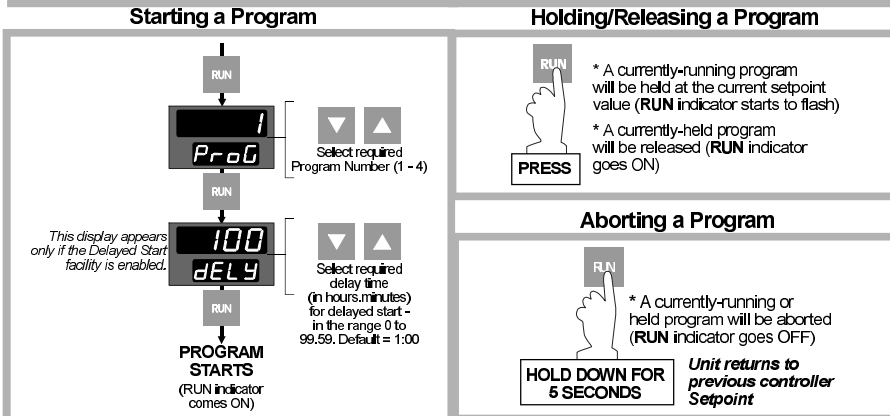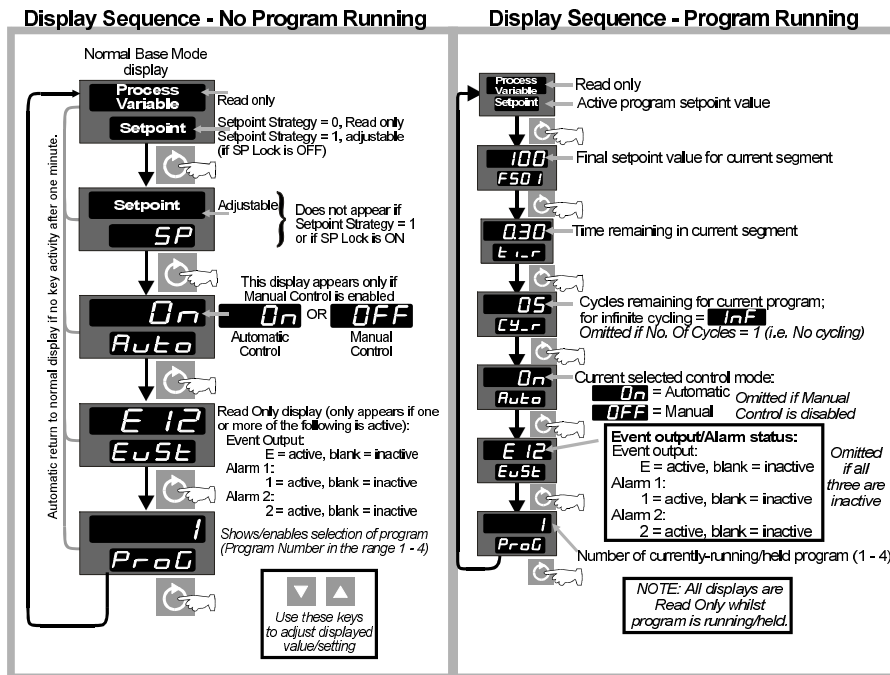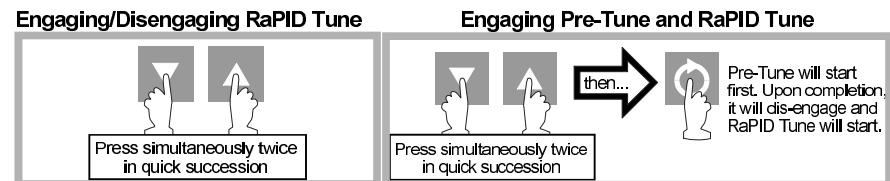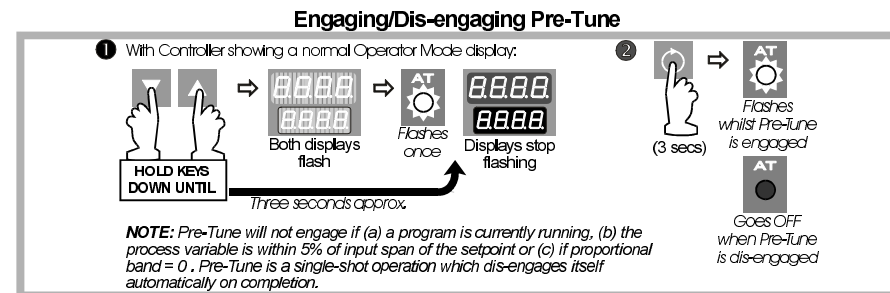# $\frac{1}{16}$-DIN PROFILER CONTROLLER CONCISE PRODUCT MANUAL (59228-2)

BASE MODE

NOTE: Set all Base Mode, Configuration Mode and Set Up Mode parameters as desired before starting normal operations.
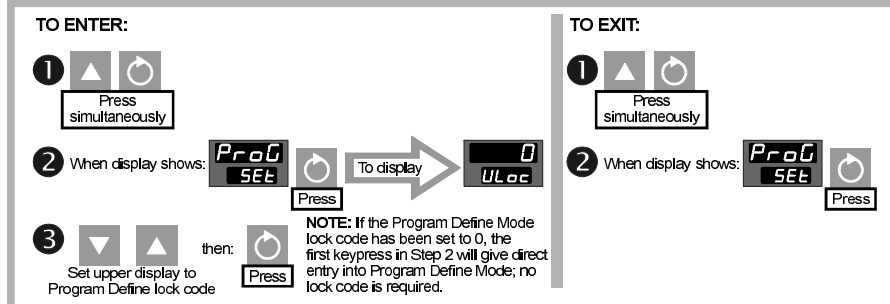
Display Sequence - No Program Running
Display Sequence - Program Running

Starting a Program

Holding/Releasing a Program

* A currently-running program will be held at the current setpoint value (**RUN** indicator starts to flash)
* A currently-held program will be released (**RUN** indicator goes ON)

PRESS

Aborting a Program

* A currently-running or held program will be aborted (**RUN** indicator goes OFF)

HOLD DOWN FOR 5 SECONDS — *Unit returns to previous controller Setpoint*

Tuning

Engaging/Dis-engaging Pre-Tune

NOTE: Pre-Tune will not engage if (a) a program is currently running, (b) the process variable is within 5% of input span of the setpoint or (c) if proportional band = 0 . Pre-Tune is a single-shot operation which dis-engages itself automatically on completion.

Engaging/Disengaging RaPID Tune
Engaging Pre-Tune and RaPID Tune

PROGRAM DEFINE MODE

NOTE: Set all Configuration Mode and Set Up Mode parameters as desired before defining programs.

Entry/Exit

NOTE: If the Program Define Mode lock code has been set to 0, the first keypress in Step 2 will give direct entry into Program Define Mode; no lock code is required.
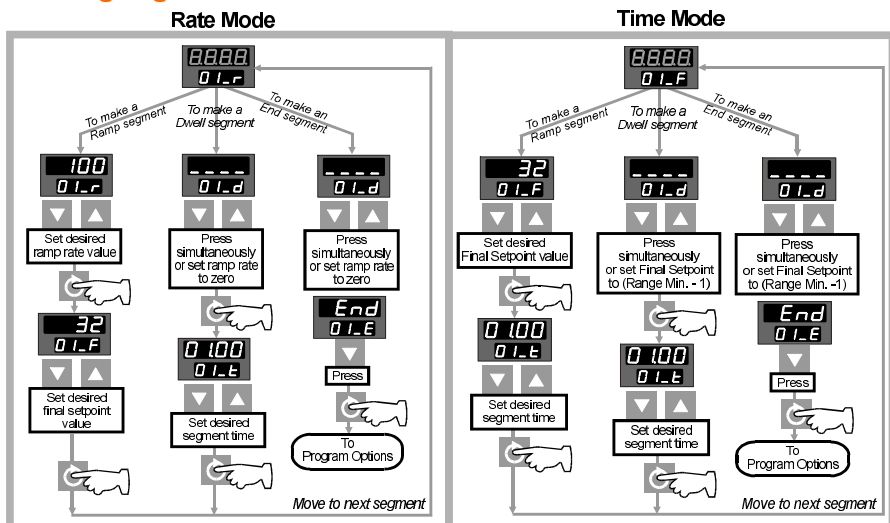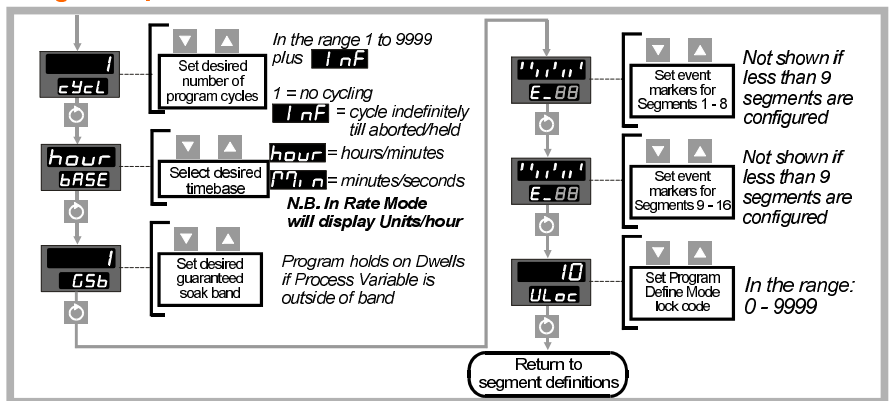
Basic Steps in Creating a Program

1. Define the program segments.
2. Set the Program Options as required.

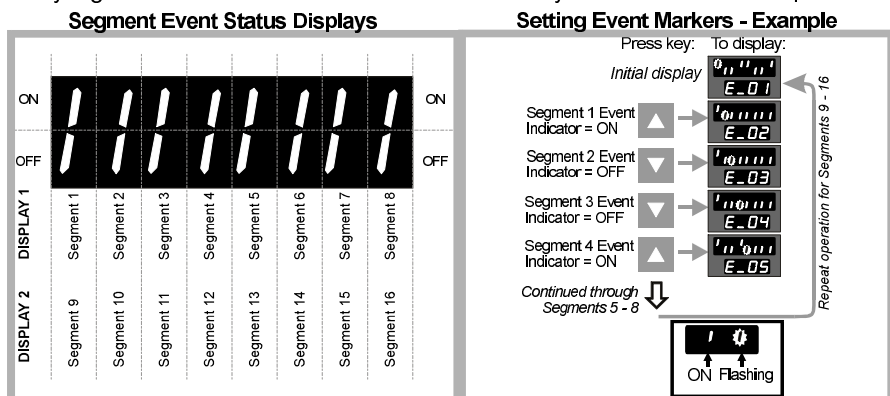### Defining Segments

Rate Mode   **Time Mode**

Program Options

Segment Event Status

Every segment has an associated event indicator which may be set ON or OFF as required.
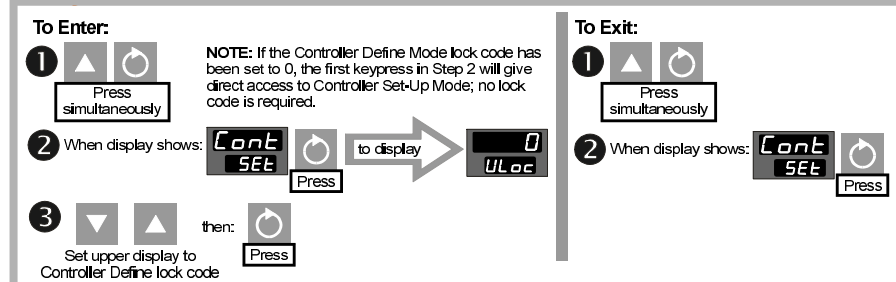
Segment Event Status Displays   **Setting Event Markers - Example**

Default Values and Adjustment Ranges

Parameter	Range Minimum	Range Maximum	Default
Ramp Rate	0 (Dwell Segment) −1 (End Segment)	9999 then INF	100
Final (End of Ramp) Setpoint	Range Minimum	Range Maximum	Range Minimum
Segment Time	00:00	99:59	01:00
Number of Cycles	1	9999 then INF	1
Guaranteed Soak Band	1	Span plus OFF	OFF

CONTROLLER SET-UP MODE

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

Entry/Exit

NOTE: If the Controller Define Mode lock code has been set to 0, the first keypress in Step 2 will give direct access to Controller Set-Up Mode; no lock code is required.

NOTE: If, on entry into Controller Set-Up Mode, the upper display shows all decimal points ON, one or more Configuration Mode parameters have been changed, causing all Controller Set-Up Mode parameters to be defaulted. To clear this display, alter the value/setting of any Controller Set-Up Mode parameter.

Configurator Mode Parameter List

Parameter	Legend	Function	Adjustment Range
Input Filter Time Constant	FiLt	Removes extraneous pulses from process (PV) input.	OFF, 0.5 secs to 100.0 secs in 0.5-second increments
Process Variable Offset	OFFS	Offset PV + actual PV = PV value used	±input span
Output Power 1 [5]	Out1	Current Output 1 power level	0 to 100% (read only)
Output Power 2 [5]	Out2	Current Output 2 power level	0 to 100% (read only)
Proportional Band 1 (PB1)	Pb1	Proportion of input span over which Output 1 power level is proportional to the PV value	0.0 to 999.9% of input span
Proportional Band 2 (PB2) [1,5]	Pb2	Proportion of input span over which Output 1 power level is proportional to the PV value	0.0 to 999.9% of input span
Reset [1]	rSEt	Integral Time Constant	1sec to 99min 59sec and OFF
Rate [1]	rAtE	Derivative Time Constant	00sec to 99min 59sec
Overlap/Deadband [1,5]	OL	Portion of PB1 + PB2 in which both outputs are active (overlap - positive value) or inactive (deadband - negative value)	−20% to +20% of PB1 + PB2
Manual Reset (Bias)	bi.AS	Bias (percentage of output power) applied to output power	0% to 100% (Output 1 only); −100% to +100% (Output 1 & Output 2)
ON/OFF Differential [2]	di.F1	Output 1 only	0.1% to 10.0% of input span
	di.F2	Output 2 only	
	di.FF	Outputs 1 & 2	
Setpoint Lock	SPL	Enables/disables setpoint (SP) adjustment in Base Mode	OFF - SP adjustable ON - SP not adjustable
Recorder Output Scale Maximum (if option is fitted)	roPH	Process variable or setpoint value (as appropriate) for which the recorder output is a maximum	−1999 to 9999 (decimal point position as for input range)
Recorder Output Scale Minimum (if option is fitted)	roPL	Process variable or setpoint value (as appropriate) for which the recorder output is a minimum	−1999 to 9999 (decimal point position as for input range)
Output 1 Power Limit [1]	OPh.1	Limits Output 1 power level to protect the process	0% to 100% of full power
Output 1 Cycle Time (not with linear output)	Ct1	Limits the frequency of operation of the output relay to optimise relay lifetime	0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 or 512 seconds
Output 2 Cycle Time (not with linear output)	Ct2	Limits the frequency of operation of the output relay to optimise relay lifetime	0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 or 512 seconds
Process High Alarm 1 value [3]	h.A1	If Alarm 1 is a Process High Alarm, the value of process variable at or above which the alarm will be active	Input Range Minimum to Input Range Maximum
Process Low Alarm 1 value [3]	L.A1	If Alarm 1 is a Process Low Alarm, the value of process variable at or below which the alarm will be active	Input Range Minimum to Input Range Maximum
Band Alarm 1 value [3]	b.A1	If Alarm 1 is a Band Alarm, the band of process variable value, centred on the setpoint, outside which the alarm will be active	0 to input span from (program) setpoint
Deviation Alarm 1 value [3]	d.A1	If Alarm 1 is a Deviation Alarm, gives a value above (positive) or below (negative) the setpoint. If the process variable deviates from the setpoint by a margin greater than this value, the alarm becomes active.	±(input span) from (program) setpoint
Alarm 1 Hysteresis	AHY1	Defines a hysteresis band on the "safe" side of the Alarm 1 value	1 to 250 units
Process High Alarm 2 value [3]	h.A2	If Alarm 2 is a Process High Alarm, the value of process variable at or above which the alarm will be active	Input Range Minimum to Input Range Maximum
Process Low Alarm 2 value [3]	b.A2	If Alarm 2 is a Process Low Alarm, the value of process variable at or below which the alarm will be active	Input Range Minimum to Input Range Maximum
Band Alarm 2 value [3,7]	L.A2	If Alarm 2 is a Band Alarm, the band of process variable value, centred on the setpoint, outside which the alarm will be active	0 to input span from (program) setpoint

Parameter	Legend	Function	Adjustment Range
Deviation Alarm 2 value [3,7]	d_A2	If Alarm 2 is a Deviation Alarm, gives a value above (positive) or below (negative) the setpoint. If the process variable deviates from the setpoint by a margin greater than this value, the alarm becomes active.	±(input span) from (program) setpoint
Alarm 2 Hysteresis	AHY2	Defines a hysteresis band on the "safe" side of the Alarm 2 value.	1 to 250 units
Scale Range Decimal Point Position [4]	rPnt	Defines decimal point position	0 (xxxx), 1 (xxx.x), 2 (xx.xx) or 3 (x.xxx)
Scale Range Maximum [4]	rhi	Defines the scaled input value when the process variable input is at its maximum value	−1999 to 9999
Scale Range Minimum [4]	rLo	Defines the scaled input value when the process variable input is at its minimum value	−1999 to 9999
Manual Control Enable/ Disable	PoEn	Enables/disables selection of manual control	0 (disabled) or 1 (enabled)
Setpoint Strategy	SPSt	Determines whether or not the setpoint is adjustable in the normal Base Mode display	0 = not adjustable 1 = adjustable
Communications Write Enable/Disable [6]	CoEn	Enables/disables changing of parameter values via the communications link	0 (disabled) or 1 (enabled)
Controller Set-Up Mode Lock Code	Loc	Defines the four-digit code required to enter Controller set-Up Mode	0 to 9999

NOTES
1. Not operative if Proportional Band = 0.
2. Switching differential for ON/OFF control output (centred about Setpoint).
3. Optional; only one legend will appear for each alarm.
4. Only applicable if a DC linear input is fitted.
5. Only applicable if Output 2 is fitted as a secondary control (COOL) output.
6. Applicable only if the Communications Option is fitted.
7. When a program is running, respective to program setpoint.
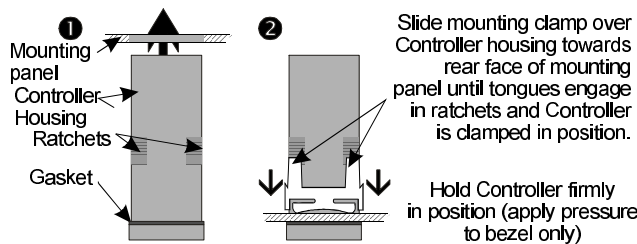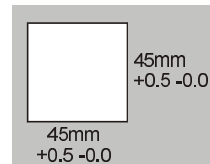
SERIAL (MODBUS) COMMUNICATIONS

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

INSTALLATION

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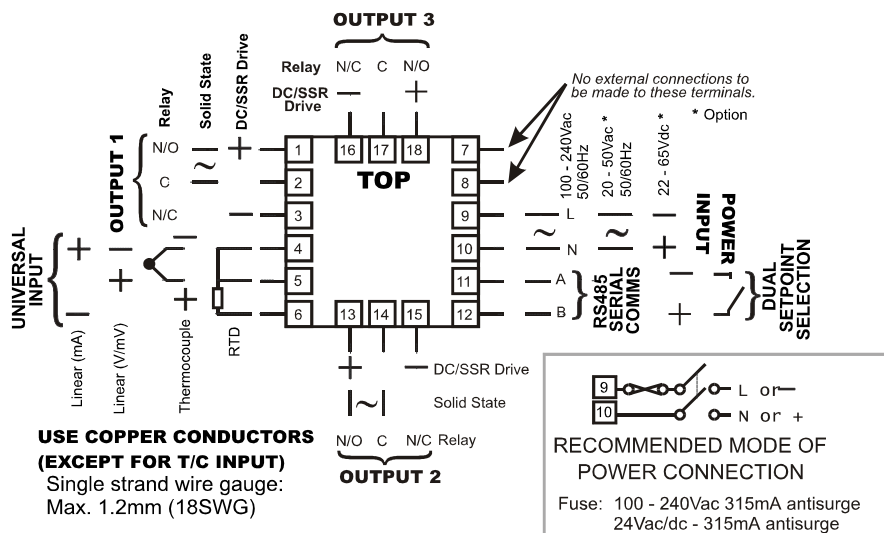
Panel-Mounting

The mounting panel must be rigid and may be up to 6.0mm (0.25 inches) thick. The cut-outs required 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.

45mm +0.5 -0.0
45mm +0.5 -0.0

❶ Mounting panel
Controller Housing
Ratchets
Gasket

❷ Slide mounting clamp over Controller housing towards rear face of mounting panel until tongues engage in ratchets and Controller is clamped in position.

Hold Controller firmly in position (apply pressure to bezel only)

⚠ **Caution:** Do not remove the panel gasket. It is a seal against dust and moisture

Rear Terminals

USE COPPER CONDUCTORS (EXCEPT FOR T/C INPUT)
Single strand wire gauge: Max. 1.2mm (18SWG)

RECOMMENDED MODE OF POWER CONNECTION
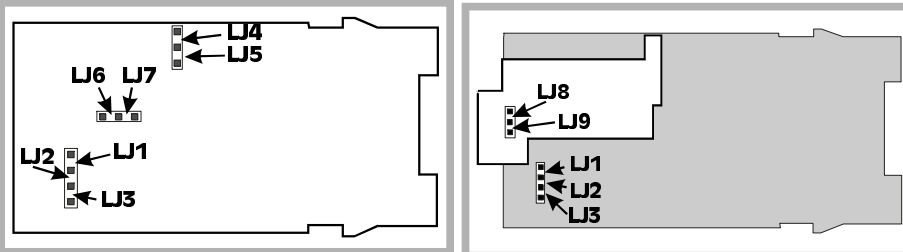Fuse: 100 - 240Vac 315mA antisurge
24Vac/dc - 315mA antisurge

OUTPUT 1: Always primary control (HEAT) output - Relay, SSR Drive, Solid State or DC.
OUTPUT 2: Secondary control (COOL) or Alarm Output - Relay, SSR Drive or Solid State.
Event output or program active output - Relay, SSR Drive or Solid State.
OUTPUT 3: Alarm Output - Relay or SSR Drive.
Recorder Output - DC only for setpoint or process variable.
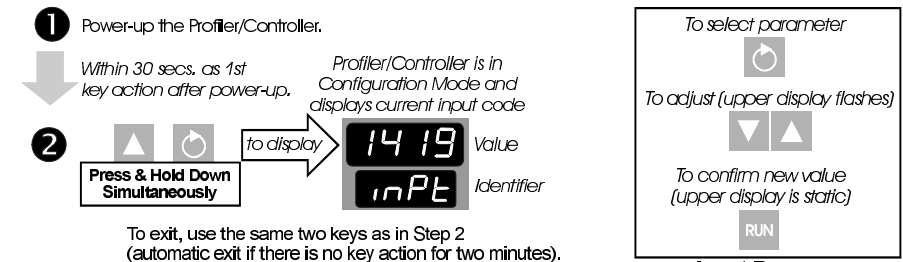
Input/Output Type Selection

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

Output 3 Option PCB
Output 2 Option PCB
RS485 Serial Comms. Option PCB
VIEW FROM REAR OF UNHOUSED INSTRUMENT
DC Output 1 PCB (Option)

LJ4 LJ5
LJ6 LJ7
LJ2 LJ1
LJ3

LJ8 LJ9
LJ1 LJ2 LJ3

CPU PCB (Relay/SSR/Solid State Output 1)

Input Type and Output 1 Type	Link Jumpers (CPU PCB)
Input Type	
RTD	None (parked)
DC (mV)	None (parked)
T/couple	LJ3
DC (mA)	LJ2
DC (V)	LJ1
Output 1 Type:	
Relay	LJ5 & LJ6
Solid State	LJ5 & LJ6
SSR Drive	LJ4 & LJ7
DC (0 - 10V)	LJ8
DC (0 - 20mA)	LJ9
DC (0 - 5V)	LJ8
DC (4 - 20mA)	LJ9

CPU PCB (DC Output 1)

Output 2/Output 3 Type	
Output Type	**Fitted**
DC (0 - 10V)	LJ8
DC (0 - 20mA)	LJ9
DC (0 - 5V)	LJ8
DC (4 - 20mA)	LJ9

LJ9 LJ8
DC Output 2/3 Option PCB

CONFIGURATION MODE

Entry/Exit

❶ Power-up the Profiler/Controller.

Within 30 secs. as 1st key action after power-up.

❷ Press & Hold Down Simultaneously
to display
1419 Value
inPt Identifier

Profiler/Controller is in Configuration Mode and displays current input code

To exit, use the same two keys as in Step 2 (automatic exit if there is no key action for two minutes).

To select parameter
To adjust (upper display flashes)
To confirm new value (upper display is static)
RUN

Configuration Mode Parameter Sequence

Parameter	Legend	Description
Input Range	inPt	A four-digit code (see table on right)
Outpt 1 Action	CtrL	rEv Reverse-acting / dir Direct-acting
Alarm 1 Type	ALA1	P-hi Process High Alarm
		P-Lo Process Low Alarm
		dEv Deviation Alarm
		bAnd Band Alarm
		nonE No alarm
Alarm 2 Type	ALA2	As for Alarm 1 Type.
Alarm Inhibit	inhi	nonE No alarms inhibited
		ALA1 Alarm 1 inhibited
		ALA2 Alarm 2 inhibited
		both Alarm 1 & Alarm 2 inhibited
Program Ramp Mode	tYPE	rA Rate Mode
		ti Time Mode
Output 2 Usage (if fitted)	USE2	Out2 Output 2 COOL output
		A2-d Alarm 2 output, direct
		A2-r Alarm 2 output, reverse
		or-d Alarm 1 OR Alarm 2, direct
		or-r Alarm 1 OR Alarm 2, reverse
		Ad-d Alarm 1 AND Alarm 2, direct
		Ad-r Alarm 1 AND Alarm 2, reverse
		Pr-d Profile Active output, direct
		Pr-r Profile Active output, reverse
		Ed Event Output, direct
Output 3 Usage (if fitted)	USE3	A1-d Alarm 1 output, direct
		A1-r Alarm 1 output, reverse
		or-d Alarm 1 OR Alarm 2, direct
		or-r Alarm 1 OR Alarm 2, reverse
		Ad-d Alarm 1 AND Alarm 2, direct
		Ad-r Alarm 1 AND Alarm 2, reverse
		rEcS Recorder Output - SP H
		rEcP Recorder Output - PV H
		Pr-d Profile Active output, direct
		Pr-r Profile Active output,reverse
		Et Event Output, direct
LEDs Usage	LEdS	rdir Ramp direction: ▲ = positive
		▼ = negative
		▲ = dwell
		outS Output State: ▲ = Output 1 ON
		▼ = Output 2 ON
Guaranteed Soak Enable/Disable	SoAP	EnAb Enabled (Manual holds at end diSA Disabled of dwell until RUN key MAn Manual is pressed)
Delayed Start Enable/Disable	dELY	EnAb Enabled / diSA Disabled
Power Loss Recovery	rEc	cold Cold Start (return to Controller SP) hot Warm Start (resumes program)

Input Ranges

Type	Range	Code
T/C (R)	0 - 1650°C	1127
T/C (R)	32 - 3002°F	1128
T/C (S)	0 - 1649°C	1227
T/C (S)	32 - 3000°F	1228
T/C (J)	0.0 - 205.4°C	1415
T/C (J)	32.0 - 401.7°F	1416
T/C (J)	0 - 450°C	1417
T/C (J)	32 - 842°F	1418
T/C (J)	0 - 761°C	1419
T/C (J)	32 - 1401°F	1420
T/C (T)	−200 - 262°C	1525
T/C (T)	−328 - 503°F	1526
T/C (T)	0.0 - 260.6°C	1541
T/C (T)	32.0 - 501.0°F	1542
T/C (K)	−200 - 760°C	6726
T/C (K)	−328 - 1399°F	6727
T/C (K)	−200 - 1373°C	6709
T/C (K)	−328 - 2503°F	6710
T/C (L)	0.0 - 205.7°C	1815
T/C (L)	32.0 - 402.2°F	1816
T/C (L)	0 - 450°C	1817
T/C (L)	32 - 841°F	1818
T/C (L)	0 - 762°C	1819
T/C (L)	32 - 1403°F	1820
T/C (B)	211 - 3315°F	1934
T/C (B)	100 - 1824°C	1938
T/C (N)	0 - 1399°C	5371
T/C (N)	32 - 2550°F	5324
T/C (CW5)	0 - 2316°C	5111
T/C (CW5)	32 - 4201°F	5112
RTD	0 - 800°C	7220
RTD	32 - 1471°F	7221
RTD	0.0 - 205.7°C	2229
RTD	−100.9 - 100.0°C	2230
RTD	−149.7 - 211.9°F	2231
RTD	0 - 300°C	2251
RTD	0.0 - 100.9°C	2295
RTD	32.0 - 213.6°F	2296
RTD	−200 - 206°C	2297
RTD	−328 - 402°F	2298
RTD	−100.9 - 537.3°C	7222
RTD	−149.7 - 999.1°F	7223
DC	0 - 20mA	3413
DC	4 - 20mA	3414
DC	0 - 50mV	4443
DC	10 - 50mV	4499
DC	0 - 5V	4445
DC	1 - 5V	4434
DC	0 - 10V	4446
DC	2 - 10V	4450

Parameter	Legend	Description
Start On (initial SP value at program start)	StOn	ProC Setpoint at current PV value SEtP Setpoint at Controller SP value
Comms. Protocol (if fitted)	bAud	Nbbo MODBUS with odd parity NbbE MODBUS with even parity Nbbn MODBUS with no parity
Comms. Baud Rate	Prot	1200, 2400, 4800 or 9600 Baud
Comms. Address	Addr	In the range 1 - 255
CJC Enable/Disable	CJC	EnAb Enabled diSA Disabled
Controller Set-Up Mode Lock Code	LocC	Read Only display of lock code
Program Define Mode Lock Code	LocP	Read Only display of lock Code

When In Configuration Mode:

PRESS SIMULTANEOUSLY
to display
Hardware Definition Code
2100 dEFn
Also to return to Configuration Mode.

With Hardware Definition Code displayed:

PRESS
to display one of:
nonE OPtn No option
r485 OPtn

Hardware Definition Code

Output 1 Type	Output 2 Type
1 = Relay	0 = Not fitted
2 = SSR Drive	1 = SSR Drive
3 = DC (0 - 10V)	2 = DC (0 - 10V)
4 = DC (0 - 20mA)	3 = DC (0 - 20mA)
5 = DC (0 - 5v)	4 = DC (0 - 20mA)
7 = DC (4 - 20mA)	5 = DC (0 - 5v)
8 = Solid State	8 = Solid State

2100 dEFn

Input Type	Output 3 Type
1 = RTD/Linear DC (mV)	0 = Not fitted
2 = Thermocouple	1 = Relay
3 = Linear DC	2 = SSR Drive
4 = Linear DC (V)	3 = DC (0 - 10V)
	4 = DC (0 - 20mA)
	5 = DC (0 - 5v)
	7 = DC (0 - 20mA)

SPECIFICATION

UNIVERSAL INPUT
Input impedance: Greater than 1MΩ resistive, except for DC mA (4.7Ω) and DC V (47kΩ)
Isolation: Isolated from all outputs (except SSR Drive) at 240V AC.

REMOTE RUN/HOLD INPUT (OPTION)
Type: Voltage-free or TTL-compatible; edge-sensitive. ON-OFF: current program will run. OFF-ON: current program will be held.
Voltage-free operation: Contacts open = OFF (minimum contact resistance = 5000Ω). Contacts closed = ON (maximum contact resistance = 50Ω).

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 >4.2V into 1KΩ minimum.
Isolation: Not isolated from input or other SSR Drive outputs.

Solid State
Operating Voltage Range: 20 - 280V rms (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/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 - 50V AC 50/60Hz (option) 7.5VA or
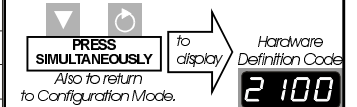22 - 65V DC (option) 5W maximum

ENVIRONMENTAL
Approvals: CE, UL, CUL.
EMC: Certified to EN61326.

Safety Considerations: Complies with EN61010-1:1993.
Front Panel Sealing: To IP66.

PHYSICAL
Dimensions: Depth - 110mm (behind panel)
Front Panel: Width - 48mm, Height - 48mm
Mounting: Plug-in with panel mounting fixing strap. Panel cut-out 45mm x 45mm.
Terminals: Screw type (combination head).
Weight: 0.21kg maximum.