



# 636

## Refrigeration Control Units for Display Cabinets & Coldstore Coolers

- AKV10/20 expansion valve control using temperature or pressure
- Liquid valve and Fan control
- Electric, Hotgas, and offcycle Defrost control
- Dewpoint control of Trim heaters
- Suction valve & Lighting control
- Control-air temperature alarms
- Fan-fail & Coldstore door alarms
- PT1000 or Thermistor probes
- Local panel display and set-up
- Remote RS485 communications

## Operation and Set-up Manual

GUARDIAN 636 Refrigeration Controllers are mains-powered, energy efficient, refrigeration temperature and defrost sequence controllers for supermarket display cases and coldrooms using liquid valve or AKV10/20 expansion valve control.

The controller communicates with the GUARDIAN Consultant and the Woodley System 5 which provide remote central alarm monitoring, data recording and graphs.

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

**GUARDIAN**  
Tel. +44 (0) 1270 760599  
Fax. +44 (0) 1270 766804  
Email: [Sales@guardian-controls.com](mailto:Sales@guardian-controls.com)  
[www.guardian-controls.com](http://www.guardian-controls.com)

# CONTENTS

<b>636</b> .....	<b>1</b>
Refrigeration Control Units for Display Cabinets & Coldstore Coolers .....	1
<b>GETTING STARTED</b> .....	<b>4</b>
<b>SKD.9 KEYSWITCH DISPLAY OPERATION</b> .....	<b>4</b>
<b>BUTTON OPERATION SHORTHAND</b> .....	<b>5</b>
<b>HARDWARE CONFIGURATION CHECKS</b> .....	<b>5</b>
<b>CONFIGURE UNIT MODEL, SYSTEM No &amp; ADDRESS</b> .....	<b>6</b>
Enter Passcode PP05 for normal changes .....	6
Select Unit Model .....	6
Select System No and Address .....	6
RS485 Communications .....	6
<b>UNIT MODELS</b> .....	<b>7</b>
<b>Available Unit Models for the 636</b> .....	<b>7</b>
<b>636 GENERAL SPECIFICATION</b> .....	<b>7</b>
636 Input/Output Signals.....	8
636 Termination Wiring .....	8
<b>OPERATION</b> .....	<b>9</b>
<b>CASE CLEANING OPERATION</b> .....	<b>9</b>
FANS ONLY .....	9
OFF for cleaning .....	9
AUTO control after cleaning.....	9
Temperature Displays .....	10
Alarm Indications.....	11
<b>USEFUL BUTTON SEQUENCES</b> .....	<b>13</b>
Check Unit Model.....	13
Select Stub, Case No and Address.....	13
Cut-in Setpoint for Liquid Valve.....	13
Case FANS only.....	13
Case OFF for Cleaning .....	14
Case AUTO Mode.....	14
Initiate DEFROST .....	14
<b>SETUP OPERATION</b> .....	<b>15</b>
<b>PP05 Menu</b> .....	<b>15</b>
<b>PP06 Menu</b> .....	<b>19</b>
<b>PP07 Menu</b> .....	<b>19</b>
<b>PP09 Menu</b> .....	<b>20</b>
<b>Lighting Set-up</b> .....	<b>23</b>
<b>PP11 Menu</b> .....	<b>24</b>
<b>Expansion Valve Setup</b> .....	<b>26</b>
<b>Dewpoint Control of Trim Heaters</b> .....	<b>28</b>
<b>Product Ratio</b> .....	<b>30</b>
<b>Alarm Unit</b> .....	<b>31</b>
<b>Control</b> .....	<b>32</b>
FIG.1 LIQUID VALVE CONTROL .....	32
FIG.2 DEFROST CYCLE VALVE CONTROL .....	32
<b>Defrost Control</b> .....	<b>33</b>
Hg-C - Hotgas Cycle .....	33
Hg-t - Hotgas Terminate.....	33
O-C Off-Cycle Defrost .....	34
Stor - Coldstore Defrost .....	34
<b>COMMUNICATIONS</b> .....	<b>35</b>

<b>SETUP / COMMISSIONING PARAMETERS .....</b>	<b>36</b>
PP05 Normal Menu Settings.....	36
PP05 Normal Menu Settings Continued .....	37
<b>PP06 Menu Settings .....</b>	<b>37</b>
PP07 Menu Settings .....	38
PP09 (level 2) Settings.....	38
PP11 (level 3) Settings.....	41
<b>QUICK SET-UP FOR 636 CONTROLLER LSOL.....</b>	<b>42</b>
Case with Liquid Line Solenoid and TEV .....	42
<b>QUICK SET-UP FOR 636 CONTROLLER AKV.....</b>	<b>44</b>
Case with Electronic Expansion Valve AKV .....	44
<b>636 RETURN TO DEFAULT &amp; RE-CALIBRATION .....</b>	<b>46</b>
Recalibration:-.....	46

# GETTING STARTED

Guardian Controllers provide refrigeration engineers with

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

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

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

- a) All GUARDIAN controllers need to be set up with a unit model selection and other basic settings for setpoints, timers and addresses. All these settings need to be done using the SKD.9 Keyswitch Display, so the understanding of the button operation of this unit is essential.
- b) The shorthand used in the following chapters for concisely expressing button pressing and selection sequences to do all this set-up needs to be understood.
- c) Mains power input voltage and hardware switch and link option selections (if any are required) must correspond to the selected unit model configuration.
- d) Since each controller can be configured in a number of different ways to perform flexible refrigeration control then an understanding of how to find out what unit model is currently selected, what it does and how it is connected, is also necessary.

## SKD.9 KEYSWITCH DISPLAY OPERATION

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

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

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



next raise lower enter keyswitch

SKD.9 buttons have the following functions when pressed: -

- **'next' button** displays next value or menu selection in sequence.
- ⤴ **'raise' button** raises a menu settings value or menu item selection.
- ⤵ **'lower' button** decreases a menu settings value or item selection.
- ⤴ **'accept' or 'enter' button** accepts any alarm and is used for entering a menu selection or settings value data entry

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

**The Keyswitch must be returned to the 9 o'clock position after every operation, and NOT left in the 12 o'clock position.**

## BUTTON OPERATION SHORTHAND

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

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

### EXAMPLES

      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

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

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

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

## HARDWARE CONFIGURATION CHECKS

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

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

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

## CONFIGURE UNIT MODEL, SYSTEM No & ADDRESS

### Enter Passcode PP05 for normal changes

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

Most normal system settings require entry of passcode PP05

⊙>>⊙ SEt ⊙ PP00 ⤴>>⤴ PP05 ⊙

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

### Select Unit Model

⊙>>⊙ SEt ⊙ PP00 ⤴>>⤴ PP05 ⊙

Enter Passcode PP05 as button sequence above

⊙>>⊙ Unit ⊙ 635 ⤴>>⤴ 515 ⊙ 515

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. 515) and then press 'enter' which causes the display to wink briefly and display the new unit model selection( e.g. 515)

### Select System No and Address

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

Enter Passcode as button sequence as above

⊙>>⊙ Unit ⊙  
 ⊙>>⊙ S001 ⤴>>⤴ S060 ⊙ S060  
 ⊙ E001 ⊙ E001  
 ⊙ 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 35

# UNIT MODELS

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

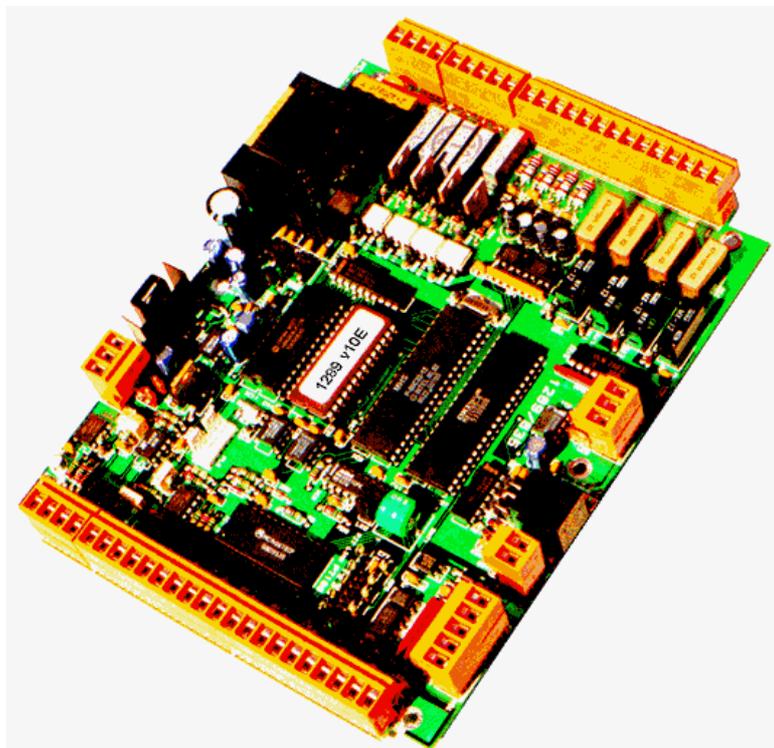
## Available Unit Models for the 636

**636 LSoL** Standard liquid line solenoid valve control.

**636 EEt** Electronic expansion valve using coil in and coil out temperatures.

## 636 GENERAL SPECIFICATION

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





# OPERATION

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

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

Case cleaning operation using the keyswitch.

Passcode protected set-up of controller setpoints, timers and limits.



next raise lower enter keyswitch

## CASE CLEANING OPERATION

### FANS ONLY

To switch from normal automatic control mode to FANS ONLY prior to case cleaning:-  
Insert security Key into the keyswitch on the display unit.

Ensure key turned anti-clockwise

Turn key clockwise.

FANS is now displayed and all control relays are switched off except for the fans relay.

Turn key anti-clockwise.

Remove key until required for OFF selection.

### OFF for cleaning

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

Insert security Key into the keyswitch on the display unit.

Ensure key turned anti-clockwise

Turn key clockwise.

The display unit now displays -OFF and all control relays are switched off.

Turn key anti-clockwise.

Remove key until required for Auto selection after cleaning is complete.

The case is now safe for cleaning.

### AUTO control after cleaning

To switch from -OFF mode to AUTO after case cleaning:-

Insert security Key into the keyswitch on the display unit.

Ensure key turned anti-clockwise

Turn key clockwise.

The display unit now displays the software version V1.0b followed by AUTO and then after a delay returns to the default temperature display.

Turn key anti-clockwise.

Remove key until required for the next case cleaning.

**The Keyswitch must be returned to the 9 o'clock position after every operation, and NOT left in the 12 o'clock position.**

**DISPLAY INDICATIONS****Temperature Displays**

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

Identity	Temperature on display
<b>CPCL</b>	Calculated product temperature (control if 'cpon')
<b>DEL</b>	Delivery air temperature
<b>REEL</b>	Return air (coldstore control)
<b>E11</b>	Evaporator inlet coil - 1
<b>E01</b>	Evaporator outlet coil - 1
<b>SH1</b>	Superheat

**dt** If coldstore selected then, Sh1 replaced by dt defrost termination on probe 5 or 1.

**EITHER**

<b>H09</b> <b>1148</b>	Store humidity%	A Humidity probe is fitted to this case on (TB9 ) for dewpoint control of trim heaters. PP09 PreS high value must be set to H 100
<b>SE09</b> <b>1178</b>	Store temperature C	A temperature probe must be fitted to this case (TB5-1&2) for dewpoint control of trim heaters.

**OR**

<b>H09C</b> <b>1148</b>	Store humidity%	This value is captured from the case with a humidity probe on same RS485 highway
<b>SE9c</b> <b>1178</b>	Store temperature °C	This value is captured from the case with a humidity probe on same RS485 highway

<b>DP</b> <b>1118</b>	Dewpoint °C calculated from Humidity and store temperature
<b>DC</b> <b>1140</b>	pulsing Duty cycle % of trim heater dependent on dewpoint

**EEL** **1177** If EEt selected - equivalent suction temperature dependant on gas type

Identity	Control relay outputs	
<b>L</b>	if Liquid control relay energised	- bar if not.
<b>d</b>	if Defrost relay energised	- bar if not.
<b>H</b>	if Hotgas/trim/pan Heater energised	- bar if not.
<b>F</b>	if Fan relay energised	- bar if not

**EEU** Electronic expansion valve state

<b>SRAE</b> <b>S</b>	Superheat alarm	- bar if not
<b>R</b>	Superheat defrost recovery	- bar if not
<b>A / H</b>	A - valve being modulated automatically	

		H - valve modulation held whilst control air temperature is satisfied or after restart or coil-in temperature is near the evaporating temperature. The last valve percent output is remembered
	☐	Expansion valve solenoid relay on
POSn		Valve position 0 - 100%
EEEn		Elapse time (Defrost mode only) where nn = minutes into defrost
SEEn		Go to Setup Mode when Enter pressed.

### Status Display

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

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

	-DEF	While defrost is in progress
	-Pd	From end of defrost cycle until discharge air temperature is within alarm band after defrost is complete
	-FAn	Selected for Fans Only prior to cleaning from local display or switch input
	-OFF	Selected OFF for cleaning from local display or switch input
PC	FAIL	RS485 communications to controller failure. Baud rate set at 9600 and PC is not communicating
	635	Unit model operation selected -displayed on power on
	8888	Display check after power on
	v1.7.H	Software version displayed after power on with software version with dewpoint control of trim heaters fitted.
	Auto	After power on or case OFF waiting for restart delay before opening liquid solenoid or AKV valve.

### Alarm Indications

Alarms alternately flash with selected temperature channel during Default and Normal operation. a, 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:

☐	fan 1	display A
☐	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:

☐☐☐☐	☐-☐☐	☐H☐☐	Hi if discharge air temperature is above the control setpoint plus alarm diff. for longer than the guardtime.
------	------	------	---

**DEL**    **-28**    **Lo**    Lo discharge air temperature is below the setpoint minus alarm differential for longer than the guardtime.

Return air not discharge air alarms are given for coldstores.  
 Temperature alarms are inhibited during defrost cycles and during case cleaning.  
 Guardtime count is reset each time the discharge air returns within limits.  
 Alarm states Hi, Lo are automatically reset when the discharge air returns within limits.

### *Probe Failure*

**DEL**    **OC**    **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 require 'nF' set-up)  
**Hum**    **OC**    **FAIL**    Humidity probe open circuit fault  
**Store**    **OC**    **FAIL**    Store temperature probe fault

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

### *Trim Heater Dewpoint Failures*

**Hum**    **OC**    **FAIL**    Humidity probe open circuit fault on master unit  
**Store**    **OC**    **FAIL**    Store temperature probe fault on master unit  
**HumC**    **nF**    **FAIL**    Slave unit cannot get a value for humidity due to probe fault, probe not available or RS485 communications failure with master unit  
**Store**    **nF**    **FAIL**    Slave unit cannot get a value for Store temperature due to probe fault, probe not available or RS485 communications failure with master unit  
**dP**    **nF**    **FAIL**    Slave unit cannot get a value for Dewpoint due to probe fault, probe not available or RS485 communications failure with master unit

### *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 25)  
 PC fail messages are also removed by selecting **ndad** or **nda** under unit settings.(see page 25)

## USEFUL BUTTON SEQUENCES

The following button sequences should prove useful during normal service operation

### Check Unit Model

●>>● **SEt**    ⏴    **PP00**    ⏶>>⏶    **PP05**    ⏴  
 ●>>● **UnT**    ⏴    **635**    This unit model is '635'  
 ●>>● **End**    ⏴    **-26**

### Select Stub, Case No and Address

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

●>>● **SEt**    ⏴    **PP00**    ⏶>>⏶    **PP05**    ⏴  
 ●>>● **Sn01**    ⏶>>⏶    **Sn60**    ⏴    **Sn60**  
 ●    **Ca01**    ⏴    **Ca01**  
 ●    **Ad01**    ⏶>>⏶    **A180**    ⏴    **A180**  
 ●>>● **End**    ⏴    **-26**

### Cut-in Setpoint for Liquid Valve

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

●>>● **SEt**    ⏴    **PP00**    ⏶>>⏶    **PP05**    ⏴  
 ●    **CRSE**    ⏴    ●    **2-11**    ⏶>>⏶    **2-17**    ⏴  
 ●>>● **End**    ⏴    The unit now controls to the new discharge air cut-in setpoint (-17).

### Case FANS only

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

●>>● **SEt**    ⏴    **PP00**    ⏶>>⏶    **PP05**    ⏴  
 ●    **CRSE**    ⏴    ●>>●    **FANS**    ⏴    **-FAn**

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

FANS mode may be selected remotely via RS485 communication command.

The case is switched OFF by selecting OFF mode.

The case is switched back on by selecting Auto mode.

See also Keyswitch Fans Only selection page 9

### Case OFF for Cleaning

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



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

OFF mode may be selected remotely via a switch input or a RS485 communication command.

The case is switched back on by selecting Auto mode.

See also Keyswitch Case OFF for cleaning selection page 9

### Case AUTO Mode

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



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

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

To prevent overloading the compressor on restart after a total power fail or compressor fault the controllers start sequentially. The restart delay is automatically calculated using the stub number of the case.

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

See also Keyswitch Case AUTO after cleaning selection page 9

### Initiate DEFROST

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



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 i.e. Off-Cycle, Hotgas Terminate, Hotgas Cycle, GdFr, or Coldstore.

DEF mode may be selected remotely via a RS485 communication command.

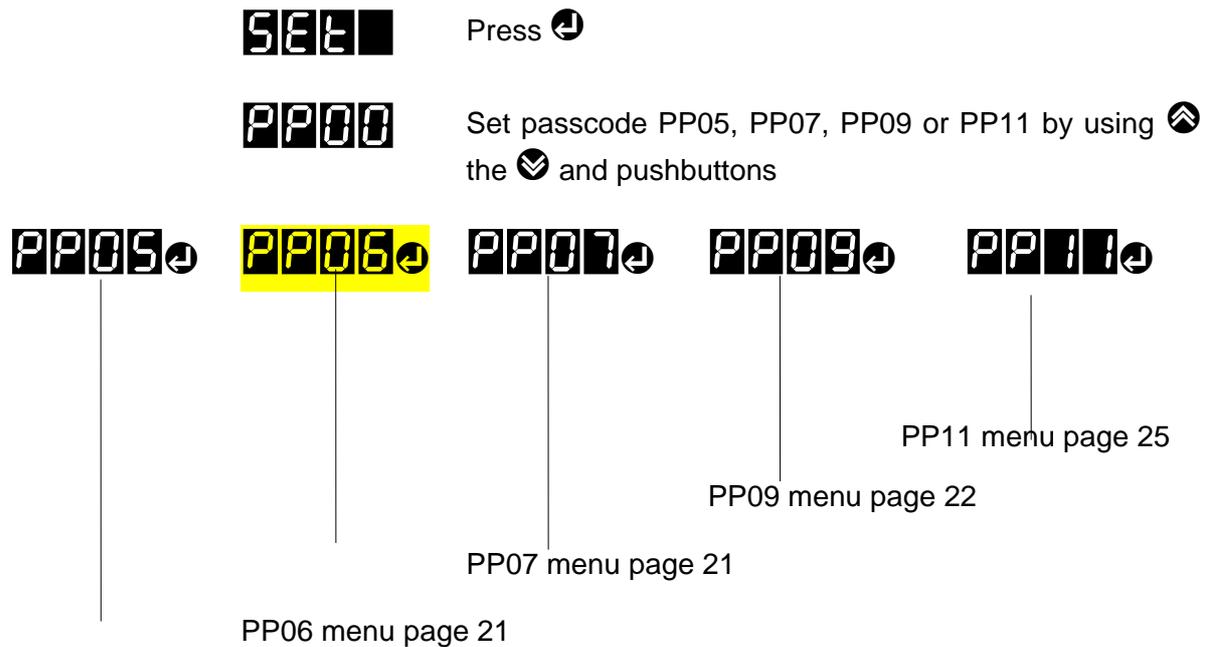
The defrost may be terminated (after draindown delay) by selecting Auto mode.

# SETUP OPERATION

Setup operation lasts for a maximum of 5 minutes after being activated by pressing  with SET on the display panel.

During set-up operation, alarms, temperature and defrost controls are inhibited.

If the correct passcode is not entered then set-up values may be displayed but any attempted changes are ignored.



## PP05 Menu

Press  to sequence through the Set-up selections

Press  to accept the settings

Case	<b>CASE</b>	Change control mode or cooling setpoint
Defrost	<b>DEFr</b>	Defrost type, times and settings
Unit	<b>Unit</b>	Stub and case identity
Test	<b>TEST</b>	Toggle output relays Faulty valve check.
End	<b>End</b>	Return to normal operation

**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

**l n n** nn = -40 to +40°C

Calculated Product  
Temperature

**y y y y** CPon/CPoF select if control on CPT or discharge

YYYY = CPon Control on CPT now on  
CPoF Control on CPT now oFF

i.e. normal control on discharge

The controller can be selected to control on Calculated Product Temperature (CPT) instead of discharge air for all defrost types except 'Stor' if 'CPon' is selected.

Coldstore always control on return air.

Mode selection

**y y y y**

yyyy = idEF Initiate defrost (only if in Auto) page 15  
FAnS Fans only prior to cleaning (not allowed for coldstore) page 14

OFF Select case OFF for cleaning page 10

Auto Return to Automatic control page 10

These selections only operate when keyswitch selection for OFF or FAnS are not present.

**DEFr**

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 T1  
HGt1 Hotgas terminate on probe T1

For all defrost selections except 'Stor' coldstore, the fans and trim heaters defrost state can be selected during defrost as follows:-

Fnon/FnoF Fans on/oFFduring defrost

tron/troF Trim Heaters on/OFF during defrost

Number of defrosts  
per day

**d n n** n = 0 to 6

First defrost time T1  
hours

**1 h n** n = 0 to 5 hrs

Delay 2nd defrost by  
n hours if dn=2

**d 2 d n** n = 0 to 9 hrs

First defrost time T1 minutes	<b>1t nn</b>	nn = 0 to 59 min
Defrost period	<b>dP nn</b>	nn = 0 to 60 min
Defrost termination temperature (not Off-Cycle cases)	<b>d nn</b>	nn = 0 to +40 °C
Defrost termination differential (for Hotgas Cycle cases only)	<b>dd nn</b>	nn = 1 to +10 °C

**U n i t**Press  to sequence through the Setup selectionsPress  or  to change the settingsPress  to accept the settings

Model type selection

**9999**

635

Control Type Selection

**9999**

635

YYYY = LSOL Liquid solenoid valve control

635

EET Electronic expansion valve control using coil-in and coil-out temperatures

635

EEP Electronic expansion valve control using suction pressure and coil-out temperatures

If EEP or EET then evaporating temperature is displayed:-

**E Value**, is the coil-in temperature at which 5°C above the AKV is allowed to resume automatic control after recovery from Defrost or Pulldown.The E Value is therefore **relative** to the Pack Evaporating Temperature, and should **not** be set at the **Actual** Evaporating Temperature.**E Value**,**E - nn**nn = -40 to 40°C, **Set to 10°C above the Plant Evaporating Temperature.**

E Value Differential, Fixed @ 5° when set to EET

**Only in EEP**

nn = 5 to 20°C

Adjustable in EEP

**Ed nn**

Pressure Transducer 20ma high range value

**P h nn**

nn = (1 to 24 bar gauge)

Pressure transducer 4 ma low range

**PL - n**

n = (-1, 5)

Gas type

**9999**

YYYY = r22 /NH3/404A

Gas type required for calculation of equivalent suction temperature from pressure input value is displayed as Ei1 coil-in temperature

Serial Display

**Sd9**

Y = 9 or 8 where:-

Sd9 is SKD9 serial display with keyswitch

Sd8 is SKD8 serial display

Stub number	<b>Snnn</b>	nn = 1 to 80
Case number (normally 3 max.)	<b>Cnnn</b>	n = 1 to 4
Woodley MkV address number	<b>Rnnn</b>	nnn = 1 to 255
Control Relay 3	<b>yyyy</b>	YYY = Htr Trim heater control Y = Hgas Pack hotgas valve control input Y = 3 Future use Y = Alarm unit (see page 24)
Invert Relay 3 Output	<b>yyyy</b>	YYY = Pos Relay 3 output Positive YYY = Neg Relay 3 output Negative (For use when Relay 3 set to <b>Hgas remote input signal</b> and trim heaters still required to be on during refrigeration, then set to <b>Neg</b> )
Product Ratio %	<b>Pnnn</b>	nn = 0 to 99 (see page 23)
Temperature Probe Type	<b>yyyy</b>	YYY = tP22 2.2 Kohm at 25C (standard) Y = tP20 2.0 Kohm at 25C Y = Pt PT1000 resistance thermometer
Digital Alarm Detection and Display	<b>yyyy</b>	YYY = ndad No digital alarm display Y = nda No digital alarms required Y = dad Digital alarms displayed

**TEST**Press  to sequence through the relay selectionsRepeatedly press  to switch the relays on and off

<b>10FF</b>	<b>1 on</b>	Relay R1
<b>20FF</b>	<b>2 on</b>	Relay R2
<b>30FF</b>	<b>3 on</b>	Relay R3
<b>40FF</b>	<b>4 on</b>	Relay R4
<b>50FF</b>	<b>5 on</b>	Relay SSR5

**End**All outputs return to automatic control when SETUP is ended  
Return from Setup to normal operation page 10

**PP06 Menu****PP06**Press  to sequence through the Setup selectionsPress  or  to change the settingsPress  to accept the settingsHumidity Transducer  
High range Setting**Hnnn**

nn = 0 to 100 %

**If no humidity sensor fitted to this unit then set to 0**

Normally set to zero

Humidity Transducer  
Low range Setting  
End**L 0****End**

Return to normal operation

**PP07 Menu**

Temperature number

**n-AL**

n = 1 to 9

Press  to select Temperature (1 to 9)Press  to display for selected temperature:-Alarm setpoint (SP)  
for temperature n**n-tt**

tt = -40 to 40°C

Change by  or  and then  
press 

Alarm type selection

**yyyy**

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

Guardtime

**gt nn**

nn = 0 to 90 mins

Alarm Differential

**Ad nn**

nn = 2 to 40 °C

Digital input d

**d-AL**

d = A to H

Press  to select digital input (A to H)Press  to display for selected input:-Digital alarm type  
selection**yyyy**

YYYY = on Goes into alarm if input ON after Gt  
 OFF Goes into alarm if input OFF after Gt  
 roFF Future reset facility  
 nonE Never goes into alarm

Guardtime for input d

**d nn**

nn = 0 to 90 mins

Change by  or  and then press 

## PP09 Menu

Press  to sequence through the Setup selections

Press  to accept the settings

Real time clock		Clock settings
System settings		Times and alarms
End		Return to normal operation



Press  to sequence through the Setup selections

Press  or  to change the settings

Press  to accept the settings

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

**545E**Press  to sequence through the Setup selectionsPress  or  to change the settingsPress  to accept the settings

Cooling differential for control	<b>cdnn</b>	nn = 0 to 5° C
Defrost pumpdown delay time	<b>Pt.n.n</b>	n.n = 0.0 to 9.9 min
Defrost draindown delay time	<b>dt.nn</b>	nn = 1 to 20 min
Bypass valve delay after draindown	<b>bt.n.n</b>	n.n = 0.0 to 9.9 min
Liquid delay after suction	<b>Lt.n.n</b>	n.n = 0.0 to 9.9 min
Defrost Fan delay time	<b>Ft.nn</b>	nn = 0 to 20 min
Time on for suction valve pulsing during bypass period	<b>tnn.n</b>	n.n = 0.0 to 9.9 min
Time off for suction valve pulsing during bypass period	<b>tFn.n</b>	n.n = 0.0 to 9.9 min
Dewpoint pulse % default setting	<b>tcnn</b>	nn = 0 to 100% Pulse % reverts to this value after any probe or communications failure
Dewpoint pulse % low setting	<b>tLnn</b>	nn = 0 to 100% Automatic dewpoint control will allow pulse % to go down to this value This is normally at 20% but if condensation is a problem then it can be raised to 50 ,60,70% Normally set to 10 minutes
Dewpoint control of trim heaters pulse time cycle	<b>tP 10</b>	
Control air temp. alarm Guardtime	<b>gt.nn</b>	nn = 0 to 99 min
Alarm differential control air	<b>Adnn</b>	nn = 2 to 40°C
Calculated defrost times - display only		
Defrost T1 time hours	<b>1hnn</b>	nn = 0 to 23 hrs
Defrost T1 time minutes	<b>1t.nn</b>	nn = 0 to 59 min
Defrost T2 time hours	<b>2hnn</b>	nn = 0 to 23 hrs

Defrost T2 time  
minutes            **2t nn**            nn = 0 to 59 min

**etc.**

Defrost T6 time  
hours            **6h nn**            nn = 0 to 23 hrs

Defrost T6 time  
minutes            **6t nn**            nn = 0 to 59 min

## Lighting Set-up

ECLE

Press  to sequence through the Setup selections

Press  or  to change the settings

Press  to accept the settings

1Hnn

Sunday time on Hours  
nn = 00 to 23

1nnn

Sunday time on minutes  
nn = 00 to 59

1hnn

Sunday time off hours  
nn = 00 to 23

1Fnn

Sunday time off minutes  
nn = 00 to 59

2Hnn

Monday time on hours  
nn = 00 to 23

2nnn

Monday time on minutes  
nn = 00 to 59

2hnn

Monday time off hours  
nn = 00 to 23

2Fnn

Monday time off minutes  
nn = 00 to 59

etc. to

7Hnn

Saturday time on hours  
nn = 00 to 23

7nnn

Saturday time on minutes  
nn = 00 to 59

7hnn

Saturday time off hours  
nn = 00 to 23

7Fnn

Saturday time off minutes  
nn = 00 to 59

### Note

For lights permanently **ON**, Set the ON and OFF times to the same time,  
(EXCEPT 00Hrs & 00Mins) each day.

2H07 2n30 2h07 2F30

For lights permanently **OFF**, Set the ON and OFF times to the same times of  
00Hrs & 00Mins, each day.

2H00 2n00 2h00 2F00

End

End

Return to normal operation  
Page 11

## PP11 Menu

Press  to sequence through the following PP11 menu selections:-

Press  to select the displayed menu

Port	<b>Port</b>	Serial communications port
Loop	<b>LOOP</b>	Control PID Loop Parameters
End	<b>End</b>	Return to normal operation

**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 Baud rate  
nonE Removes PC FAIL if no PC present

Electronic Expansion  
Valve Parameters

**YYYY**

YYYY = F-EE Returns all parameters to default values below.  
F-EE RETURNS TO DEFAULTS

C-EE Allows values to be changed during  
commissioning.

Superheat High.  
Maximum superheat

**SHnn**

nn = 0 to 99°C

Superheat Low.  
Minimum superheat

**SLn.n**

n.n = 0.0 to 9.9°C

Superheat Alarm  
Limit at which  
superheat recovery is  
actioned

**SAnn**

nn = 0 to 99°C

Stable Band.

**Sbn.n**

nn = 0.0 to 9.9°C  
Taken +/- about current superheat setpoint.  
Oscillations of superheat outside Sb cause  
increase in superheat towards SH. If superheat  
remains within Sb then superheat is reduced  
towards SL.( 0 = function not active)

Stable band Delay  
time

**Sdnn**

nn = 0 to 99 mins  
Time after which Sb setpoint change is applied

Defrost Recovery  
Valve position

**drnn**

nn = 0 to 99%

Starting Output

**Soann**

nn = 0 to 99%  
Valve position after power restart or thermostatic

Superheat Alarm Time OFF	<b>tfn n</b>	cycle of AKV10 nn = 0 to 15 min Valve is shut for this time after superheat alarm before attempting recovery procedure
Superheat Alarm Time ON	<b>tn n n</b>	nn = 0 to 15 min Valve is open for this time after superheat alarm and TF time above whilst attempting recovery procedure

**LOOP**Press  to sequence through the Setup selectionsPress  or  to change the settingsPress  to accept the settings

Change Settings	<b>yyyy</b>	Factory / Commissioning change Settings YYYY = F-LP Returns all parameters to default values below. F-LP RETURNS TO DEFAULTS C-LP Allows values to be changed during commissioning.
Proportional Gain	<b>p . n . n</b>	n.n = 0 to 9.9
Integral Gain	<b>i . n . n n</b>	n.nn = 0.00 to 0.99
Differential Gain	<b>d . n . n</b>	n.n = 0.0 to 9.9
Bleed position	<b>bl n n</b>	nn = 0 to 99% Sets minimum valve position
Ramp rate	<b>r . n . n</b>	n.n = 0.0 to 9.9°C Sets rate of change of superheat from SH to SL
Integral Time	<b>i t n n</b>	nn = 0 to 99 mins Delayed time for loop integral action
Loop Period	<b>p d n n</b>	nn = 0 to 99 secs
Coil Time	<b>ct n n</b>	nn = 0 to 99 mins Time delay to establish coil-in/coil-out temperatures before control action starts
Ramp Time	<b>rt n n</b>	nn = 0 to 99 secs Time at which ramp rate, r, is applied
End	<b>End</b>	Return to normal operation Page 10

## Expansion Valve Setup

For coil temperature control 'EEt' the only parameter that requires setup is the 'E' term Value. **Set the E value to 10°C above the Plant Evaporating Temperature.**

This is the coil-in temperature at which 5°C above the AKV is allowed to resume automatic control, after recovery from Defrost or Pulldown.

The E Value is therefore **relative** to the Pack Evaporating Temperature, but should **not** be set at the **Actual** Evaporating Temperature

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

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

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

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

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

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

### Terminology

Under the **000E** heading in **PP05** the relevant settings are:-

**E000** Electronic Expansion Valve auto control starting point, **Set the E value to 10°C above the Plant Evaporating Temperature.**

**E000** Evaporating temperature differential (the temperature above system setpoint at which protective measures are taken).EEt is fixed at 5°C and will switch to superheat recovery mode where the valve will close for **E0** time then open for **E0** time to **S0** value and maintains this cycle until **E0** is restored to normal and superheat is stabilised.

Under EEP **E0** is adjustable between 5 and 20°C with a default of 10°C. If the set value is exceeded the valve will close until **E0** is within limits again and will then go straight back into auto control.

Under the **000E** heading in **PP11** the relevant settings are:-

**EEU** Electronic expansion valve parameters which allows access to all control settings for the valve. The default setting is **FEF** or factory settings which will be sufficient for most applications. **CFEE** can be selected which will allow the user to tailor the control to a specific application.

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

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

**SA** Superheat alarm (low) limit closes valve for **EF** period.

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

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

**DR** Defrost recovery valve position. This is the % valve opening held for time **CE**.

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

**EF** Superheat alarm time off. This is the time duration the valve is closed at the onset of a superheat alarm.

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

Under **LOOP** heading in **PPU** 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.

## Dewpoint Control of Trim Heaters

Using store dewpoint to control the energy used by the frozen food case trim heaters results in energy savings of up to 60%. The G636 controller may be set up to automatically control Trim heater energy on store dew point as follows:-

### Master Controller for Dewpoint control on RS485 highway

- i) To check the 636 has dewpoint control capability press lower button which should display software version **01.00.H** or later issues.
- ii) Provided that temperature probe input TB5 1&2 is not already in use for defrost termination, select any 636 controller as a master for dewpoint control. If TB5 1& 2 are in use, find another 636 that does not use them. Model 205 or 515 controllers cannot be selected as master - find a 636 or 1289 controller
- iii) Check whether Temperature Probe type is selected for **0222** ( Thermistor 2K2) or **024** (Pt1000 probe). See PP05 menu Unit page 17
- iv) Fit 4-20ma humidity probe to TB9 and store temperature probe to TB5 1&2. If probe type is tP22 then ensure correct thermistor humidity probe is fitted.
- v) Select **000** and enter **0000** and press next.
- vi) press enter on **000** and raise **H** value to **0100** and press enter. **0100** setting makes this controller a master with humidity
- vii) press next and raise **L** value to **0000** and press enter.
- viii) Press next until **000**

The master unit is now setup for measuring humidity and temperature which will be picked up by all other 636 controllers on the same RS485 highway if the network is OK.

### The following Trim Heater Master control values should be displayed:-

- ix) On default display of master 636, press next until **000** is displayed with its humidity value eg **0040** . The value should normally be between 40% and 60%.
- x) If it says **00** **0000** instead then check probe and connections press next until **0000** is displayed with its temperature value eg. **0010** . The value should normally be between 18C and 30C. If it says **00** **0000** instead then check probe and connections
- xi) press next until **000** dewpoint is displayed - it should be 8C to 15C. If it says **00** **0000** instead of value then check both probes and connections
- xii) press next until **000** pulse ratio % is displayed - it should be 40% to 100%. Immediately after power up this value remains at 70% for 10 minutes.

### The following default Trim Heater control settings may be displayed if required:-

- xiii) Select **000** and enter **0000** and next.
- xiv) press enter on **0000** and press next until **0000** is displayed.( 70% pulse as default)
- xv) press next ; **0020** minimum control pulse% value is normally 20%. Press enter.
- xvi) press next ; **0010** pulse% period value is normally 10 minutes. Press enter.
- xvii) Press next until **000**

**All other 636 units for Dewpoint trim heater control on same RS485 highway**

- i) To check the 636 has dewpoint control capability press lower button which should display software version **01.7.11** or later issues.
- ii) No humidity or temperature probes are required for these cases. The store dew point is calculated from the humidity and store temperature from the master controller.
- iii) Select **555** and enter **0000** and press enter followed by next.
- iv) press enter on **0000** and lower **0** value to **0000** and press enter. This ensures that the 636 looks for humidity and temperature on the RS485 highway.
- v) Press next until **END**

**The following Trim Heater control values should be displayed:-**

- vi) On default display, press next until **0000** is displayed with its humidity % value eg. **0040**. The value should normally be between 40% and 60%.  
If it says **00 FAIL** then check master probe and RS485 comms connections
- vii) Press next until **555** is displayed with its temperature value eg. **0010**. the value should normally be between 18C and 30C.  
If it says **00 FAIL** then check master probe and RS485 comms connections
- viii) press next until **000** dewpoint is displayed - it should be 8C to 15C  
If it says **00 FAIL** then check master probe and RS485 comms connections
- ix) press next until **000** pulse ratio % is displayed - it should be 40% to 100%

**After a Trim Heater software upgrade or fitting a replacement controller the following additional checks should be made:-**

- i) check Real Time Clock on each controller still has correct time (see page 20 )
- ii) Check Woodley 5 or other alarm panel still displays all case temperatures and RS485 communications are OK.

## Product Ratio

636 controller does not have fitted links.

If probe 1 (case) has no probe wired to it then ' nF ' (not fitted) is set-up under PP07 1-AL (HI/lo/HiLo/None/ nF ) then the default temperature value displayed and logged for probe 1 is the PR% ratio of the discharge and return air.

Pr 00

If PR% = 0 then the return air value is displayed  
(Use for Coldstore)

Pr 99

If PR% = 99 then the discharge air value is displayed

Pr 50

If PR% = 50 then the mean of discharge and return air value is displayed

The Product Ratio PR = 88% is set-up as follows using passcode 5 under UNIT selection provided PPO7 1-AL has been set to 'nf'.

⊙»⊙	SETE	⬇	PP00	⬆»⬆	PP05	⬇
⊙»⊙	UNTE	⬇				
⊙»⊙	PR00	⬆»⬆	PR88	⬇	PR88	

If PPO7 1-AL is **not** set to 'nf' then case displays ' oc ' and the PR% menu is not displayed.

If **Stor** with probe 1 used for defrost termination, if display readout is probe 1 temp then PPO7 1-AL has **not** been set to 'nf'.

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

## Alarm Unit

The 635/515 may be configured as a supermarket central alarm indicator and teledialler unit for systems using the GUARDIAN M Autograph Terminal.

### Alarm Monitor settings

When 635 control is selected these settings are automatically returned to the appropriate control limits.

When used as an alarm monitor, the temperature alarm setpoints and contact alarms may be setup as follows: -

The required **Unit** settings are: -

**5280**

Stub number = 80

**001**

Case number = 1

**A249**

Unit address = 249

**ALC.**

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

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

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

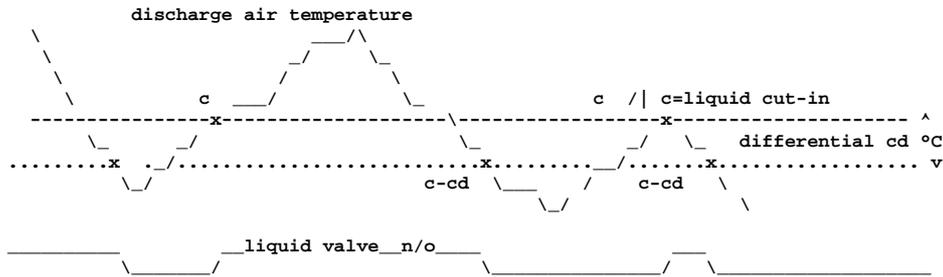
Any new alarms cause the cycle to be repeated with a contact closure for the teledialler and a flashing alarm lamp and beacon.

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

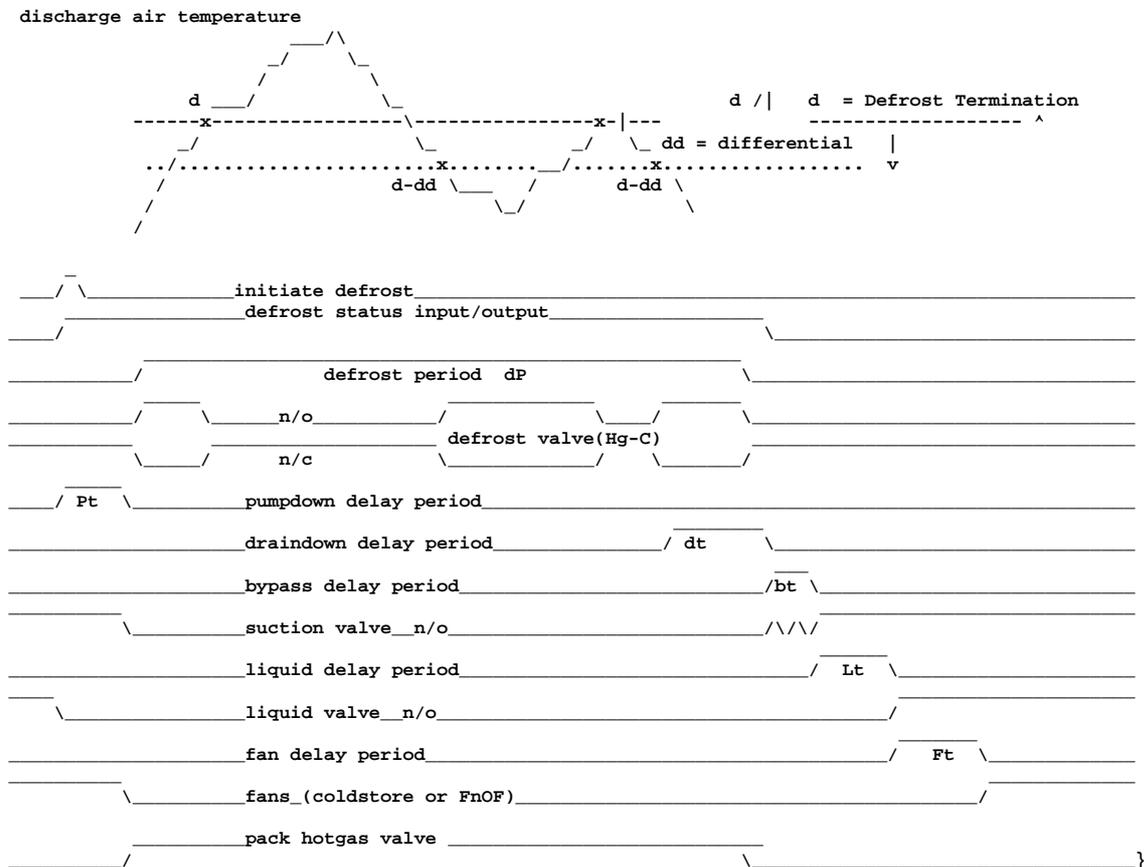
The correct unit address 249 must be set-up for stub 80 on the Autograph Terminal to make the system function correctly.

# Control

**FIG.1 LIQUID VALVE CONTROL**



**FIG.2 DEFROST CYCLE VALVE CONTROL**



## Defrost Control

### Hg-C - Hotgas Cycle

```

request ____/\_____
**** PACK ****
Hotgas valve____/____hot gas_____\_____shut_____
Suction valve\_____shut_____/_open_____
bypass valve_____/_open_____
**** CASE ****
FANS-1,2,3_____run_____
Trim Heaters_____on_____
LV_____shut_____/_open_____
HGV1__shut__/_open_\_____\_____\_____\_____\_____
draindown_____defrost time-1...../ dt \_____
liquid delay_____/_ Lt \_____

```

### Hg-t - Hotgas Terminate

```

request ____/\_____
defrost status_____defrost any case in stub_____
input/output____/_stub done_____
PACK
Hotgas valve____/____hot gas_____\_____coolant_____
Suction valve\_____shut_____/_open_____
bypass valve_____open_____/______
FANS-1,2 \ .....stop ( if FnOF)...../
Trim Heaters \.....off.( if trOF)...../
LV1_____shut_____/_open_____
HGV1__shut__/_open_\_____\_____\_____
draindown_____defrost time-1.....
terminate case 1 .....x
draindown delay 1_____/_dt 1 \_____
liquid delay 1_____/_ Lt1 \_____
LV2_____shut_____/_open_____
HGV2__shut__/_open_\_____\_____\_____
draindown_____defrost time-2.....
terminate case 2 .....x
draindown delay 2_____/_ dt2 \_____
liquid delay 2_____/_ Lt2 \_____

```

## O-C Off-Cycle Defrost

```

request ____/\_____

PACK
3-way valve - not used
                    run
FANS 1,2
LV1 _____/_____ open
                    \ shut
HGV1 __ not used
                    ..... defrost time-1.....
Liquid delay 1 _____/ Lt1 \_____

LV2 _____/_____ shut
HGV2 __ not used
                    ..... defrost time-2....
Liquid delay2 _____/Lt2 \_____

```

## Stor - Coldstore Defrost

(Similar to Hotgas terminate HG-T except FANS are switched off)

Coldstores control the liquid valve on the return air probe and NOT on discharge probe.

Coldstores terminate defrost on probe 1 and NOT on discharge probe.

Coldstore door input is monitored by **volt-free** contact TB7

Door closed = contact open

Door open = contact closed

Coldstores fans are switched off until fan delay is complete

```

request ____/\_____

LIQUID _____/_____ on
                    \ off
                    On
DEFROST_off _____/_____
                    ..... defrost time-1.....
Pan Heater _____/_____ on
                    \ off
pumpdown ____/ Pt \_____

terminate on probe 1
draindown delay _____/ dt \_____
bypass delay _____/ bt \_____
Liquid delay _____/ Lt \_____
fan start delay _____/ Ft \_____
FANS-1 _____/_____ run
                    \ stop

```

(Probe 1 **MUST** be set as not fitted "nF" in PP07 1-AL)

# COMMUNICATIONS

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

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

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

UU is stub no. 1-80

u is case / 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 Consultant Communication commands available are: -

- a) Transmit Unit Status            which replies with command plus stub status & case temperature
- b) Transmit Values                which replies with stub address plus latest signed temperature values, time, trip states, relay states and internal status
- c) Transmit Setpoints            which replies with setpoints and limits.  
System Sn and unit Addresses Axxx may not be changed via the RS485 serial link
- d) Receive setpoints with new setpoint values
- e) Receive Time and Date with new hours and minutes, day, month and year for real time clock
- f) Initiate/Terminate a hot gas or off-cycle defrost
- g) ON auto / FANS only / case OFF selection for case cleaning

# Setup / Commissioning Parameters

## PP05 Normal Menu Settings

	unit	ACTUAL settings	Default setting	Min. setting	Max. setting
<b>CASE</b> Control probe CpoF=control on air off Cpon=control on product ratio(see unit menu) (not available on stor defrost)			CpoF	CpoF	
Cut-in setpoint for Liquid valve	°C	<b>c</b>	c-25	c-40	c 40
Mode Selection idEF FanS OFF Auto			Auto		

<b>DEF</b> Defrost type Hgt1 O-C Hg-C Hg-t Stor					
Number of defrosts per day		<b>dn</b>	dn 4	dn00	dn06
First defrost time T1 hours	hrs	<b>1h</b>	1h01	1h00	1h05
Delay 2 <sup>nd</sup> defrost by n hours if dn=2	hrs	<b>d2d</b>	d2d0	d2d0	d2d9
First defrost time T1 minutes	mins	<b>lt</b>	lt30	lt00	lt59
Defrost period	mins	<b>dP</b>	dP15	dP02	dP60
Defrost term temp (not Off-Cycle cases)	°C	<b>d</b>	d 15	d 00	d 40
Defrost term differential (Hotgas-Cycle only)	°C	<b>dd</b>	dd01	dd01	dd10
Fans on/off during defrost Fnon/FnoF		<b>Fn</b>	Fnon	FnoF	
Trim heaters on/off during defrost		<b>tr</b>	tron	troF	

## PP05 Normal Menu Settings Continued

	unit	ACTUAL settings	Default setting	Min. setting	Max. setting
<b>0000E</b> Model type selection 635 1085 1088 1080 975 1297 1289					
Control type selection LSoL EEt EEP					
<b>See Note E Value Page 18</b> <b>AKV auto control starting point (Coil-in)</b> <b>Set the E value to 10°C above the Plant Evaporating Temperature.</b>	°C	<b>E</b>	E -10	E -40	E 40
E Value differential only adjustable in EEP, Fixed at 5° when in EET	°C	<b>Ed</b>	Ed10	Ed05	Ed20
Pressure Transducer 20ma high range	bar.	<b>P</b>	P24	-1	50
Pressure Transducer 4 ma low range	bar.	<b>P</b>	P-1	-1	50
Gas type 404a r22 nh3 (Only in EET)			404a		
Serial display type		<b>Sd</b>	Sd9	Sd8	Sd9
Stub number		<b>Sn</b>	Sn01	Sn 0	S255
Case number (normally 3 max.)		<b>Cn</b>	Cn1	Cn 0	Cn 4
Woodley MkV address number		<b>A</b>	A3	A 0	A255
Control relay 3 <b>Htr HgAS</b>			Htr		
Invert Relay 3 Output ( Hgas input )			Pos	Pos	neg
Input E Terminal 11, <b>Htrf</b> heater fail input or <b>rdEF</b> remote defrost signal input			HtrF	Htrf	rdEF
Product ratio %		<b>Pr</b>	Pr50	Pr00	Pr99
Temperature probe type			Pt	tP20	tP22
Digital alarm detection and display			ndAd	ndAd	dAd

## PP06 Menu Settings

	unit	ACTUAL settings	Default setting	Min. setting	Max. setting
<b>0000S</b> Humidity probe High range	%		24	0	100
Humidity probe Low range	%		-1	-1	50

**PP07 Menu Settings**

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

**PP09 (level 2) Settings**

unit	ACTUAL	Default	Min.	Max.
------	--------	---------	------	------

		settings	setting	setting	setting
<b>rtc</b>	Real clock time hours	hrs	<b>rh</b>		rh00 rh23
	Real clock time minutes	mins	<b>rt</b>		rt00 rt59
	Weekday	day			Sun SA
	Day of Month	no.	<b>dn</b>		1 31
<b>sys</b>	Cooling differential for control Cut-Out (0 = 1°C)	°C	<b>cd</b>	cd 0	cd 0 cd 5
	Defrost pumpdown delay time	min	<b>Pt</b>	Pt1.0	Pt0.0 Pt9.9
	Defrost draindown delay time	min	<b>dt</b>	dt 01	dt 00 dt 10
	Bypass valve delay after draindown	min	<b>bt</b>	bt 0.2	bt 0.0 bt 9.9
	Liquid delay after suction	min	<b>Lt</b>	Lt1.0	Lt0.0 Lt9.9
	Defrost Fan delay time	min	<b>Ft</b>	Ft02	Ft00 Ft10
	Time on for suction valve pulsing during bypass period	min	<b>tn</b>	tn0.1	tn0.0 tn9.9
	Time off for suction valve pulsing during bypass period	min	<b>tF</b>	tF0.1	tF0.0 tF9.9
	Trim Heater pulse % default control setting after probe or comms fail	%	<b>tc</b>	tc70	tc20 Tc99
	Trim Heater pulse % minimum allowable control level setting	%	<b>tL</b>	tc20	tc20 Tc99
	Trim Heater control pulse% period	min	<b>tP</b>	tP10	TP10 Tp30
	Control air temp. alarm Guardtime	min	<b>gt</b>	gt45	gt00 gt99
	Alarm differential control air	°C	<b>Ad</b>	Ad05	Ad02 Ad40
	Defrost T1 time hours				
	Defrost T1 time minutes				
	Defrost T2 time hours				
	Defrost T2 time minutes				
	Defrost T3 time hours				
	Defrost T3 time minutes				
	Defrost T4 time hours				
	Defrost T4 time minutes				
	Defrost T5 time hours				
	Defrost T5 time minutes				
	Defrost T6 time hours				
	Defrost T6 time minutes				

<b>eti</b>	Sunday Time On Hours		<b>1H</b>	9	0	23
	Sunday Time On Minutes		<b>1n</b>	30	0	59
	Sunday Time Off Hours (1 <sup>st</sup> Off time)		<b>1h</b>	16	0	23

Sunday Time Off Mins (1 <sup>st</sup> Off time)		<b>1F</b>	30	0	59
Monday Time On Hours		<b>2H</b>	7	0	23
Monday Time On Minutes		<b>2n</b>	30	0	59
Monday Time Off Hours		<b>2h</b>	22	0	23
Monday Time Off Minutes		<b>2F</b>	30	0	59
Tuesday Time On Hours		<b>3H</b>	7	0	23
Tuesday Time On Minutes		<b>3n</b>	30	0	59
Tuesday Time Off Hours		<b>3h</b>	22	0	23
Tuesday Time Off Minutes		<b>3F</b>	30	0	59
Wednesday Time On Hours		<b>4H</b>	7	0	23
Wednesday Time On Minutes		<b>4n</b>	30	0	59
Wednesday Time Off Hours		<b>4h</b>	22	0	23
Wednesday Time Off Minutes		<b>4F</b>	30	0	59
Thursday Time On Hours		<b>5H</b>	7	0	23
Thursday Time On Minutes		<b>5n</b>	30	0	59
Thursday Time Off Hours		<b>5h</b>	22	0	23
Thursday Time Off Minutes		<b>5F</b>	30	0	59
Friday Time On Hours		<b>6H</b>	7	0	23
Friday Time On Minutes		<b>6n</b>	30	0	59
Friday Time Off Hours		<b>6h</b>	22	0	23
Friday Time Off Minutes		<b>6F</b>	30	0	59
Saturday Time On Hours		<b>7H</b>	7	0	23
Saturday Time On Minutes		<b>7n</b>	00	0	59
Saturday Time Off Hours		<b>7h</b>	22	0	23
Saturday Time Off Minutes		<b>7F</b>	30	0	59

**Note**

For lights permanently **ON**, Set the ON and OFF times to the same time, (EXCEPT 00Hrs & 00Mins) each day.

**2407 2430 2407 2430**

For lights permanently **OFF**, Set the ON and OFF times to the same times of 00Hrs & 00Mins, each day.

**2400 2400 2400 2400**

N.B. Set To 0Hrs/0Mins If NOT USED

Sunday Time Off Hours (2 <sup>nd</sup> Off time)		<b>8h</b>	0	0	23
Sunday Time Off Mins (2 <sup>nd</sup> Off time)		<b>8F</b>	0	0	59

## PP11 (level 3) Settings

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

# Quick Set-up for 636 Controller LSOL

## Case with Liquid Line Solenoid and TEV

**PAOS**

**CASE**

Set **0P0F** Control on Air Off probe (Delivery)

Or

Set **0P00** Control on ratio of Air Off & Air On probes (Delivery & Return)

Set **0-25** to temperature Control Set-point

**DEFR**

Set defrost type

**49-E** = defrost terminated by Air Off probe

Or

**49E1** = defrost terminated by probe 1 (**For use when fans set to OFF during defrost**)

Or

**5E0F** = Coldstore (fans off during defrost) defrost terminated by probe 1

**dn04** Set number of defrosts required per day

**1600** Set time **Hour** of first defrost

**1E00** Set time **Mins** of first defrost

**2P30** Set time **duration** of defrost

**2 10** Set temperature **Termination** of defrost

**F000** Set **Fans On** during defrost

Or

**Fn0F** Set **Fans Off** during defrost (**Terminate on probe 1**)

**TrOn** Set **Trim Heaters On** during defrost

Or

**TrOff** Set **Trim Heaters Off** during defrost

**Unite**

**E35** Set **Controller Type**

**LSol** Set for **Liquid Line Solenoid**

**Sn01** Set for **System Number**

**Cn01** Set for **Case Number**

**A01** Set for **Address Number**

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

Or

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

**End**

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

**For all other configurations consult the main manual.**

# Quick Set-up for 636 Controller AKV

## Case with Electronic Expansion Valve AKV

**PA05**

**CASE**

Set **CP05** Control on Air Off probe (Delivery)

Or

Set **CP00** Control on ratio of Air Off & Air On probes (Delivery & Return)

Set **C-25** to temperature Control Set-point

**DEFR**

Set defrost type

**H9-E** = defrost terminated by air off probe

Or

**H9E1** = defrost terminated by probe 1 (**For use when fans set to OFF during defrost**)

Or

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

**dn04** Set number of defrosts required per day

**1400** Set time **Hour** of first defrost

**1E00** Set time **Mins** of first defrost

**dP30** Set time **duration** of defrost

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

**FnOn** Set **Fans On** during defrost

Or

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

**TrOn** Set **Trim Heaters On** during defrost

Or

**TrOff** Set **Trim Heaters Off** during defrost

**Unite**

**E35** Set **Controller Type**

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

**E-10** Set value of **E**

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

**Sn01** Set for **System Number**

**Cn01** Set for **Case Number**

**Ad01** Set for **Address Number**

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

Or

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

**End**

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

**For all other configurations consult the main manual**

## 636 Return to Default & Re-calibration

Return to Default ( DO NOT ACTIVATE PP02 without first being in possession of a set of 5 Precision, 0.1%, 1000Ohm Resistors, as a re-calibration must be carried out after this command )

N.B. All Settings are lost after accepting PP02.

Prior to this command, please note the relevant Controller setpoints, such as the Control setpoint, address, defrost type, time, duration, & termination temp, etc.

	Press  to enter setup	SEt
	Press  to enter program pages	PP00
	Press  to PP02	PP02
PP02	Press  to accept the settings	PP02
	Press  to Next to SurE	SurE
	Press  to accept the settings	SurE
<b>The Controller is now locked and requires a Power Reset.</b>		

### Recalibration:-

Remove All Case Probes and insert 5x Precision 1000 Ohm Resistors

Note although the controller has defaulted to PT probes, if the actual probes are TP22 then before proceeding further, the 5 links, located immediately adjacent the probes, must be re-fitted to the board.

**Now note the temperature display readings.**

If the calibration is correct All Probes should read 0°C.

**If readings are not 0°C then Recalibrate as below.**

	Press  to enter setup	SEt
	Press  to enter program pages	PP00
	Press  to PP29	PP29
PP29	Press  to accept the settings	PP29
	Press  to Next to rEF	rEF
	Press  to accept the settings	0014
	<b>Adjust this Number up or down respective to the display error</b>	0010
	Press  to accept the settings	
	Press  to Next to End	End
	<b>( Caution DO NOT adjust any settings in SPAN or PTC )</b>	
End	Press  to accept	SEt
	Press  to Next to View Actual Temperatures are now reading 0°C	0000

## Index

636 Input/Output Signals.....	8	LOOP.....	26
636 Return to Default & Re-calibration...	46	Port .....	25
636 Termination Wiring .....	8	PP11 Menu.....	25
Alarm Indications.....	11	Probe Fails .....	12
Alarm Unit.....	31	Product ratio .....	18
AUTO control after cleaning.....	9	Product Ratio.....	30
Available Unit Models for the 636.....	7	Quick Set-up for 636 Controller AKV .....	44
<b>Blown Fuse Alarms</b> .....	11	Quick Set-up for 636 Controller LSOL....	42
BUTTON OPERATION SHORTHAND.....	5	Recalibration:- .....	46
Case AUTO Mode .....	14	RS485 .....	12
CASE CLEANING OPERATION .....	9	RS485 Communications.....	6
Case FANS only.....	13	Select Stub, Case No and Address.....	13
Case OFF for Cleaning .....	14	Select System No and Address.....	6
Check Unit Model.....	13	Select Unit Model .....	6
COMMUNICATIONS.....	35	setup.....	12
CONFIGURE UNIT MODEL, SYSTEM No & ADDRESS.....	6	SETUP OPERATION .....	15
Control.....	32	SKD.9 KEYSWITCH DISPLAY OPERATION.....	4
Control Air alarms (return air if coldstore) .....	12	Status Display .....	11
Cut-in Setpoint for Liquid Valve.....	13	Stor - Coldstore Defrost.....	34
DEFROST CONTROLS .....	33	Temperature Displays .....	10
DEFROST CYCLE VALVE CONTROL .....	32	UNIT MODELS.....	7
DISPLAY INDICATIONS .....	10	USEFUL BUTTON SEQUENCES.....	13
Enter Passcode PP05 .....	6		
Expansion Valve Setup .....	27, 29		
FANS ONLY .....	9		
GENERAL SPECIFICATION.....	7		
GETTING STARTED.....	4		
HARDWARE CONFIGURATION CHECKS .....	5		
Hg-C - Hotgas Cycle .....	33		
Hg-t - Hotgas Terminate.....	33		
Initiate DEFROST.....	14		
LIGHTING SETUP .....	24		
LIQUID VALVE CONTROL .....	32		
O-C Off-Cycle Defrost .....	34		
OFF for cleaning.....	9		
OPERATION .....	9		
PC FAIL.....	12		
PP05 CASE .....	16		
dEfr.....	16		
Test.....	18		
Unit .....	17		
PP05 Menu.....	15		
PP07 Menu.....	20		
PP09 rtc.....	21		
SYSt.....	22		
tcL1 .....	24		
PP09 Menu.....	21		
PP11			



Tel. +44 (0) 1270 760599  
Fax. +44 (0) 1270 766804  
Email: [Sales@guardian-controls.com](mailto:Sales@guardian-controls.com)  
[www.guardian-controls.com](http://www.guardian-controls.com)