GUARDIAN CONTROLS
international

GUARDIAN

ITC-975

Intelligent Temperature Controller

for supermarket cases and coldstores

* **discharge-air temperature alarm monitor**
* **blown-fuse trip alarm monitor**
* **refrigeration temperature monitor & display**
* **liquid valve and defrost cycle control**
* **hotgas, bypass and suction valve control**
* **local panel display and setup**
* **remote panel mode selection**
* **real time calendar clock**
* **remote communications to Woodley Mk V**

* **9 temperatures**
* **3 mode inputs**
* **1 defrost input or trim heater trip**
* **3 fan-fuse trips**
* **4 control relays**
* **1 defrost mode output**

issue H 1/3/92
mtm

CONTENTS

OVERVIEW

The ITC-975 Intelligent Temperature Controller is a mains-powered, refrigeration case/coldstore temperature controller which provides setup and display facilities at the case and communicates with a Guardian RM256 Refrigeration Monitor or Woodley system 5 monitor.

The system comprises a) control unit,
b) display panel
c) nine 5 metre thermistor probes

The Controller provides facilities for:-

a) Measurement of upto 9 refrigeration temperatures including:- case, discharge air, return air and 6 coils. All temperatures are displayed in degree Centigrade as sign plus 2 digits on the 4-digit LED display panel above the case. Values are rounded down ie -30.5 is displayed as -31. Channel identification of displayed temperature values is indicated as 1 to 9 on the first LED display.

b) Detection of 240vac input states on upto 4 blown fuse alarms (Fans a,b,c,h). Fan c input is used for coldstore door if coldstore. Input h may be selected as a mains defrost input.

c) Detection of control air Hi,Lo alarms after guardtime. Alarms are inhibited during defrost cycles.

d) Liquid solenoid valve control dependent on control air temperature and control setpoint. The normally open valve is closed (denergised) when defrost or setup are in operation or on failure of the control air probe.

e) Defrost sequence initiatiation using internal defrost timeclock settings , draindown time and fan delay times if coldstore. (see Fig.2)

f) Display of Defrost in progress by -dEF or pulldown after defrost by CooL instead of case temperature display.

g) control of the Defrost valve dependent on defrost termination temperature and termination cut-in setpoint and differential while defrost is in operation . Defrost is inhibited during setup or on failure of the termination termperature probe.(see FIG.2)

h) Fan inhibit control output during 'Case OFF' or Hot Gas defrost cycles if coldstore.

i) 3-way valve termination control for complete stub and Trim/Pan Heater control in defrost, Fans or OFF modes.

j) staggered restart delay dependent on stub number before opening liquid valves to prevent compressor start-up overload after trip or power fail.

k) Local modification and display of temperatures,unit number and control settings and defrost times via pushbuttons on the display panel.

l) Remote modification and display of temperatures, control settings,defrost times, control and alarm status via the RS485 multi-drop serial highway.

m) Provision for future expansion for 3 additional liquid valve relays for modulating valve control of 3 coils.

CONTROL UNIT

The control unit comprises a printed circuit board in an unsealed plastic enclosure with internal fixing holes and has overall dimensions approximately:-

base 150mm * hight 65mm * length 220mm.

power 240vac at 5 watt

12vdc at 10ma for status inputs

Input/output signals

analogue input (thermistor) (-40 to +40 deg.C)

- **c case temperature DISPLAY**
- **d discharge air temperature**
- **r return air temperature**
- **4 Coil 1a temperature**
- **5 Coil 1b temperature**
- **6 Coil 2a temperature**
- **7 Coil 2b temperature**
- **8 Coil 3a temperature**
- **9 Coil 3b temperature**

Status input (12vdc 10 ma per input)

- **10 OFF for cleaning**
- **11 FANS only**
- **12 DEFROST request P/B**

alarm trip input (240vac)

- **a Fans a circuit fail**
- **b Fans b circuit fail**
- **c Fans c fail or coldstore door open.**
- **d Trim Heater fail/defrost request input**

Relay output (1 Amp 240Vac with suppressors)

- **1 liquid valve control (n/o)**
- **2 defrost termination control (c/o)**
- **3 Hotgas valve/trim/pan heater control (n/o)**
- **4 Fan control (n/o)**

Status output (12vdc)

DEFROST request to other cases in stub (same terminal as defrost status input)

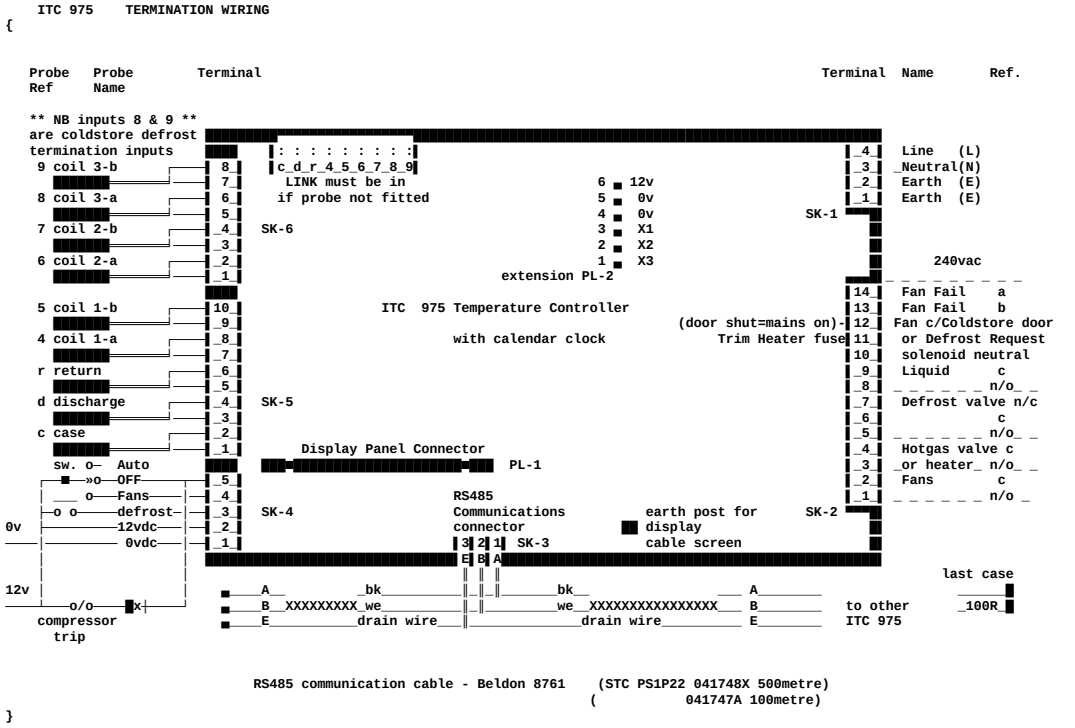
LED display outputs

- **1-7 LED display segment selection**
- **8-11 LED display digit selection**

Pushbutton digital input

- **1 NEXT function /channel**
- **2 LOWER value**
- **3 RAISE value**
- **4 ENTER value**

Communications RS485 serial link selectable at 1200,2400,4800 and 9600 baud.

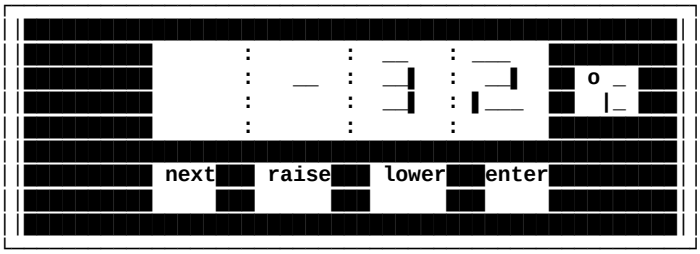

ITC 975 TERMINATION WIRING
{
Probe Ref
Probe Name
Terminal
Terminal
Name
Ref.
** NB inputs 8 & 9 **
are coldstore defrost
termination inputs
9 coil 3-b
8 coil 3-a
7 coil 2-b
6 coil 2-a
5 coil 1-b
4 coil 1-a
r return
d discharge
c case
8
7
6
5
4
3
2
1
10
9
8
7
6
5
4
3
2
1
SK-6
c d r 4 5 6 7 8 9
LINK must be in
if probe not fitted
6 12v
5 0v
4 0v
3 X1
2 X2
1 X3
extension PL-2
SK-1
240vac
ITC 975 Temperature Controller
with calendar clock
(door shut=mains on)-
Trim Heater fuse
4 Line (L)
3 Neutral(N)
2 Earth (E)
1 Earth (E)
14 Fan Fail a
13 Fan Fail b
12 Fan c/Coldstore door
11 or Defrost Request
10 solenoid neutral
9 Liquid c
8 n/o
7 Defrost valve n/c
6 c
5 n/o
4 Hotgas valve c
3 or heater n/o
2 Fans c
1 n/o
Display Panel Connector
PL-1
SK-5
SK-4
SK-3
SK-2
RS485
Communications
connector
earth post for
display
cable screen
E B A
sw. o— Auto
OFF
Fans
defrost
12vdc
0vdc
0v
12v
o/o
X
compressor
trip
A
bk
B
XXXXXXXXX
we
E
drain wire
bk
we
XXXXXXXXXXXXXXX
drain wire
A
B
E
to other
ITC 975
last case
100R
RS485 communication cable - Beldon 8761 (STC PS1P22 041748X 500metre)
(041747A 100metre)
}

DISPLAY PANEL UNIT

The Display unitt comprises a front panel in a display bezel with a 1.2 meter round, screened, earthed cable from the control unit terminated by DIL connectors at both ends.
The front panel houses:-
4 7-segment LED displays for channel/function/alarm indication and a sign plus 2-digit temperature/setpoint display.
4 pushbuttons next, raise, lower, enter, used in conjunction with LED Displays to provide setup and display facilities.

The temperature display flashes with discharge air or blown fuse fail conditions.

A B C D
channel/ sign temperature /
function setpoint



size - 95 x 48 x 40 mm

Default Display
The unit reverts to the default state if no buttons have been pressed for 3 minutes and displays the case temperature (channel 1). The case temperature display is replaced by a status message if any of the following conditions occur.

-dEF while defrost is in progres

CooL 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

Auto - after power on or case OFF waiting for restart delay before opening liquid valve.

Temperature Displays

Pressing the NEXT push button selects temperature channels for display in sequence as follows.
Temperature values for the selected channel are updated every 2 seconds.

LED Display A	Temperature on display
(blank)	case
d	discharge air (normal control input)
r	return air (control i/p if coldstore)
4	coil 1-a
5	coil 1-b
6	coil 2-a)- if fitted
7	coil 2-b)
8	coil 3-a)]- coldstore & HGt8
9	coil 3-b)] termination inputs

Relay Output Status Display

LED Display

A C if Control relay energised - bar if not
B d if Defrost relay energised - bar if not
C H if Hotgas/trim/pan Heater energised - bar if not
D F if Fan relay energised - bar if not

Elapse time (Defrost mode only)

Et39 where 39= minutes into defrost.
SEt - goto Setup Mode when Enter pressed.

ALARM INDICATIONS

Alarms alternately flash with selected temperature channel during Default and Normal operation.
a,b,c,h, d-Hi ,d-Lo,d-OC ,d-SC.
Alarms are not displayed during Setup operation.
All alarms are reset automatically when the fault has diappeared.

Blown Fuse Alarms

Blown fuse Alarms are identified on LED display A-D as below

a	**fan 1**	**display A**
b	**fan 2**	**display B**
c	**fan 3**	**display C**
h	**trim heater**	**display D (IF HTR selected for relay 3)**

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
d-Hi if discharge air temperature is above the control setpoint plus alarm differential for longer thas the guardtime
d-Lo discharge air temperature is below the setpoint minus alarm differential for longer than the guardtime
Return air not discharge air alarms are given for coldstores
Temperature alarms are inhibited during defrost cycles and during case cleaning.
Guardtime count is reset each time the discharge air returns within limits. Alarm states Hi , Lo are automatically reset when the discharge air returns within limits
Probe Fails
open circuit probes indicate OC on displays C,D and value
shortcircuit probes indicate SC "
not fitted probes indicate nF (requires shorting link)
The liquid valve is closed on any failure of the control air probe.

SETUP OPERATION

Setup operation lasts for a maximum of 5 minutes after being activated by pressing enter with SEt on the display panel. During setup operation, alarms, temperature and defrost controls are inhibited.
On entry to Setup passcode PP00 is displayed.
To change any settings passcode PP05 or PP09 must be first selected using raise and enter pushbuttons.
If the correct passcode is not entered then setup values may be displayed but any attempted changes are ignored.

NEXT pushbutton sequences through the menu selections below or setpoints to be changed and the display indicates the function and/or its latest setup value.

PP05 menus	PP09 menus
CasE change control mode or cooling setpoint	rtc real time clock time and date (set at factory)
DEFr defrost type, times and settings (commissioning only)	SySt system settings times and alarms (set at factory)
unit stub and case identity (commissioning only)	
test toggle output relays (faulty valve check)	
End return to normal operation	End return to normal

ENTER menu selection or new value button
- pressing the ENTER button selects the displayed menu above or stores the displayed value as the new value of the selected function. The display 'winks' after a valid entry.

RAISE pushbutton -increments the displayed setpoint value. If the raise button is held on for more than 1 seconds then the value increases automatically

LOWER pushbutton - decrements the displayed setpoint value. If the lower button is held on for more than 1 seconds then the value decreases automatically

Test Control outputs

Pressing ENTER with Test on displays relay outputs C,D,h,f. in sequence with their current state e.g.

C on	**liquid valve cooling relay energised**
doff	**Defrost output relay de-energised**
3 on	**3-way(or pan heaters) relay energised**
Foff	**Fans relay de-energised**

The state of a relay may be toggled by pressing ENTER when the particular control output is on display. Relay outputs return to automatic settings when SETUP is terminated.

End - return to normal control
Pressing Enter with End on display terminates Setup Operation and the unit reverts to normal control

SETUP FUNCTIONS (level 1)

Menus or functions are sequenced by pressing NEXT button.
Menus are selected by pressing ENTER button.
Mode and Type Functions are selected by pressing ENTER.
settings are increased by RAISE followed by ENTER
settings are decreased by LOWER followed by ENTER
new values are ignored if incorrect passcode is entered

Setup Functions available for setpoint change and display are

Menu	Function	Range	Units

PPOO Passcode 5 must be entered before any changes are accepted

CASE
- **c** cut-in setpoint for Liquid Valve -40 to +40 'C
- **idEF / FAnS / OFF / Auto** mode selection
  - initiate defrost (only if in auto)
  - **FAns** Fans only prior to cleaning
  - (not allowed for coldstore)
  - **OFF** select case OFF for cleaning
  - **Auto** return to Automatic control
  - *** These selections only operate when switch selection inputs for OFF or FAnS are not present.

DEFr
- **O-C ,HG-C,HG-t,Stor,HGt8** defrost type (Off-cycle,Hotgas Cycle,Hotgas terminate on discharge air, Coldstore, Hotgas terminate on probe 8)
- **dn** number of defrosts per day 0 to 6
- **1h** first defrost time T1 hours 0 to 5 hrs
- **1t** first defrost time T1 minutes 0 to 59 min
- **dP** defrost period 0 to 60 min
- **d** defrost termination temperature 0 to +40 'C (not Off-Cycle cases)
- **dd** defrost termination differential 1 to +10 'C (for Hotgas-Cycle cases only)

Unit
- **Sn** Stub number 1 to 80
- **Cn** Case number (normally 3 max.) 1 to 4
- **Annn** Woodley MkV address number 1 to 255
- *** Woodley MDM address automatically calculated is (Sn x 3) + Cn-1 eg stub 30 case 2 has MDM address (30 x 3) + 2-1 = 91.

Htr /HgaS/ 3 /ALr. control relay 3 selection as trim heater control, pack hotgas valve control output or alarm unit.

PR00 Product ratio % (see later)

teSt force output relays on/off
- **C** liquid valve control relay on / oFF
- **d** defrost relay output on / oFF
- **3** 3-way Hotgas valve relay output on / oFF
- **F** Fans relay output on / oFF

All control outputs return to automatic control when SETUP is ended.

End return from SETUP to normal operation

Cut-in Setpoint for Liquid Valve (c)

To change the cooling cut-in setpoint for the liquid valve the procedure is as follows:-

BUTTON	DISPLAY
keep pressing next button until	SEt is displayed
press enter button	
	display now reads PP00
press raise button until display reads PP05	
press enter button	
press next button	
	display now reads CASE
press enter button	
	display now reads c xx (xx = old cut-in)
press raise or lower until display is c yy (yy = new cut-in)	
press enter button	
	display winks and still reads c-yy
press next button	
	display now reads idEF
press next button	
	display now reads OFF
press next button	
	display now reads FAnS
press next button	
	display now reads Auto
press next button	
	display now reads dEFr
press next button	
	display now reads unit
press next button	
	display now reads test
press next button	
	display now reads End
press enter button	

display winks and displays case temperature -zz

The unit controls to the new discharge air cut-in setpoint (yy).

CASE FANS ONLY

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

BUTTON	DISPLAY
keep pressing next button until	SEt is displayed
press enter button	
	display now reads PP00
press raise button until display reads PP05	
press enter button	
press next button	
	display now reads CASE
press enter button	
	display now reads c nn
press next button	
	display now reads idEF
press raise button until display reads FAns	
press enter button	
	display now reads -FAn

When the unit displays -Fan instead of the case temperature, all alarms, liquid valve control and defrost cycles are turned off but the fans are kept running.
FANS mode may be selected remotely via a 12vdc status switch input or RS485 communication command.
The case is switched OFF by selecting OFF mode.
The case is switched back on by selecting Auto mode.

CASE OFF for Cleaning

To switch off a case /coldstore for cleaning the procedure is as follows:-

BUTTON	DISPLAY
keep pressing next button until	SEt is displayed
press enter button	
	display now reads PP00
press raise button until display reads PP05	
press enter button	
press next button	
	display now reads CASE
press enter button	
	display now reads c nn
press next button	
	display now reads idEF
press raise button until display reads OFF	
press enter button	
	display now reads -OFF

When the unit displays -OFF instead of the case temperature, all alarms, liquid valve control, defrost cycles and fan outputs are turned off.
OFF mode may be selected remotely via a 12vdc status switch input or a RS485 communication command.
The case is switched back on by selecting Auto mode.

CASE AUTO MODE .

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

BUTTON	DISPLAY
keep pressing next button until	SEt is displayed
press enter button	
	display now reads PP00
press raise button until display reads PP05	
press enter button	
press next button	
	display now reads CASE
press enter button	
	display now reads c nn
press next button	
	display now reads Auto
press enter button	
	display winks and still reads Auto

When the unit displays Auto instead of the case temperature, all alarms are allowed and fan outputs are turned on.
Time scheduled defrosts are restarted immediately if required.
Liquid valve control is inhibited until the restart delay timer has finished.
The restart delay timer prevents overloading the compressor on restart after a total power fail or compressor fault and is automatically calculated using the stub number of the case.
When the restart delay is complete,the liquid valve returns to automatic control and the case temperature value is displayed .

Initiate DEFROST

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

BUTTON	DISPLAY
keep pressing next button until	SEt is displayed
press enter button	
	display now reads PP00
press raise button until display reads PP05	
press enter button	
press next button	
	display now reads CASE
press enter button	
	display now reads c nn
press next button	
	display now reads idEF
press enter button	
	display now reads -dEF

When the unit displays -dEF instead of the case temperature, all alarms and liquid valve control are turned off.
The defrost cycle performed is dependent on the DEFROST TYPE selection ie Off-Cycle,Hotgas Terminate,Hotgas Cycle or Coldstore.
DEF mode may be selected remotely via a 12vdc status pushbutton input or RS485 communication command.
The defrost may be terminated (after draindown delay) by selecting Auto mode.

Product Ratio.

If probe 1 (case) has no probe wired to it and a 'not fitted' link inserted then the default temperature value displayed and logged for probe 1 is the PR% ratio of the discharge and return air.

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

The Product Ratio PR% is setup using passcode 5 under UNIT selection provided the 'not fitted' link has been inserted. If the 'not fitted' link is not present then case displays ' oc ' and the PR% menu is not displayed.

The required PR% value is entered using raise or lower followed by enter as for other parameters.

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

ALARM UNIT
The ITC 975 may be configured as a supermarket central alarm indicator and teledialler unit for systems using the Guardian GUARDIAM Autograph Terminal.

The required settings are

UNIT Sn=80 stub number
Cn=1 case number
A=249 unit address
ALr. Alarm selection for relay 3 (only if A=249)

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

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

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

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

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

SETUP FUNCTIONS (level 2)
normally FACTORY settings

Menus or functions are sequenced by pressing NEXT button.
Menus are selected by pressing ENTER button.
settings are increased by RAISE followed by ENTER
settings are decreased by LOWER followed by ENTER
new values are ignored if incorrect passcode is entered

Setup Functions available for level 2 change and display are

Menu	Function	Range	Units	FACTORY SETTING
PPOO	**Passcode 9 must be entered before any changes are accepted**			
rtc	**real time clock**			
rh	**rt clock time hours**	**0 to 23**	**hrs**	**correct**
rt	**rt clock time minutes**	**0 to 59**	**min**	**"**
Syst				
Lt	**defrost Liquid draindown delay time**	**1 to 20**	**min**	**1**
Ft	**defrost Fan delay time**	**0 to 20**	**min**	**1**
gt	**control air temp. alarm Guardtime**	**0 to 99**	**min**	**45**
Ad	**Alarm differential control air**	**2 to 40**	**'C**	**5**
	Calculated defrost times - display only			
1h	**Defrost T1 time hours**	**0 to 23**	**hrs**	
1t	**Defrost T1 time minutes**	**0 to 59**	**min**	
2h	**Defrost T2 time hours**	**0 to 23**	**hrs**	
2t	**Defrost T2 time minutes**	**0 to 59**	**min**	
3h	**Defrost T3 time hours**	**0 to 23**	**hrs**	
3t	**Defrost T3 time minutes**	**0 to 59**	**min**	
4h	**Defrost T4 time hours**	**0 to 23**	**hrs**	
4t	**Defrost T4 time minutes**	**0 to 59**	**min**	
5h	**Defrost T5 time hours**	**0 to 23**	**hrs**	
5t	**Defrost T5 time minutes**	**0 to 59**	**min**	
6h	**Defrost T6 time hours**	**0 to 23**	**hrs**	
6t	**Defrost T6 time minutes**	**0 to 59**	**min**	
End	**return from SETUP to normal operation**			

SETUP FUNCTIONS (level 3) passcode 11
normally FACTORY settings only

Port	**serial communications port**			
9600	**communications baud rate**	**1200/2400/4800/9600**		**9600**
8n_2	**parity selection**	**8n_2, 8e_1, 8n_1**		**8n_2**
off	**future log modes**			**off**
End	**return from SETUP to normal operation**			

FIG.1 LIQUID VALVE CONTROL

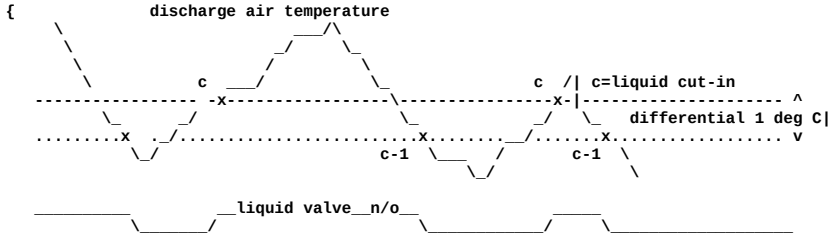
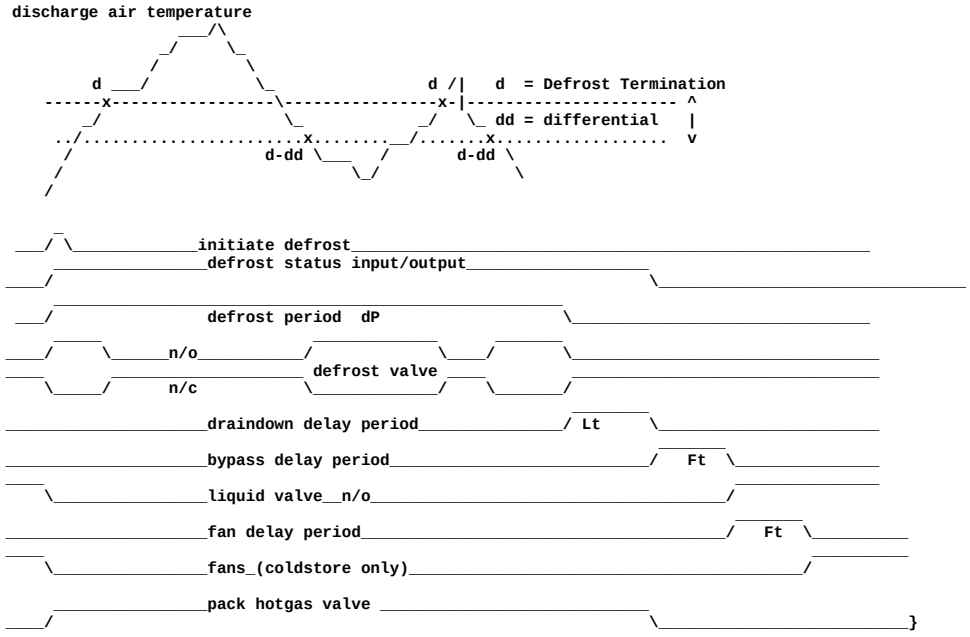
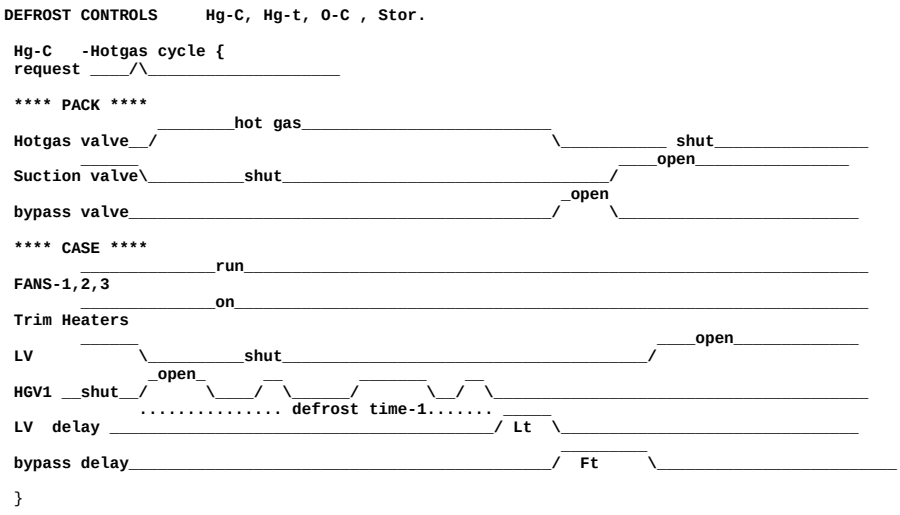
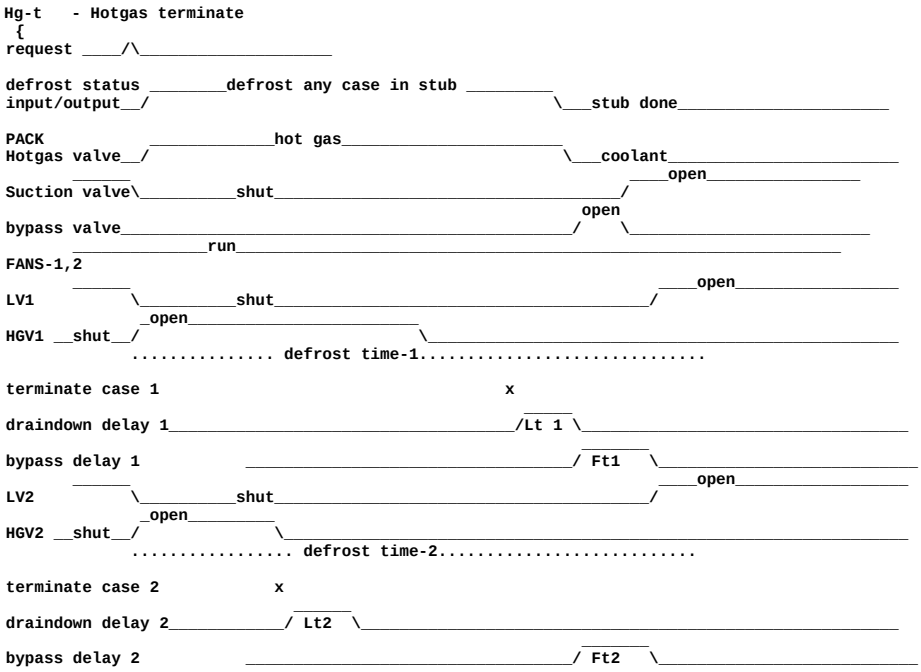
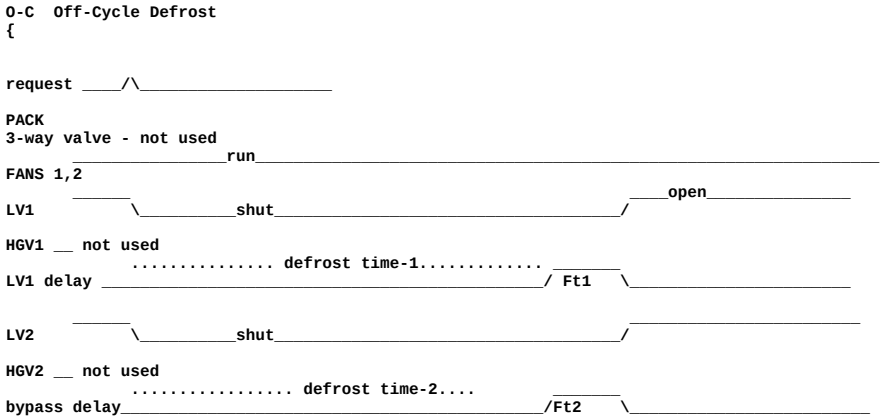


FIG.2 DEFROST CYCLE VALVE CONTROL




DEFROST CONTROLS Hg-C, Hg-t, O-C , Stor.
Hg-C -Hotgas cycle {
request
**** PACK ****
hot gas
Hotgas valve
shut
open
Suction valve
shut
bypass valve
open
**** CASE ****
run
FANS-1,2,3
on
Trim Heaters
LV
open
shut
HGV1
open
shut
defrost time-1
LV delay
Lt
Ft
bypass delay
}


Hg-t - Hotgas terminate
request
defrost status
input/output
defrost any case in stub
stub done
PACK
Hotgas valve
hot gas
coolant
open
Suction valve
shut
bypass valve
open
run
FANS-1,2
LV1
shut
open
HGV1
shut
open
defrost time-1
terminate case 1
x
draindown delay 1
Lt 1
bypass delay 1
Ft1
open
LV2
shut
open
HGV2
shut
open
defrost time-2
terminate case 2
x
draindown delay 2
Lt2
bypass delay 2
Ft2


O-C Off-Cycle Defrost
{
request
PACK
3-way valve - not used
run
FANS 1,2
LV1
shut
open
HGV1 not used
defrost time-1
LV1 delay
Ft1
LV2
shut
HGV2 not used
defrost time-2
bypass delay
Ft2
}

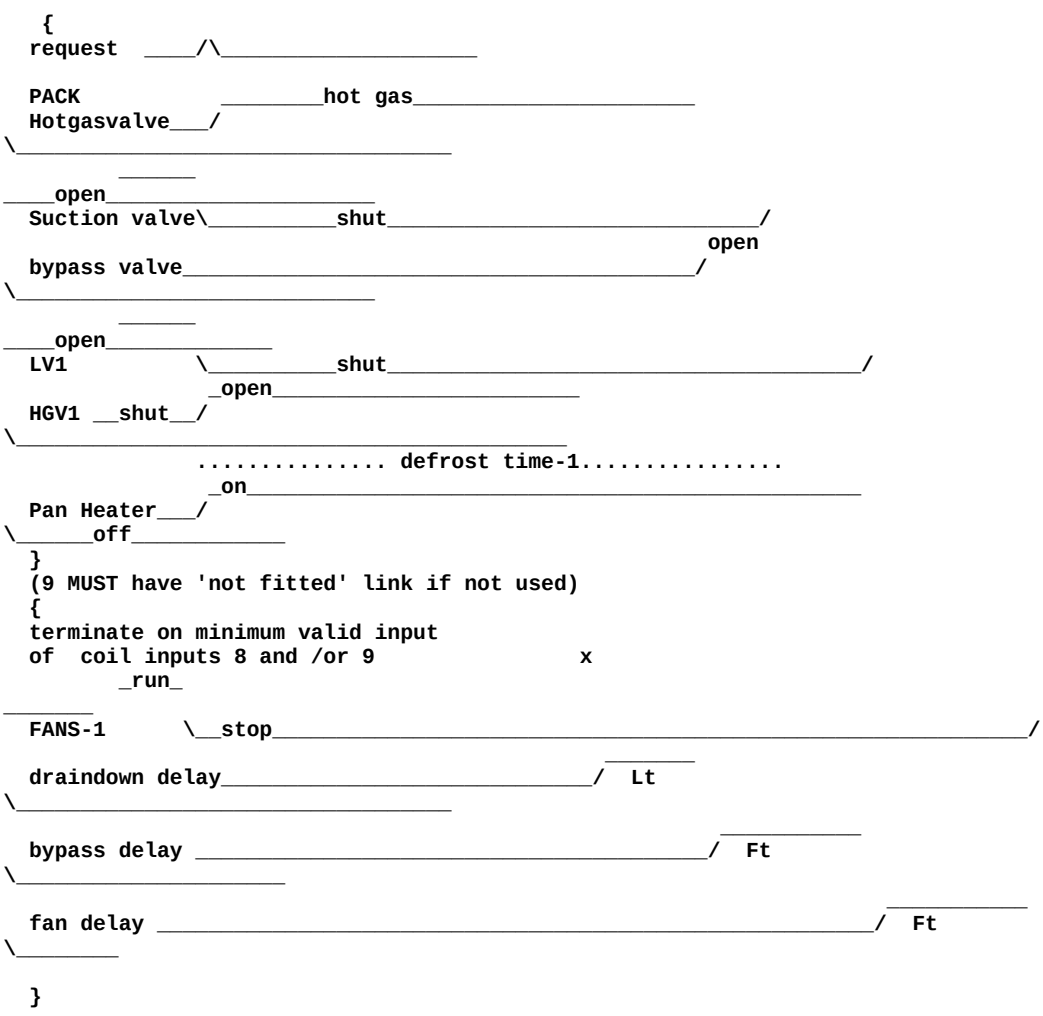
Stor - Coldstore Defrost

(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 on lowest valid coil probe 8 and 9 and NOT on discharge probe.

Coldstore door input is monitored by input c
door closed = contact closed = mains present
door open = contact open = no mains present
Coldstores fans are switched off until fan delay is complete



GENERAL
Temperature specification 0-40 C for box and cases.
All setup parameters are saved in EEPROM.
A battery-backed real-time clock provides all defrost times.
Auto restart is performed after power-up and watchdog fail.

Auto Restart
After power or WDT fail the unit automatically performs an auto restart routine which

a) Reinitialises all parameters from EEPROM
b) Sets up all internal microprocessor settings
c) Tests all display segments (8888) for a five second period.
d) starts restart delay timer which inhibits liquid valve control to give staggered start.
e) checks to see if a scheduled defrost cycle should be in progress and continues remainder of cycle if required.

Item a) is also performed if a sumcheck error on the memory is detected.
Item b) is also performed every time the Watchdog timer is addressed .

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 ITC-975 units in series.

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

Each ITC-975 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 addresss 56/3

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.

ITC-975 units 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 the ITC-975 units only accept status requests which transmit case, discharge and return air temperatures and defrost status.

GUARDIAN RM-256 Refrigeration Monitor Communication commands available are

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

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

c) Transmit Setpoints which replies with setpoints and limits

UUu Addresses may not be changed via the link

f) Receive setpoints with new setpoint values

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

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

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

ITC-975 supermarket case/coldroom controller

Please find enclosed the issue A 1/1/91 specification for the ITC-975 controller.
the unit provides:-

- **9 temperatures, (case, air-on, air-off, 6 coils)**
- **3 status inputs (off,fans,defrost) from stubpanel**
- **4 blown fuse trips**
- **1 status output (defrost not yet complete)**
- **4 relay output (Liquid, hotgas, 3-way valve ,fans)**
- **1 Real-time calendar clock with leap year**
- **1 RS485 serial link with DANBUS protocol.**

Provision is made for future add-on expansion for 2 relays for modulating liquid valve control of 3 coils.
No provision is made for history data storage or lighting circuit control.

ITC-975 supermarket case/coldroom controller

Please find enclosed the issue B 1/4/91 specification for the ITC-975 controller.
the unit provides:-

- **9 temperatures, (case, air-on, air-off, 6 coils)**
- **3 12vdc inputs (off,fans,defrost) from stubpanel**
- **4 blown fuse trips**
- **1 status output (defrost not yet complete)**
- **4 relay output (Liquid, hotgas, 3-way valve ,fans)**
- **1 Real-time calendar clock with leap year**
- **1 RS485 serial link with Woodley Mark V protocol.**

Provision is made for future add-on expansion for 3 relays/SCRs for modulating liquid valve control of 3 coils.
No provision is made for history data storage or lighting circuit control.

The unit calculates restart delay using the formula
stub number UNITS x 20secs

eg all sections of stubs 5,15,25,35,45 all switch on

5x20secs=100secs
after power-on or after OFF due to cleaning or compressor trip.

The Woodley address is calculated from
stub number x 3 + (casenumber-1)
eg stub 35 case 3 has woodley address
35 x 3 +(3-1) = 105 + 2 = 107
coldstore 42 (unit 0) has woodley address
42 x 3 + 0 = 132

****** PLEASE NOTE ONLY 3 SECTIONS ARE ALLOWED WITHIN A STUB ******

STUBCON-024 supermarket case/coldroom stub controller

.

Both units are 3U (100mm x 160mm) Eurocards width 6E (1.2") suitable for 14 modules per rack.
Each module requires power at 9 vac at 0.5 amp and provides:-

INPUT/OUTPUT

1 9 vac compressor trip status input
1 stub mains healthy input
4 relay output
(Suction, Hotgas, Bypass,common Pressure relief)

PANEL

1 front panel containing
1 3-way switch (AUTO/FANS/OFF)
1 pushbutton (request Defrost)
3 LED indicators (POWER, Cooling,Defrost)

MCB

1 OPTIONAL PCB mounted minature circuit breaker for stub mains supply. This MCB has power healthy contact and manual OFF/RESET facility

STUBCON-I/024 ONLY

1 8031 microprocessor with 16k prom and watchdog.
2 RS485 serial link with Oakapple/Woodley MARK V protocol.
2 LED digit display (Stub number) on front panel

STUBCON-L/024 ONLY

1 5-way connections for cable with 12vdc,0vdc, defrost,FANS only and OFFinput/outputs to ITC-975 logic signal connector.

This system requires an additional 5-way cable per stub which must be wired to all cases within that stub.

LAYOUT & SYSTEM CONNECTIONS - see attached sheets 1-3.

INTELIGENT STUBCON-024 SYSTEM FUNCTIONS

1. On restart after power-off
a) - Request 'wildcard' stub status from case 1.
- Remember stub number in reply.
- if no reply flash message 'C1'.

b) - Request 'wildcard' stub status from case 2.
- Check stub number in reply same as case 1.
- if different flash message 'C2'.
- if no reply assume only 1 case in stub.
c) - Request 'wildcard' stub status from case 3.
- Check stub number in reply same as case 1.
- if different flash message 'C3'.
- if no reply assume only 2 cases in stub.
d) - display stub number on 2-digit LED display.
- work out Woodley addresses for stub.

2. Retransmit all Woodley Mark V commands and replies to/from ITC 975 controllers.
(This is done by timers and logic in a similar manner to RS485 communication interface module.)

a) if no Mark V requests for 30 seconds assume local communications control mode for defrost valves.
b) intercept ITC975 replies to Woodley Mark V and look for defrost input on any case in associated stub and initiate stub defrost sequence.
c) Control Hotgas, suction, suction bypass and common pressure relief valve sequence with fixed bypass delay of [1 minute].

3. Retransmit Laptop PC / GUARDIAN RM256 commands and replies to/from ITC 975 controllers in stub.

4. Monitor STUBCON frontpanel Auto/Fans/OFF and Defrost inputs and send appropriate commands to all cases in stub without interfering with Woodley Mark V operation.

5. If Local communications control mode then every 30 seconds

a) request status of each case in the stub
b) initiate any necessary defrost requests to other cases in stub if required.
c) control mezzanine Hotgas/suction sequence and LEDs.
d) alternately flash any stub alarms on stub number display i.e. 2H, 3L , 1F , 2C.

ITC-975 controller.
the unit provides:-

- **9 temperatures, (case, air-on, air-off, 6 coils)**
- **3 12vdc inputs (off,fans,defrost) from stubpanel**
- **3 blown fuse trips**
- **1 Mains defrost input (or coldstore door)**
- **1 status output (defrost not yet complete)**
- **4 relay output (Liquid, hotgas, 3-way valve ,fans)**
- **1 Real-time calendar clock with leap year**
- **1 RS485 serial link with Woodley Mark V protocol.**

Provision is made for future add-on expansion for 3 relays/SCRs for modulating liquid valve control of 3 coils.
No provision is made for history data storage or lighting circuit control.

The unit calculates restart delay using the formula
stub number UNITS x 20secs

eg all sections of stubs 5,15,25,35,45 all switch on

5x20secs=100secs
after power-on or after OFF due to cleaning or compressor trip.

The Woodley address is calculated from
stub number x 3 + (casenumber-1)
eg stub 35 case 3 has woodley address
35 x 3 +(3-1) = 105 + 2 = 107
coldstore 42 (unit 0) has woodley address
42 x 3 + 0 = 132

****** PLEASE NOTE IF 4 SECTIONS ARE USED WITHIN A STUB ******
THEN WOODLEY ADDRESS WILL HAVE TO BE SET UP TO AN OUT OF SEQUENCE NUMBER.