GUARDIAN

HVAC-14

HVAC and Lighting Control Unit for Supermarkets and Coldstores

- **Average temperature & humidity control**
- **Heat Reclaim & 2-stage heating**
- **Economy Dampers & 2-stage cooling**
- **Timeclock, temperature & fan control**
- **Temperature & overload alarms**
- **HVAC dehumidification setpoint optimization option for minimum energy**
- **Local panel display and setup**
- **Remote communications to GUARDIAN Autograph Terminal**

Operation and Setup Manual

GUARDIAN HVAC-14 Controller is a mains powered, rail-mounted HVAC & Lighting Controller for supermarkets which is configurable as either :-

- **HVAC** - Temperature and humidity control and monitoring for heating, cooling and/or dehumidification of the SALESFLOOR ambient air using the salesfloor temperature and humidity probes.
- **SALE** - Temperature control and humidity monitoring for heating, cooling and fresh air dampers for the SALESFLOOR ambient air.
- **PLANT** - Temperature dependent PLANTROOM staged ventilation control with additional time-scheduled heating, lighting or ventilation control outputs with overload detection.
- **STORE** - Similar facilities to Plantroom for time-scheduled STOREROOM staged ventilation control.
- **PFAN** - Industrial condenser control of pump and 2-speed fans on discharge pressure. A timeclock is available.

Local temperature displays and modification of all timeclocks, alarm and control settings is available when the unit is connected to the optional GUARDIAN SKD-8 Serial Keypad Display.

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Contents

Getting Started

Guardian Controllers provide refrigeration engineers with

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

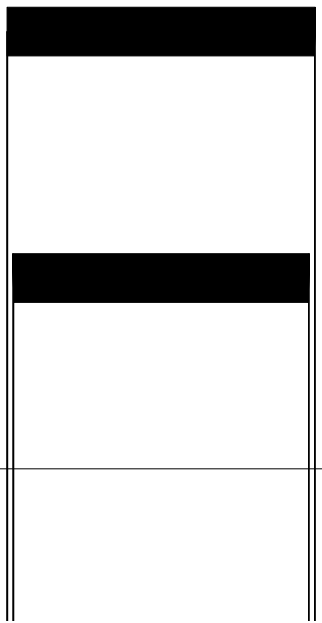
This manual provides refrigeration designers, installers, service mechanics and supermarket personnel with the necessary information to achieve the above objectives.

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 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 4.8b

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. HVAV) and then press **'enter'** which causes the display to wink briefly and display the new unit model selection
(e.g. HVAC)

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 40

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 (HVAC-14)

HVAC-14 'SALE'	Salesfloor HEATING/COOLING
HVAC-14 'Stor'	Storeroom and fan control
HVAC-14 'PLnt'	Plantroom and office control
HVAC-14 'HvAC'	Store dehumidification
HVAC-14 'PFAn'	Industrial pump and 2-speed fans

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.

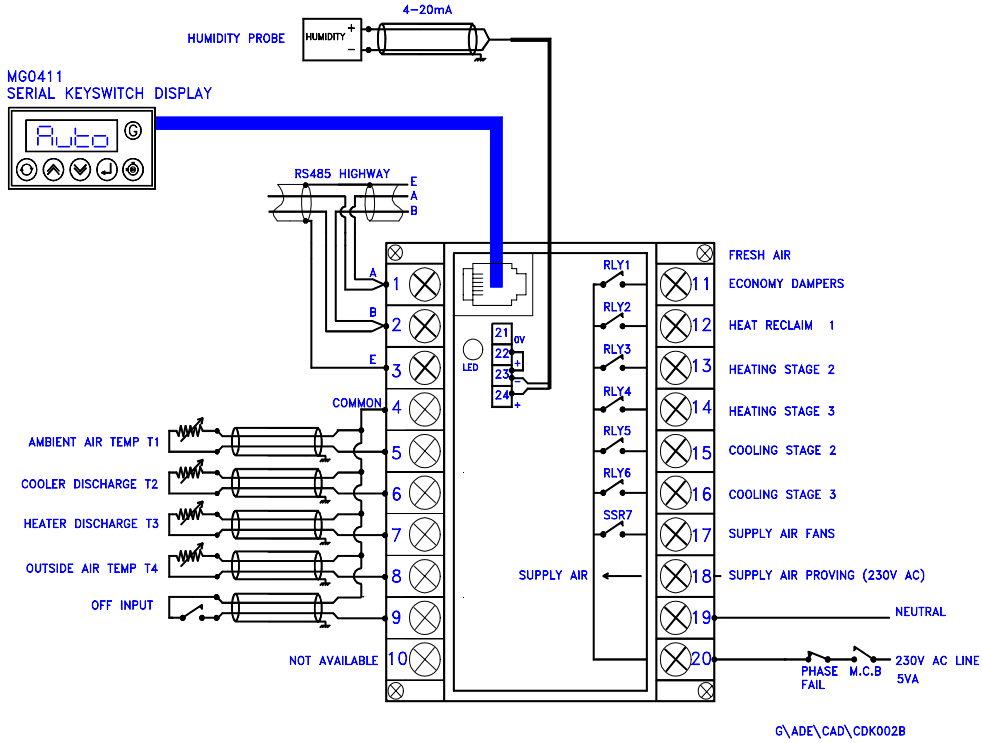
The HVAC-14 controller is housed in a DIN rail mounting enclosure with 20 screw clamp connectors.

HVAC-14 Model 'SALE' Input/Output Signals

SALE - Temperature control and humidity monitoring for heating, cooling and fresh air dampers for the SALESFLOOR ambient air.
Heating and cooling stages are controlled relative to the store temperature setpoint
Humidity is for monitoring only. Control is inhibited if the supply air input is not present
Fresh air dampers are open as first stage of cooling provided outside air is within specified band (12C to 21C)

SALE		
Analogue Inputs		
P1	Humidity HA	4-20mA 0 - 100%
Digital Inputs		
T1	Ambient Air Temperature	
T2	Cooler Discharge	
T3	Heater Discharge	
T4	Outside Air Temperature	
T5	Off Input	Closed = Off
T6		
Mains Inputs 230Vac		
	Supply Air Proving	
Relay Outputs 230/24v AC 3 amp. Maximum Accumulative Current 10 amp.		
RLY1	Economy Dampers	
RLY2	Heat Reclaim 1	
RLY3	Heating Stage 2	
RLY4	Heating Stage 3	
RLY5	Cooling Stage 2	
RLY6	Cooling Stage 3	
SSR7	Supply Air Fans	

HVAC- 14 Model ‘SALE’ Termination Wiring



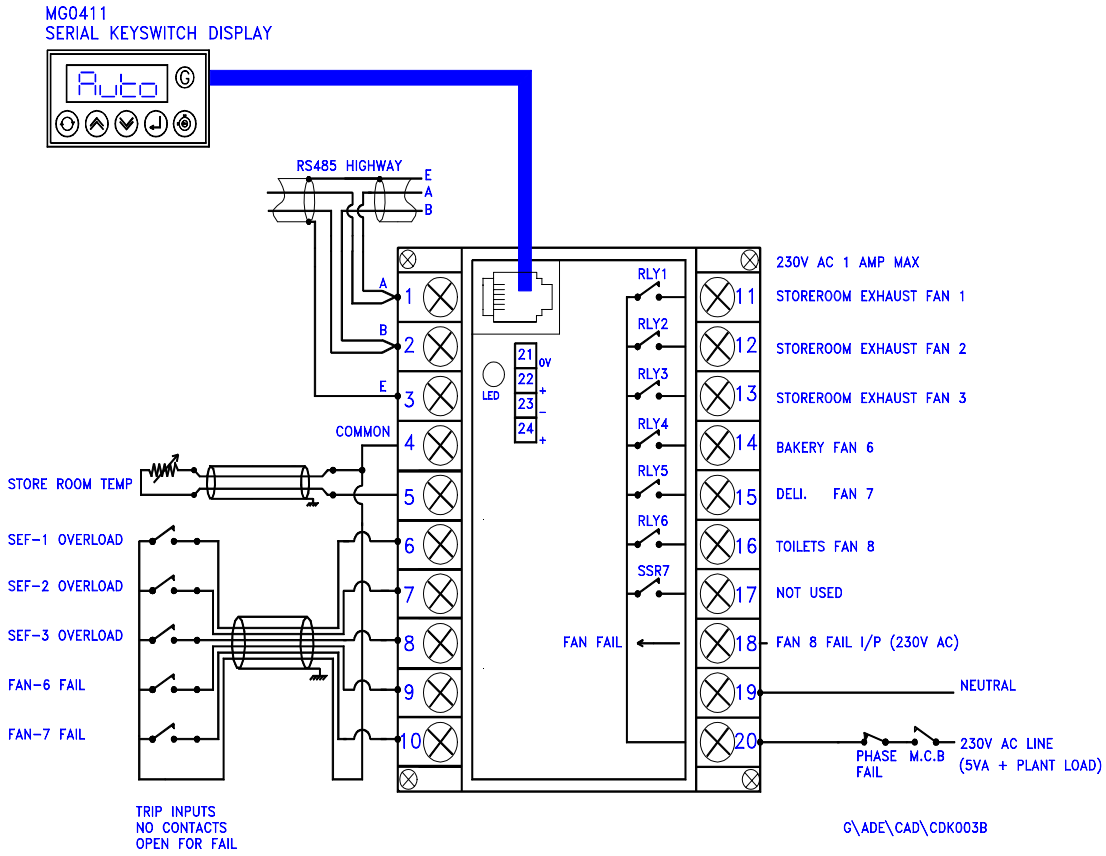
HVAC-14 Model 'Stor' Input/Output Signals

- **STORE** - Similar facilities to Plantroom for time-scheduled STOREROOM staged ventilation control.

` Storetroom control outputs all works on timeclock 1
Other outputs can be selected to work of timeclock 1 or 2

Stor		
Analogue Inputs		
P1		
Digital Inputs		
T1	Store room Temperature	
Trip 2	Store room exhaust Fan 1 overload	open=trip
Trip 3	Store room exhaust Fan 2 overload	open=trip
Trip 4	Store room exhaust Fan 3 overload	open=trip
Trip 5	Baker Fan 6 Fail	open=fail
Trip 6	Deli Fan 7 Fail	open=fail
Mains Inputs 230Vac		
	Toilets Fan 8 Fail	open=fail
Relay Outputs 230/24v AC 3 amp. Maximum Accumulative Current 10 amp.		
RLY1	Store room exhaust Fan 1	
RLY2	Store room exhaust Fan 2	
RLY3	Store room exhaust Fan 3	
RLY4	Bakery Fan 6	
RLY5	Deli Fan 7	
RLY6	Toilets Fan 8	
SSR7		

HVAC- 14 Model 'Stor' Termination Wiring



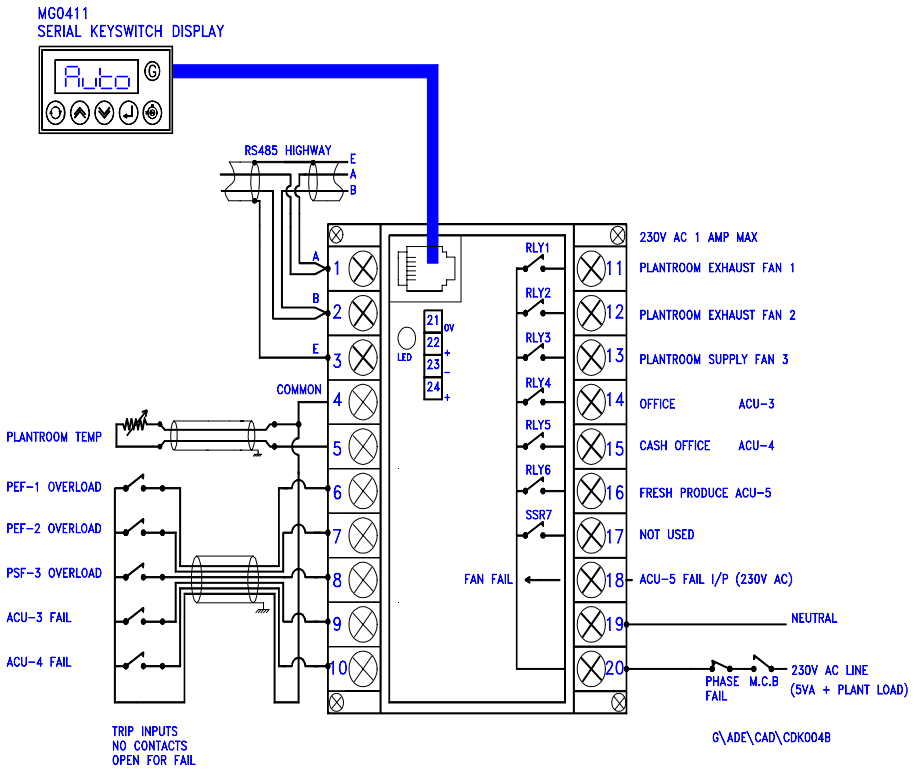
HVAC-14 Model 'PLnt' Input/Output Signals

- **PLANT** - Temperature dependent PLANTROOM staged ventilation control with additional time-scheduled heating, lighting or ventilation control outputs with overload detection.

` Plantroom control outputs all works on timeclock 1
Other outputs can be selected to work of timeclock 1 or 2

PInt		
Analogue Inputs		
P1		
Digital Inputs		
T1	Plantroom Temperature	
Trip 2	Plantroom exhaust Fan 1 overload	open=trip
Trip 3	Plantroom exhaust Fan 2 overload	open=trip
Trip 4	Plantroom Supply Fan 3 overload	open=trip
Trip 5	ACU-3 Fail	open=fail
Trip 6	ACU-4 Fail	open=fail
Mains Inputs 230Vac		
	ACU-5 Fail	open=fail
Relay Outputs 230/24v AC 3 amp. Maximum Accumulative Current 10 amp.		
RLY1	Plantroom exhaust Fan 1	
RLY2	Plantroom exhaust Fan 2	
RLY3	Plantroom Supply Fan 3	
RLY4	Office ACU-3	
RLY5	Cash Office ACU-4	
RLY6	Fresh Produce ACU-5	
SSR7		

HVAC- 14 Model 'PLnt' Termination Wiring

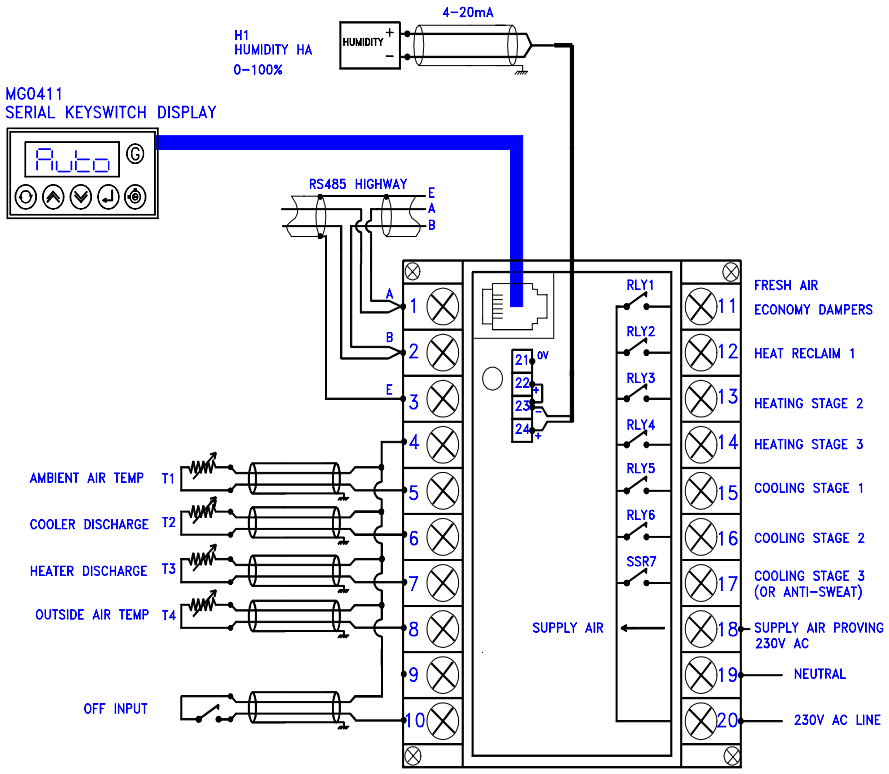


HVAC-14 Model 'HvAC' Input/Output Signals

- **HVAC** - Temperature and humidity control and monitoring for heating, cooling and/or dehumidification of the SALESFLOOR ambient air using the salesfloor temperature and humidity probes.
-

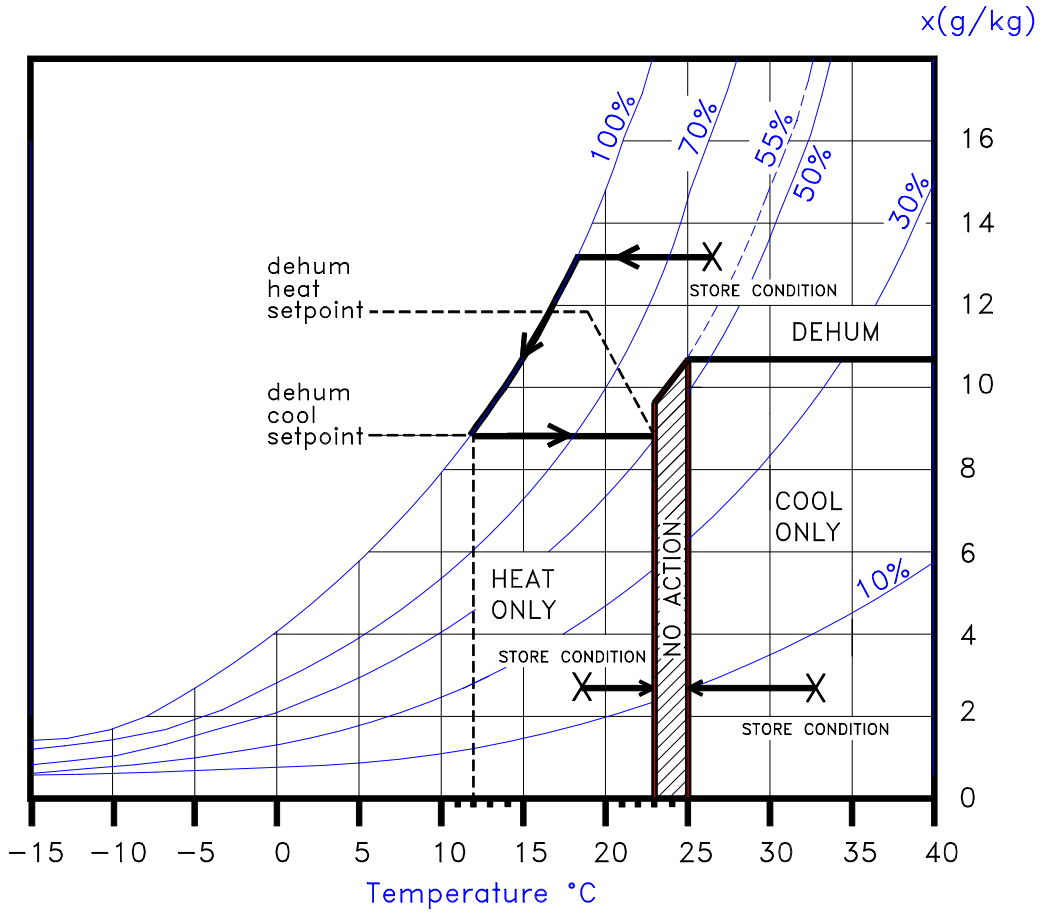
HAVC		
Analogue Inputs		
P1	Humidity HA	4-20mA 0 - 100%
Digital Inputs		
T1	Ambient Air Temperature	
T2	Cooler Discharge	
T3	Heater Discharge	
T4	Outside Air Temperature	
T5		
T6	Off Input	Closed = Off
Mains Inputs 230Vac		
	Supply Air Proving	
Relay Outputs 230/24v AC 3 amp. Maximum Accumulative Current 10 amp.		
RLY1	Economy Dampers	
RLY2	Heat Reclaim 1	
RLY3	Heating Stage 2	
RLY4	Heating Stage 3	
RLY5	Cooling Stage 1	
RLY6	Cooling Stage 2	
SSR7	Cooling Stage 3 / Anti-sweat	

HVAC- 14 Model 'HvAC' Termination Wiring



HVAC Control

HVAC control is run during store open hours as determined by Timeclock 1
It is also run out of hours if timeclock 1 is OFF and average salesfloor temperature is >24C or <17C
HVAC is controlled on T1
Fan speed-1 is run if not OFF when store open hours Timeclock 1 is ON
HVAC Healthy goes off if any alarm is detected.



PSYCHROMETRIC CHART FOR HVAC CONTROLLERS

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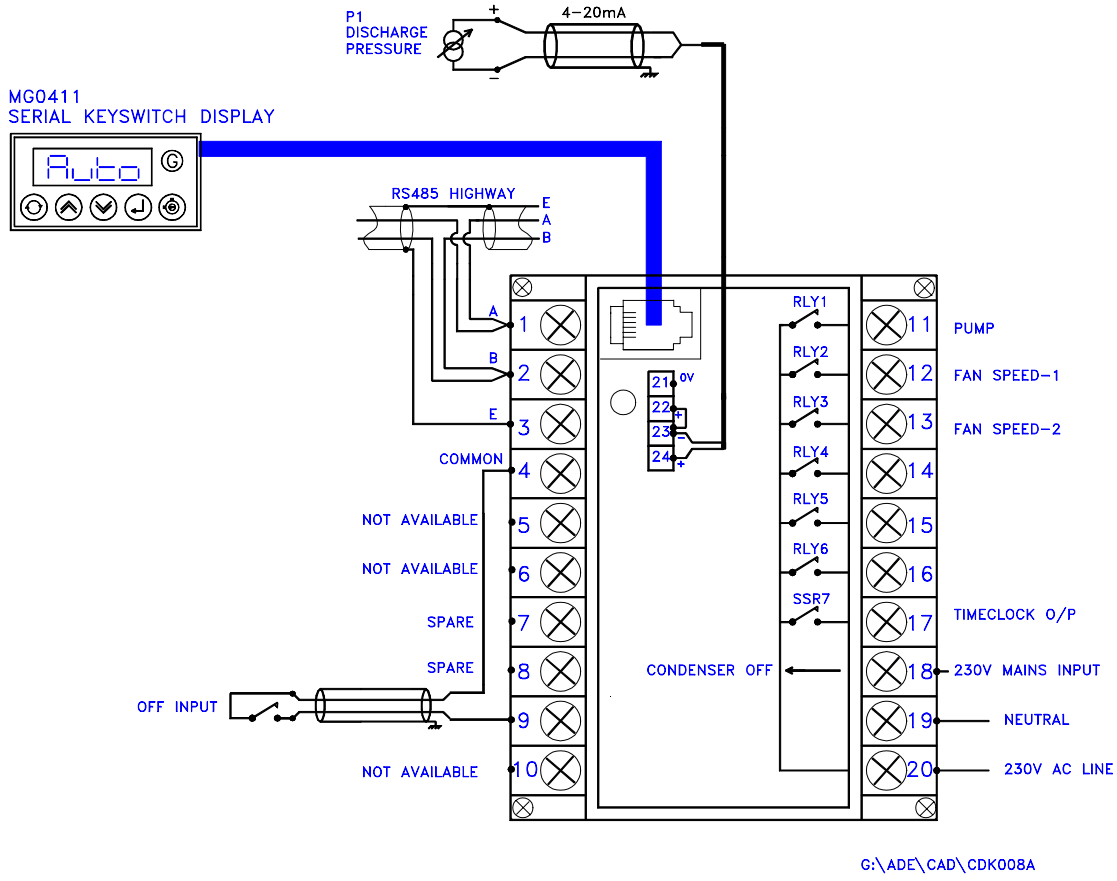
HVAC-14 Model 'PFAN' Input/Output Signals

- **PFAN** - Industrial condenser control of pump and 2-speed fans on discharge pressure. A timeclock is available.

PFAn		
Analogue Inputs		
P1		
Digital Inputs		
Trip 1	Not available	
Trip 2	Not available	
Trip 3	Spare	
Trip 4	Spare	
Trip 5	Off input	
Trip 6	Not available	
Mains Inputs 230Vac		
	Condenser Off	
Relay Outputs 230/24v AC 3 amp. Maximum Accumulative Current 10 amp.		
RLY1	Pump	
RLY2	Fan Speed-1	
RLY3	Fan Speed-2	
RLY4	Not Used	
RLY5	Not Used	
RLY6	Not Used	
SSR7	Time clock output	

HVAC- 14 Model 'PFAN' Termination Wiring

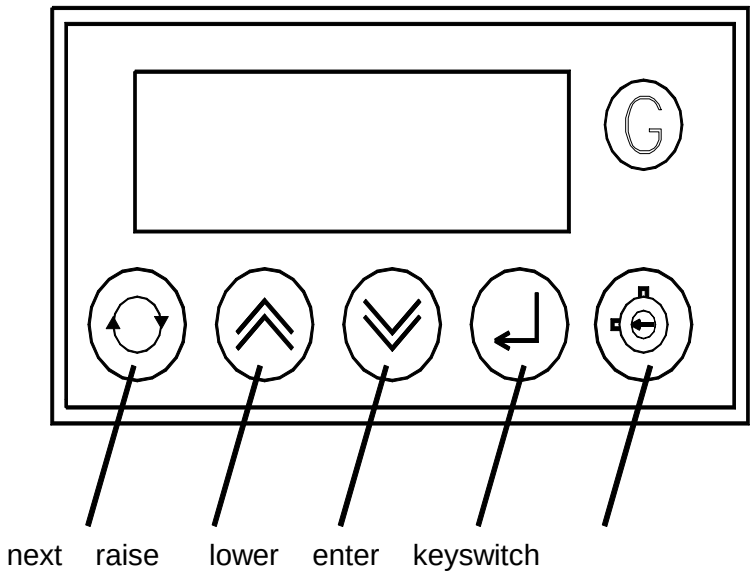


OPERATION

The SKD.9 Keyswitch display provides a display at the controller of salesfloor, store or plantroom temperature .

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.



DISPLAY INDICATIONS

SALESFLOOR DISPLAY (SALE)

When setup as 'SALE', the controller reverts to the default display if no buttons have been pressed for 3 minutes and displays the salesfloor temperature (T1)
The default display is replaced by a status message if any of the following conditions occur:-

8888	After power on restart
u1.1A	Software version displayed after power on or after OFF
Auto	Restart routine in progress
OFF/	HVAC selected OFF mode from PC or local display
Air/ FAIL	Supply air failure input active
//23	Defaults Salesfloor Temperature

TEMPERATURE DISPLAYS (SALE)

Pressing the NEXT push button displays the next channel identification with the temperature or humidity value for the channel. Repeated pressing of next displays in sequence the points listed below:-

Identity	Temperature on display
Blank	Salesfloor air temperature
1/11	Cooling discharge air temperature
2/24	Heating discharge air temperature
o/15	Outside air temperature
4/oc	OFF switch state (sc = closed for OFF)
H/nn	Ambient air % humidity
SC55	Present Setpoint for heating/cooling
/123	Relay output states R1 to R3
4567	Relay output states R4 to R7
H-Ab	Input and timeclock status

- H Supply air healthy
- \- Input off
- A Timeclock 1 on
- b Timeclock 2 on

SEt /	Go to Setup Mode when ? press

STORE/PLANT ROOM DISPLAY (Stor, Plnt)

When setup as 'Stor' or 'PLnt', the controller reverts to the default display if no buttons have been pressed for 3 minutes and displays the salesfloor temperature (T1)
The default display is replaced by a status message if any of the following conditions occur:-

8888	After power on restart
u1.1d	Software version displayed after power on or after OFF
Auto	Restart routine in progress
OFF /	HVAC selected OFF mode from PC or local display
FAn / triP	Exhaust Fan 1 to 6 overload fail input open circuit
//20	Default storeroom/plantroom temperature

TEMPERATURE DISPLAYS (Stor, PLnt)

Pressing the NEXT push button displays the next channel identification with the temperature or humidity value for the channel. Repeated pressing of next displays in sequence the points listed below:-

Identity	**Temperature on display**
Blank	Storeroom/plantroom air temperature
1 / YY	Fan I overload state yy = Sc = short circuit = OK yy = oc = open circuit = Trip
2 / YY	Fan 2 overload state
3 / YY	Fan 3 overload state
4 / YY	Fan 4 overload state
5 / YY	Fan 5 overload state
SP25	Present Setpoint for heating
/123	Relay output states R1 to R3
4567	Relay output states R4 to R7
H-Ab	Input and timeclock status

H Fan 6 overload healthy
\- Input off
A Timeclock 1 on

b Timeclock 2 on

SEt / Go to Setup Mode when ? press

SALESFLOOR DISPLAY (HVAC) with dehumidification

When setup as 'HVAC', the controller reverts to the default display if no buttons have been pressed for 3 minutes and displays the average salesfloor temperature (T1)

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

8888	After power on restart
u1.1A	Software version displayed after power on or after OFF
Auto	Restart routine in progress
OFF/	HVAC selected OFF mode from PC or local display
Air/ FAIL	Supply air failure input active
//24	Defaults Salesfloor Temperature

TEMPERATURE DISPLAYS (HVAC)

Pressing the NEXT push button displays the next channel identification with the temperature or humidity value for the channel. Repeated pressing of next displays in sequence the points listed below:-

Identity	**Temperature on display**
Blank	Salesfloor air temperature
c/11	Cooling discharge air temperature
d/25	Heating discharge air temperature
o/17	Outside air temperature
4/oc	OFF switch state (Sc = closed for OFF)
H/53	Ambient air % humidity
SC12	Present Setpoint for cooling
SH26	present Setpoint for heating
YYYY	Present Control Mode
YYYY = HEAt	Control action is reheat only to fixed setpoint (Fhnn). Heating stages turned on in sequence, cooling valves closed.
COOL	Control action is cool only, fixed setpoint (Fcnn). Liquid valves staged open.
Air	Control action is reheat only, variable setpoint. Reheat setpoint is 1 degree above ambient air temperature. Liquid valve closed.

OFF	No control action, reheat and cooling valves are closed. Alarms are inhibited.
DHun	Control action is Dehum mode with cooling setpoint (dCnn) and reheat setpoint (dHnn.) Heating and cooling staged on as required
/123	Relay output states R1 to R3
4567	Relay output states R4 to R7
H-Ab	Input and timeclock status
H	Supply air healthy
-	Input off
A	Timeclock 1 on
b	Timeclock 2 on
SEt /	Go to Setup Mode when ? press

INDUSTRIAL CONDENSER CONTROL (PFAN)

When setup as 'PFAn', the controller reverts to the default display if no buttons have been pressed for 3 minutes and displays the discharge pressure.
The default display is replaced by a status message if any of the following conditions occur:-

	8888	After power on restart
	u1.1A	Software version displayed after power on or after OFF
	Auto	Restart routine in progress
	OFF/	HVAC selected OFF mode from PC or local display
Air/	FAIL	Supply air failure input active
	15.6b	Default discharge pressure in bar guage (b)

DISPLAYS (PFAn)

Pressing the NEXT push button displays the next channel identification with the temperature or humidity value for the channel. Repeated pressing of next displays in sequence the points listed below:-

	Identity	**Temperature on display**
	15.6b	Discharge pressure
dSPt	15.0b	Alternates 'dSPt' with discharge setpoint value 'nn.nb' for condenser control
	/123	Relay output states R1 to R3
	4567	Relay output states R4 to R7
	H-Ab	Input and timeclock status
	YYYY = H	Trips healthy
	-	Input off
	A	Timeclock 1 on
	b	Timeclock 2 on
	SEt/	Go to Setup Mode when ? press

Alarm Indications

Alarms alternately flash with selected temperature channel during Default and Normal operation.
Hi, Lo, OC, SC, PC FAIL
Alarms are not displayed during Setup operation.
All alarms are reset automatically when the fault has disappeared.

IF no RS485 highway is connected then the PC FAIL message can be removed by selecting setup as follows:-

@:@	SEt=	?	PP00	/:/	PP11	?
@:@	bAud	?	9600	/:/	nonE	? none
@:@	End=	?	==24			

Temperature Alarms

Temperature alarms are indicated on LED displays as:-

/Hi/	If the temperature is above the control setpoint plus alarm differential for longer than the guardtime
/Lo/	If the temperature is below the setpoint minus alarm differential for longer than the guardtime

Temperature alarms are inhibited when '-OFF' is selected from the keypad, the local OFF switch or from the remote PC.

Guardtime Alarm Indications:

Alarm Guardtime count is reset each time the discharge air returns within limits.
Alarm states **Hi** and **Lo** are automatically reset when the discharge air returns within limits.

Probe Fails Alarm Indications:

/OC/	Open circuit probe
/SC/	Short circuit probe

USEFUL BUTTON SEQUENCES

The following button sequences should prove useful during normal service operation

Check Unit Model

@:@	SEt=	?	PP00 /:/ PP05	?
@:@	Unit	?	HUAC	This unit model is 'HVAC'
@:@	End=	?	==23	

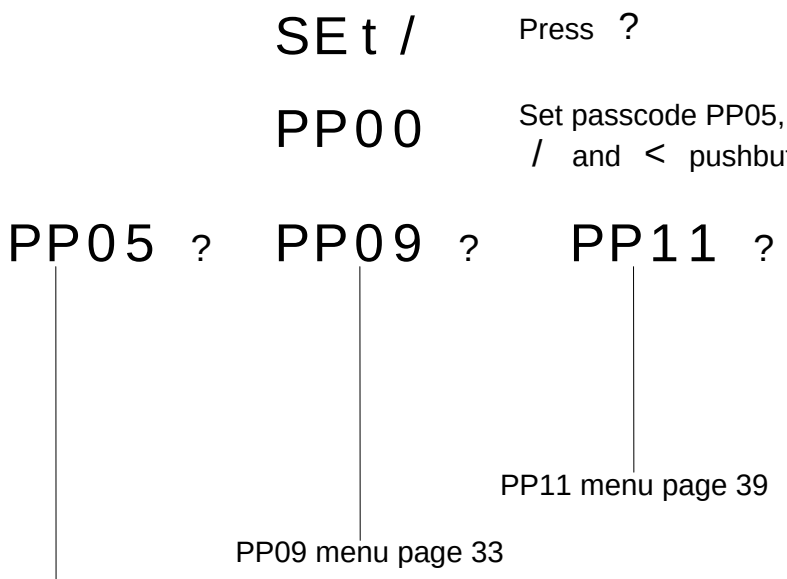
Select Stub, Case No and Address Useful Button Sequences:

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

@:@	Unit				
@:@	Sn01	/:/	Sn60	?	Sn60
@	Cn01	?	Cn01		
@	A001	/:<	A180	?	A180
@:@	End=	?	==26		

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.



PP05 Menu

Press @ to sequence through the following PP05 menu selections
Press ? to select the displayed menu

Unit	HVAC-14 unit identity Page 31
tESt	Test relays Page 31
End /	Return to normal operation

Setup Functions (level 1) passcode 05

PP05 Menu

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 = SALE	Salesfloor Heating/cooling	Sn = 71, 72
Stor	Storeroom and Fan control	Sn = 73
PLnt	Plantroom and office control	Sn = 74
HvAC	Store dehumidification	(not used)
PFAn	Industrial Pump and 2-speed Fans	

Stub number **Snnn** nn = 1 to 80 See above

Case number **Cn / n** n = 1 to 4
normally = 1

Address number **Annn** nnn = 1 to 255, 213 to 225
Address automatically calculated is (Sn x 3) + Cn-1
e.g. Stub 30 case 2 has MDM address (30 x 3) + 2 - 1 = 91

Digital alarm option selection **YYYY**

YYYY = ndad	No digital alarm display on keypad
nda	No digital alarms - digital alarms inhibited
dad	Digital alarms displayed on keypad

tESt

t ES t

Press @ to sequence through the relay selections

Repeatedly press ? to switch the relays on and off

Relay R1 **1OFF 1 / on**

Relay R2 **2OFF 2 / on**

etc. to

Relay R7 **7OFF 7 / on**

All outputs return to automatic control when SETUP is ended

End

End / Return from Setup to normal operation

Setup Functions (level 2) passcode 09

PP09 Menu

Press @ to sequence through the following PP09 menu selections

Press ? to select the displayed menu

Real time clock	r t c /	Page 33
Fan Control Setpoint number. Timeclock number	FCS t	Skipped if SALE or HVAC Page 34
Condenser Pump and Fan parameters	PFAn	Skipped if SALE / HVAC / Stor / PLnt is selected Page 34
Salesfloor heat/cool parameters	SALE	Skipped if HVAC / Stor / PLnt is selected Page 35
Timeclock 1 settings	t CL 1	Page 36
Timeclock 2 settings	t CL 2	Page 36
Mode and setpoint selection	HuAC	Only if HVAC is selected Page 37
Adjust response of stages of cooling	COOL	Page 38
Adjust response of stages of heating	HEA t	Page 38
Adjust delay time (minutes) between stages for both heating	DELY	Page 4
	End /	Return to normal operation

rtc

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 hnn	nn = 0 to 23 hrs
Real clock time minutes	r t nn	nn = 0 to 59 mins
Weekday	YYYY	YYYY = Sun/nnon/tuE/uuEd/tHu/Fri/SAt

FCSt (Skipped if SALE selected)

FCS t

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

1F0.1	Fan 1 controlled on timeclock 1 only
2F1.2	Fan 2 controlled on setpoint 1 timeclock 2
3F3.3	Fan 3 controlled on setpoint 3 always
4F0.2	Fan 4 controlled on timeclock 2 only
5F0.3	Fan 5 always on
6F0.0	Fan 6 never on

PFAn (Skipped if SALE / HVAC / Stor / Plnt selected)

PFAn

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Discharge pressure setpoint	dnn.n	nn.n = 0.0 to 25.5
	ALL cutin/cutouts are relative	
Pump relative cutin level	1Cn.n	n.n = 0.0 to 5.0
Lowspeed Fans relative cutin	2Cn.n	n.n = 0.0 to 5.0
Highspeed Fans relative cutin	3Cn.n	n.n = 0.0 to 5.0
Condenser differential cutout	cCn.n	n.n = 0.0 to 5.0
Highspeed to Lowspeed delay	tnnn	nnn = 0 - 225 secs

SALE (Skipped if HVAC / Stor / Plnt selected)

sALE

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Salesfloor setpoint temperature	SPnn	nn = 10 to 35°C
Outside air Damper Low level cutin	Ldnn	nn = 0 to 20°C
Outside air Damper High level cutout	Hdnn	nn = 10 to 30°C
Fresh Air Damper differential cutin	1Cn.n	n.n = 0.0 to 5.0
Cooling Stage 2 differential cutin	2Cn.n	n.n = 0.0 to 5.0
Cooling Stage 3 differential cutin	3Cn.n	n.n = 0.0 to 5.0
Cooling differential cutout	cCn.n	n.n = 0.0 to 5.0
Heat reclaim differential cutin	1Hn.n	n.n = 0.0 to 5.0
Heating Stage 2 differential cutin	2Hn.n	n.n = 0.0 to 5.0
Heating Stage 3 differential cutin	3Hn.n	n.n = 0.0 to 5.0
Heating differential cutout	cHn.n	n.n = 0.0 to 5.0

tCL1

tCL1

Press @ to sequence through the Setup selections

Press / or < to change the settings. Press ? to accept

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.	
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

tCL2 (Skipped if SALE / HVAC / PFAn)

tCL2

Press @ to sequence through the Setup selections

Press / or < to change the settings. Press ? to accept

Similar to timeclock 1

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
etc.	

IF time on = time off then timeclock always ON
IF time on = 0 or time off = 0 then timeclock always OFF

HvAC (Only if HVAC is selected)

HuAC

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Reheat level setpoint (fixed)	Fhnn	nn = 10 to 35°C
Cool only level setpoint (fixed)	FCnn	nn = 10 to 35°C
Cool setpoint (Dehum mode)	dCnn	nn = 10 to 35°C
Reheat setpoint (Dehum mode)	dHnn	nn = 10 to 35°C
Control deadband	db0n	n = 0 to 9
HVAC control mode selection	YYYY	

YYYY = Auto (Normal automatic state) Control action is in automatic mode and control action is calculated using a physcrometric chart using the average Relative Humidity and average salesfloor temperature readings.
Control actions wait 5 minutes before changing mode in order to prevent chatter at the boundaries.
Liquid valves are staged open if cooling required.
Heaters are staged on if heating required.

HEAt Control action is reheat only to fixed setpoint (Fhnn). Liquid valve closed.

Air Control action is reheat only, variable setpoint.
Reheat setpoint is 1 degree above ambient air temperature.
Liquid valve closed.

OFF No control action, reheat and cooling are turned off.
Liquid valve closed.
Alarms are inhibited.

CooL Control action is cool only, fixed setpoint (Fcnn).
Liquid valves staged open.

Dhun Control action is Dehum mode with cooling setpoint (dCnn) and reheat setpoint (dHnn).
Liquid valves staged open.

Fresh air dampers (R1) are open if the outside air temperature is between 14 and 20°C and cooling is required (salesfloor temperature > cooling setpoint).

COOL

COOL

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Fast band for cooling control	Fbnn	nn = 1 - 9
Cooling Algorithm stage UP	CAun	nn = 0 - 9
Cooling Algorithm stage DOWN	CAdn	nn = 0 - 9

HEAt

HEAt

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Fast band for heating control	Fbnn	nn = 1 - 9
Heating Algorithm stage UP	CAun	nn = 0 - 9
Heating Algorithm stage DOWN	CAdn	nn = 0 - 9

dELy

dELy

Press @ to sequence through the Setup selections

Press / or < to change the settings

Press ? to accept the settings

Cooling stage delay minutes	Cdn.n	n.n = 0.0 to 5.0
Heating stage delay minutes	Hdn.n	n.n = 0.1 to 5.0

End

End / Return from SETUP to normal operation

Setup Functions (level 3) passcode 11

PP11 Menu

Port - Serial Communications Port

Port	Press @ to sequence through the Setup selections	
	Press / or < to change the settings	
	Press ? to accept the settings	
Communications baud rate	YYYY	
	YYYY = 9600	
	nonE	'nonE' removes PC FAIL if no PC present
Parity selection	8Y-n	8Y-n = parity selection:- 8n_2, 8e_1, or 8n_1
Future log modes	oFF/	

End

End/	Return from SETUP to normal operation

COMMUNICATIONS

Communication facilities are available for interrogation of temperatures, humidity, status and modification/display of setpoints, limits and loop settings. All communication is via a daisy chain RS485 link which connects all HVAC-14 units in series with all other Guardian units.

Communication commands and replies are checked for parity and block length and automatically retransmit if errors are detected.

Each HVAC-20 has a unique unit number address Annn and System Number Snn which is used to select the appropriate unit for interrogation or modification.
Sn is system no. 1-80 normally 71, 72, 73, 74 for HVAC-14
Annn is address 1-255 normally 213 to 225

Some communication commands may use ‘wildcard’ stub number 99 and ‘wildcard’ case number 9 to access all systems on the highway or all addresses within a system.

HVAC-14 units are inactive until they are addressed.

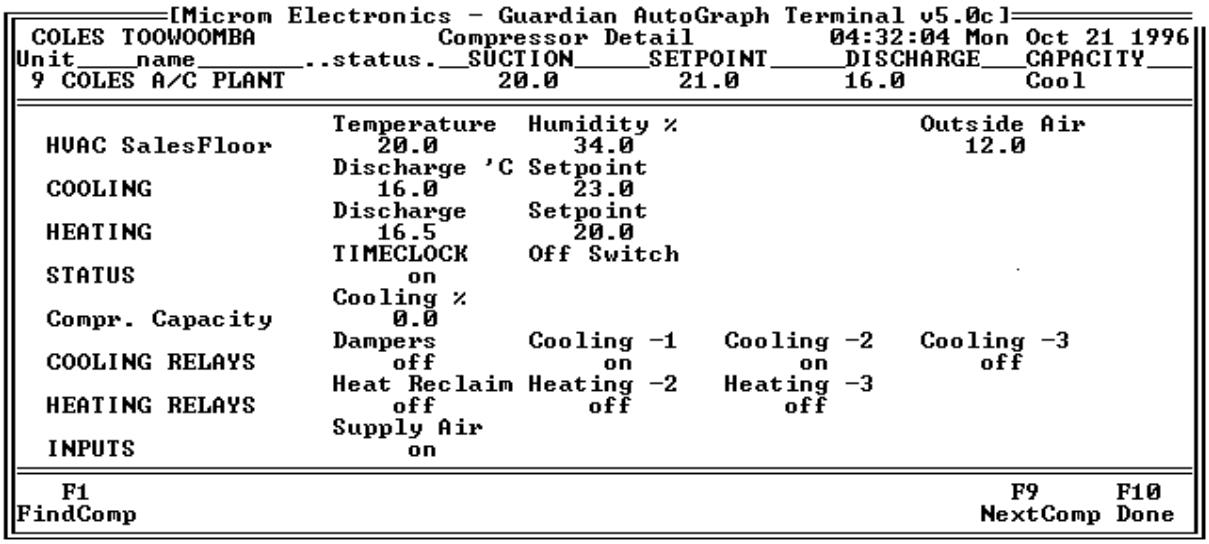
GUARDIAN Autograph Refrigeration Monitor Communication commands available are:-

a) Transmit Unit Status which replies with command plus humidity, status & air temperature.
b) Transmit Values which replies with address plus latest signed temperature values ,time, trip states, relay states and internal status.
c) Transmit Setpoints which replies with setpoints and limits

Uuu addresses may not be changed via the link.

d) Receive setpoints with new setpoint values from controller

HVAC14 HVAC Detaill

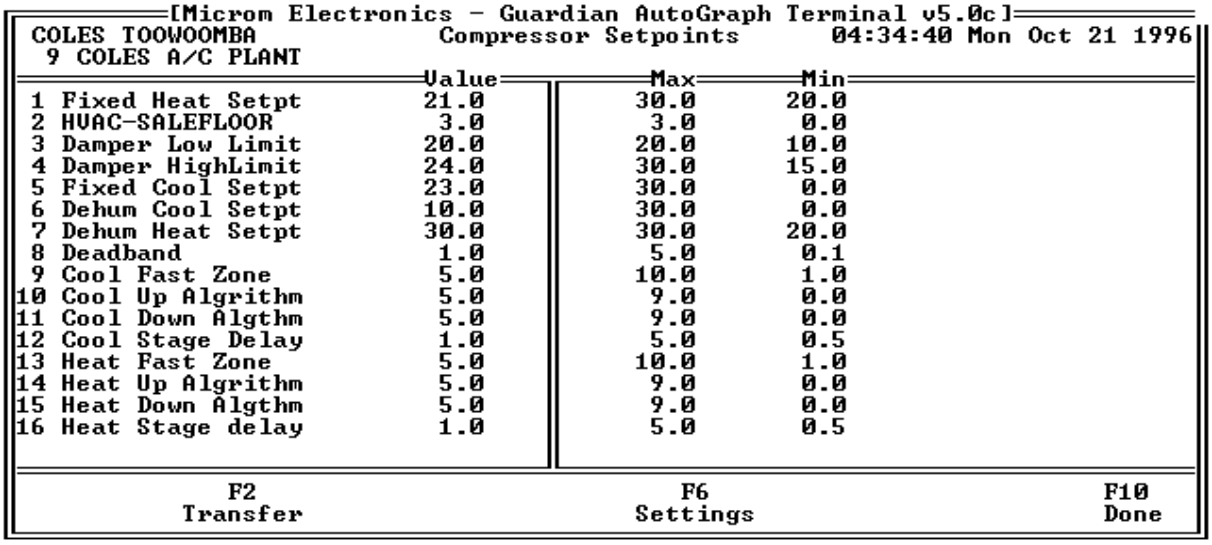


```
[Microm Electronics - Guardian AutoGraph Terminal v5.0c]
 COLES TOOWOOMBA            Compressor Detail        04:32:04 Mon Oct 21 1996
Unit____name_______..status.__SUCTION_____SETPOINT_____DISCHARGE___CAPACITY___
 9 COLES A/C PLANT              20.0         21.0         16.0          Cool

                    Temperature  Humidity %                    Outside Air
  HVAC SalesFloor      20.0         34.0                          12.0
                    Discharge 'C Setpoint
  COOLING              16.0         23.0
                    Discharge    Setpoint
  HEATING              16.5         20.0
                    TIMECLOCK    Off Switch
  STATUS                on
                    Cooling %
  Compr. Capacity       0.0
                    Dampers      Cooling -1   Cooling -2   Cooling -3
  COOLING RELAYS        off          on           on           off
                    Heat Reclaim Heating -2   Heating -3
  HEATING RELAYS        off          off          off
                    Supply Air
  INPUTS                on

   F1                                                          F9      F10
FindComp                                                    NextComp Done
```

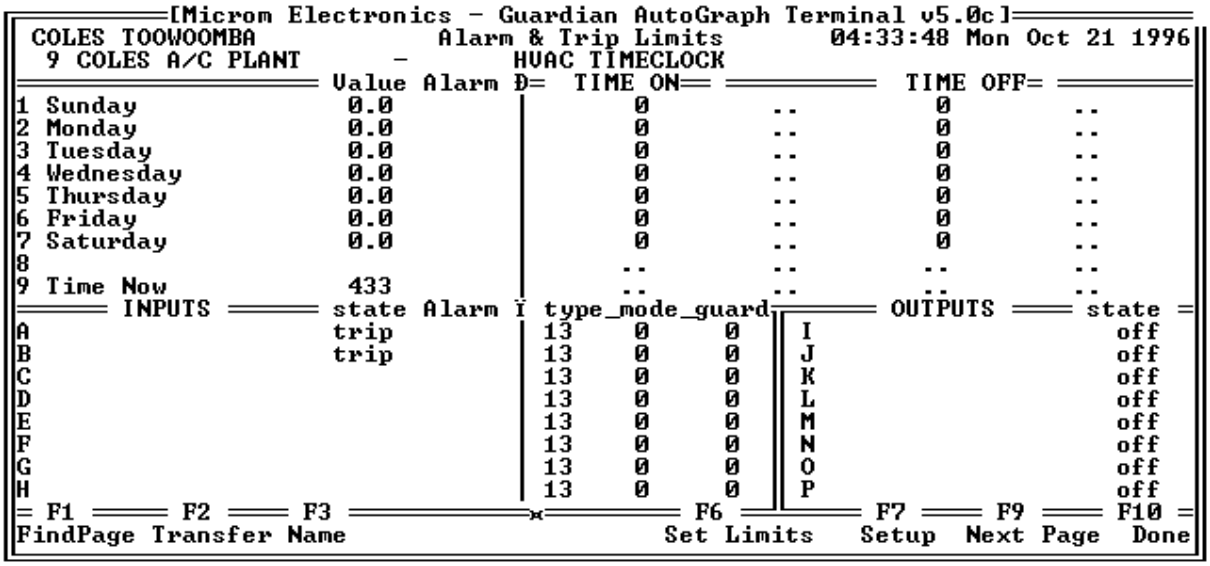
HVAC (HVAC) Setpoints



```
[Microm Electronics - Guardian AutoGraph Terminal v5.0c]
 COLES TOOWOOMBA            Compressor Setpoints     04:34:40 Mon Oct 21 1996
  9 COLES A/C PLANT
                              Value          Max          Min
 1 Fixed Heat Setpt            21.0         30.0         20.0
 2 HVAC-SALEFLOOR               3.0          3.0          0.0
 3 Damper Low Limit            20.0         20.0         10.0
 4 Damper HighLimit            24.0         30.0         15.0
 5 Fixed Cool Setpt            23.0         30.0          0.0
 6 Dehum Cool Setpt            10.0         30.0          0.0
 7 Dehum Heat Setpt            30.0         30.0         20.0
 8 Deadband                     1.0          5.0          0.1
 9 Cool Fast Zone               5.0         10.0          1.0
10 Cool Up Algrithm             5.0          9.0          0.0
11 Cool Down Algthm             5.0          9.0          0.0
12 Cool Stage Delay             1.0          5.0          0.5
13 Heat Fast Zone               5.0         10.0          1.0
14 Heat Up Algrithm             5.0          9.0          0.0
15 Heat Down Algthm             5.0          9.0          0.0
16 Heat Stage delay             1.0          5.0          0.5

          F2                          F6                          F10
       Transfer                    Settings                      Done
```

HVAC Timeclock



Index

Setup / commissioning Parameters

PP05 (Level 1) Settings

		unit	ACTUAL settings	Default setting	Min. setting	Max. setting
Unit	Model type selection			SALE	SALE	PFAn
	Display type			Sd9	Sd9	Sd8
	Stub number		***Sn***	Sn01	Sn01	Sn80
	Case number (1 to 4)		***Cn***	Cn 1	Cn 1	Cn 4
	Autograph address number		***A***	A255	A 00	A255
	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		***1-AL***	Hi	Hi	nonE
Alarm Limits	°C	***1***	−01	−40	40
Temperature number 2 Alarm type		***2-AL***	Hi	Hi	nonE
Alarm Limits	°C	***2***	−01	−40	40
Temperature number 3 Alarm type		***3-AL***	Hi	Hi	nonE
Alarm Limits	°C	***3***	−01	−40	40
Temperature number 4 Alarm type		***4-AL***	Hi	Hi	nonE
Alarm Limits	°C	***4***	−01	−40	40
Temperature number 5 Alarm type		***5-AL***	Hi	Hi	nonE
Alarm Limits	°C	***5***	−01	−40	40
Temperature number 6 Alarm type		***6-AL***	Hi	Hi	nonE
Alarm Limits	°C	***6***	−01	−40	40
Guardtime	mins	***gt***	gt 30	gt 00	gt 99
Alarm differential	°C	***Ad***	Ad 05	Ad 02	Ad 40
Digital input - A Alarm type		***A-AL***	oFF	on	nonE
Guardtime for input A	mins	***A***	A 00	A 00	A 99
Digital input - b Alarm type		***b-AL***	oFF	on	nonE
Guardtime for input b	mins	***b***	b 00	b 00	b 99
Digital input - C Alarm type		***C-AL***	oFF	on	nonE
Guardtime for input C	mins	***C***	C 00	C 00	C 99
Digital input - d Alarm type		***d-AL***	oFF	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
Digital input - h Alarm type		***h-AL***	oFF	on	nonE
Guardtime for input h	mins	***h***	h 00	h 00	h 99

PP09 (level 2) Menu Settings

		unit	ACTUAL settings	Default setting	Min. setting	Max. setting
r t c =	Real clock time hours	hrs	***rh***	rh00	rh00	rh23
	Real clock time minutes	mins	***rt***	rt00	rt00	rt59
	Weekday			Sun	Sun	SAt
FCS t	Skipped if SALE selected					
	Fan 1		***1F***	1F0.0	1F0.0	1F3.3
	Fan 2		***2F***	2F0.0	2F0.0	2F3.3
	Fan 3		***3F***	3F0.0	3F0.0	3F3.3
	Fan 4		***4F***	4F0.0	4F0.0	4F3.3
	Fan 5		***5F***	5F0.0	5F0.0	5F3.3
	Fan 6		***6F***	6F0.0	6F0.0	6F3.3
	Fan 7		***7F***	7F0.0	7F0.0	7F3.3
PFAn	Skipped if SALE / HVAC / Stor / Plnt selected					
	Discharge pressure setpoint		***d***	d25.5	d 0.0	d25.5
	Pump relative cutin level		***1C***	1C0.0	1C0.0	1C5.0
	Lowspeed Fans relative cutin		***2C***	2C0.0	2C0.0	2C5.0
	Highspeed Fans relative cutin		***3C***	3C0.0	3C0.0	3C5.0
	Condenser differential cutout		***cC***	cC0.0	cC0.0	cC5.0
	Highspeed to Lowspeed delay	secs	***t***	t255	t 00	t255
SALE	Skipped if HVAC/Stor/Plnt selected					
		unit	ACTUAL settings	Default setting	Min. setting	Max. setting
	Highspeed Fans relative cutin	°C	***SP***	SP10	SP10	SP35
	Condenser differential cutout	°C	***Ld***	Ld00	Ld00	Ld20
	Highspeed to Lowspeed delay	°C	***Hd***	Hd10	Hd10	Hd30
	Fresh Air Damper differential cutin	°C	***1C***	1C0.0	1C0.0	1C5.0
	Cooling Stage 2 differential cutin	°C	***2C***	2C0.0	2C0.0	2C5.0
	Cooling Stage 3 differential cutin	°C	***3C***	3C0.0	3C0.0	3C5.0
	Cooling differential cutout	°C	***cC***	cC0.0	cC0.0	cC5.0
	Heat reclaim differential cutin	°C	***1H***	1H0.0	1H0.0	1H5.0
	Heating Stage 2 differential cutin	°C	***2H***	2H0.0	2H0.0	2H5.0
	Heating Stage 3 differential cutin	°C	***3H***	3H0.0	3H0.0	3H5.0

Heating differential cutout	°C	***cH***	cH0.0	cH0.0	cH5.0

t CL 1

	unit	ACTUAL settings	Default setting	Min. setting	Max. setting
Sunday Time On Hours	Hrs	***1H***	00	00	23
Sunday Time On Minutes	mins	***1n***	35	00	59
Sunday Time Off Hours	Hrs	***1h***	00	00	23
Sunday Time Off Minutes	mins	***1F***	35	00	59
Monday Time On Hours	Hrs	***2H***	00	00	23
Monday Time On Minutes	mins	***2n***	35	00	59
Monday Time Off Hours	Hrs	***2h***	00	00	23
Monday Time Off Minutes	mins	***2F***	35	00	59
Tuesday Time On Hours	Hrs	***3H***	00	00	23
Tuesday Time On Minutes	mins	***3n***	35	00	59
Tuesday Time Off Hours	Hrs	***3h***	00	00	23
Tuesday Time Off Minutes	mins	***3F***	35	00	59
Wednesday Time On Hours	Hrs	***4H***	00	00	23
Wednesday Time On Minutes	mins	***4n***	35	00	59
Wednesday Time Off Hours	Hrs	***4h***	00	00	23
Wednesday Time Off Minutes	mins	***4F***	35	00	59
Thurday Time On Hours	Hrs	***5H***	00	00	23
Thurday Time On Minutes	mins	***5n***	35	00	59
Thurday Time Off Hours	Hrs	***5h***	00	00	23
Thurday Time Off Minutes	mins	***5F***	35	00	59
Friday Time On Hours	Hrs	***6H***	00	00	23
Friday Time On Minutes	mins	***6n***	35	00	59
Friday Time Off Hours	Hrs	***6h***	00	00	23
Friday Time Off Minutes	mins	***6F***	35	00	59
Saturday Time On Hours	Hrs	***7H***	00	00	23
Saturday Time On Minutes	mins	***7n***	35	00	59
Saturday Time Off Hours	Hrs	***7h***	00	00	23
Saturday Time Off Minutes	mins	***7F***	35	00	59

tCL2

Sunday Time On Hours	Hrs	***1H***	00	00	23
Sunday Time On Minutes	mins	***1n***	35	00	59
Sunday Time Off Hours	Hrs	***1h***	00	00	23
Sunday Time Off Minutes	mins	***1F***	35	00	59
Monday Time On Hours	Hrs	***2H***	00	00	23
Monday Time On Minutes	mins	***2n***	35	00	59
Monday Time Off Hours	Hrs	***2h***	00	00	23
Monday Time Off Minutes	mins	***2F***	35	00	59
Tuesday Time On Hours	Hrs	***3H***	00	00	23
Tuesday Time On Minutes	mins	***3n***	35	00	59
Tuesday Time Off Hours	Hrs	***3h***	00	00	23
Tuesday Time Off Minutes	mins	***3F***	35	00	59
Wednesday Time On Hours	Hrs	***4H***	00	00	23
Wednesday Time On Minutes	mins	***4n***	35	00	59
Wednesday Time Off Hours	Hrs	***4h***	00	00	23
Wednesday Time Off Minutes	mins	***4F***	35	00	59
Thurday Time On Hours	Hrs	***5H***	00	00	23
Thurday Time On Minutes	mins	***5n***	35	00	59
Thurday Time Off Hours	Hrs	***5h***	00	00	23
Thurday Time Off Minutes	mins	***5F***	35	00	59
Friday Time On Hours	Hrs	***6H***	00	00	23
Friday Time On Minutes	mins	***6n***	35	00	59
Friday Time Off Hours	Hrs	***6h***	00	00	23
Friday Time Off Minutes	mins	***6F***	35	00	59
Saturday Time On Hours	Hrs	***7H***	00	00	23
Saturday Time On Minutes	mins	***7n***	35	00	59
Saturday Time Off Hours	Hrs	***7h***	00	00	23
Saturday Time Off Minutes	mins	***7F***	35	00	59

		unit	ACTUAL settings	Default setting	Min. setting	Max. setting
HuAC	Reheat level setpoint (fixed)	°C	***FH***	FH10	FH10	FH35
	Cool only level setpoint (fixed)	°C	***FC***	FC10	FC10	FC35
	Cool setpoint (Dehum mode)	°C	***dC***	dC10	dC10	dC35
	Reheat setpoint (Dehum mode)	°C	***dH***	dH10	dH10	dH35
	Control deadband		***db***	db00	db00	db09
	HVAC control mode selection			Auto	Auto	dHun
COOL	Fast band for cooling control		***Fb***	Fb00	Fb00	Fb09
	Cooling Algorithm stage UP		***CAu***	CAu0	CAu0	CAu9
	Cooling Algorithm stage DOWN		***CAd***	CAd0	CAd0	CAd9
HEAt	Fast band for heating control		***Fb***	Fb00	Fb00	Fb09
	Heating Algorithm stage UP		***HAu***	HAu0	HAu0	HAu9
	Heating Algorithm stage DOWN		***HAd***	HAd0	HAd0	HAd9
dELY	Cooling stage delay minutes	mins	***Cd***	Cd0.0	Cd0.0	Cd5.0
	Heating stage delay minutes	mins	***Hd***	Hd0.0	Hd0.0	Hd5.0

PP11 (level 3) Menu Settings

		unit	ACTUAL settings	Default setting	Min. setting	Max. setting
bAud	Communications baud rate			9600	9600	nonE
	Parity selection			8n2	8n2	8n1
	Future log modes			oFF	oFF	list