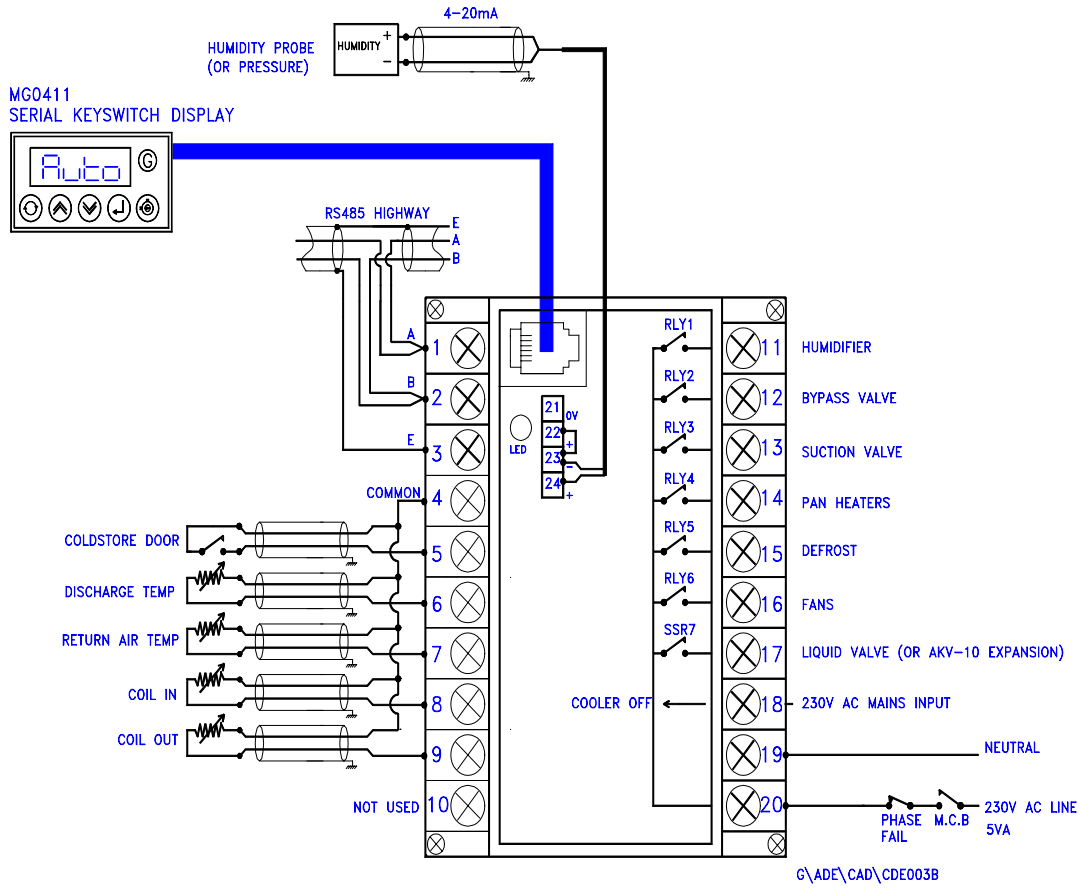
RCU-14 Termination Wiring - '3DEF' and '6OC' model selection



RCU-14 'EVAP' and 'COND' Input/Output Signals

EVAP	COND		
Analogue Inputs			
P1		Humidity	4 to 20ma 0 - 100%
T1		Coldstore door	
T2		Discharge temperature	°C
T3		Return Air temperature	°C
T4		Coil in temperature	°C
T5		Coil out temperature	°C
T6		Not used	
Mains Input			
1		Cooler OFF	
Relay Outputs (5 amp 24VAC n/o with suppressers			
R1		Humidifier	
R2		Bypass valve	
R3		Suction valve	
R4		Pan heaters	
R5		Defrost	
R6		Fans	
SSR7		AKV-10 Expansion or Liquid valve	

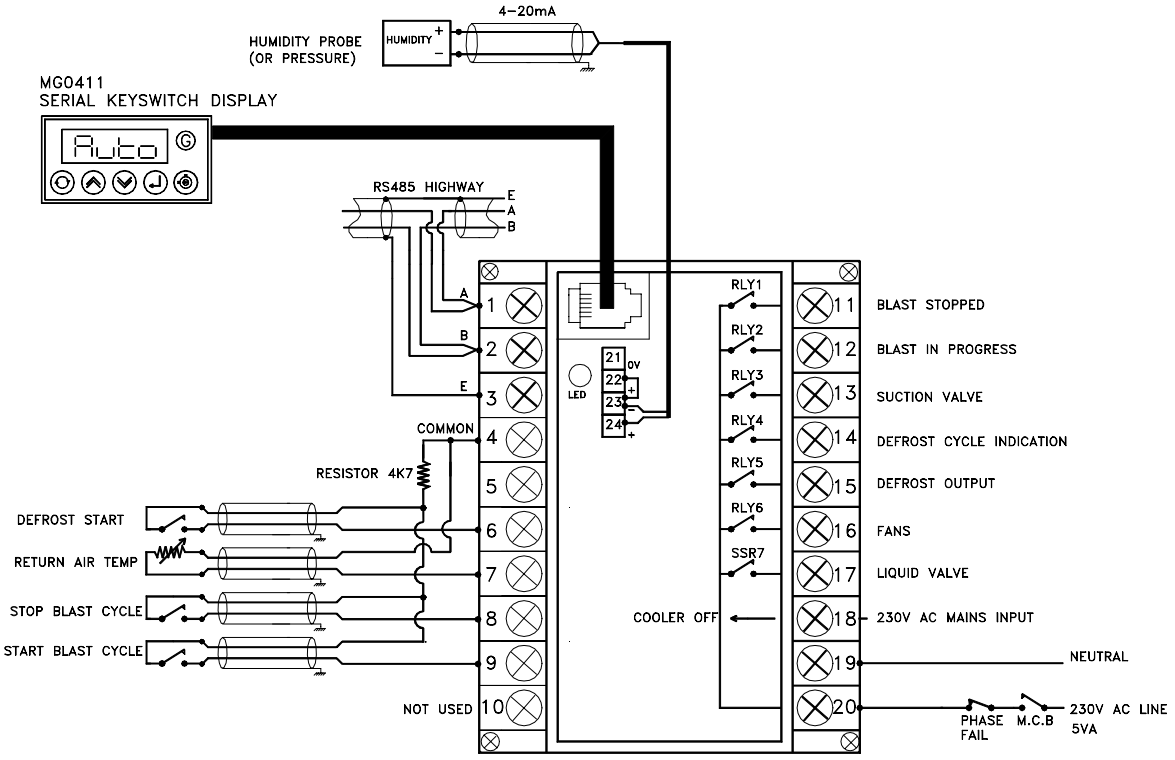
RCU-14 Termination Wiring - 'EVAP' or 'Cond' model selection



RCU-14 ‘bLAS’ Input/Output Signals

bLAS		
Analogue Inputs		
P1	Humidity	4 to 20ma 0 - 100%
T1	Not fitted	
T2	Defrost start	n/o contact closed=start
T3	Return Air temperature	°C
T4	Stop Blast cycle	n/o contact closed=stop
T5	Start Blast cycle	n/o contact closed=start
T6	Not used	
Mains Input		
1	Cooler OFF	
Relay Outputs (5 amp 24VAC n/o with suppressers		
R1	Blast stopped	
R2	Blast in progress	
R3	Suction valve	
R4	Defrost cycle indication	
R5	Defrost output	
R6	Fans	
SSR7	Liquid valve	

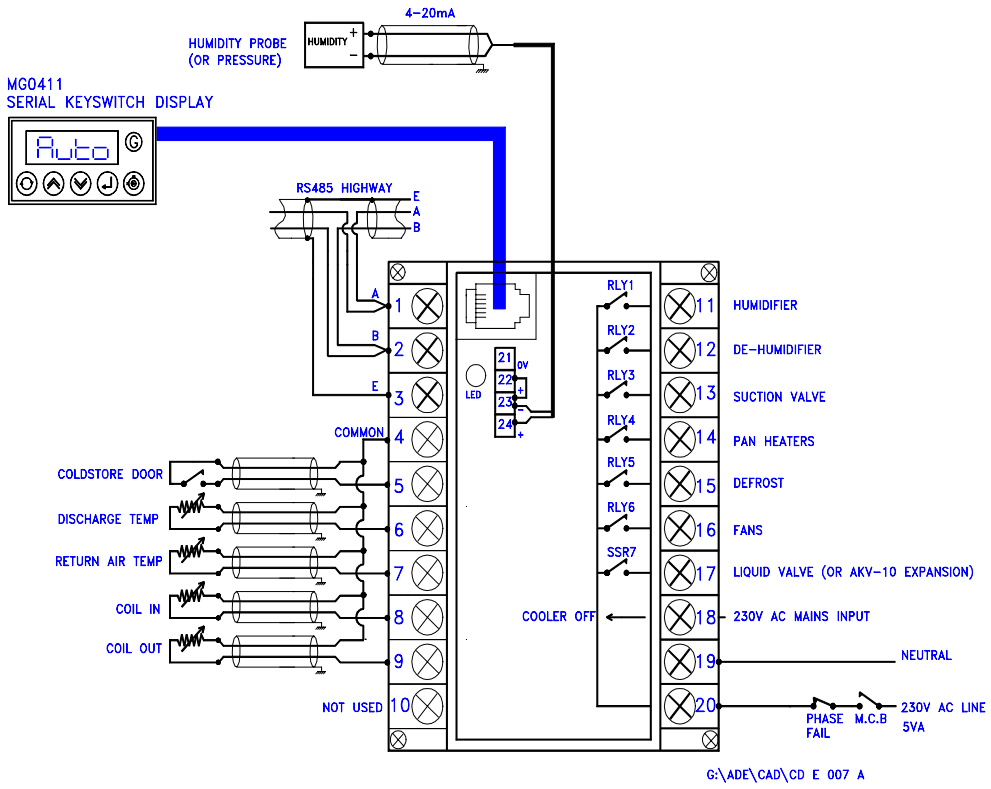
RCU-14 Termination Wiring - ‘bLAS’ model selection



RCU-14 ‘hunC’ and Input/Output Signals

hunC		
Analogue Inputs		
P1	Humidity	4 to 20ma 0 - 100%
T1	Coldstore door	
T2	Discharge temperature	°C
T3	Return Air temperature	°C
T4	Coil in temperature	°C
T5	Coil out temperature	°C
T6	Not used	
Mains Input		
1	Cooler OFF	
Relay Outputs (5 amp 24VAC n/o with suppressers		
R1	Humidifier	
R2	De-hunidifier	
R3	Suction valve	
R4	Pan heaters	
R5	Defrost	
R6	Fans	
SSR7	AKV-10 Expansion or Liquid valve	

RCU-14 Termination Wiring - ‘hunC’ model selection

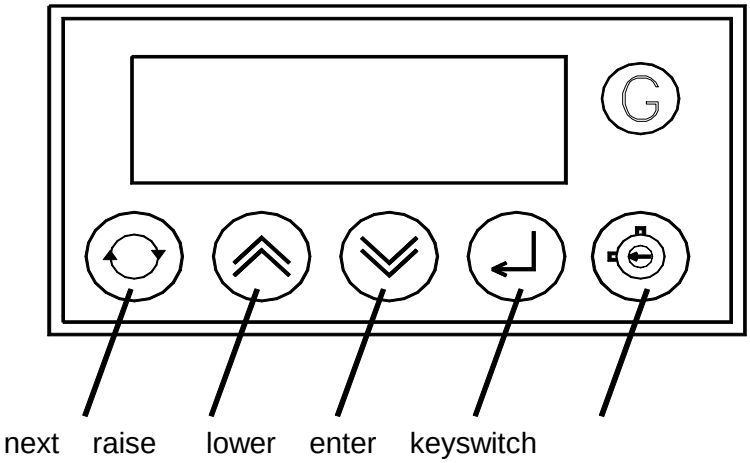


OPERATION

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

Display of other temperatures and humidity by pressing 'next' @ button, the values displayed depend on the unit model selected.

Passcode protected setup of controller setpoints, timers and limits.



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

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=	FAIL	RS485 communications to controller failure. Baud rate set at 9600 and PC is not communicating
	Auto	After power on or case OFF waiting for restart delay before opening liquid valve.
8888	u2.0A	Software version displayed after power on

Temperature Displays - 6OC

Pressing @ 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
1 - 01	Case 1 discharge temperature
2==7	Case 2 discharge temperature
3==2	Case 3 discharge temperature
4=11	Case 4 discharge temperature
5=10	Case 5 discharge temperature
6==5	Case 6 discharge temperature
11=#	**Relay outputs on R1 to R7**
=2==	**Mains inputs** _input 1 not available 2/- state of heater/door/defrost input (- = off, 2 = on)
SEt=	Go to Setup Mode when Enter pressed.
Et39	Elapse time (Defrost mode only) where 39 = minutes into defrost

Temperature Displays - 3DEF

Pressing @ 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
1 - 18	Case 1 discharge temperature
2 - 17	Case 2 discharge temperature
3 - 22	Case 3 discharge temperature
4 - 16	Case 1 coil temperature
5 - 18	Case 1 coil temperature
6 - 18	Case 1 coil temperature
11=#	Relay outputs on R1 to R7
=2==	**Mains inputs** _input 1 not available 2/- state of heater/door/defrost input (- = off, 2 = on)
SEt =	Go to Setup Mode when Enter pressed.
Et 39	Elapse time (Defrost mode only) where 39 = minutes into defrost

Temperature Displays - EVAP

Identity	Temperature on display
blank	Case / room/ calculated product temperature
d===	Delivery air temperature
r===	Return air - Control input if coldstore
I===	Evaporator inlet coil - Coldstore and HGt8 termination inputs
O===	Evaporator outlet coil
H===	Humidity 0 - 100%
CdHF	**relay outputs**
C	if Cooling in progress - 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 .
12AE	**mains inputs**
1 / -	Input 1 not available
2 / -	State of heater/door/defrost input (- = off, 2 = on)
A / H	Auto/Hold on Expansion valve control
E /	Pulse on /off to expansion valve
SEt =	Go to Setup Mode when Enter pressed.
Et 39	Elapse time (Defrost mode only) where 39 = minutes into defrost

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 LED display A-D as below:

A===	fan 1	display A
=b==	fan 2	display B
==c=	fan 3	display C
===h	trim heater (IF 'Htr ' selected for relay 3)	display D

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

Control Air alarms (return air if coldstore)

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 Fails

dEL=	=OC=	FAIL	open circuit probes indicate OC instead of value
dEL=	=SC=	FAIL	short-circuit probes indicate SC instead of value
dEL=	=nF=		not fitted probes indicate nF (may requires 'nF' setup)

The liquid 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= FAIL

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 30)
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=	?	PP00	/:/ PP05	?
@:@	Unit	?	EUAP	This unit model is 'EVAP'	
@:@	End=	?	=-26		

Select Stub, Case No and Address

e.g. setup unit for system 60, case 1, at address 180

@:@	SEt=	?	PP00	/:/ PP05	?
@:@	Sn01	/:/	Sn60	?	Sn60
@	Cn01	?	Cn01		
@	A001	/:/	A180	?	A180
@:@	End=	?	=-26		

Cut-in Setpoint for Liquid Valve (c) - EVAP

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 -05

@:@	SEt=	?	PP00	/:/ PP05	?
@	CASE	?	c-11	/:/ c-05	?
@:@	End=	?	The unit now controls to the new discharge air cut-in setpoint -05°C		

Cut-in Setpoint for Liquid Valve (c) - 3DEF and 6OC

To change the cooling cut-in setpoint for case 2 liquid valve the procedure is as follows if the old setpoint is -11 the new setpoint is -05.

@:@	SEt=	?	PP00	/:/ PP05	?
@	CASE	?	1-01	@:@ 2-11	
/:/	2-05	?	2-05		
@:@	End=	?	The unit now controls to the new discharge air cut-in setpoint -05°C for case 2		

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	?	PP00	/:/	pp05	?	
@	CASE	?	@:@	FAnS	?	-FAn	

When the unit displays -FAn instead of the case temperature, all alarms, liquid valve control 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 xx

Case OFF for Cleaning - EVAP

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

	SEt=	?	PP00	/:/	pp05	?	
@:@							
@	CASE	?	@:@	OFF=	?	-OFF	

When the unit displays - OFF instead of the case temperature, all alarms, liquid valve control, 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 12

Case OFF for Cleaning - 3DEF and 6OC

To switch off a case for cleaning an alternative procedure to using the keyswitch is as follows:-
Selecting case 2 OFF for cleaning:-

@:@	SEt=	?	PP00	/:/	PP05	?	
@	CASE	?	1-01	@:@	oFF2	?	
@:@	End=	?					

Case AUTO Mode - EVAP

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

@:@	SEt=	?	PP00	/:/	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.
The restart delay timer prevents overloading the compressor on restart after a total power fail or compressor fault and 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 13

Case AUTO Mode - 3DEF and 6OC

To return case 2 back into Auto after cleaning the procedure is as follows:-

@:@	SEt=	?	PP00	/:/	PP05	?	
@	CASE	?	1-01	@:@	Aut2	?	
@:@	End=	?					

Initiate DEFROST - EVAP

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

@:@	SEt=	?	PP00	/:/	pp05	?	
@	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.

Initiate DEFROST - 3DEF and 6OC

To initiate a manual defrost request for case 2 the procedure is as follows:-

@:@	SEt=	?	PP00	/:/	PP05	?	
@	CASE	?	1-01	@:@	dEf2	?	
@:@	End=						

SETUP OPERATION

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

SEt	Press ?
PP00	Set passcode PP05, PP09 or PP11 by using the / and < pushbuttons

PP05 ? PP09 ? PP11 ?

PP11 menu page 30

PP09 menu page 28

Setup Functions (level 1) passcode 05

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Case	CASE	Change control mode or cooling setpoint Page 20
Defrost	dEFr	Defrost type, times and settings (Commissioning only) Page 21
Electronic valve expansion	EEu=	Electronic expansion valve Page 22
Unit	Uni t	Stub and case identity (Commissioning only) Page 23
Test	tESt	Toggle output relays Faulty valve check. Page 24
End	End=	Return to normal operation Page 13

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

Mode selection — YYYY

yyyy = idEF — Initiate defrost (only if in Auto) page 20
FAnS — Fans only prior to cleaning (not allowed for coldstore) page 18
OFF — Select case OFF for cleaning page 18
Auto — Return to Automatic control page 19
These selections only operate when keyswitch selection for OFF or FAnS are not present.

(3DEF)

Cut-in setpoint for liquid valve 1 — 1-nn — nn = -40 to +40°C

Initiate defrost mode for case 1 — dEF1

Select case 1 off for cleaning — OFF1

Return case 1 back to automatic control — Aut1

etc to

Cut-in setpoint for liquid valve 3 — 3-nn — nn = -40 to +40°C

Initiate defrost mode for case 3 — dEF3

Select case 3 off for cleaning — OFF3

Return case 3 back to automatic control — Aut3

(6OC)

Cut-in setpoint for liquid valve 1 — 1-nn — nn = -40 to +40°C

Initiate defrost mode for case 1 — dEF1

Select case 1 off for cleaning — OFF1

Return case 1 back to automatic control — Aut1

etc to

Cut-in setpoint for liquid valve 6	6 - n n	nn = -40 to +40°C
Initiate defrost mode for case 6	d E F 6	
Select case 6 off for cleaning	O F F 6	
Return case 6 back to automatic control	A u t 6	

Defrost
DE f r

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Defrost type — Y Y Y Y

YYYY = O-C	Off-cycle defrost
HG-C	Hotgas Cycle on differential
HG-t	Hotgas terminate on discharge air
Stor	Coldstore terminate on probe T4
HGt4	HGt4 = Hotgas terminate on probe T4
GdFr	Glassdoor Freezer -fans off in defrost

Number of defrosts per day — d n = n — n = 0 to 6

First defrost time T1 hours — 1 h = n — n = 0 to 23 hrs

3DEF and 6OC setup automatically delays the defrost by one hour for each system .
i.e. if 1h03 1t30 is set for the unit then the defrost start times will be:

Stub system	1	2	3	4	5	6
	0330	0430	0530	0630	0730	0830

Delay 2nd defrost by n hours if dn=2 — d 2 d n — n = 0 to 9 hrs

First defrost time T1 minutes — 1 t n n — nn = 0 to 59 min

Defrost period — d P n n — nn = 2 to 60 min

Defrost termination temperature (not Off-Cycle cases) — d = n n — nn = 0 to +40 °C

Defrost termination differential (for Hotgas Cycle cases only) — d d n n — nn = 1 to 9 °C

Electronic Expansion Valve Parameters -

EEu
EEu=

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Superheat High. Maximum superheat	SHnn	nn = 0 to 40 °C
Superheat Low. Minumum superheat	SLn.n	n.n = 0 to 99 °C
Superheat Alarm Limit at which superheat recovery is actioned.	SAnn	nn = 0 to 40 °C
Stable Band	Sbn.n	n.n = 0 to 99 °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
Evaporating temperature of pack system	E=nn	nn = -40 to 40 °C If the coil in temperature is reading 5°C above this limit then the controller goes into superheat recovery mode
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

Unit
Un i t

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Model type selection — YYYY

YYYY = EVAP	Used for industrial cold stores with control on return air..
COND	Used for Conditioning rooms, utilising the defrost output to prevent room temperature going too low.
Blas	Used for Blast Freezers.
hunC	Used in cold stores with Humidity control via outputs for humidifier and de-humidifier.
3DEF	3-case sections with separate setpoints and defrost start times
6OC	6 off-cycle case sections with separate setpoints and defrost start times

Stub number — Snnn — nn = 1 to 80

EVAP only requires 1 stub system = 3 addresses
3DEF require 3 stub systems = 9 succesive addresses and use every third i.e. 3, 6, 9
6OC requires 6 stub systems = 18 succesive addresses and use every third i.e. 3, 6, 9, 12, 15, 18

Case number (normally 3 max.) — Cn=n — n = 1 to 4

Autograph address number — Annn — nnn = 1 to 255
Guardian unit address automatically calculated is (Sn x 3) + Cn-1 e.g. stub 30 case 2 has address (30 x 3) + 2-1 = 91

Input 2 selection — YYYY

YYYY = Htr	Trim heater fuse fail
Hgas	Pack hot gas valve control input
door	Door open alarm

Product ratio % — Prnn — nn = 0 to 99
(see page 27) (Also used as Humidity set point)

Dead Band % (only displayed if 'hunC' selected) — dbnn — nn = 0 to 99.

YYYY

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

Test
tESt

Press @ to sequence through the relay selections

Repeatedly press ? to switch the relays on and off

Humidifier relay	1OFF	1=on	Relay R1
Bypass output ‘EvaP’ De-Humidifier ‘HunC’	2OFF	2=on	Relay R2
Suction output	3OFF	3=on	Relay R3
Anti-sweat (or pan heaters)	4OFF	4=on	Relay R4
Defrost output	5OFF	5=on	Relay R5
Fans	6OFF	6=on	Relay R6
Expansion / liquid valve	7OFF	7=on	Relay R7

Relay outputs return to automatic settings when SETUP is ended

End
End=

Return from Setup to normal operation

Expansion Valve Setup

For coil temperature control 'EEt' the only parameter that requires setup is the 'E' term for pack evaporating temperature.
Other parameters at their default values should provide adequate electronic expansion valve control.
IIf 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 preset defrost or startup open positions (dr=50% or So=50%) 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.

Terminology

Under the Eeu= heading in PP05 Electronic expansion valve parameters which allows access to all control settings and are most likely to be adjusted for the valve are

E=== **Set the E value to 10°C above the Plant Evaporating Temperature**.

Ed is the Evaporating temperature differential (the temperature above system setpiont at which protective measures are taken). That 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.

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 assed.

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 occured.

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

If probe 1 (case) has no probe wired to it and so is 'oc' then the default temperature value displayed and logged for probe 1 is the PR% ratio of the discharge and return air.

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

Product Ratio may be used to save the cost of a probe and to display return air as the default temperature for a coldstore.

The Product Ratio PR = 88% is setup as follows using passcode 5 under UNIT selection provided T1 is 'oc':- open circuit.

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

Humidity Control

If EVAP is selected the PR% term is used as a humidity control set point for the humidifier.

Relay R1 is switched ON if humidity < PR% - 3%

Relay R1 is switched OFF if humidity >- PR%

If ‘hunC’ is selected then a deadband is made available and relay R2 is used to control a de-humidifier.

Relay R1 is switched ON if humidity < PR% - deadband.

Relay R2 is switched ON if humidity > PR% + deadband.

(See diagram page).

Alarm Unit

The RCU14 may be configured as a supermarket central alarm indicator and teledialler unit for systems using the Guardian GUARDIAN Autograph Terminal.

The required Unit settings are:-

Sn80	Stub number = 80
Cn=1	Case number = 1
A249 A250	Unit address = 249 or 250
Alr=	Alarm selection for relay 3 (only if A = 249 / 250)

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

TB11	(fans)	Energises remote 230vac flashing beacon in store which stops when MUTE pushbutton is pressed.
TB13	(defrost)	Closes its n/o contacts for 30 seconds to initiate an alarm via the store teledialler
	* * *	This output has suppressers to 230vac neutral and requires an auxiliary teledialler alarm relay to provide a volt free teledialler contact.

IF a continuous output is required for the duration of the alarm then set Ft_Fan_delay=10 (Ft10) in PP09

TB15	(LSV)	After a 30 second delay, flashes the 230vac alarm lamp every half second until the MUTE pushbutton is pressed when it goes steady until ALARM LIST on the AUTOGRAPH Terminal is ACCEPTED.
TB18	(heater fail)	Is used for the MUTE pushbutton input.

TB12, TB14, TB16/TB17 Should be connected to TB20 - 230Vac line

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 setup for stub 80 on the Autograph Terminal to make the system function correctly.

The RCU14 alarm unit display output connector may be connected to an Autograph II terminal in order to provide signals to drive the AUTOGRAPH panel ALARM LAMP, BEEPER AND MUTE pushbutton.

Setup Functions (level 2) passcode 09

Normally FACTORY settings

PP09 Menu

Press @ to sequence through the following PP09 menu selections:-

Press ? to select the displayed menu

Real time clock	r t c =	Page 28
System settings	SYS t	Times and alarms Page 28
Blast Freezer settings (only displayed if 'Blas' selected)	bLAS	Cycle duration and Defrost Start time Page 28
End	End=	Return to normal operation Page 13

Real Time Clock
r t c

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Real clock time hours	r h n n	nn = 0 to 23 hrs
Real clock time minutes	r t n n	nn = 0 to 59 mins

System Settings
SYS t

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Cooling differential for control	c d = n	nn = 0 to 5° C
Defrost Liquid draindown delay time	L t nn	nn = 0 to 9 min
Defrost Fan delay time	F t nn	nn = 0 to 9 min

If EVAP is selected then the following defrost timers are displayed for pumpdown, suction, and fan control

Fan off delay after liquid shut	o t n . n	n.n = 0.0 to 9.9 mins
Defrost pumpdown delay time	P t n . n	n.n = 0.0 to 9.9 mins
Bypass valve delay after draindown	b t n . n	n.n = 0.1 to 9.9 mins
Suction valve delay after bypass	S t n . n	n.n = 0 to 99 mins

These 4 delays can not be changed from the PC

Control air temp. alarm Guardtime	g t nn	nn = 0 to 99 min
Alarm differential control air	Adnn	nn = 2 to 40 'C

Calculated defrost times - display only

Defrost T1 time hours	1 h nn	nn = 0 to 23 hrs
Defrost T1 time minutes	1 t nn	nn = 0 to 59 min
Defrost T2 time hours	2 h nn	nn = 0 to 23 hrs
Defrost T2 time minutes	2 t nn	nn = 0 to 59 min

etc.

Defrost T6 time hours	6 h nn	nn = 0 to 23 hrs
Defrost T6 time minutes	6 t nn	nn = 0 to 59 min

End

End = Return from SETUP to normal operation Page 13

Setup Functions (level 3) passcode 11

Normal Factory settings only

PP11 Menu

Press @ to sequence through the following PP09 menu selections:-

Press ? to select the displayed menu

baud	bAud	Serial communications port
Loop	LOOP	Control PID Loop Parameters Page 31
End	End=	Return to normal operation Page 13

baud
bAud

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Communications baud rate

YYYY

YYYY = 9600 Baud rate
nonE None removes PC FAIL if no PC present

Parity selection

YYYY

YYYY = 8n_2
8e_1
8n_1
8n_2

oFF= Future log modes

LOOP
LOOP

Press @ to sequence through the Setup selections

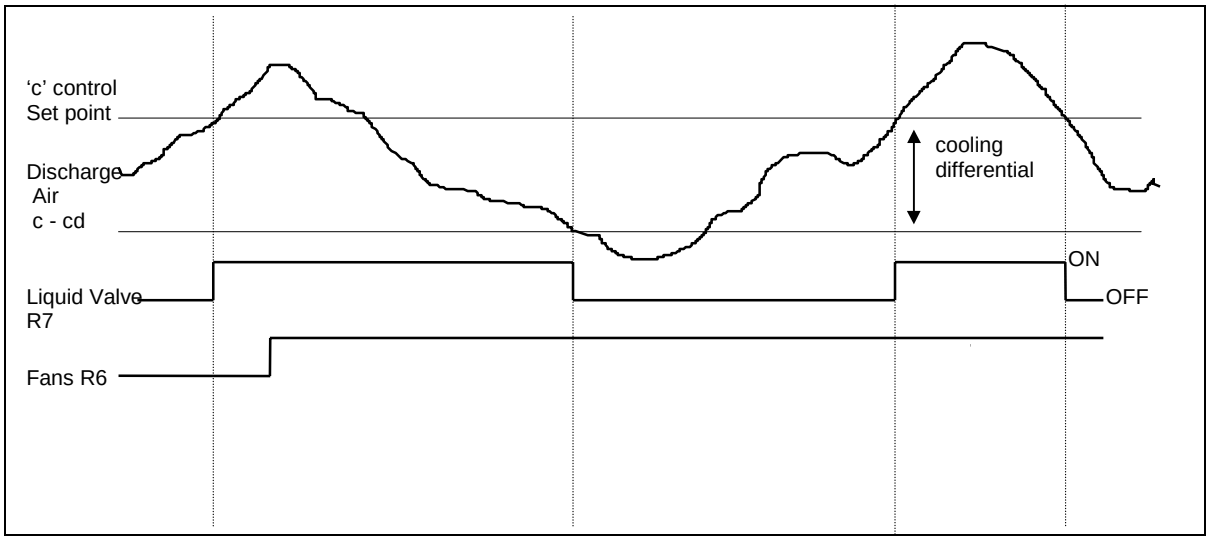
Press / or < to change the settings

Press ? to accept the settings

Proportional Gain	P=n.n	n.n = 0 to 255
Integral Gain	in.nn	n.nn = 0 to 255
Differential Gain	d=n.n	n.n = 0 to 255
Bleed Position	bLnn	nn = 0 to 99% Sets minimum valve position
Ramp Rate	r=n.n	n.n = -40 to 40°C Sets rate of change of superheat from SH to SL
Integral Time	itnn	nn = 0 to 99 mins Delayed time for loop integral action
Loop Period	Pdnn	nn = 0 to 99 secs
Coil Time	ctnn	nn = 1 to 99 mins Time delay to establish coil-in/coil out temperatures before control action starts
Ramp Time	rtnn	nn = 0 to 99 secs Time at which ramp rate, r, is applied

End
End= Return from SETUP to normal operation Page 13

FIG.1 LIQUID VALVE CONTROL



NB. Cooling Differential, ('cd'), is always a minimum of 1 °C.

FIG.2 DEFROST CYCLE VALVE CONTROL

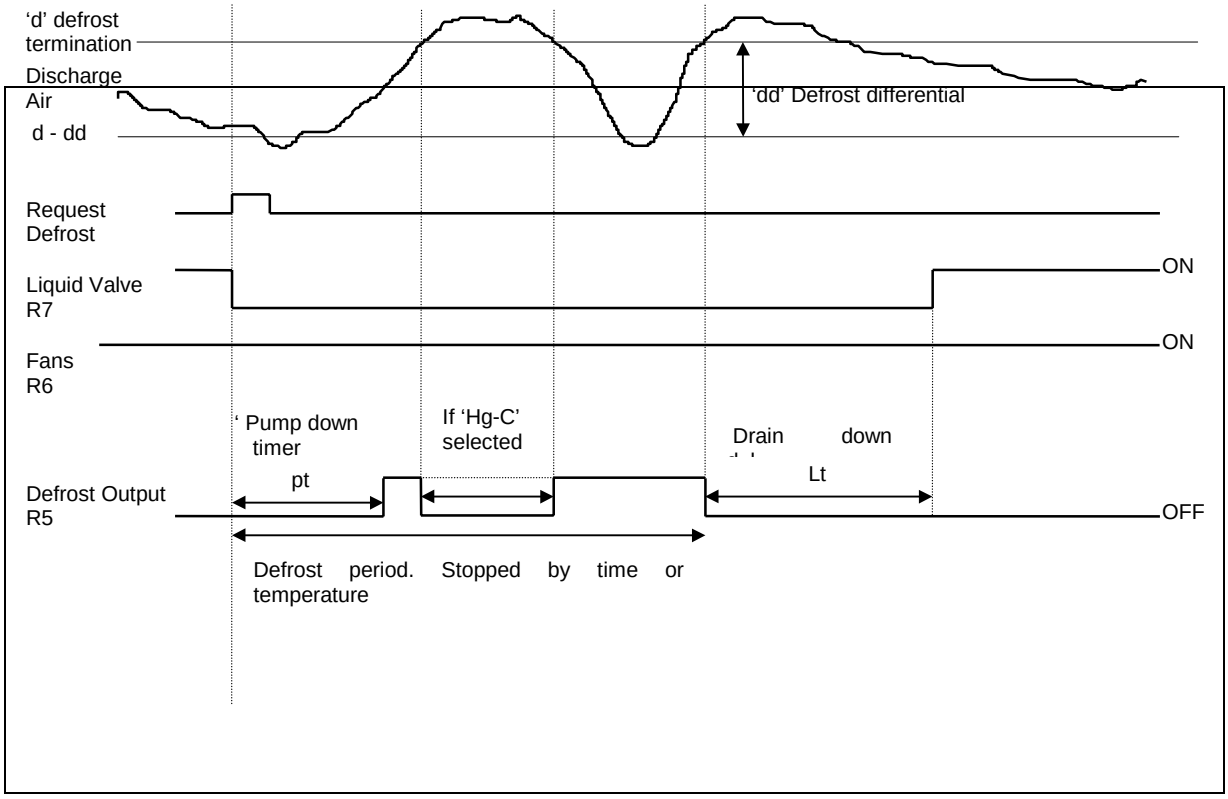
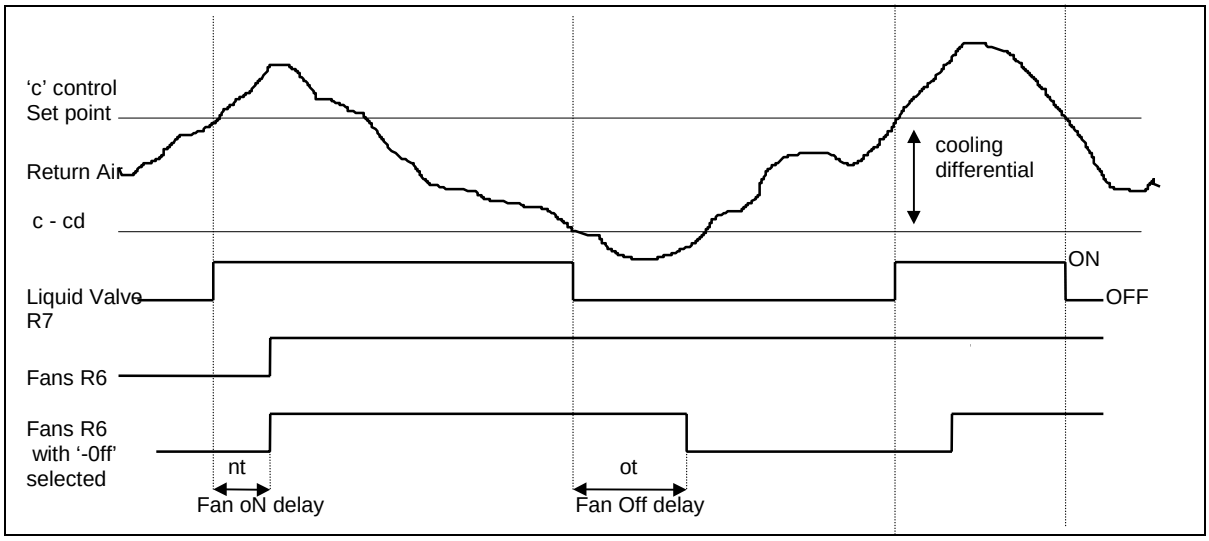


FIG.3 (EVAP) LIQUID VALVE CONTROL ON RETURN AIR



NB. Cooling Differential, ('cd'), is always a minimum of 1 °C.

FIG.4 (EVAP) DEFROST CYCLE

with 'STOR' selected Evaporators control the liquid valve on the return air probe and NOT on discharge probe. Evaporators terminate on lowest valid coil probe 4 and 5 and NOT on discharge probe. Coldstore door input is monitored by input T1 door open = contact closed = s/c = open message

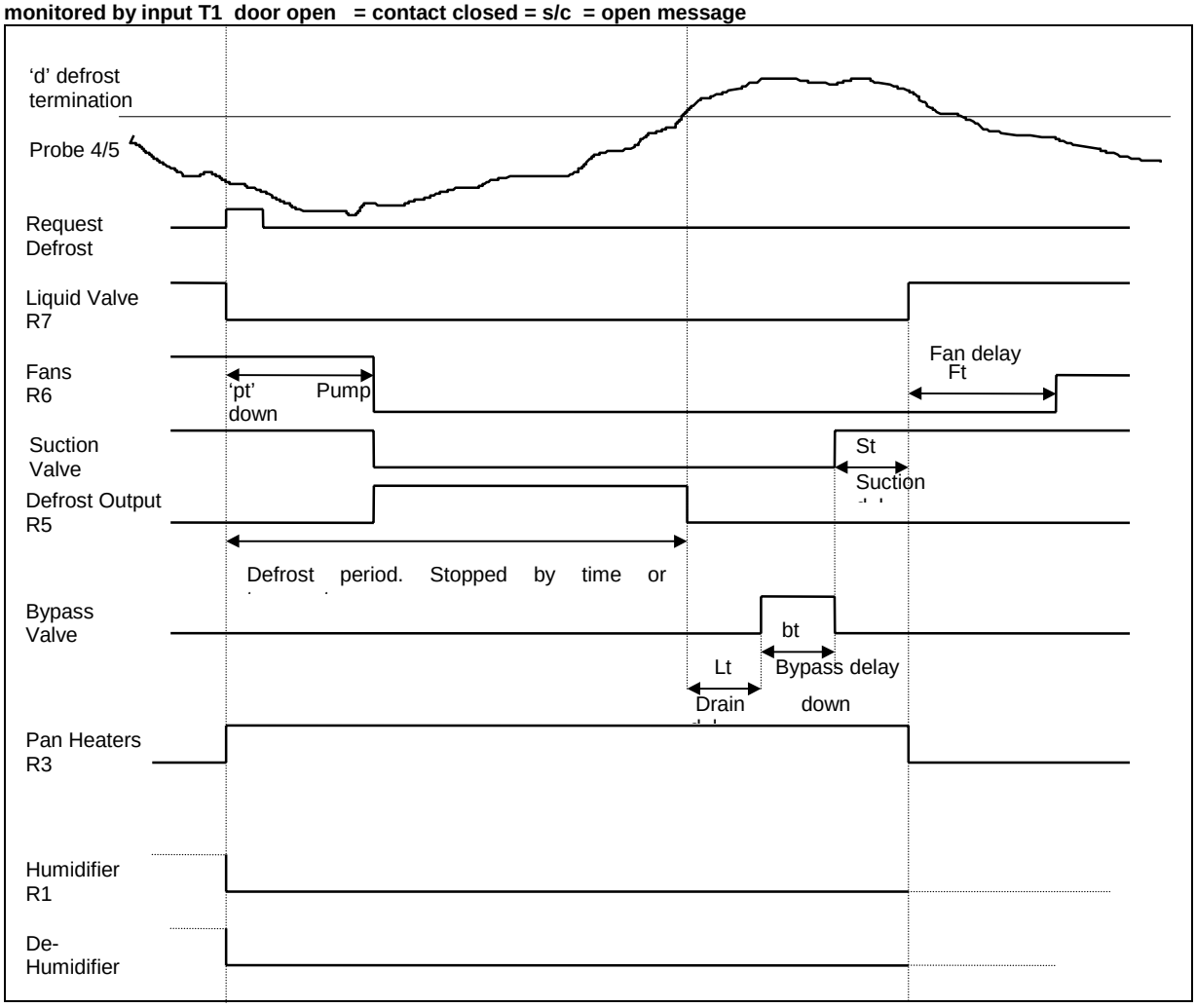


FIG.5 'EVAP'HUMIDIFIER VALVE CONTROL

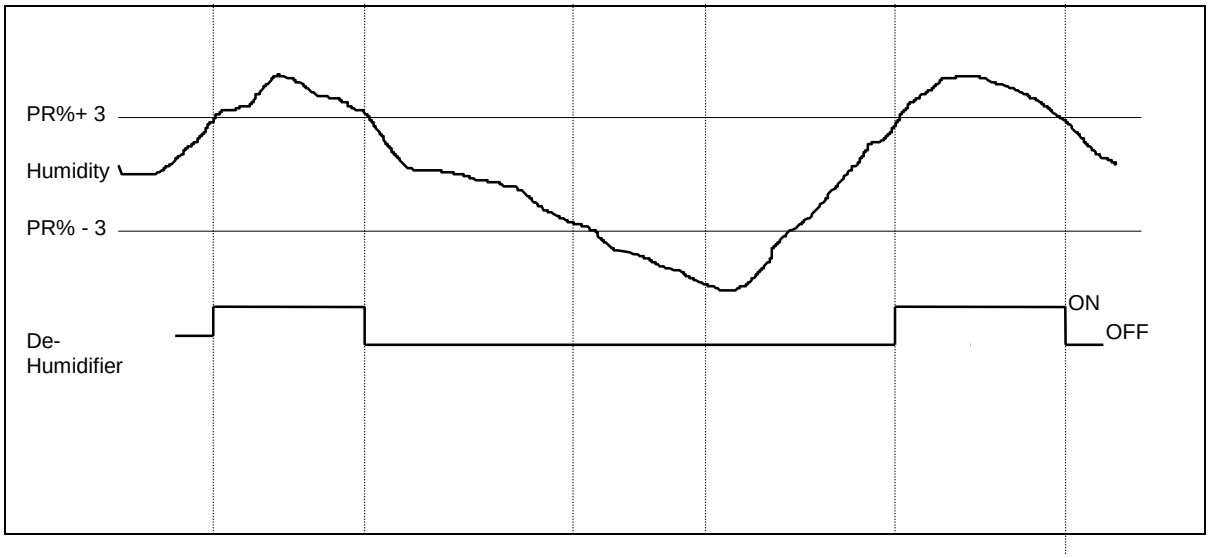


FIG.6 'HUNC' HUMIDIFIER &DE-HUMIDIFIER CONTROL

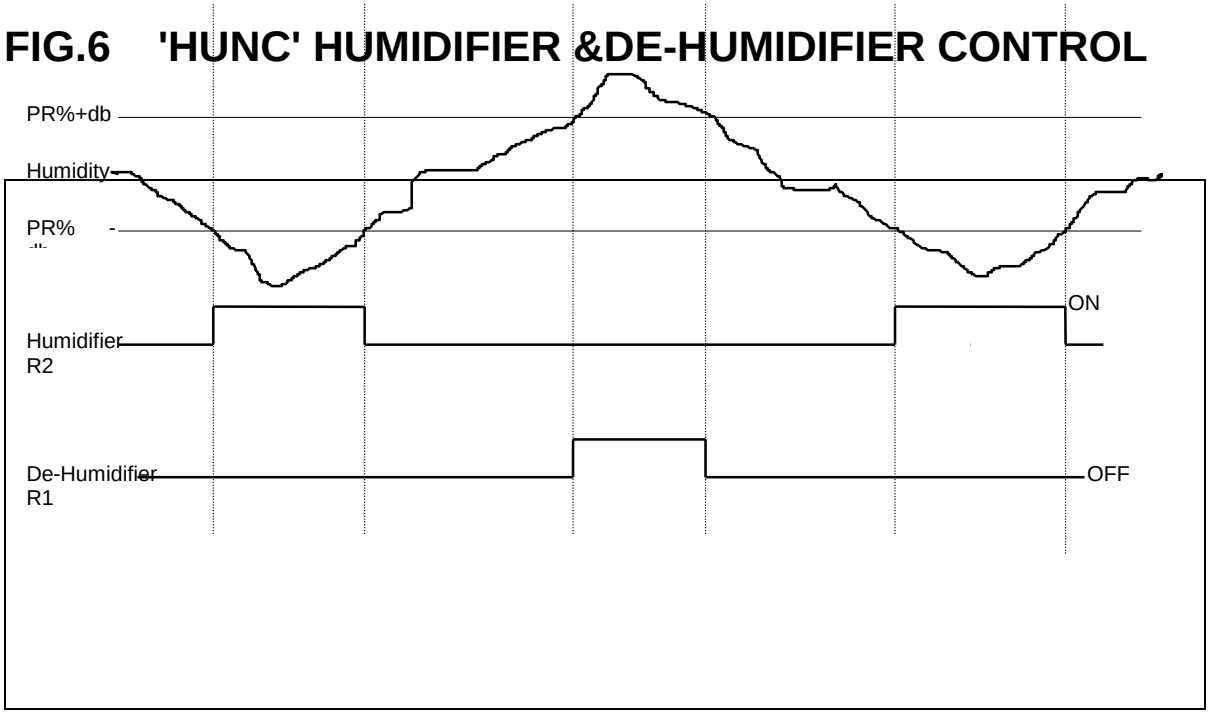


FIG.7 'Cond' Conditioning Room Control

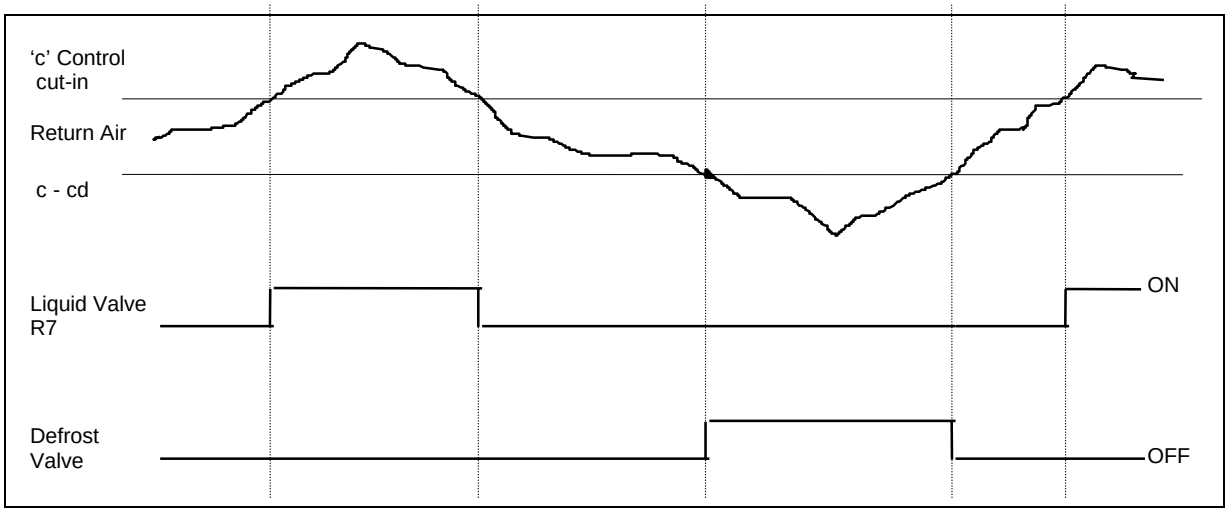
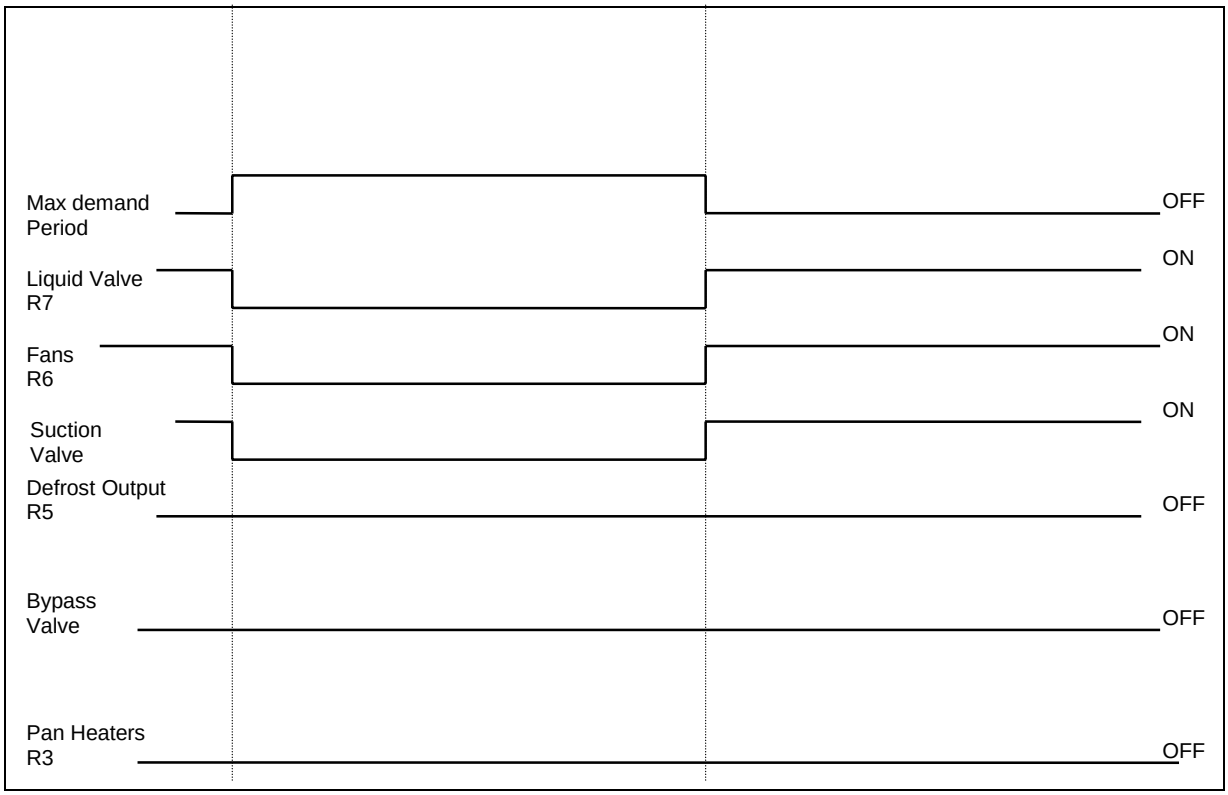


FIG.8 (EVAP) MAX DEMAND INHIBIT



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.

Communication 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 / coldstore number 1-3.
i.e. case 3 stub 56 has address 56/3
and coldstore 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

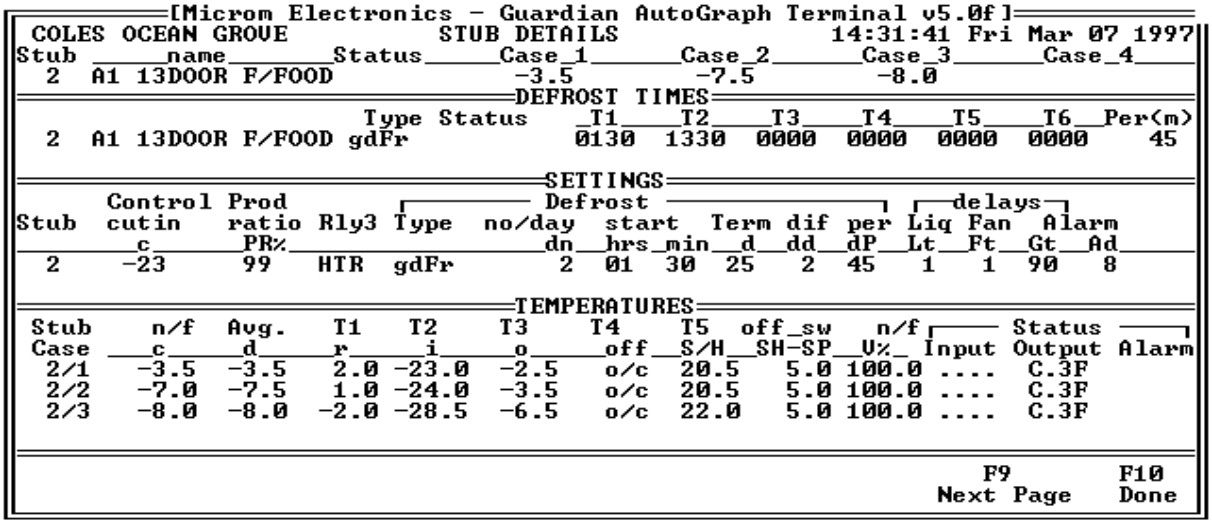
e) Receive Time and Date with new hours and minutes, day, month and year for real time clock

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

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

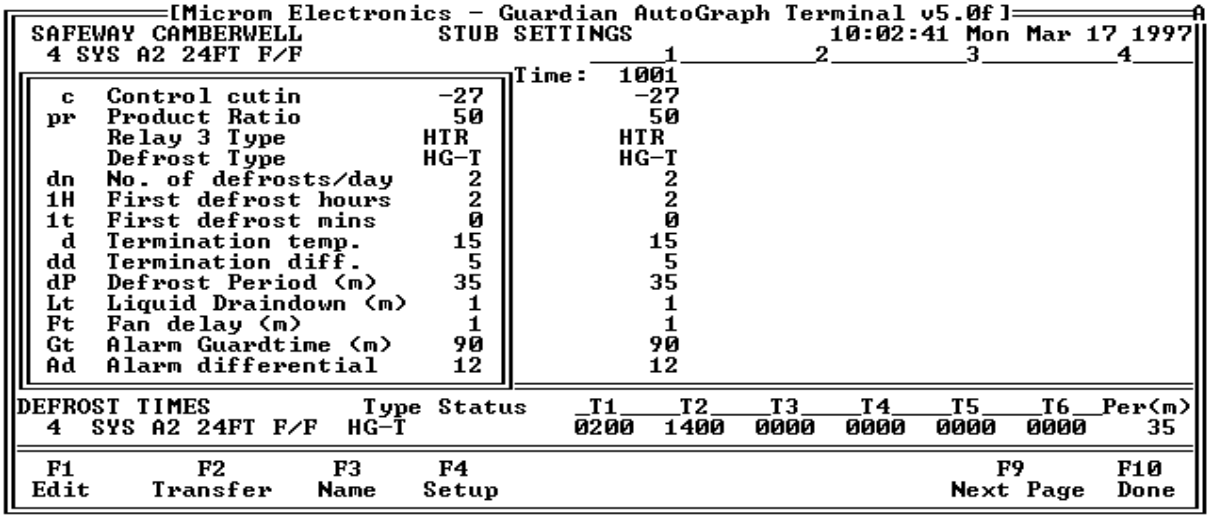
RCU14 AUTOGRAPH FORMATS

F2 Stub Detail Display



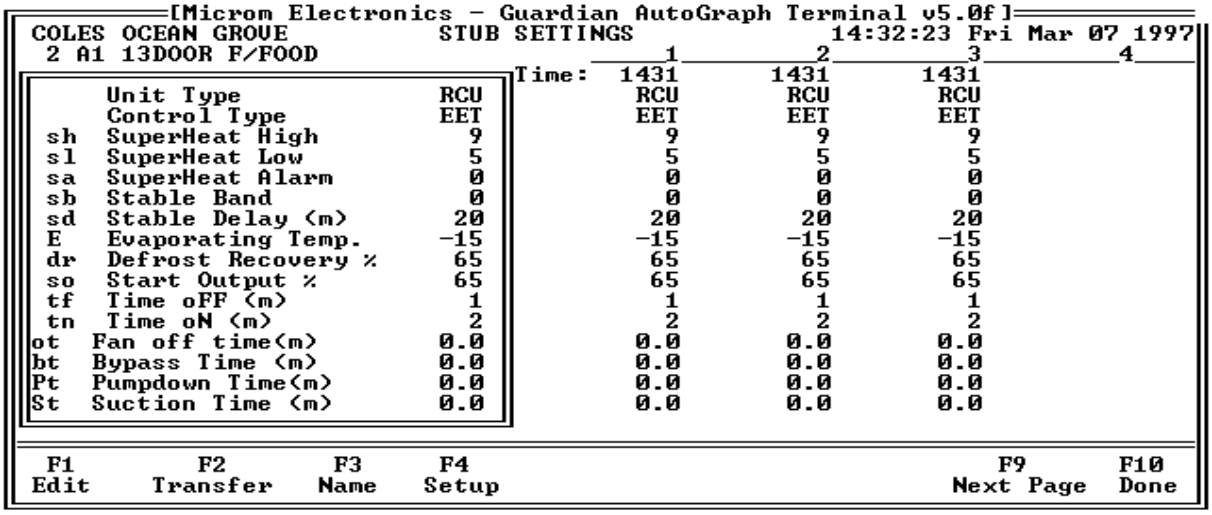
```
═══════[Microm Electronics - Guardian AutoGraph Terminal v5.0f]═══════
 COLES OCEAN GROVE          STUB DETAILS          14:31:41 Fri Mar 07 1997
Stub _____name_____Status_____Case_1_____Case_2_____Case_3_____Case_4____
  2  A1 13DOOR F/FOOD            -3.5         -7.5         -8.0
═══════════════════════════DEFROST TIMES═══════════════════════════════
                          Type Status    _T1___T2___T3___T4___T5___T6__Per(m)
  2  A1 13DOOR F/FOOD gdFr             0130  1330  0000  0000  0000  0000    45

═══════════════════════════SETTINGS═══════════════════════════════════
      Control Prod          ┌──────── Defrost ──────────────┐ ┌─delays─┐
Stub  cutin   ratio Rly3 Type  no/day  start  Term dif per Liq Fan  Alarm
_____c_____PR%_____________dn__hrs_min__d__dd__dP__Lt__Ft__Gt__Ad_____
  2    -23     99   HTR  gdFr      2  01   30  25   2  45   1   1  90   8

═══════════════════════TEMPERATURES═══════════════════════════════════
 Stub     n/f   Avg.   T1    T2     T3     T4     T5  off_sw   n/f ┌──── Status ────┐
 Case ___c_____d_____r_____i_____o_____off__S/H__SH-SP__V%_ Input Output Alarm
  2/1   -3.5  -3.5   2.0 -23.0  -2.5    o/c   20.5    5.0 100.0 ....  C.3F
  2/2   -7.0  -7.5   1.0 -24.0  -3.5    o/c   20.5    5.0 100.0 ....  C.3F
  2/3   -8.0  -8.0  -2.0 -28.5  -6.5    o/c   22.0    5.0 100.0 ....  C.3F


                                                          F9        F10
                                                       Next Page   Done
```

F7 Setpoints Display page 1



```
═══════[Microm Electronics - Guardian AutoGraph Terminal v5.0f]═══════A
 SAFEWAY CAMBERWELL         STUB SETTINGS          10:02:41 Mon Mar 17 1997
  4 SYS A2 24FT F/F                          _____1_____2_____3_____4____
                                          Time:  1001
  c  Control cutin              -27          -27
 pr  Product Ratio               50           50
     Relay 3 Type               HTR          HTR
     Defrost Type               HG-T         HG-T
 dn  No. of defrosts/day          2            2
 1H  First defrost hours          2            2
 1t  First defrost mins           0            0
  d  Termination temp.           15           15
 dd  Termination diff.            5            5
 dP  Defrost Period (m)          35           35
 Lt  Liquid Draindown (m)         1            1
 Ft  Fan delay (m)                1            1
 Gt  Alarm Guardtime (m)         90           90
 Ad  Alarm differential          12           12
DEFROST TIMES          Type Status    _T1___T2___T3___T4___T5___T6__Per(m)
  4  SYS A2 24FT F/F  HG-T            0200  1400  0000  0000  0000  0000    35
 F1        F2        F3     F4                                  F9       F10
 Edit    Transfer   Name   Setup                            Next Page  Done
```

F7 EET Settings page 2



```
[Microm Electronics - Guardian AutoGraph Terminal v5.0f]
COLES OCEAN GROVE          STUB SETTINGS          14:32:23 Fri Mar 07 1997
 2 A1 13DOOR F/FOOD
                                        1         2         3         4
                                Time:  1431      1431      1431
     Unit Type                  RCU     RCU       RCU       RCU
     Control Type               EET     EET       EET       EET
 sh  SuperHeat High               9       9         9         9
 sl  SuperHeat Low                5       5         5         5
 sa  SuperHeat Alarm              0       0         0         0
 sb  Stable Band                  0       0         0         0
 sd  Stable Delay (m)            20      20        20        20
 E   Evaporating Temp.          -15     -15       -15       -15
 dr  Defrost Recovery %          65      65        65        65
 so  Start Output %              65      65        65        65
 tf  Time oFF (m)                 1       1         1         1
 tn  Time oN (m)                  2       2         2         2
ot   Fan off time(m)            0.0     0.0       0.0       0.0
bt   Bypass Time (m)            0.0     0.0       0.0       0.0
Pt   Pumpdown Time(m)           0.0     0.0       0.0       0.0
St   Suction Time (m)           0.0     0.0       0.0       0.0

 F1        F2        F3      F4                          F9        F10
 Edit      Transfer  Name    Setup                       Next Page Done
```

F1 Display Store Temperatures

```
[Microm Electronics - Guardian AutoGraph Terminal v5.0d]                A
 COLES STH MELBOURNE          Store Temperatures        21:56:52 Fri Apr 25 1997
Stub _____name_______Status_____Case_1_____Case_2_____Case_3_____Case_4____
 1  *** SYSTEM A ***
 2  A1 17DR GDFZ      DEFROST    -17.5        -17.0        -16.5        -16.0
 3  A2 9DR GDFZ           OFF    -18.0          s/c Fail
 4  A3 3DR GDFZ BAKE  *ALARM    -10.5 High
 5
 6
 7  *** SYSTEM B ***
 8  B1 15DR GDFZ         Fail    -15.5        -16.5          o/c Fail
 9  B2 3DR GDFZ                  -16.5
10  B3 F/F C/R                   -16.0
11
12
13
14
15
16

                              F3                                   F9        F10
                             Graph                            Next Page    Done
```

F2 '6OC' Detail Display

```
[Microm Electronics - Guardian AutoGraph Terminal v5.0f]
 SAFEWAY CAMBERWELL            STUB DETAILS            10:00:53 Mon Mar 17 1997
Stub _____name_______Status_____Case_1_____Case_2_____Case_3_____Case_4____
  3  SYS A4 12FT+C/E              -24.0        -25.0        -23.0
                                DEFROST TIMES
                          Type Status    _T1___T2___T3___T4___T5___T6__Per(m)
  3  SYS A4 12FT+C/E  HG-T            0300  1500  0000  0000  0000  0000    35

                                  SETTINGS
      Control Prod          ┌──────── Defrost ──────────────┐ ┌─delays─┐
Stub  cutin   ratio Rly3 Type  no/day  start  Term dif per Liq Fan  Alarm
_____c_____PR%_____________dn__hrs_min__d__dd__dP__Lt__Ft__Gt__Ad_____
  3    -27     50   HTR  HG-T       2  03  00  15   5  35   1   1  90  12

                               TEMPERATURES
 Stub     n/f  Avg.   T1   T2    T3    T4    T5  off_sw   n/f ┌──── Status ────┐
 Case ___c_____d_____r_____i_____o_____off__S/H__SH-SP__U%_ Input Output Alarm
  3/1     n/f -24.0   n/f   n/f   n/f   n/f   n/f   n/f   n/f  ....  C...
  3/2     n/f -25.0   n/f   n/f   n/f   n/f   n/f   n/f   n/f  ....  C...
  3/3     n/f -23.0   n/f   n/f   n/f   n/f   n/f   n/f   n/f  ....  C...

                                                          F9        F10
                                                       Next Page    Done
```

Setup / commissioning Parameters

PP05 Normal Menu Settings

		unit	ACTUAL settings	Default setting	Min. setting	Max. setting
CASE	Cut-in setpoint for Liquid valve 1	°C	***c***	c -01	c -40	c 40
	(EVAP)					
	Fan state when liquid valve is shut on temperature.		***Fn***	Fn on	Fn on	Fn oF
	Suction valve state when liquid valve is shut on temperature.		***Su***	Su on	Su on	Su oF
	Suction valve normally open/closed		***SP***	SPoS	SPos	Sneg
	(3DEF)					
	Cut-in setpoint for liquid valve 1	°C	***1***	1 -01	1 -40	1 40
	Cut-in setpoint for liquid valve 2	°C	***2***	2 -01	2 -40	2 40
	Cut-in setpoint for liquid valve 3	°C	***3***	3 -01	3 -40	3 40
	(6OC)					
	Cut-in setpoint for liquid valve 1	°C	***1***	1 -01	1 -40	1 40
	Cut-in setpoint for liquid valve 2	°C	***2***	2 -01	2 -40	2 40
	Cut-in setpoint for liquid valve 3	°C	***3***	3 -01	3 -40	3 40
	Cut-in setpoint for liquid valve 4	°C	***4***	4 -01	4 -40	4 40
	Cut-in setpoint for liquid valve 5	°C	***5***	5 -01	5 -40	5 40
	Cut-in setpoint for liquid valve 6	°C	***6***	6 -01	6 -40	6 40
DEFr	Defrost type			Hg-t	O-C	gdFr
	Number of defrosts per day		***dn***	dn 04	dn 00	dn 06
	First defrost time T1 hours	hrs	***1h***	1h 00	1h 00	1h 23
	First defrost time T1 minutes	mins	***1t***	1t 00	1t 00	1t 59
	Delay 2nd defrost by n hours if dn=2	hrs	***d2d***	d2d0	d2d0	d2d9
	Defrost period	mins	***dP***	dP 15	dP 02	dP 60
	Defrost periods system 2 (4oc,)	mins	***2P***	2P 30	2P 02	2P 60
	Defrost periods system 3 (both)	mins	***3P***	3P 30	3P 02	3P 60
	Defrost periods system 4(4oc,)	mins	***4P***	4P 30	4P 02	4P 60
	Defrost termination temperature (not Off-Cycle cases)	°C	***d***	d 15	d 00	d 40
	Defrost termination differential (for Hotgas-Cycle cases only)	°C	***dd***	d 01	dd 00	dd 09

EEu=

	unit	ACTUAL settings	Default setting	Min. setting	Max. setting
Superheat High. Maximum	°C	***SH***	SH 08	SH00	SH40
Superheat Low. Minimum	°C	***SL***	SL 00	SL 00	SL 99
Superheat Alarm Limit at which superheat recovery is actioned.	°C	***SA***	SA 01	SA00	SA40
Stable Band		***Sb***	Sb 00	Sb 00	Sb 99
Stable band Delay time		***Sd***	Sd 00	Sd 00	Sd 99
Pack Evaporating temperature		***E***	E -01	E -40	E 40
Defrost Recovery Valve position		***dr***	dr 50	dr 00	dr 99
Starting Output		***So***	So 50	So 00	So 99
Superheat Alarm Time OFF		***tF***	tF 01	tF 00	tF 15
Superheat Alarm Time ON		***tn***	tn 01	tn 00	tn 15

Unit

	unit	ACTUAL settings	Default setting	Min. setting	Max. setting
Model type selection			EVAP	EVAP	hunC
Control type			LSoL	LSoL	Eet
Stub number		***Sn***	Sn 01	Sn 01	Sn 80
Case number (normally 3 max.)		***Cn***	Cn 01	Cn 01	Cn 04
Autograph address number		***A***	A255	A 00	A255
Input 1 selection			oFF	oFF	FanF
NOT USED ON THIS CONTROLLER			Htr	Htr	door
Product ratio % or Humidity set point		***Pr***	Pr 50	Pr 00	Pr 99
Dead band % if 'hunC' selected		***db***	db 5	db 00	db 99
Digital alarm detection and display			ndAd	ndAd	dAd

PP07 Alarm Settings

	unit	ACTUAL settings	Default setting	Min. setting	Max. setting
Temperature number 1 Alarm type		***1-AL***	nonE	Hi	nonE
Alarm Limits	°C	***1***	-01	-40	40
Temperature number 2 Alarm type		***2-AL***	HiLo	Hi	nonE
Alarm Limits	°C	***2***	-01	-40	40
Temperature number 3 Alarm type		***3-AL***	nonE	Hi	nonE
Alarm Limits	°C	***3***	-01	-40	40
Temperature number 4 Alarm type		***4-AL***	nonE	Hi	nonE
Alarm Limits	°C	***4***	-01	-40	40
Temperature number 5 Alarm type		***5-AL***	nonE	Hi	nonE
Alarm Limits	°C	***5***	-01	-40	40
Guardtime	mins	***gt***	gt 30	gt 00	gt 99
Alarm differential	°C	***Ad***	Ad 05	Ad 02	Ad 40
		At	At 00	At 00	At 99
Digital input - A Alarm type		***A-AL***	nonE	on	nonE
Guardtime for input A	mins	***A***	A 00	A 00	A 99
Digital input - b Alarm type		***b-AL***	nonE	on	nonE
Guardtime for input b	mins	***b***	b 00	b 00	b 99
Digital input - C Alarm type		***C-AL***	nonE	on	nonE
Guardtime for input C	mins	***C***	C 00	C 00	C 99
Digital input - d Alarm type		***d-AL***	nonE	on	nonE
Guardtime for input d	mins	***d***	d 00	d 00	d 99
Digital input - e Alarm type		***e-AL***	oFF	on	nonE
Guardtime for input e	mins	***e***	e 00	e 00	e 99
Digital input - F Alarm type		***F-AL***	oFF	on	nonE
Guardtime for input F	mins	***F***	F 00	F 00	F 99
Digital input - g Alarm type		***g-AL***	oFF	on	nonE
Guardtime for input g	mins	***g***	g 00	g 00	g 99

PP09 (level 2) Settings

		unit	ACTUAL settings	Default setting	Min. setting	Max. setting
r t c =	Real clock time hours	hrs	***rh***	rh 00	rh 00	rh 23
	Real clock time minutes	mins	***rt***	rt 00	rt 00	rt 59
SYS t	Cooling differential for control **cd 0 = 1°C**	°C	***cd***	cd 00	cd 00	cd 05
	Defrost Cycle Start					
	At Defrost Start, Pumpdown delay time (Liquid valve closed, Fans On, Derfost Valve Closed)	mins	***Pt***	Pt 2.5	Pt 0.0	Pt 9.9
	Defrost Period (Defrost Valve Open)					
	At the end of Defrost Period, Liquid Valve delay time for Draindown (All Valves Closed)	mins	***Lt***	Lt 1.0	Lt 0.0	Lt 9.9
	Bypass Valve Open Duration after Draindown	mins	***bt***	bt 0.5	bt 0.0	bt 9.9
	Suction Valve Open Duration prior to Opening of Liquid Valve	mins	***St***	St 15	St 00	St 99
	Fan delay time after Suction and Liquid Valves Open	mins	***Ft***	Ft 1.0	Ft 0.0	Ft 9.9
	Defrost Cycle End					
	If Fan OFF Selected on Temp Cycle PP05					
	Fan on delay after liquid shut	mins	***nt***	nt 1.0	nt 0.0	nt 9.9
	Fan off delay after liquid shut	mins	***ot***	ot 1.0	ot 0.0	ot 9.9
	Control air temp. alarm Guardtime	mins	***gt***	gt 30	gt 00	gt 99
	Alarm differential control air	°C	***Ad***	Ad 05	Ad 02	Ad 40
	Time after Alarm for Evaporator Shutdown. NO ACTION if set to Zero Requires Power OFF for Restart	°C	***At***	At 00	Ad 00	Ad 99

t c L 1	Time On Hours. Used for max. demand	Hrs	***1H***	1H 0	1H 00	1H 23
	Time On Minutes. Used for max. demand	mins	***1n***	1n 0	1n 0	1n 59
	Time OFF Hours. Used for max. demand	Hrs	***1h***	1h 0	1h 0	1h 23
	Time OFF Minutes. Used for max. demand	mins	***1F***	1F 0	1F 0	1n 59
b l a s	Blast Freeze Cycle Time	Hrs	***ct***	ct 18	ct 00	c 99
	Elapsed time in 15 minute counts. (display only)	cnts	***Et***	N/A	N/A	N/A
	Defrost time. Time in blast cycle that defrost will occur.	Hrs	***dt***	dt 0	dt 0	dt 99

PP11 (level 3) Settings

bAud

Communications baud rate			9600	9600	nonE
Parity Selection			8n2	8n2	8n1

LOOP

Proportional Gain		***P***	P 255	P 00	P 255
Integral Gain		***I***	i 255	i 00	i 255
Differential Gain		***d***	d 255	d 255	d 255
Bleed Position		***bl***	bL 00	bL 00	bL 99
Ramp Rate		***r***	r -01	r -40	r 40
Integral Time	mins	***it***	it 03	it 00	it 99
Loop Period	secs	***Pd***	Pd 02	Pd 00	Pd 99
Coil Time	secs	***ct***	ct 01	ct 01	ct 99
Ramp Time	secs	***rt***	rt 12	rt 00	rt 99

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