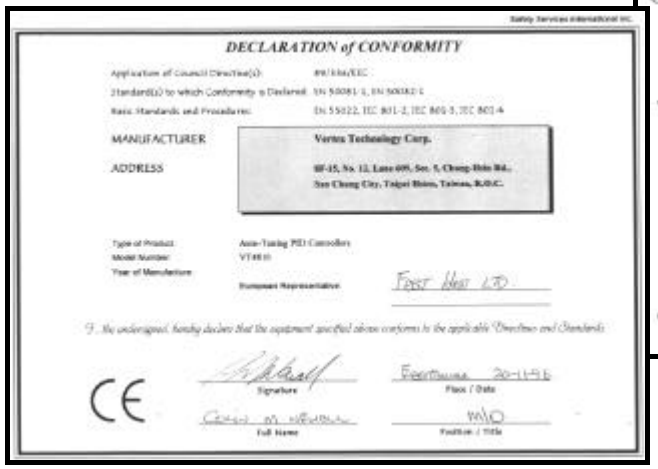
APPROVAL CERTIFICATES


DECLARATION of CONFORMITY

MANUFACTURER Vortex Technology Corp.

ADDRESS 8F-15, No. 12, Lane 609, Sec. 5, Chung-Hsin Rd., San Chung City, Taipei Hsien, Taiwan, R.O.C.

Type of Product: Auto-Tuning PID Controller

Model Number: VT4810

Year of Manufacture:

European Representative: First West LTD

I, the undersigned, hereby declare that the equipment specified above conforms to the applicable Directives and Standards.

CE

Signature

Place / Date: Eastbourne 20-11-96

Full Name

Position / Title: MD

Thermocouple Type	BS4937 (IEC584-3) : Outer / + / -	BS1843 (Old UK Standard) Outer / + / -	US Outer / + / -
J : Iron / Copper-Nickel	Black / Black / White	Black / Yellow / Blue	Black / White / Red
K : Nickel-Chrome / Nickel-Al	Green / Green / White	Red / Brown / Blue	Yellow / Yellow / Red
T : Copper / Copper-Nickel	Brown / Brown / White	Blue / White / Blue	Blue / Blue / Red
E : Nickel-Chrome / Copper-Nickel	Violet / Violet / White	Brown / Brown / Blue	Violet / Red / Violet
B : Platinum-30%Rh / Platinum-6%Rh			Grey / Grey / Red
R : Platinum-13% / Platinum	Orange / Orange / White	Green / White / Blue	Green / Black / Red
S : Platinum-10%Rh / Platinum	Orange / Orange / White	Green / White / Blue	Green / Black / Red
N : Nickel-Chrome-Si / Nick-Chr-Mg	Pink / Pink / White	Orange / Orange / Blue	

International Thermocouple Compensating Cable Colour Codes

CE The '10' series of Digital Temperature Controllers conforms to all relevant European Directives.

FHD109-V5-0303

VT49/72/94/9610 CONTROLLER

INSTALLATION & OPERATING MANUAL

Model Number	
Serial Number	
Location	
Date Of Last Cal	
Date Of Next Cal	

INTRODUCTION

The VT4910, VT7210, VT9410 and VT9610 controllers are panel mounting, temperature controllers. They contains many advanced features, which are available using the configuration parameters on the controller. Please take the time to read through this manual before installing the controller as this may prevent problems in the future.

The hardware and software configuration of all three controllers are identical, differing only in the layout of the front panel and the size of the cases.

CONTENTS

The contents of this package should include the following :

- VT49/72/94/9610 Installation Manual (This document)
- VT4910, VT7210, VT9410 or VT9610 Digital Temperature Controller
- 2 x Fixing Brackets

INSTALLATION

- Cut out the hole in the panel to the dimensions shown.
- Insert the controller into the panel.
- Locate the two fixing brackets into the holes in the case of the controller. The fixing holes can be found on the top and bottom faces of the case. The screw head of the fixing bracket will face towards the rear of the case. If the bracket cannot be located, it may be that the bolt is tightened too far. Loosen the bolt by hand before re-locating.
- Once located, tighten the bolts to locate the controller into the panel.
- DO NOT OVER TIGHTEN.

CONTROLLER DIMENSIONS & PANEL CUT-OUT

Type	Width (mm)	Height (mm)	Depth (mm)	Cutout (mm)
VT4910	48	96	90	45 x 92 +0.5
VT7210	72	72	90	68 x 68 +0.5
VT9410	96	48	90	92 x 45 +0.5
VT9610	96	96	90	92 x 92 +0.5

PARAMETER VALUE RECORD

Mnemonic	Parameter	Quick-Start Value	Value	Range
SP	Setpoint	As Required		LoLt -> HiLt
rAmP*	Setpoint Ramp	30.0		0.0 -> 100.0 Degrees C per Minute
oPoF*	Setpoint Offset	0		(LoLt - SP) -> (HiLt - SP)
tiMe*	Alarm Delay Time	0		0 -> 9999 Min (0 = Off)
A1SP	Alarm 1 Setpoint	10		(LoLt - SP) -> (HiLt - SP)
A2SP*	Alarm 2 Setpoint	10		(LoLt - SP) -> (HiLt - SP)
Pb	Propband	10		0.0% -> 100.0% Of Span
C Pb*	Cool Propband	10		0.0% -> 100.0% Of Span
ti	Integral Time	240		0 -> 3000 Seconds
td	Derivative Time	60		0 -> 3000 Seconds
rEmo	Remote Mode	0		0 = Keypad active 1 = Keypad inactive
P-L	Parameter Lock	0		0 -> 15 : See table for settings
A1Fu	Alarm 1 Function	0		0 -> 15 : See table for settings
A2Fu*	Alarm 2 Function	0		0 -> 15 : See table for settings
A1Hy	Alarm 1 Hysteresis	0.1		0.0% -> 25.5% of Span
A2Hy*	Alarm 2 Hysteresis	0.1		0.0% -> 25.5% Of Span
Act	Control Action	1		0=Cooling (Direct), 1=Heating (Reverse)
unit	Display Units	1		0 = Degrees F, 1 = Degrees C
dp	Decimal Places	0		0, 1, 2 or 3 = Decimal Places
Ct	Cycle Time	Pulse=1, Rly=15		0 -> 100 Seconds
C Ct*	Cool Cycle Time	Pulse=1, Rly=15		0 -> 100 Seconds
Hyst	Hysteresis	0.5		0% -> 25.5% Of Span
EroP	Error Protection	0		0 -> 15 : See table for settings
Addr	Comms. Address	0		0 -> 31
PyoF	Proc Value Offset	0		-500 -> +500
tyPE	Sensor Input Type	As Required		0 -> 10
LoLt	Low Setpoint Limit	Lowest Value		
HiLt	High Setpoint Limit	Highest Value		
tunE	Auto Tune Function	0		0 -> 5 : See table for settings

Please note that parameters marked with an '*' will only appear in the menu list when hardware or software configured.

FREQUENTLY ASKED QUESTIONS

Why does the red measured value display flash?

The measured value of the sensor is displayed on the red upper LED display of the controller. When the controller detects that a sensor is fitted and operational, it will display the measured value on the display. If this value is outside the limits set by the Lolt and Hilt parameters, the display will flash as a warning.

Why does the red measured value display show 'oPen'?

If the controller does not detect that a sensor is fitted, then the upper red LED display will show the word 'oPen'. If it is believed that a sensor is fitted, then it is worth checking the following : That the sensor is wired the correct way round, that the sensor is of the correct type for the controller (Thermocouple or PRT), that the controller is set to the correct sensor ('type' parameter) and that the sensor is not faulty (a quick way to check this with a thermocouple input, is to remove the sensor and short out the input terminals. If ambient temperature is shown on the display, then the controller is fine and there is probably an error with the sensor).

Why does the green setpoint display show 'H' and a value?

The controller is displaying the output power being applied to the load. This can be done by pressing the right hand 'Enter' key, when looking at the setpoint. The letter 'H', for heat, will be shown along with the output power (as a percentage). To return to reading the setpoint, press the right hand 'Enter' key once again.

Why does the alarm LED flash?

The alarm function has been set to alarm delay, such that the triggering of the alarm relay occurs some pre-defined time after the occurrence of the alarm event. This time is set by the tiMe parameter in hours and minutes. When an alarm event occurs, this time will count down to zero, when it will operate the alarm output. During this time, the alarm led will flash. The alarn LED will also flash during the soak phase if the alarm function has been set to a Ramp / Soak function.

Although power is applied to the controller, no display is shown?

If you are sure that power is applied, then the only reason for the display not to be lit, is a fault with the power supply and the unit should be returned for repair.

The Measured Value is stable, but not at the setpoint

If the measured value is stable and the controller appears to be controlling, there are two possible reasons why the Measured Value is incorrect. The first is that the input sensor has been incorrectly set. This is most likely to happen with Thermocouple input where the incorrect thermocouple type has been selected. The second possible reason is that the 'PVoF' or Process Value Offset has been set to a value. Under nearly all circumstances, this should be set to zero.

The Measured Value is unstable

The most likely cause for this is that the controller has not been tuned to the load. The VT4810 is a full PID controller and whilst these values are set at values that are suitable for most loads, they are not ideal and oscillation about the Setpoint can occur. Use 'Quick-Start' values on back page to set the controller to default values and then re-tune the controller by following the instructions elsewhere in this manual.

POWER

- Connect the power to the controller by connecting the Live and Neutral power leads to terminals, as shown. The supply voltage must be between 85 and 265V ac and between 50 and 60Hz.
- It is recommended that an in-line quick blow fuse of rating 500mA is used on the Live connection.

	VT7210	VT4910/9410
Live (90—264 Vac)	8	19
Neutral	9	20

THERMOCOUPLE SENSOR

- Always use the correct compensating cable to connect the sensor to the controller (See chart).
- Always route low voltage sensor cables away from high voltage power cables.
- When using shielded cables, ensure that the cable is grounded at one end only.

	VT7210	VT4910/9410
Thermocouple +	6	8
Thermocouple -	5	9

RESISTANCE THERMOMETER SENSOR

- Always route low voltage sensor cables away from high voltage power cables.
- When using shielded cables, ensure that the cable is grounded at one end only.
- Connect the probe resistance between terminals 9 & 10.
- Connect the third, error compensating lead to terminal 8.

	VT7210	VT4910/9410
PRT Link	5	8
PRT Link / Resistance	6	9
PRT Resistance	7	10

DISPLAY ERRORS

- **Thermocouple sensor only:** If the sensor is heated and the measured value decreases then it is likely that the connection from the thermocouple is reversed, either with the compensating cable on the rear of the controller or at the junction of the compensating cable and the sensor leads.
- If the measured value display shows 'oPEn' then it is possible that there is an open circuit in the sensor wiring or poor cable connection.
- If the measured value display flashes, this indicates that the measured value is outside the limits set by the parameters 'LoLt' and 'HiLt'.

- If the display shows 'AdEr' then there is possibly an internal circuit error and you should contact your supplier to assist in diagnosing the problem or replacing the controller.

OUTPUT CONTROL : RELAY

- The fitted relay has a maximum output rating of 3 amps at 240V ac into a resistive load. This is equivalent to 750W at 240V ac. It is recommended that a rating of 2A (500W) is not exceeded when driving an element heater.
- The relay acts as a switch only and requires an external voltage to be applied to one of the contacts to perform a control function by switching the control voltage onto the other terminals.
- It is recommended that an in-line quick blow fuse rated at 2A is wired between the output of the relay and the load.
- Where the relay is to be used to switch power to an inductive load (e.g. heater), it is recommended that a suppression network consisting of a 100R, 0.5W resistor is connected in series with a 0.1uF, 250V ac Polyester Capacitor and this network connected across the switched terminals of the relay.

Output 1 (Heat)	VT7210	VT4910/9410
Relay Common	10	16
Relay Normally Open	11	17
Relay Norm. Closed	12	18

Output 2 (Cool)	VT7210	VT4910/9410
Relay Common	16	14
Relay Normally Open	15	15

OUTPUT CONTROL : SSR DRIVE (PULSE)

- The rating of this type of output is : 24V = ON, Less than 4V = OFF.
- The controller provides the necessary voltage for this output. No external voltage supply is required.
- Connect positive output terminal of the controller to the positive input terminal of the SSR. Connect negative output terminal of the controller to the negative terminal of the SSR.

Output 1 (Heat)	VT7210	VT4910/9410
Logic O/P + (24V)	10	16
Logic O/P- (0V)	11	17

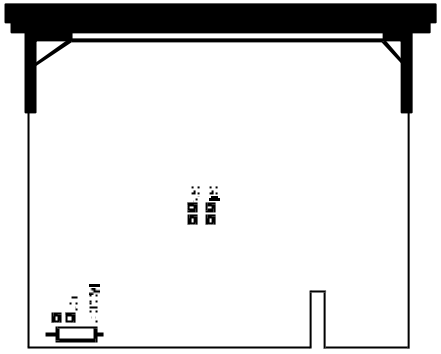
Output 2 (Cool)	VT7210	VT4910/9410
Logic O/P + (24V)	16	14
Logic O/P- (0V)	15	15

ALARM RELAY

- The fitted relay has a maximum output rating of 2A at 240V ac. This is equivalent to 500W.

Alarm 1	VT7210	VT4910/9410
Relay Common	13	12
Relay Normally Open	14	13

Once the hardware has been configured, the 'type' parameter must be set to correspond to the type of input selected and, in the case of thermocouples, the type.

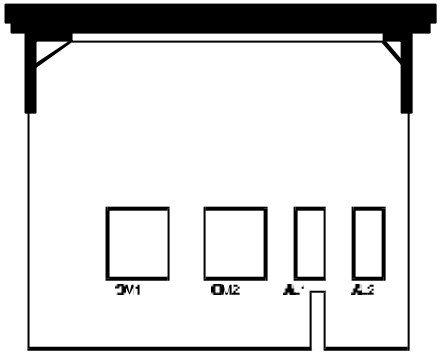


OUTPUT SELECTION

There are two output types that can be fitted to the Controller for heat and cool : Relay or Logic/Pulse. The only hardware requirement to change from one type of output to the other, is the fitting of either a Relay or 330R resistors.

Relay output : A relay is fitted to the circuit board giving a voltage free contact with a rating of 2Amps at 240V. The location of the relay is marked on the PCB by a white box. The location of the holes ensures that the relay can only be fitted one way round.

Logic/Pulse output : A voltage of 24V dc is produced to signify that the output is on, and a voltage of less than 4V to signify that the output is off. The location of the two current limiting relays (RL1 and RL2) are marked on the PCB. The resistors are 300R, 1/4 Watt types.



Heat Output : PCB Location = OM1
Cool Output : PCB Location = OM2

Note: The fitting of an additional PCB is required to provide a second output channel (Cool) on the VT7210.

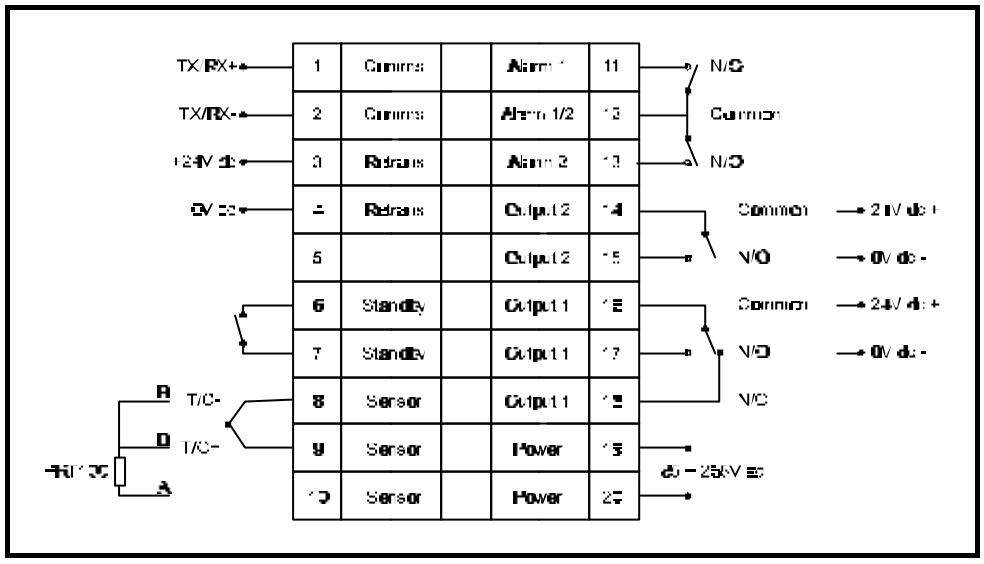
ALARM RELAY

To fit an alarm output, simply solder a relay into the location marked with a white box on the micro-processor PCB. The location of the holes ensures that the relay can only be fitted one way round.

Alarm 1 : PCB Location = AL1
Alarm 2 : PCB Location = AL2

Link Number	Link Open	Link Closed
G1	PRT 100 Input	Thermocouple Input
G3	Alarm 2 Activated	Alarm 2 Inactive
G4	Cool Channel Activated	Cool Channel Inactive

VT4910/9410 REAR TERMINAL WIRING



WIRING RECOMMENDATIONS

- Connect a 500mA fuse in-line with the Live power connection to the controller.
- Connect a suitably rated fuse between the Live power connection and the load, when using a relay output.
- Connect a 'snubber network' of a 100R 0.5W resistor and a 0.1uF 250V ac capacitor in series across the common and normally open terminals of a relay output when connected to an element heater.
- Route thermocouple cable and other low voltage signal cables away from high voltage cables to avoid interference.
- Always use the correct compensating or extension cable with thermocouples.

HARDWARE CONFIGURATION

This section of the manual details the various hardware configuration options available on the VT4910, VT9410 & VT9610 controllers.

INPUT SELECTION

There are two basic input options, to have either a thermocouple input or a resistance thermometer input (commonly referred to as PRT100). To configure the hardware, a link must be altered to determine the type of input.

Thermocouple input : Link (G1) must be made as this enables the CJC compensation.

PRT100 input : Link (G1) must be broken to disable CJC compensation.

However, it is recommended that a rating of 1A (250W) is not exceeded.

- The relay acts as a switch only and requires an external voltage to be applied to one of the contacts to perform a control function.
- It is recommended that an in-line fuse of 2A is wired between the output of the relay and the alarm device.

Alarm 2	VT7210	VT4910/9410
Relay Common	4	12
Relay Normally Open	3	11

STANDBY

- On some versions of software fitted to the VT4910 controller a standby function is available. Please check the software version of your controller to see whether this function is fitted.
- When this function is part of the software, in order to operate fully, a link must be made between terminals 6 & 7. This disables STANDBY mode.
- Opening this link puts the controller into STANDBY mode. This disables the heat output (including the setting of manual output power) and, on version 2.A, disables the alarms. This feature is to enable the remote disabling of the controller by a switch or PLC.

	VT7210	VT4910/9410
Standby Link	N/A	6
Standby Link	N/A	7

POWER ON DIAGNOSTIC DISPLAY

- On power up, the controller will perform a number of internal diagnostic checks, the first of which illuminates all the segments of the front panel display. This is followed by a display showing the version of software it is

2.An2
tc1

A display such as shown above, indicates version 2.A software ('2.A'), that the unit is configured for heat only operation ('n', 'C' would indicate Heat / Cool), that alarm 1 & 2 are active ('2', 'n' would indicate alarm 1 only) and that the input is thermocouple ('tc', 'rt' would indicate resistance thermometer input, 'Ln' is linear).

S/W Version	Heat/Al1/Al2	Cool	Standby Inc Alm	Standby Exc Alm
2.A	✓	×	×	✓
2.0	✓	✓	×	×
2.2	✓	✓	×	×
2.3	✓	×	✓	×
2.4	✓	✓	×	×

fitted with, whether the unit is heat / cool or heat only, the number of active alarms and whether the input is thermocouple or resistance thermometer.

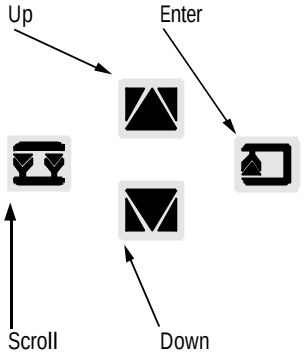
- Please note that different software versions have different features, as indicated in the table below.

BASIC OPERATION

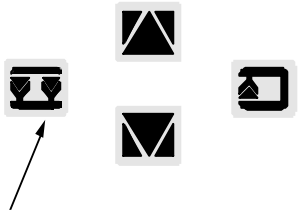
- Changes in parameter settings are performed by using the [Up] and [Down] arrow keys. The change in value is shown on the bottom red LED display. Changes in value are automatically stored in the memory of the controller and are retained during power down.
- The parameters are stored in 4 menus numbered 1 to 4.
- The parameters available in any one menu are dependant on the software version, the configuration of the controller and the setting of parameter lock parameter.
- The controller always powers up in Menu 1.
- If no key is pressed for 60 seconds, the display will revert to Menu 1 and show the Setpoint Value (SV) and Process Value (PV).
- For any given menu, to change to the next parameter in the list, press the left hand, [Scroll] key.
- To change to the next menu, press both the left hand [Scroll] and right hand [Enter] keys together and hold for 5 seconds. The display will change to show the first parameter of the next menu.
- It is possible to step to the next menu level down from any parameter in the current menu.
- When you have scrolled to the end parameter in any menu, pressing the [Scroll] key again will take you to back to the first parameter in the list.
- From any point in any menu, press the [Enter] key to return to the Setpoint Value display.

AUTO TUNE

- Auto-Tune is a process by which the controller will automatically set the P, I, D and oPoF parameters to give the best control performance for the connected load.
- To perform the calculations necessary, the controller applies full power and then zero power to the load and analyses the response.
- The temperature at which tune function operates is determined by the 'tunE' parameter.



Front Panel Keys



Scroll key :
Press and hold for 5 seconds to activate Auto-Tune. Auto-Tune active is indicated by the flashing of the right most red led in the top display.

MENU 4

This menu permits the user to calibrate the controller. The controller stores the calibration values for all the sensor input ranges available. Although it is possible to re-calibrate any sensor range, this does not effect the calibration settings of the other sensor inputs. It should be noted that re-calibration is required on a 12 monthly basis and that the calibration process will require a compensated millivolt source (for thermocouple inputs) or a high accuracy resistance bridge (for PRT inputs).

Before calibrating, ensure that the 'tYPE' parameter is set to the sensor input required and that the calibration source is correctly connected to the sensor input terminals of the controller.

LoCA Low Calibration Setpoint.When the LoCA parameter is displayed, set the value to the low limit of the range that you wish to calibrate. This will normally be the value displayed, but can be changed if required. Input to the controller the input signal equivalent to the displayed temperature in the preset sensor type. Let settle for 10 seconds and press the [Enter] key and hold for 5 seconds. The low calibration value will be set.

HiCA High Calibration Setpoint. When the HiCA parameter is displayed, set the value to the high limit of the range that you wish to calibrate. This will normally be the value displayed, but can be changed if required. Input to the controller the input signal equivalent to the displayed temperature in the preset sensor type. Let settle for 10 seconds and press the [Enter] key for 5 seconds. The high calibration value will be set.

tunE Auto Tune Trigger Setting. Under normal circumstances, the Auto-Tune function is triggered by the operator from the front panel keys. However, by setting this parameter, it is possible for the controller to automatically start the Auto-Tune function every time that it is powered up or just the once.

The default value for this parameter is 0. This will tune the controller at a temperature of the Setpoint - 10% of the span value. e.g. LoIt = 0, HiIt = 500, Sp = 200. Auto-Tune temperature = 200 - (10% of 500 - 0) = 200 - 50 = 150. This ensures that during the tune process, 100% power is not applied at setpoint. It is possible to tune at setpoint by setting the 'tunE' parameter to the relevant value.

tunE	Auto-Tune
0	Manual operation. Tune at Setpoint - 10% of span.
1	Manual operation. Tune at Setpoint.
2	One shot tune on power up at Setpoint - 10% of span. Resets 'tunE' parameter to 0 after operation.
3	One shot tune on power up at Setpoint. Resets 'tunE' parameter to 1 after operation.
4	Always tune on power up at Setpoint - 10% of span.
5	Always tune on power up at Setpoint.

Erop Error Output. Should an error occur, the output states of Output 1 and Alarm 1 can be pre-determined. An error can either be internal (AdEr) or external (sensor break). For value / output settings see table. The default value is 2 : Alarm 1 is On and all other outputs are turned Off.

EroP	AI1	OP1
0	Off	Off
1	Off	On
2	On	Off
3	On	On

Addr Communications Address. When using digital communications with the controller, the controller communications address must be set to a value between 0 & 31. All controllers being communicated to on the same communications link must have a unique address. 0 is the factory default value.

PyoF Process Value Offset. This parameter offsets the output by adding the parameter value to the setpoint value. The PyoF can be set between -500 and +500 degrees. The default value of 0 is usually satisfactory and this parameter can be left alone under normal circumstances.

tyPE Sensor Linearisation Table. The value of this parameter sets the type of linearisation table used by the controller and the display / range limited. See table for value and settings.

Type	Input Sensor Type
0	J : -50C to 1000C
1	K : -50 to 1370C
2	T : -270 to 400C
3	E : -50C to 750C
4	B : 0C to 1800C
5	R : 0C to 1750C
6	S : 0C to 1750C
7	N : -50C to 1300C
8	PT(DIN) : -200C to 500C
9	PT(JIS) : -200C to 500C
10	Linear : -1999 to 9999

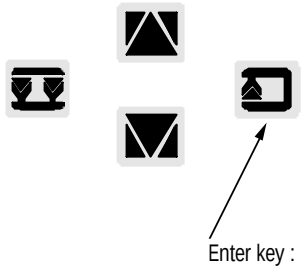
LoLt Setpoint Low Limit. Within the low limit of the preset sensor type and up to the value of the HiLt parameter, the setpoint low limit can be set by this parameter. The setpoint cannot be set lower than this value. The front panel display of the Measured Value will flash if it is lower than this limit.

HiLt Setpoint High Limit. Within the high limit of the preset sensor type and down to the value of the LoLt parameter, the setpoint high limit can be set by this parameter. The setpoint cannot be set higher than this value. The front panel display of the Measured Value will flash if it is higher than this limit.

- If the controller is part of a multi-zone system, it is recommended that each controller is tuned individually.
- Auto-Tune can be activated when viewing any parameter.
- To activate Auto-Tune, press and hold the left hand [Scroll] key for 5 seconds, at which point the right most red dot of the top display will flash.
- The Auto-Tune process may take 5 - 10 minutes (or more with larger loads), when the red flashing dot will go out and the new control values will be stored into memory.
- If desired, the Auto-Tune function can be cancelled by pressing the left hand [Scroll] key for 5 seconds while the red dot is flashing. The red dot will go out and the Auto-Tune process will be cancelled. The control parameters will remain at their original values.

AUTO / MANUAL CONTROL

- The controller remains in the mode in which it was powered down. i.e. if powered down in automatic mode, the controller will power up in automatic mode. The value will also be retained e.g. 50.0% power or a setpoint of 125C.
- In automatic mode, the sensor is read and the controller automatically determines the correct output power to ensure that the temperature of the process is that set by the Setpoint Value.
- If the sensor fails, or for general commissioning purposes, the controller can be put into Manual mode where the output power is determined by the operator.
- By pressing and holding the right hand [Enter] key, the controller will enter Manual mode and a green dot in the bottom right hand corner of the lower LED display will flash. In addition, the display will show 'H *.*' where *.* is the percentage power output. This can be changed using the [Up] and [Down] arrow keys between 0.0 and 100.
- On a Heat / Cool unit the manual display will show both a power output for heat (H *.*) and cool (c *.*). Both parameters can be set as required.
- If possible, the upper display will continue to show the measured value.
- To change back to Automatic mode press and hold the [Enter] key for 5 seconds. The green flashing dot will go out.
- The controller will automatically change to automatic mode if the Auto-Tune feature is activated when in manual mode.
- **NOTE:** When the controller is in manual mode, the green,



Enter key :
Press and hold for 5 seconds to activate Manual Mode. Manual Mode active is indicated by the flashing of the right most green led in the bottom display.

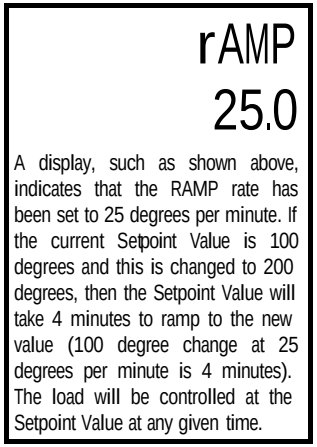
lower display will blink every 2 - 3 seconds. After the percentage power has been changed and before removing the power, allow the display to blink twice in order for the new value to be stored in memory.

RAMP TO SETPOINT

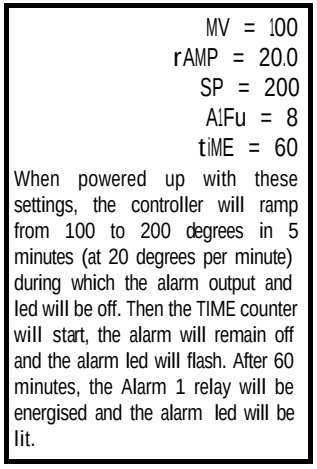
- The RAMP parameter permits the rate of change of temperature between the current Process Value and a new Setpoint to be altered. By using this parameter it is possible to implement a crude form of 'Soft Start'.
- The RAMP parameter is on Menu 1. However, this function can be disabled (and the parameter removed from the menu) by the use of the P-L parameter lock function.
- The RAMP value is Degrees per Minute. The maximum value is 100.0, indicating a ramp rate of 100 Degrees per minute.
- The value of 0.0 sets the RAMP facility to OFF.
- The RAMP feature is activated on power up, when removed from Standby mode or when the setpoint has changed.

RAMP / SOAK TIMER

- By combining the RAMP facility with a suitable alarm configuration, it is possible to implement a RAMP/SOAK timer. The RAMP parameter must be set to the required value (as described above) and the alarm configuration parameter must be set to 8 or 9. This function could be used to indicate to a PLC that a load has reached setpoint.
- Ramp : With the alarm configuration set to 8, when the controller is turned on, the alarm relay will remain off. The Setpoint Value will increase at the rate set by the RAMP parameter.
- Soak : When the Setpoint Value reaches its terminal value, the soak timer will start. This is indicated by the alarm led flashing. During this phase, the alarm will remain off. The duration of this phase is set by the 'timer parameter'. This value is set in minutes. During this phase, the controller will control the temperature of the load as normal.
- End : When the timer has finished its count, the alarm will energise and the alarm led will light.
- With the Aifu parameter set at 9, the process is as described above, however, the alarm energises during the Ramp and Soak phases and is released in the End phase. The alarm led is lit during the Ramp phase, flashes during the Soak phase and is extinguished during the End phase.



A display, such as shown above, indicates that the RAMP rate has been set to 25 degrees per minute. If the current Setpoint Value is 100 degrees and this is changed to 200 degrees, then the Setpoint Value will take 4 minutes to ramp to the new value (100 degree change at 25 degrees per minute is 4 minutes). The load will be controlled at the Setpoint Value at any given time.



When powered up with these settings, the controller will ramp from 100 to 200 degrees in 5 minutes (at 20 degrees per minute) during which the alarm output and led will be off. Then the TIME counter will start, the alarm will remain off and the alarm led will flash. After 60 minutes, the Alarm 1 relay will be energised and the alarm led will be lit.

Act Control Action. This setting of this parameter determines the control action of the Controller when working in Heat / Alarm output mode only. When operating as a Heat / Cool controller, this value is ignored.

unit Display Units. This setting of this parameter determines whether the displayed units will be in Degrees C or Degrees F. This value is ignored if the input type has been selected as Linear.

dp Decimal Places. This setting of this parameter determines the number of decimal places that will be used on the display. Settings 2 and 3 are available for sensor input type Linear only. For most applications, a setting of 0 is recommended.

Ct Heat Cycle Time. This parameter sets the Cycle Time for Output 1. The value is in seconds and can be adjusted between 0 & 100 seconds. If the output is a logic / pulse drive, then a setting of 1 or 2 seconds is satisfactory. However, with a relay output a setting of 15 - 20 seconds is recommended. A longer time may be necessary if the relay is driving a contactor with a long settling time.

C Ct Cool Cycle Time. This parameter sets the Cycle Time for Output 2. The value is in seconds and can be adjusted between 0 & 100 seconds. If the output is a logic / pulse drive, then a setting of 1 or 2 seconds is satisfactory. However, with a relay output a setting of 15 - 20 seconds is recommended. A longer time may be necessary if the relay is driving a contactor with a long settling time.

Hyst Control Hysteresis. When the Propband (Pb) is set to zero, the controller will operate in On/Off control mode. In this mode, the Hysteresis parameter is used to prevent oscillation of the control output. The default value of 0.5% is usually satisfactory and this parameter can be left alone under normal circumstances. This parameter is ignored when the controller is operating in 3 Term (PID) mode.

A1Fu	Alarm 1/2
0	Deviation High Alarm
1	Deviation Low Alarm
2	Process High Alarm
3	Process Low Alarm
4	Dev High Alarm + Standby
5	Dev Low Alarm + Standby
6	Proc High Alarm + Standby
7	Proc Low Alarm + Standby
8	Ramp / Soak Timer On
9	Ramp / Soak Timer Off
12	Deviation Band
13	Inverse Deviation Band
14	Deviation Band + Standby
15	Inv Deviation Band + Standby

Act	Control Action
0	Direct (Cool)
1	Reverse (Heat)

unit	Display Units
0	Degrees F
1	Degrees C

dp	Decimal Places
0	No Decimal Points
1	1 Decimal Point
2	2 Dec Points (I/P 10 Only)
3	3 Dec Points (I/P 10 Only)

MENU 3

rEm0 Remote Keypad Disable. This parameter can enable or disable the front keypad and prevent un-authorised operation. Because this is a total disable of the keypad, this function is best suited to when the controller is being used as an indicator only or is part of a digital communications setup.

rEm0	Remote
0	Control parameters can be changed from front panel
1	Control parameters cannot be changed from front panel

P-L Parameter Lock. The parameter can disable selected parameters from operation. Once disabled, the 'rAmP' or 'oPoF' parameter(s) will no longer appear in the Menu. With P-L values 5 - 15, Menus can be selectively locked. Parameters can still be inspected but not changed. See table for details.

Par Lock	Ramp	oPoF	Menu 2	Menu 3	Menu 4
0	N	N	Y	Y	Y
1	Y	N	Y	Y	Y
2	N	Y	Y	Y	Y
3	Y	Y	Y	Y	Y
4	N	N	N	Y	Y
5	Y	N	N	Y	Y
6	N	Y	N	Y	Y
7	Y	Y	N	Y	Y
8	N	N	N	N	Y
9	Y	N	N	N	Y
10	N	Y	N	N	Y
11	Y	Y	N	N	Y
12	N	N	N	N	N
13	Y	N	N	N	N
14	N	Y	N	N	N
15	Y	Y	N	N	N

A1Fu Alarm 1 Function. This parameter setting determines the function of Alarm 1. The value of this parameter will determine the effect of the value of Alarm 1 Setpoint (A1SP) and the Ramp Rate (rAmP). See also the sections on Ramp/Soak and Ramp/Dwell.

A2Fu Alarm 2 Function. As A1Fu but for alarm 2. This parameter will not appear if the unit is hardware configured for single alarm operation.

A1Hy Alarm 1 Hysteresis. If the Process Value is stable at the alarm trigger setpoint, there can be a tendency for the alarm relay to change from energised to de-energised and back again. Referred to as 'chattering', to prevent this from happening, a hysteresis deadband can be setup. From an alarm on condition, the Process Value has to drop below the Alarm Trigger Value minus the deadband value to turn off. From an alarm off condition, the Process Value has to rise above the Alarm Trigger Value plus the deadband value to turn on again. The A1Hy paramer is set as a percentage of the Setpoint, the default value of 0.1% hysteresis is sufficient to prevent relay 'chattering' from occurring.

A2Hy Alarm 2 Hysteresis. As A1Hy but for alarm 2. This parameter will not appear if the unit is hardware configured for single alarm operation.

CONFIGURATION PARAMETERS

Menu 1 ➢	Menu 2 ➢	Menu 3 ➢	Menu 4
SP	Pb	rEmo	LoCA
rAmP*	C Pb*	P-L	HiCA
oPoF*	tI	AlFu	tunE
tiME*	td	A2Fu*	
AlSP		AlHY	
A2SP*		A2HY*	
		Act	
		unit	
		dP	
		Ct	
		C Ct*	
		HYSt	
		EroP	
		Addr	
		PYoF	
		tYPE	
		LoLt	
		HiLt	

Parameters marked with an '*' will appear upon the relevant Menu list dependant upon the version of software and the settings of Parameters : P-L & A1Fu., plus whether the controller is configured for Heat / Cool or Heat Only and 1 or 2 alarm operation.

To move from a Menu level to the next level down, press and hold both the [Scroll] and [Enter] keys for 5 seconds.

To move down the Menu, press the [Scroll] key.

To exit and return to Menu 1, press the [Enter] Key.

To change a parameter value, press either the [Up] or [Down] keys. Parameter values are automatically stored. However, it is recommended that the display is allowed to blink twice before powering down to ensure that the values are stored to memory.

MENU 1

Setpoint The value that the controller will endeavour to control to. The setpoint can be changed between the limits set by the parameters LoLt and HiLt and the range limits of the selected sensor (tYPE).

rAmP Ramp rate for the Process Value. Measured in Degrees Per Minute, the ramp rate can be changed between 0.0 and 100.0. The rAmP function can be disabled by using the Parameter-Lock parameter or by setting the value to 0.0.

oPoF Output Offset. This value is set as part of the Auto-Tune process and is used as a means of temporarily moving the Prop-Band on slow loads to improve the speed at which control of the temperature at Setpoint is obtained.

This parameter does not need to be altered under normal circumstances. However, if the Control Action is set to 1 (Reverse : Heat) and the Integral Time is set to zero and the Process Value is not settling at the Setpoint, then the Output Offset value can be increased to improve control.

Similarly, if the Control Action is set to 0 (Direct : Cool), Integral Time is set to zero and the Process Value is not settling at the Setpoint, then the Output Offset value can be decreased to improve control.

A1SP Alarm 1 Setpoint. If the Alarm 1 Function is set to 0, 1, 4, 5, 14 or 15 this value is the number of degrees deviation that needs to occur before the alarm is triggered. If the Alarm 1 Function is set to 2, 3, 6 or 7, this is the actual Process Value that needs to obtained before the alarm will be triggered.

Alarm configurations with standby activated (Aifu values : 4, 5, 6, 7, 14, 15) disable the alarm function until the temperature has passed through setpoint point from a cold start.

A2SP Alarm 2 Setpoint. If the Alarm 2 Function is set to 0, 1, 4, 5, 14 or 15 this value is the number of degrees deviation that needs to occur before the alarm is triggered. If the Alarm 1 Function is set to 2, 3, 6 or 7, this is the actual Process Value that needs to obtained before the alarm will be triggered.

Alarm configurations with standby activated (Aifu values : 4, 5, 6, 7, 14, 15) disable the alarm function until the temperature has passed through setpoint point from a cold start.

tiME Alarm Delay Timer. The delay (in Minutes) between the occurrence of an alarm event and the triggering of the alarm output. During this time, the value will count down internally and the red alarm LED will flash. The value can be set between 0 (Off) and 9999 minutes. See also section on Ramp / Dwell.

MENU 2

Pb Propband. The range of temperatures within which the power level will be automatically altered to maintain the Process Value at the Setpoint. Set as a percentage of the Setpoint Value, if the Process Value is above the total of the Setpoint plus the Propband, the power output will be zero. If the Process Value is below the total of the Setpoint minus the Propband, the power output will be 100%. This value is set by the Auto-Tune function and can be left alone under normal circumstances. If this value is set to zero, the P, I, D control is disabled and the Controller operates as an On/Off controller. Please note that a controller set to P, I, D mode will maintain the temperature at setpoint far more accurately than an On/Off controller.

C Pb Cool Propband. When the controller is configured to operate in Heat / Cool mode, this parameter is used to set the Cool Propband in a similar fashion to the Heat Propband above. This value is set by the Auto-Tune function and can be left alone under normal circumstances.

ti Integral Time. Set to between 0 and 3000 seconds, this value determines the speed of response of the controller to long term differences in value between the Process Value and the Setpoint. This value is set by the Auto-Tune function and can be left alone under normal circumstances.

td Derivative Time. Set to between 0 and 3000 seconds, this value determines the speed of response of the controller to short term, rapid differences in value between the Process Value and the Setpoint. This value is set by the Auto-Tune function and can be left alone under normal circumstances.