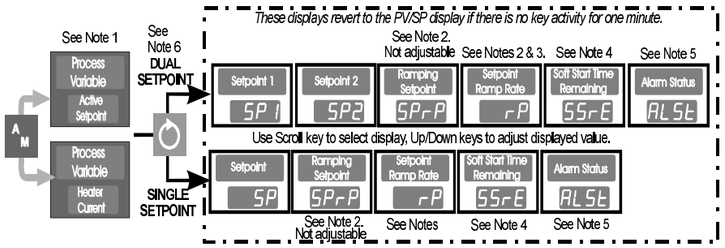
1/16-DIN PLASTICS CONTROLLER
CONCISE PRODUCT MANUAL (59225-2)

OPERATING MODE

Note: Set all Configuration Mode parameters and Set Up Mode parameters as desired before starting normal operations.



Display Sequence

NOTES

1. Setpoint is not adjustable if Setpoint Strategy = 1 (see **SET UP MODE**), or if Soft Start is in progress. "Active Setpoint" is one of (a) Setpoint, (b) Setpoint 1, (c) Setpoint 2 or (d) Soft Start Setpoint.
2. Appears only if setpoint ramping is enabled and ramp rate is in the range 1 - 9999 (see note 3).
3. Ramp rate is adjustable in the range; blank (Off) or 1 - 9999 (On) and is in Eng units per hour. Only appears if setpoint ramping is enabled.
4. Only appears if Soft Start is in progress.
5. Appears only if an alarm is active.
6. In dual setpoint operation, the lower display distinguishes between the active and inactive setpoint as shown on the right:

Soft Start

Used when a "gentle" start-up is required before going to full working temperature. Soft Start Setpoint and Soft Start Time (duration) are user-defined (see **SET UP MODE**). During a soft start, the lower display will be as shown on the right, when Heater Current display is selected.

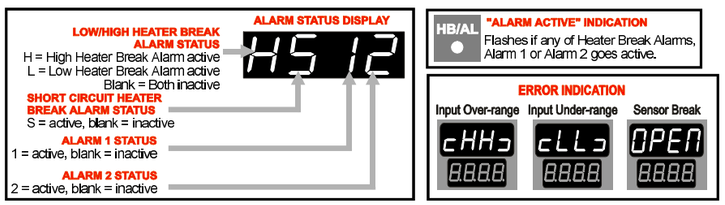
Output Turn-Off and Manual Control Mode

According to **AM Key Usage** (see **SET UP MODE**), this key serves one of three functions:

1. Toggles between automatic control and control output(s) permanently off.
2. Toggles between automatic control and manual control.
3. Selects/de-selects heater current display (see below).

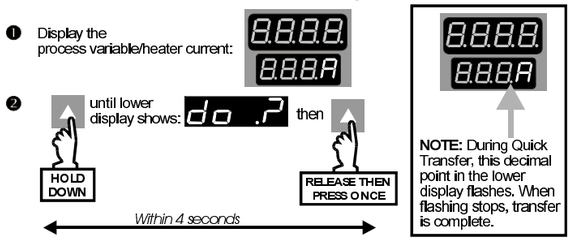
Heater Current Display

Alarms and Error Displays



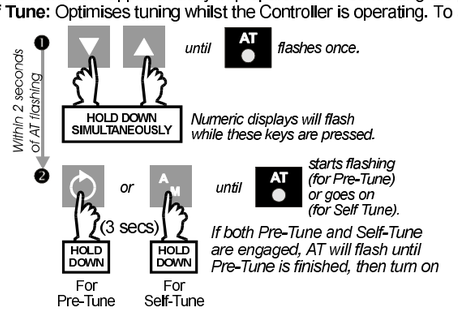
Quick Transfer of Heater Current to Nominal Value

To set the nominal value of heater current to the prevailing heater current value:



Pre-Tune & Self Tune

Pre-Tune: Tunes the Controller approximately in preparation for controlling the process (single-shot). **Self Tune:** Optimises tuning whilst the Controller is operating. To activate:



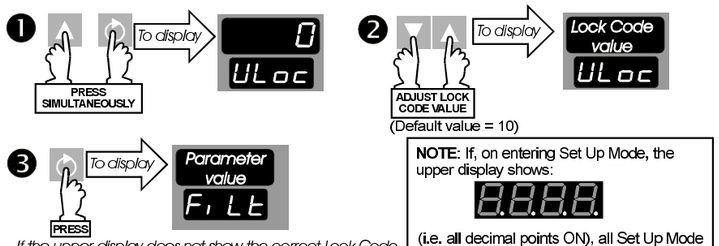
NOTE: Pre-Tune will not engage (a) if the setpoint is ramping, (b) if the process variable is within 5% of input span of the setpoint, (c) if the proportional band = 0 or (d) if Soft Start is operating. It is a single-shot routine and is thus self-disengaging. If APt = 1 (Auto Pre-Tune enabled - see SET UP MODE), Pre-Tune will run for every power-up.

SET UP MODE (SET Indicator ON)

NOTE: Set all Configuration Mode parameters as required before adjusting Set Up Mode parameters.

Entry/Exit

With Controller in Operator Mode with normal display, to enter Set Up Mode:



Use the same key sequence to exit Set Up Mode.

Set Up Mode Parameter Sequence

Use the Scroll key to step through the parameter displays and the Up/Down keys to change the value of the displayed parameter. The parameter sequence is:

Parameter	Legend	Adjustment Range	Default
Input Filter Time Constant	FiLt	OFF, 0.5s to 100.0s in 0.5s increments	2.0s
Process Variable Offset	OFFS	±input span of Controller	0
Output Power	Out1	0 to 100%	Read Only
Output Power 2 [4]	Out2	0 to 100%	Read Only
Proportional Band 1 (PB1)	Pb1	0.0% to 999.9% of input span	10.0%
Proportional Band 2 (PB2) [1,4]	Pb2	0.0% to 999.9% of input span	10.0%
Reset (Integral Time Constant)	rSEt	1s to 99m 59s and OFF	5m 00s
Rate (Derivative Time Constant)	rAtE	00s to 99m 59s	1m 15s
Overlap/Deadband [1,4]	OL	–20% to +20% of PB1 + PB2	0%
Manual Reset (Bias) [1]	bi AS	0% to 100% (single output) –100% to +100% (dual output)	25%
ON/OFF Differential Output 1 only Output 2 only [4] Outputs 1 & 2 [4]	dIF1 dIF2 dIFF	0.1% to 10% of input span	0.5%
Setpoint High Limit	SPHi	Setpoint to Range Maximum	Range Max.
Setpoint Low Limit	SPLo	Range Minimum to Setpoint	Range Min.
Recorder Output Scale Max	roPH	–1999 to 9999	Range Max.
Recorder Output Scale Min.	roPL	–1999 to 9999	Range Min.
Output 1 Power Limit [1]	OPHi	0% to 100% of full power	100%
Output 1 Cycle Time	Ct1	0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 or 512s	32s
Output 2 Cycle Time	Ct2	0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 or 512s	32s
Process High Alarm 1 value [3]	h_A1	Range Min. to Range Max.	Range Max.
Process Low Alarm 1 value [3]	L_A1	Range Min. to Range Max.	Range Min.
Band Alarm 1 value [3]	b_A1	0 to span from Setpoint	5 units
Deviation Alarm 1 value [3]	d_A1	±span from Setpoint	5 units
Alarm 1 Hysteresis	AHy1	1 - 250 units on safe side of alarm	1 unit
Process High Alarm 2 value [3]	h_A2	Range Min. to Range Max.	Range Max.
Process Low Alarm 2 value [3]	L_A2	Range Min. to Range Max.	Range Min.
Band Alarm 2 value [3]	b_A2	0 to span from Setpoint	5 units
Deviation Alarm 2 value [3]	d_A2	±span from Setpoint	5 units
Heater Current High Scale Limit	HtrH	10.0A to 20.0A in 0.1A increments 21A to 100A in 1A increments	50A
Heater Nominal Current [6]	Htrn	0 to Heater Current High Scale Limit	High Scale Limit
Low Heater Break Alarm level (% or amount below nominal heater current)	L_hb	1% to 100% of nominal and 0 (OFF) or 0.1A/1A to Heater Current High Scale Limit.	20% or 0 (OFF)
High Heater Break Alarm level (% or amount above nominal heater current)	h_hb	1% to 100% of nominal and 0 (OFF) or 0.1A/1A to Heater Current High Scale Limit.	0 (OFF)
Short Circuit Heater Break Alarm [7]	S_hb	0 (disabled) or 1 (enabled)	1 (enabled)
Soft Start Setpoint	SSSP	Range Min. to Range Max.	Range Min.
Soft Start Time	SSt_	15s to 59m 45s and 0 (OFF) in 15s increments	0 (OFF)
Auto Pre-Tune Enable/Disable	APt	0 (disabled) or 1 (enabled)	0 (disabled)
AM Key Usage	butn	oFF Output Turn-off Pon Manual Control htrA Heater Current display/ Manual Control Disable	
Setpoint Ramping Enable/disable	rPEn	0 (disabled) or 1 (enabled)	0 (disabled)
Comms Write Enable/Disable [5]	CoEn	0 (disabled) or 1 (enabled)	1 (enabled)
Setpoint Strategy	SPSt	1 or 2 (see **OPERATOR MODE - Display Sequence**)	1
Lock Value	Loc	0 to 9999	10

The normal Operator Mode Displays (setpoint, process variable, ramping setpoint, setpoint ramp rate) are also available in Set Up Mode. Once the Operator Mode displays have been viewed, the sequence restarts with first Set Up Mode parameter (Input Filter Time Constant)

NOTES:

1. These parameters are not operative if the Proportional Band = 0.
2. Switching differential with ON/OFF Control Output (centred about setpoint).
3. These parameters are optional; only one legend will appear for each alarm.
4. Only applicable if Output 2 is fitted.
5. Applicable only if the Communications Option PCB is fitted.
6. Applicable only when Heater Break Alarm is configured to Percentage Mode.
7. Does not appear if Heater Break Input Type is configured to be **SCRi** (see **CONFIGURATION MODE**).

RS485 SERIAL COMMUNICATIONS & MODBUS COMMUNICATIONS

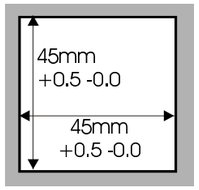
Refer to the full manual for details of this option, available from your supplier.

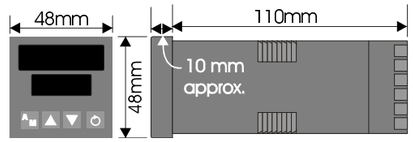
INSTALLATION

CAUTION: Installation should only be performed by personnel who are technically competent and authorised to do so. Local Regulations regarding electrical installation & safety must be observed.

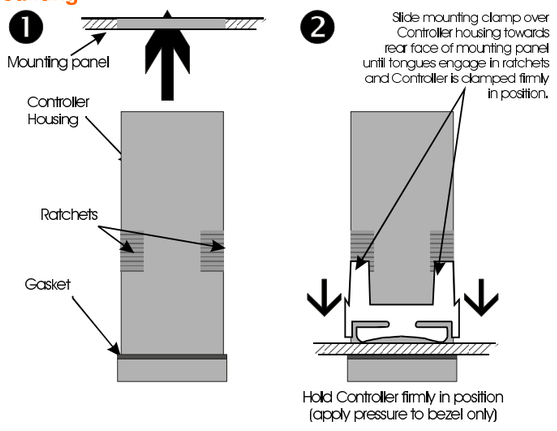
Preparing the Mounting Panel

The mounting panel must be rigid and may be up to 6mm (0.25 inches) thick. The cut-outs requiered for the Controllers are shown on the right. Controllers may be mounted side-by-side in a multiple installation for which the cut-out width (for n controllers) is (48n-4)mm or (1.89n-0.16) inches. The main dimensions of the controller are shown below:

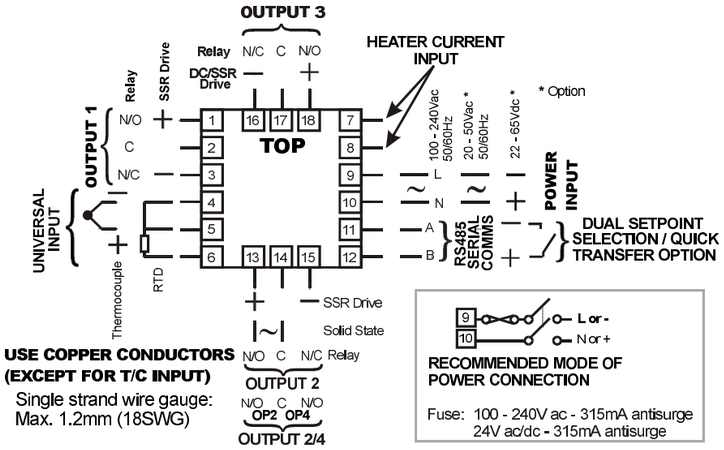




Panel-Mounting



Rear Terminal Connections



USE COPPER CONDUCTORS (EXCEPT FOR T/C INPUT)

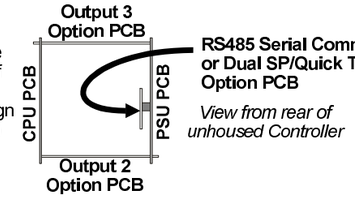
Single strand wire gauge: Max. 1.2mm (18SWG)

RECOMMENDED MODE OF POWER CONNECTION

Fuse: 100 - 240V ac - 315mA antisurge
24V ac/dc - 315mA antisurge

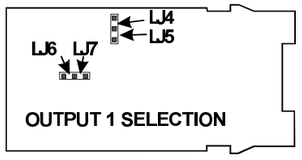
Input/Output Type Selection

To access the link jumpers, REMOVE ALL POWER, grip the side edges of the front panel and pull the Controller out of its housing, *noting its orientation*. To replace the Controller in its housing, align the CPU PCB and PSU PCB (see right) with their guides in the housing, then slowly push the Controller into position.



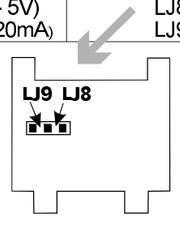
RS485 Serial Comms. or Dual SP/Quick Transfer Option PCB

View from rear of unhoused Controller



CPU PCB

Output 1 Type		Output 3 Type	
	CPU PCB Link Jumpers	Output Type	Link Jumpers (DC Output 3 Option PCB)
Output 1 Type:		DC (0 - 10V DC (0 - 20mA) DC (0 - 5V) DC (4 - 20mA)	LJ8 LJ9 LJ8 LJ9
Relay	LJ5 & LJ6		
SSR Drive	LJ4 & LJ7		

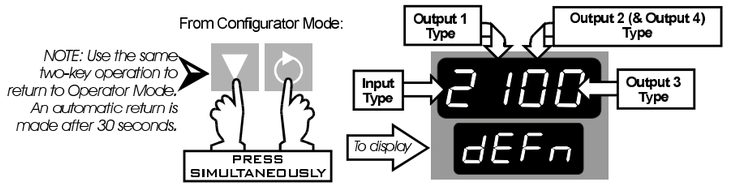


DC Output 3 Option PCB

CONFIGURATION MODE

To enter Configuration Mode, power-down and power-up, then hold down the ▲ ◯ keys until the first parameter (inPt) is displayed. Use the same two-key operation to return to Operator Mode. Use the ◯ key to select the required parameter, use the ▼ ▲ keys to adjust that parameter value and use the ▲ key to confirm the new value.

Hardware Definition Code



Value	0	1	2	3	4	5	7	9
Input		RTD	Thermo-couple					
Output 1		Relay	SSR Drive					
Output 2	Not fitted	Relay or Solid State	SSR Drive					Relay Output 2 & 4*
Output 3	Not fitted	Relay		DC 0 - 10V	DC 0 - 20mA	DC 0 - 5V	DC 4 - 20mA	

* Dual Relay Option PCB must be fitted.

Option Selection

With the Hardware Definition Code displayed, press the ◯ key to display the Option Selection (see right). Adjust and confirm new settings as previously described.

nonE OPtn — No option fitted

duAL OPtn — Dual Setpoint Option fitted.

trAn OPtn — Heater Current Quick Transfer Option fitted.

Heater Break Input Type

With the Option Selection displayed, use the ◯ key to return to show the Heater Break Input Type display (see right). The Heater Break Alarms which can be used with each input type are as follows:

	Standard Input	SCRI Input
Low Heater Break Alarm	Yes	Yes
High Heater Break Alarm	Yes	Yes
Short Circuit Heater Break Alarm	Yes	No

r485 OPtn — Standard RS485 Communications

E485 OPtn — Enhanced RS485 Communications

Std hbty — Standard Heater Break Alarm using an external current transformer (Terminals 7 & 8).

Scr i hbty — Two-wire connection to special thyristor unit (SCR) via Terminals 7 & 8.

Adjust and confirm new settings as previously described.

Configurator Mode Parameter Sequence

To edit parameters, use the keys shown on the right. Parameter sequence as follows:

◯ To select parameter
▼ To decrease value/setting
▲ To increase value/setting
▲ To confirm new value/setting

Parameter	Legend	Adjustment Range	Default
Input Range	inPt	Four-digit code (see below this table)	See below
Output 1 Action	Ctrl	rEv Reverse-acting dir Direct-acting	Reverse-acting
Alarm 1 Type	ALA1	P_hi Process High Alarm P_Lo Process Low Alarm dE Deviation Alarm bAnd Band Alarm nonE No alarm	Process High Alarm
Alarm 2 Type	ALA2	As for Alarm 1 Type	Process Low Alarm
Alarm Inhibit	I nhi	nonE No alarms inhibited ALA1 Alarm 1 inhibited ALA2 Alarm 2 inhibited both Both alarms inhibited	nonE
Heater Break Alarm Strategy	hbSt	PctN % of nominal current Amp Absolute amps	PctN
Output 2 Usage	USE2	Out2 Control (COOL) output A2_d Alarm 2, direct-acting A2_r Alarm 2, reverse-acting hb_d Heater Break Alarm, direct-acting hb_r Heater Break Alarm, reverse-acting Or_d OR of Alarm 1 and Alarm2, direct-acting Or_r OR of Alarm 1 and Alarm 2, reverse-acting Ad_d AND of Alarm 1 and Alarm 2, direct-acting Ad_r AND of Alarm 1 and Alarm 2, reverse-acting	Alarm 2, direct-acting
Output 3 Usage	USE3	A1_d Alarm 1, direct-acting A1_r Alarm 1, reverse-acting hb_d Heater Break Alarm, direct-acting hb_r Heater Break Alarm, reverse-acting Or_d OR of Alarm 1 and Alarm2, direct-acting Or_r OR of Alarm 1 and Alarm 2, reverse-acting Ad_d AND of Alarm 1 and Alarm 2, reverse-acting rEcS Recorder Output - Setpoint (DC only) rEcP Recorder Output - Process Variable (DC only)	Alarm 1, direct-acting (relay/SSR drive/solid state) or Recorder Output - PV (DC Output)
Output 4 Usage	USE4	hb_d Heater Break Alarm, direct-acting hb_r Heater Break Alarm, reverse-acting	hb_d
Comms. Baud rate	bAud	1200, 2400, 4800 and 9600	4800
Comms. Protocol	Prot	rtbn MODBUS RTU, no parity rtbO MODBUS RTU, odd parity rtbE MODBUS RTU, even parity ASCI ASCII	rtbn
Comms. Address	Addr	MODBUS RTU protocol: 1 - 128 (standard), 1 - 255 (enhanced) ASCII: 1 - 99	1
CJC Enable/Disable	CJC	EnAb Enabled d iSA Disabled	Enabled
Lock Code	Loc	Read Only	-

NOTE: When Heater Break Alarm Strategy is set to Absolute Amps, the Heater Nominal Current parameter (see **SET UP MODE - Parameter Sequence**) is not available and Quick Transfer (see **OPERATOR MODE**) is disabled.

The input ranges available, their codes and default settings are as follows:

Type	Range	Code	Type	Range	Code	Type	Range	Code
T/C (R)	0 - 1650°C	1127	T/C (K)	–200 - 760°C	6726	**RTD**	**0 - 800°C ***	**7220**
T/C (R)	32 - 3002°F	1128	T/C (K)	–328 - 1399°F	6727	***RTD***	***32 - 1471°F I***	***7221***
T/C (S)	0 - 1649°C	1227	T/C (K)	–200 - 1373°C	6709	RTD	32 - 571°F	2229
T/C (S)	32 - 3000°F	1228	T/C (K)	–328 - 2503°F	6710	RTD	–100.9 - 100.0°C	2230
T/C (J)	0.0 - 205.4°C	1415	T/C (L)	0.0 - 205.7°C	1815	RTD	–149.7 - 211.9°F	2231
T/C (J)	32.0 - 401.7°F	1416	T/C (L)	32.0 - 402.2°F	1816	RTD	0 - 300°C	2251
T/C (J)	0 - 450°C	1417	T/C (L)	0 - 450°C	1817	RTD	0.0 - 100.9°C	2295
T/C (J)	32 - 842°F	1418	T/C (L)	32 - 841°F	1818	RTD	32.0 - 213.6°F	2296
T/C (J)	**0 - 761°C ***	**1419**	T/C (L)	0 - 762°C	1819	RTD	–200 - 206°C	2297
T/C (J)	***32 - 1401°F I***	***1420***	T/C (L)	32 - 1403°F	1820	RTD	–328 - 402°F	2298
T/C (T)	–200 - 262°C	1525	T/C (B)	211 - 3315°F	1934	RTD	–100.9 - 537.3°C	7222
T/C (T)	–328 - 503°F	1526	T/C (B)	100 - 1824°C	1938	RTD	–149.7 - 999.1°F	7223
T/C (T)	0.0 - 260.6°C	1541	T/C (N)	0 - 1399°C	5371			
T/C (T)	32.0 - 501.0°F	1542	T/C (N)	32 - 2550°F	5324			

* Default (not in North America) I Default (North America)

SPECIFICATION

UNIVERSAL INPUT

Input Impedance: Greater than 100MΩ resistive.
Isolation: Isolated from all outputs (except SSR) at 240V AC.

OUTPUTS

Relay

Contact Type/Rating: Single pole double throw (SPDT); 2A resistive at 120/240V AC.
Lifetime: >500,000 operations at rated voltage/current. Isolated from all other inputs/outputs.

SSR Drive/TTL

Drive Capability: SSR 0 to 10V nominal into 500Ω minimum (>4.2V into 1KΩ for OP2/3)
Isolation: Not isolated from input or other SSR drive outputs.

Solid State

Operating Voltage Range: 20 - 240Vrms (47 - 63Hz)
Current Rating: 0.01 - 1A (full cycle rms on-state @ 25°C); derates linearly above 40°C to 0.5A @ 80°C. Isolated from all other inputs/outputs

DC

Resolution: 8 bits in 250mS (10 bits in 1s typical, >10 bits in >1s typical).
Isolation: Isolated from all other inputs and outputs.

OPERATING CONDITIONS FOR INDOOR USE

Ambient Temperature (Operating): 0°C to 55°C
Ambient Temperature (Storage): –20°C to 80°C
Relative Humidity: 20% - 95% non-condensing
Supply Voltage: 100 - 240Vac 50/60Hz (standard) 7.5VA
20 - 50Vac 50/60Hz (option) 7.5VA or
22 - 65Vdc (option) 5W maximum.

ENVIRONMENTAL

Approvals: CE, UL, ULC
EMC: Certified to EN61326
Safety Considerations: Complies with EN61010-1
Front Panel Sealing: To IP66.

PHYSICAL

Dimensions: Depth: 110mm (behind panel)
Front Panel - Width: 48mm
Height: 48mm
Weight: 0.21kg maximum