MIC 1460

1 / 4 DIN SETPOINT PROGRAMMER

OPERATORS MANUAL

FORM 3707
EDITION 1 © MAY 1996
PRICE $10.00

Partlow

CIRCULAR CHART RECORDERS • STRIP CHART RECORDERS • DATA ACQUISITION SYSTEMS
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Information in this installation, wiring, and operation manual is subject to change without notice. One manual is provided with each instrument at the time of shipment. Extra copies are available at the price published on the front cover.

This is the First Edition of the MIC 1460 manual. It was written and produced entirely on a desk-top-publishing system. Disk versions are available by written request to the Partlow Publications Department.

We are glad you decided to open this manual. It is written so that you can take full advantage of the features of your new MIC 1460 setpoint programmer.

NOTE:
It is strongly recommended that Partlow equipped applications incorporate a high or low limit protective device which will shut down the equipment at a preset process condition in order to preclude possible damage to property or products.

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Section 1 - General

1.1 PRODUCT DESCRIPTION

This instrument is a powerful, easy-to-use 1/4 DIN setpoint programmer with full PID control capability (complete with Self-Tune and Pre-Tune facilities).

Its standard features include:

- Up to eight programs of up to 16 free-format (e.i. dwell, ramp, join, or end) segments each.
- Facility to join programs to one another in any sequence (maximum program length 121 segments)
- User can change currently-running program segment.
- Delayed Start of Program facility
- End of Program relay output
- Universal input-thermocouple, RTD (PT100) or DC linear - user-selectable.
- Universal power supply (90 -264V AC 50/60 Hz)
- Configurable from front panel
- Comprehensive front panel displays
- Front panel sealing to NEMA 4 standard
- Behind-panel depth only 100mm (3.94 inchs)

Optional features include:

- Remote control and selection of program (plug-in option)
- Up to four Event relay outputs (plug-in option)
- Second control output
- Recorder output (setpoint or process variable)
- RS-485 serial communications
- User-definable program tag names
- Support software (Off-line Configurator, On-line Graphic Program Editor) - operates via RS-485 communications link.

The Setpoint Programmer has four operating modes:

Base Mode: Day to day PID control operations with no program running. In this mode, a program may be selected to run.

Program Run Mode: A selected program is running, held or waiting for a pre-defined delay before starting. In this mode, the operator can view status and program information.

Program Define Mode:* Used to view/create/edit programs. this mode is entered either from Base Mode (selected program may be edited/ created) or from Program Run Mode (currently-running program may be edited).

Controller Define Mode:** Used to define the controller characteristics.

* Entry via Lock Code; also optional Program Lock prevents changing of program definitions while a program is running.
** Enry via a Lock Code.

FIGURE 1-1
Front Panel

Section 2 - Installation & Wiring

2.1 UNPACKING PROCEDURE

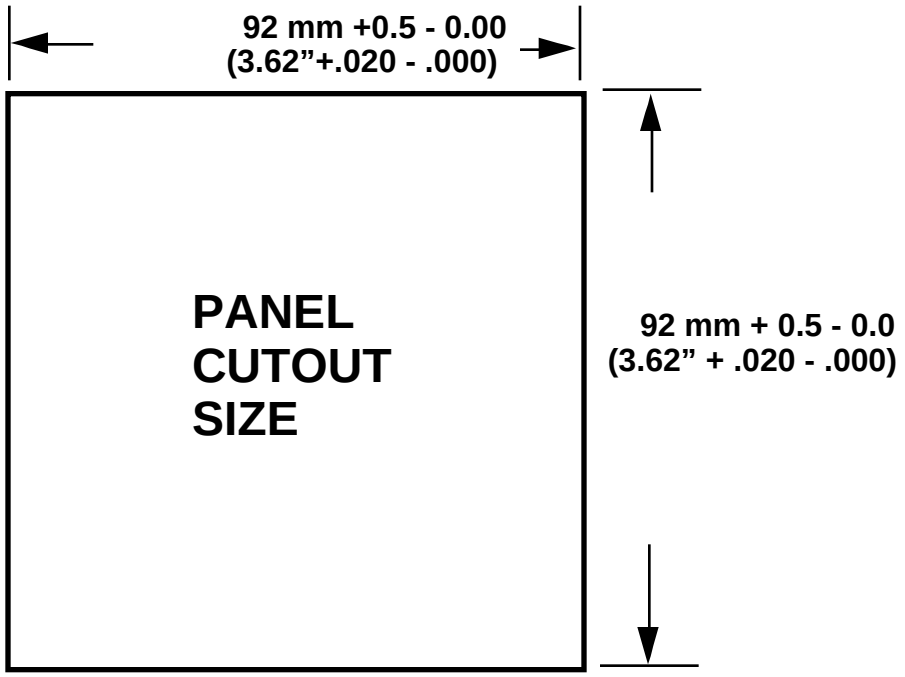
1. Remove the instrument from its packing. The instrument is supplied with a panel gasket and push-fit strap. Retain the packing for future use, should it be necessary to transport the instrument to a different site or return it to the factory for repair/testing.

2. Examine the delivered items for damage or deficiencies. If any is found, notify the carrier immediately. Check that the model number shown on the label affixed to the instrument housing corresponds to that ordered (see Appendix D).

2.2 PANEL-MOUNTING THE SETPOINT PROGRAMMER

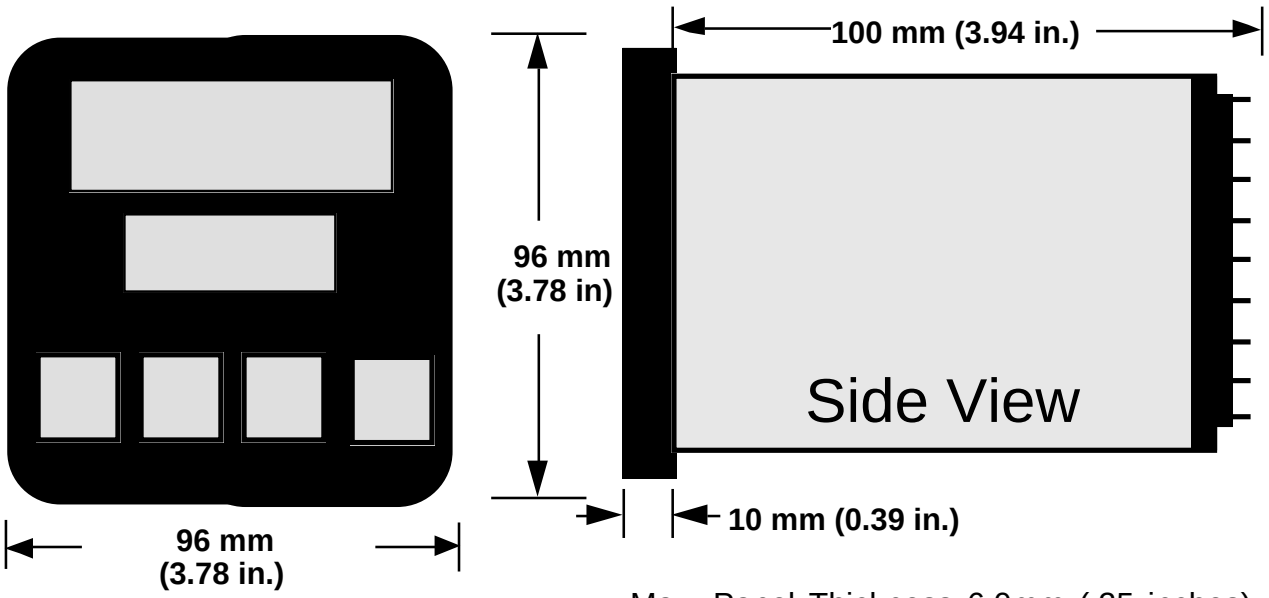
The panel on which the instrument is to be mounted must be rigid and may be up to 6.0 mm (.25 inches) thick. The cutout required for a single instrument is shown in Figure 2-1.

FIGURE 2-1
Cut-Out Dimensions



The main dimensions of the instrument are shown below.

FIGURE 2-2
Main Dimensions



Max. Panel Thickness 6.0mm (.25 inches)

To panel-mount the instrument:

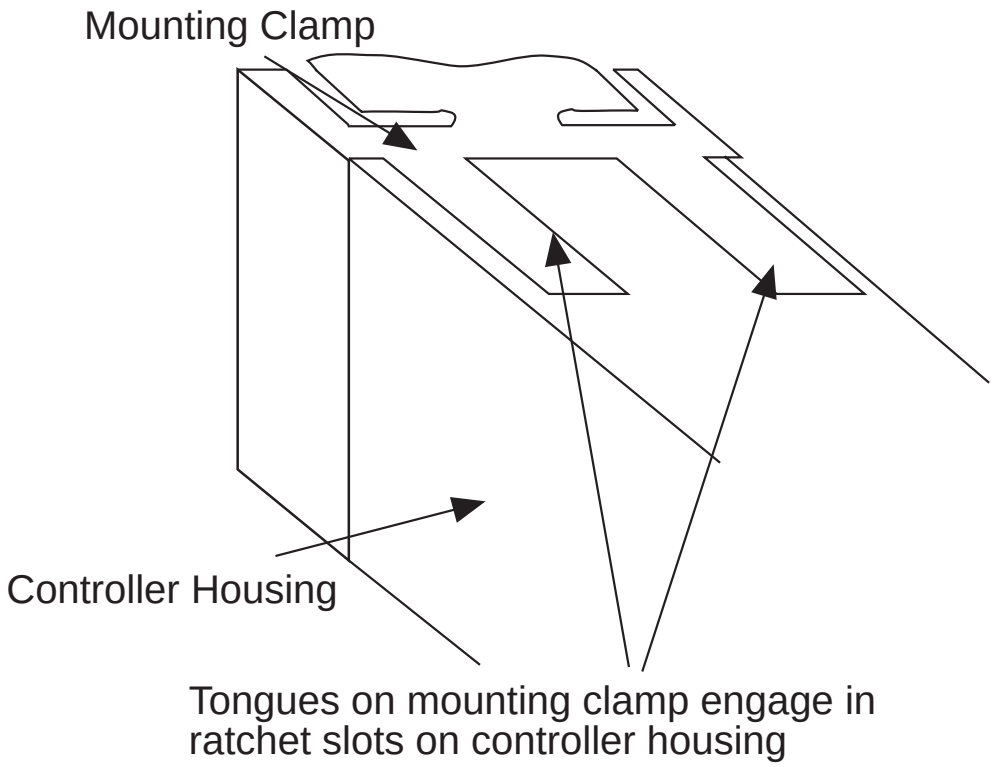
1. Insert the rear of the instrument housing through the cutout (from the front of the mounting panel) and hold the instrument lightly in position against the panel. Ensure that the panel gasket is not distorted and that the instrument is positioned squarely against the mounting panel. Apply pressure to the front panel bezel only.

Caution: Do not remove the panel gasket, as this may result in inadequate clamping of the instrument in the panel.

2. Slide the fixing strap in place (Figure 2-3) and push it forward until it is firmly in contact with the rear face of the mounting panel (the tongues on the strap should have engaged in matching rachet positions on the instrument housing and the fixing strap springs should be pushing firmly against the mounting panel rear face).

Once the instrument is installed in its mounting panel, it may be subsequently removed from its housing, if necessary, as described in Appendix B.

FIGURE 2-3
Panel-Mounting the Instrument



2.3 PREPARATION FOR WIRING

Electrical noise is a phenomenon typical of industrial environments. The following are guidelines that must be followed to minimize the effect of noise upon any instrumentation.

2.3.1 INSTALLATION CONSIDERATIONS

Listed below are some of the common sources of electrical noise in the industrial environment:

- Ignition Transformers
- Arc Welders
- Mechanical contact relay(s)
- Solenoids

Before using any instrument near the device listed, the instructions below should be followed:

1. If the instrument is to be mounted in the same panel as any of the listed devices, separate them by the largest distance possible. For maximum electrical noise reduction, the noise generating devices should be mounted in a separate enclosure.

2. If possible, eliminate mechanical contact relay(s) and replace with solid state relays. If a mechanical relay being powered by an instrument output device cannot be replaced, a solid state relay can be used to isolate the instrument.

3. A separate isolation transformer to feed only instrumentation should be considered. The transformer can isolate the instrument from noise found on the AC power input.

4. If the instrument is being installed on existing equipment, the wiring in the area should be checked to insure that good wiring practices have been followed.

2.3.2 AC POWER WIRING

Neutral (For 115 VAC)

It is good practice to assure that the AC neutral is at or near ground potential. To verify this, a voltmeter check between neutral and ground should be done. On the AC range, the reading should not be more than 50 millivolts. If it is greater than this amount, the secondary of this AC transformer supplying the instrument should be checked by an electrician. A proper neutral will help ensure maximum performance from the instrument.

2.3.3 WIRE ISOLATION

Four voltage levels of input and output wiring may be used with the unit:

- Analog input or output (i.e. thermocouple, RTD, VDC, mVDC, or mADC)
- SPDT Relays
- SSR driver outputs
- AC power

The only wires that should run together are those of the same category. If they need to be run parallel with any of the other lines, maintain a minimum 6 inch space between wires. If wires must cross each other, do so at 90 degrees. This will minimize the contact with each other and reduces "cross talk". "Cross Talk" is due to the EMF (Electro Magnetic Flux) emitted by a wire as current passes through it. This EMF can be picked up by other wires running in the same bundle or conduit.

In applications where a High Voltage Transformer is used (i.e. ignition systems) the secondary of the transformer should be isolated from all other cables.

This instrument has been designed to operate in noisy environments, however, in some cases even with proper wiring it may be necessary to suppress the noise at the source.

2.3.4 USE OF SHIELDED CABLE

Shielded cable helps eliminate electrical noise being induced on the wires. All analog signals should be run with shielded cable. Connection lead length should be kept as short as possible, keeping the wires protected by the shielding. The shield should be grounded at one end only. The preferred grounding location is the sensor, transmitter, or transducer.

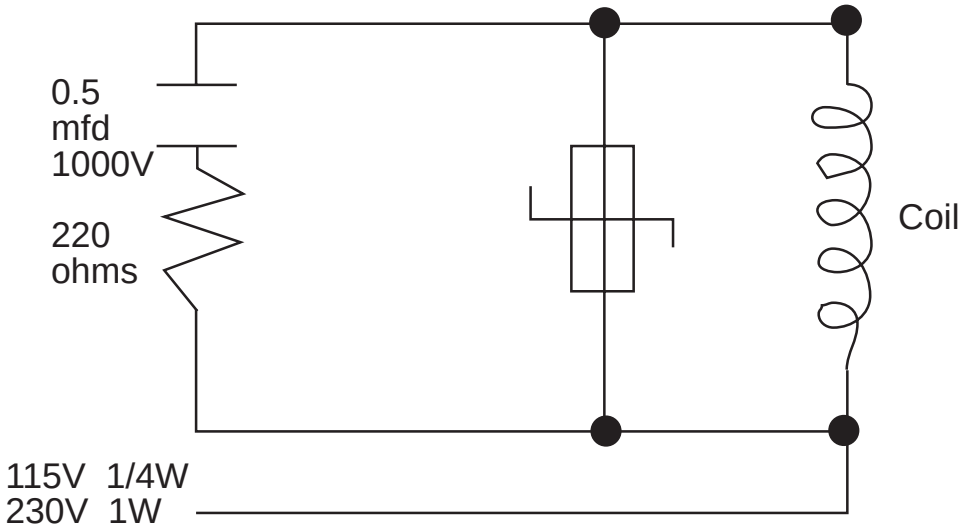
2.3.5 NOISE SUPPRESSION AT THE SOURCE

Usually when good wiring practices are followed no further noise protection is necessary. Sometimes in severe electrical environments, the amount of noise is so great that it has to be suppressed at the source. Many manufacturers of relays, contactors, etc. supply "surge suppressors" which mount on the noise source.

For those devices that do not have surge suppressors supplied. RC (resistance-capacitance) networks and/or MOV (metal oxide varistors) may be added.

Inductive Coils - MOV's are recommended for transient suppression in inductive coils connected in parallel and as close as possible to the coil. See Figure 2-4. Additional protection may be provided by adding an RC network across the MOV.

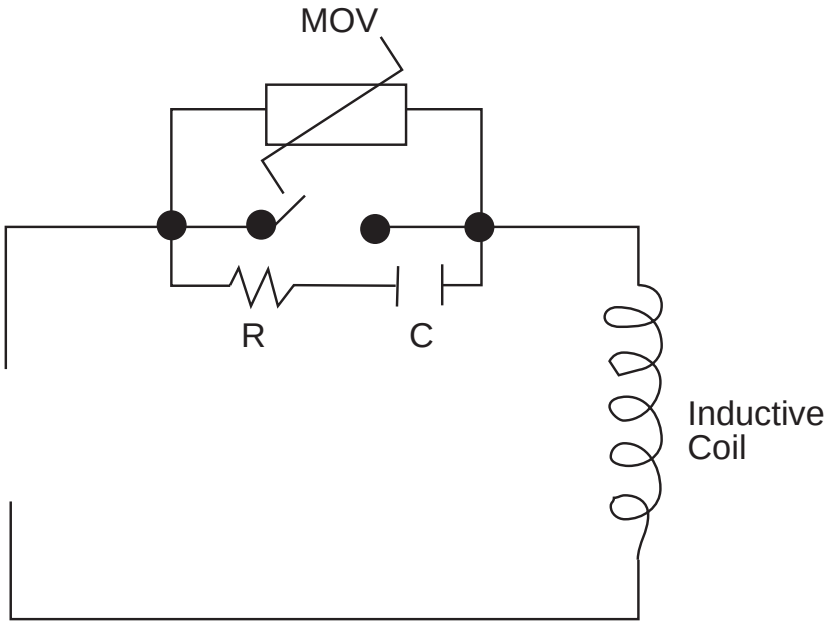
FIGURE 2-4



Contacts - Arcing may occur across contacts when the contact opens and closes. This results in electrical noise as well as damage to the contacts. Connecting a RC network properly sized can eliminate this arc.

For circuits up to 3 amps, a combination of a 47 ohm resistor and 0.1 microfarad capacitor (1000 volts) is recommended. For circuits from 3 to 5 amps, connect 2 of these in parallel. See Figure 2-5, below.

FIGURE 2-5



2.3.5 SENSOR PLACEMENT (THERMOCOUPLE OR RTD)

Two wire RTD's should be used only with lead lengths less than 10 feet.

If the temperature probe is to be subjected to corrosive or abrasive conditions, it should be protected by the appropriate thermowell. The probe should be positioned to reflect true process temperature:

In liquid media - the most agitated area
In air - the best circulated area

FIGURE 2-6
Rear Terminal Connections

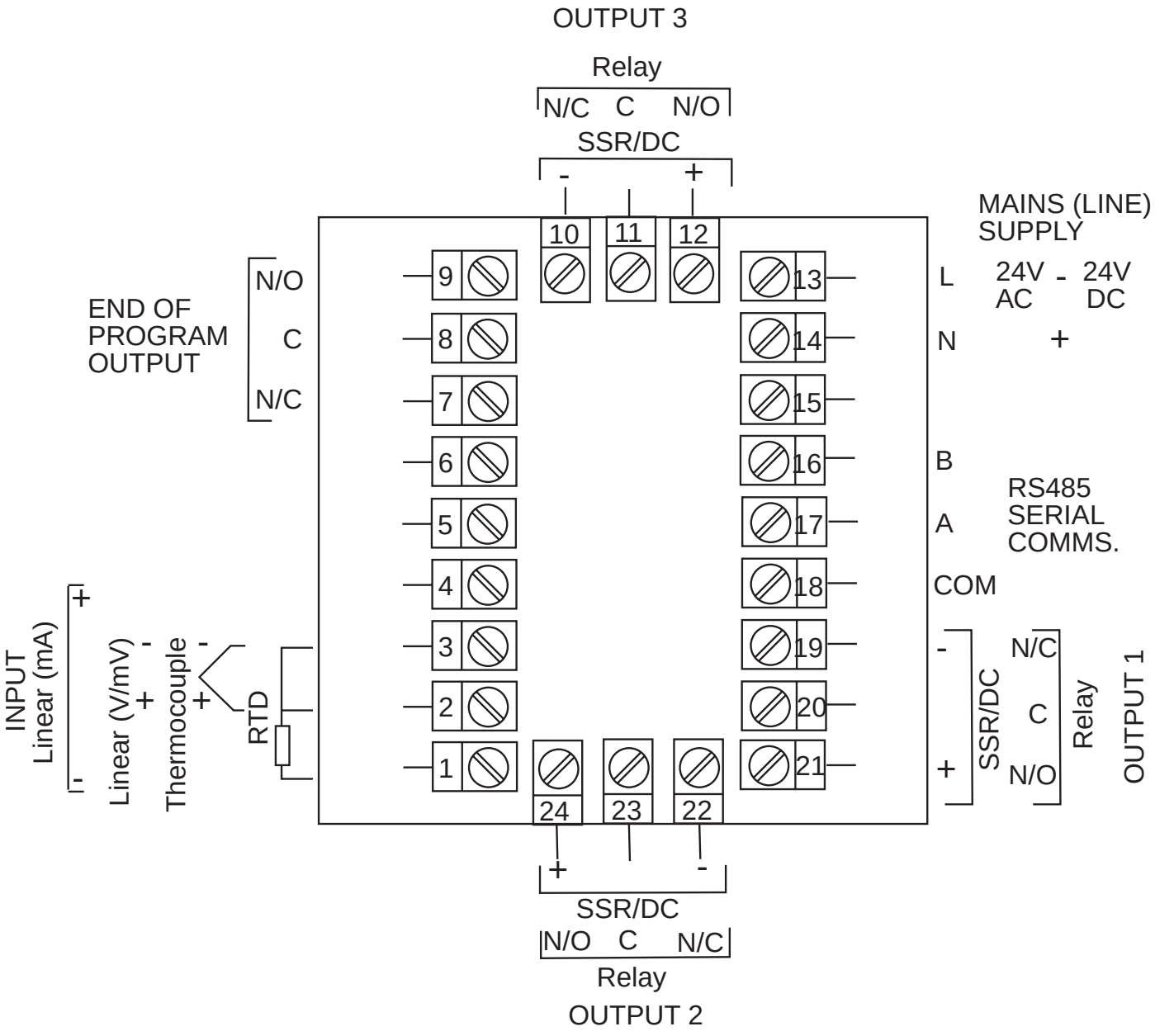
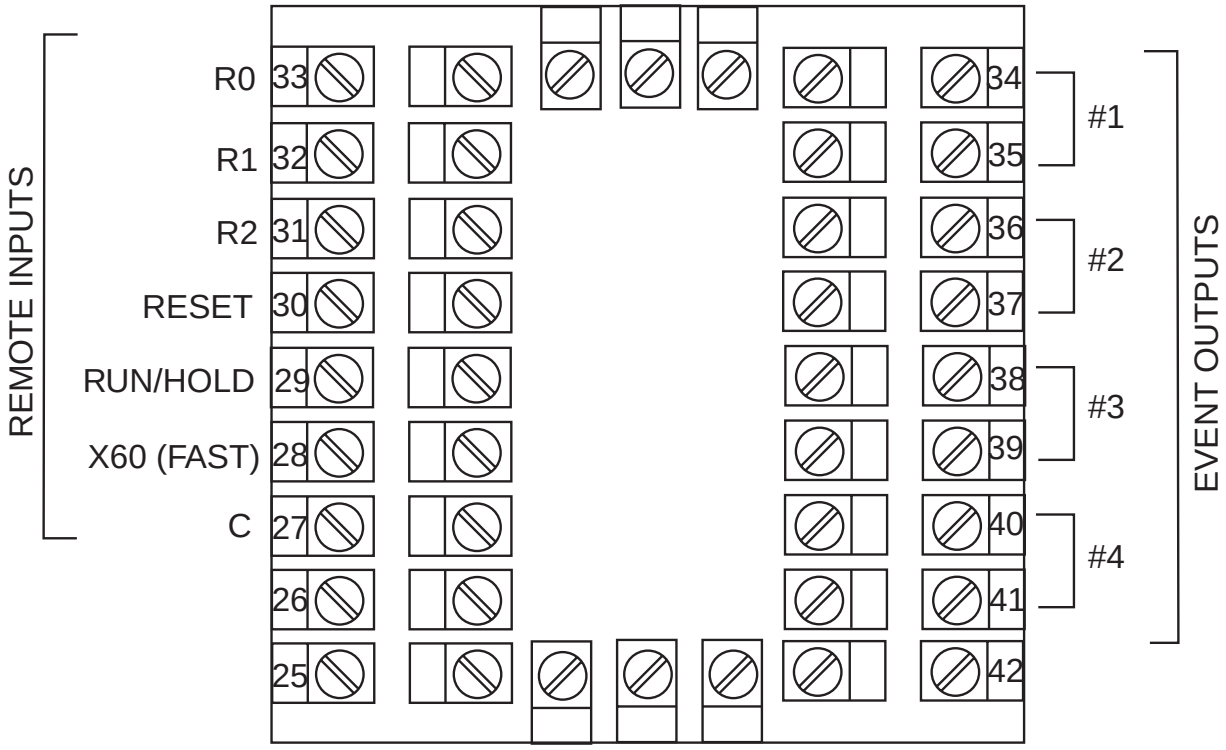


FIGURE 2-6A


REMOTE INPUTS
R0
R1
R2
RESET
RUN/HOLD
X60 (FAST)
C
33
32
31
30
29
28
27
26
25
34
35
36
37
38
39
40
41
42
#1
#2
#3
#4
EVENT OUTPUTS

2.4 Input Connections

In general, all wiring connections are made to the instrument after it is installed. Avoid electrical shock. AC power wiring must not be connected to the source distribution panel until all wiring connection procedures are completed.

Caution: This equipment is designed for installation in an enclosure which provide adequate protection against electric shock. Local regulations regarding electrical installation should be rigidly observed. Consideration should be given to prevention of access to the power terminations by unauthorized personnel. Power should be connected via a two pole isolating switch (preferably situated near the equipment) and a 1 A fuse, as shown in Figure 2-7.

FIGURE 2-7

Main Supply

The instrument will operate on 90-264V AC 50/60 Hz mains (line) supply. The power consumption is approximately 4 VA. If the instrument has relay outputs in which the contacts are to carry mains (line) voltage, it is recommended that the relay contact mains (line) supply should be switched and fused in a similar manner but should be separate from the instrument mains (line) supply.

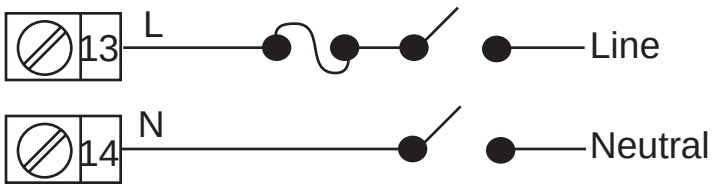


FIGURE 2-7A

24V Nominal AC/DC Supply

The supply connection for the 24V AC/DC option of the instrument are as shown below. Power should be connected via a two pole isolating switch and a 315 mA slow -blow (anti-surge type T) fuse. With the 24V AC/DC supply option fitted, these terminals will accept the following supply voltage ranges:

24V (nominal) AC 50/60Hz - 20-50V
24V (nominal) DC - 22-65V

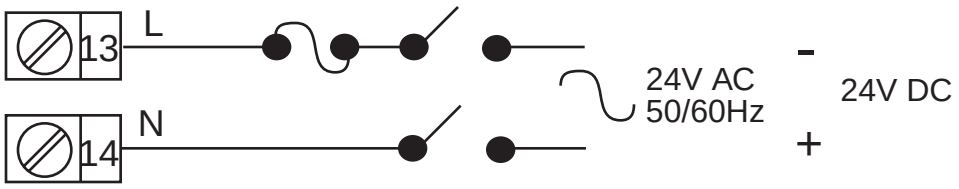


FIGURE 2-8

Thermocouple (T/C) Input

Make the thermocouple connections as illustrated below. Connect the positive leg of the thermocouple to terminal 2 and the negative leg to terminal 3.

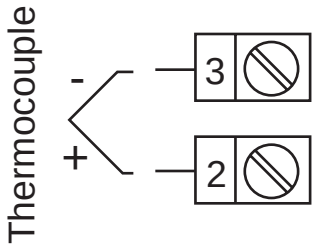


FIGURE 2-9

RTD Input

Make RTD connections as illustrated below. For a three wire RTD, connect the resistive leg of the RTD to terminal 1 and the common legs to terminals 2 and 3. For a two wire RTD, connect one leg to terminal 2 and the other leg to terminal 3 as shown below. A jumper wire supplied by the customer must be installed between terminals 2 and 3. (Continued on next page)

Input conditioning jumper must be positioned correctly (see Appendix B) and Hardware Definition Code must be correct (see Appendix C).

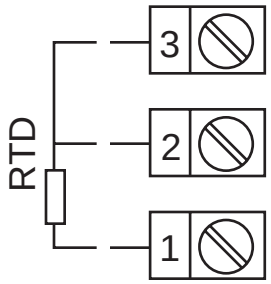


FIGURE 2-10

Volt, mV Input

Make volt and millivolt connections as shown below. Terminal 2 is positive and terminal 3 is negative. Input conditioning jumper must be positioned correctly (see Appendix B) and Hardware Definition Code must be correct (see Appendix C).

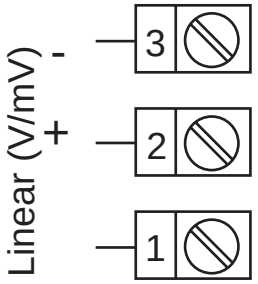


FIGURE 2-11

mADC Input

Make mADC connections as shown below. Terminal 4 is positive and terminal 1 is negative Input conditioning jumper must be positioned correctly (see Appendix B) and Hardware Definition Code must be correct (see Appendix C).

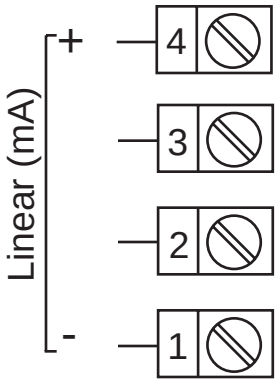
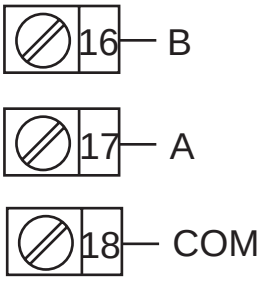


FIGURE 2-12
Remote Digital Communications - RS485
Make digital communication connections as illustrated below.



Output Connections 2.5

FIGURE 2-13
Relay Output 1 (Control Output 1)
Connections are made to Output 1 relay as illustrated below. The contacts are rated at 2 amp resistive, 120/240 VAC .

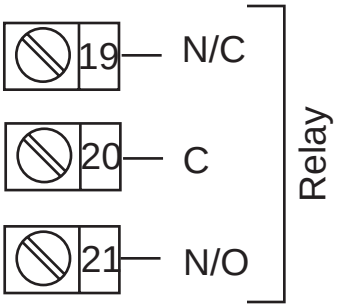


FIGURE 2-14
SSR Driver Output 1 (Control Output 1)
Connections are made to Output 1 SSR Driver as illustrated below. The solid state relay driver is a non-isolated 0-4 VDC nominal signal. Output impedance is 250 ohms.

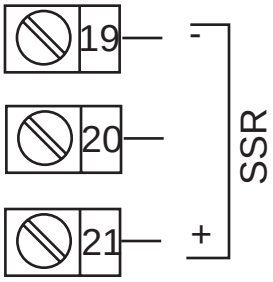


FIGURE 2-15

mADC Output 1 (Control Output 1)
Make connections for DC Output 1 as illustrated below.

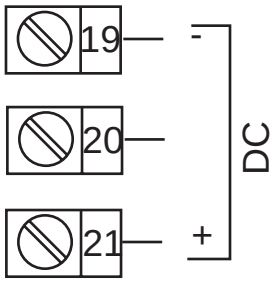


FIGURE 2-16

Relay Output 2 (Control Output 2 OR Alarm 2)
Connections are made to Output 2 relay as illustrated below. The contacts are rated at 2 amp resistive, 120/240 VAC.

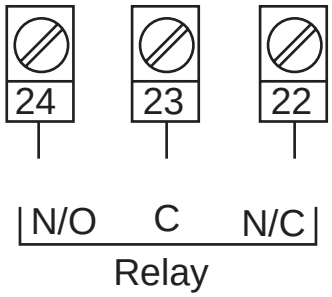


FIGURE 2-17

SSR Driver Output 2 (Control Output 2 OR Alarm 2)
Connections are made to Output 2 SSR Driver as illustrated below. The solid state relay driver is a non-isolated 0-4 VDC nominal signal. Output impedance is 250 ohms.

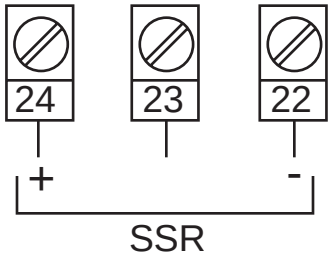


FIGURE 2-18

mADC Output 2 (Control Output 2)
Make connections for DC Output 2 as illustrated below.

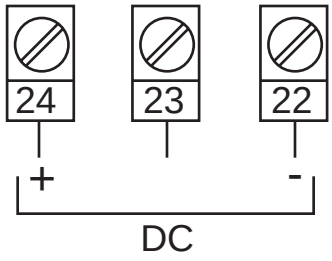


FIGURE 2-19

Relay Output 3 (Alarm 1)
Connections are made to Output 3 relay as illustrated below. The contacts are rated at 2 amp resistive, 120/240 VAC.

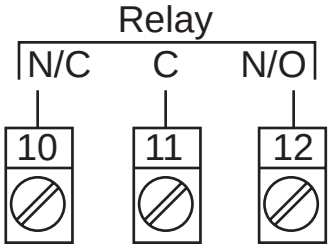


FIGURE 2-20

SSR Driver Output 3 (Alarm 1)
Connections are made to Output 3 SSR Driver as illustrated below. The solid state relay driver is a non-isolated 0-4 VDC nominal signal. Output impedance is 250 ohms.

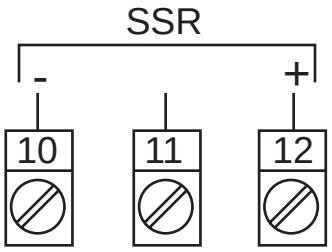


FIGURE 2-21

mADC Output 3 (Recorder Output Only)
Make connections for DC output 3 as illustrated below.

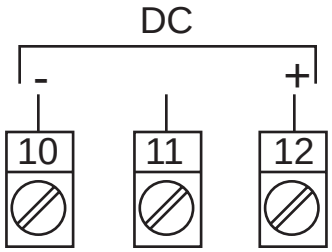


FIGURE 2-22

End of Program Output
Connections are made to End of Program Output as shown below. The contacts are rated at 5 amp resistive, 120/240 VAC.

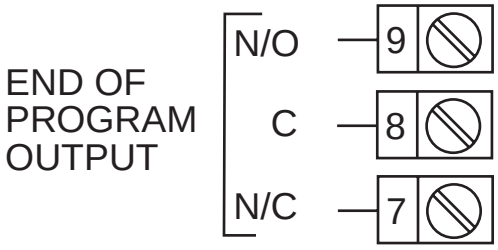


FIGURE 2-23

Event Outputs (optional)
If the Event Outputs have been specified, make connections as shown on top of next page. The contacts are rated at 5 amps, 120/240 VAC.

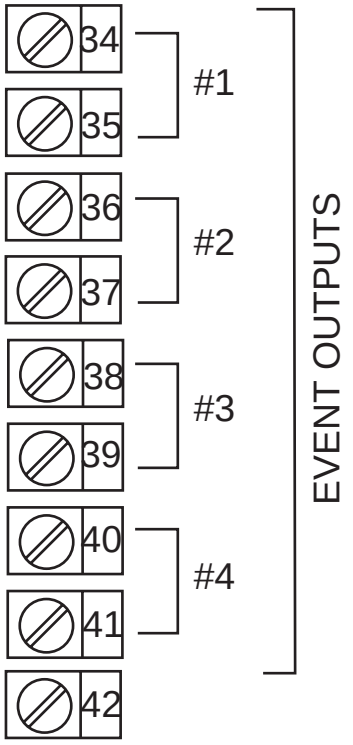
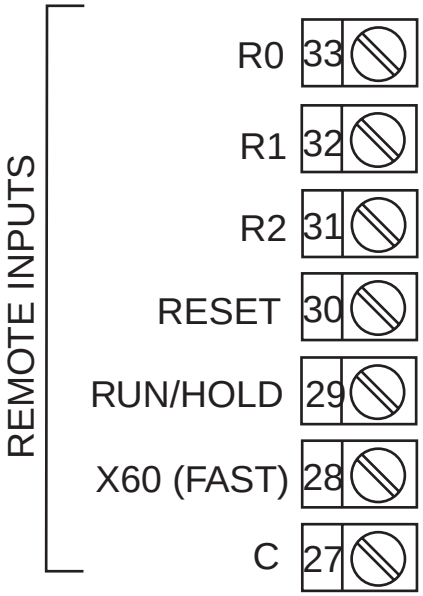


FIGURE 2-24
Remote Program Inputs (optional)
If the Remote Program Control Inputs has been specified, make connections as shown.



Note: Only one remote connection shown for clarity.

Section 3 - Operation

3.1 POWER UP PROCEDURE

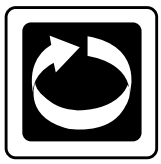
Verify all electrical connections have been properly made before applying power to the instrument.

If the instrument is being powered for the first time, it may be desirable to disconnect the controller output connections. The instrument will be into control following the power up sequence and the output(s) may turn ON . During Power up, a self-test procedure is initiated during which all LED segments in the two front panel displays appear and all LED indicators are ON . When the self-test procedure is complete, the instrument reverts to normal operation.

Note: When power is first applied, a delay of approx. 3 seconds will be seen before the displays light up.

3.2 KEYPAD OPERATION

Mode Key
Changes mode of instrument.



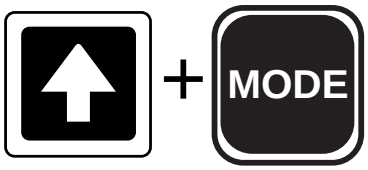
Scroll Key
Displays the next parameter in sequence (indicated by Message display).

Up Key
Increments displayed parameter value/cycles through options.

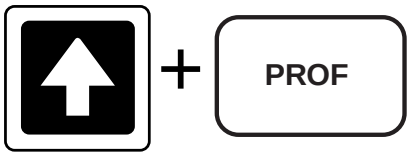
Down Key
Decrements displayed parameter value/cycles through options.

PROF Key
Cycles through Program (profile) numbers.

RUN/HOLD Key
Runs, holds or aborts current program (profile).

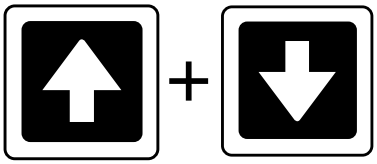


Selects/de-selects Self-Tune and Pre-Tune (when message display shows appropriate message).



Jumps to next segment, when program is running.

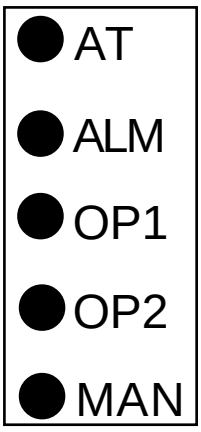
Selects/de-selects Manual Control



Sets a segment to Dwell when defining a program.

3.3 INDICATORS

Control Status Indicators



AT - ON when Self-Tune is active; flashes when Pre-Tune is active.

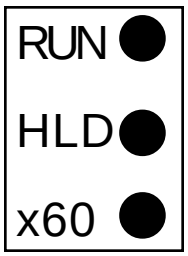
ALM - Flashes when any alarm is active.

OP1 - ON when primary control output is active.

OP2 - ON when secondary control output (if fitted) is active.

MAN - ON when Manual Control is selected.

Run Status Indicators

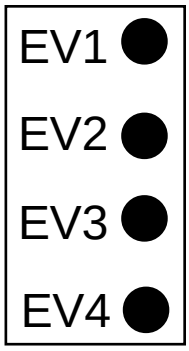


RUN - ON - Program running or (if HLD ON also) held
Flashing - Program in Delayed state

HLD - ON - Program held
Flashing - Program in Auto-Hold

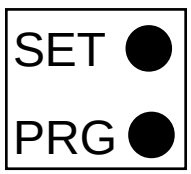
x60 - OFF - timebase = hours/minutes
ON - timebase = minutes/seconds

Event Indicators



Each indicates the status (active or inactive) of a user-defined event (OFF = inactive, ON = active)

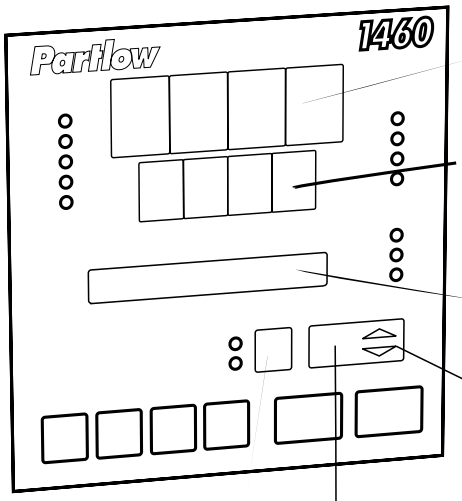
Mode Indicators



SET - ON when Controller Define Mode or Program Define Mode is entered; flashes when viewing parameters in Controller Define Mode or Program Define Mode after entry from Base Mode.

PRG - ON when Program Define Mode is entered.

3.4 DISPLAYS



UPPER DISPLAY
Process Variable value

LOWER DISPLAY
Setpoint value or value/setting
of parameter being viewed/edited.

MESSAGE DISPLAY

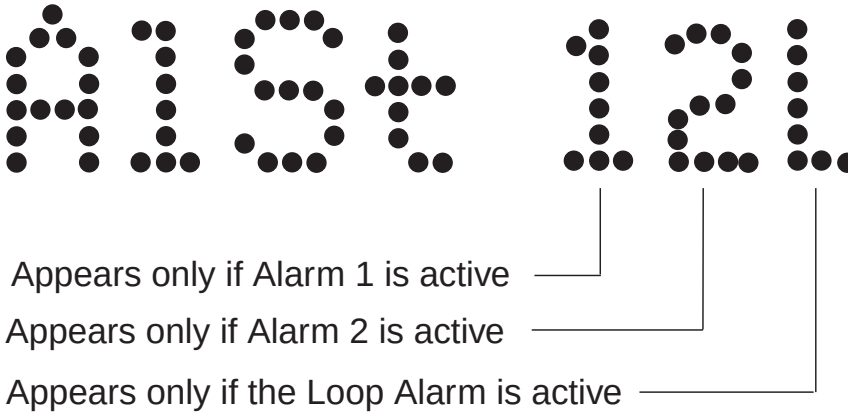
CURRENT RAMP STATE
= UP Ramp
= DOWN Ramp
BOTH ON = Dwell
Both flashing = In Manual Control while program is running

PROGRAM NUMBER
Number of currently-selected program

SEGMENT NUMBER
Number of current segment

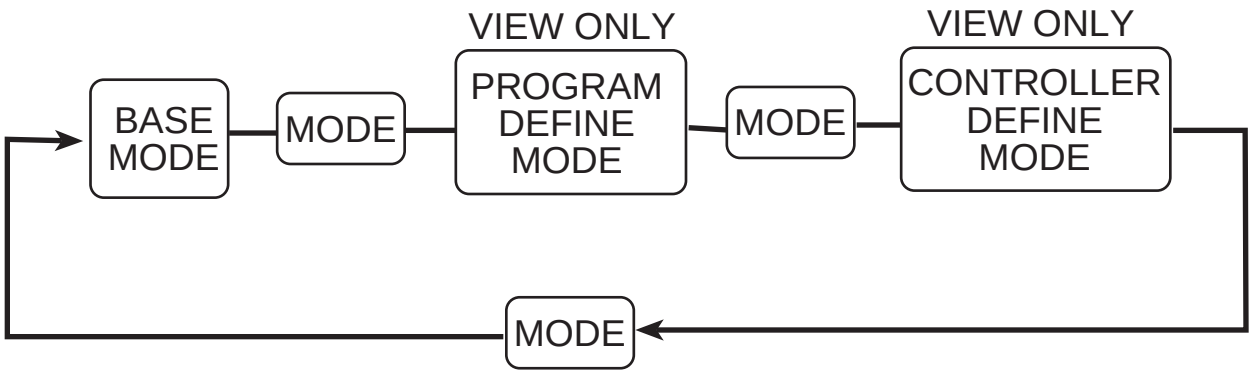
3.5 ALARM STATUS INDICATION

When any alarm is active, the **ALM** indicator will flash. To view the main status in the Message Display, press the SCROLL key until a display appears in the form:



3.6 VIEWING PROGRAM AND CONTROLLER PARAMETERS

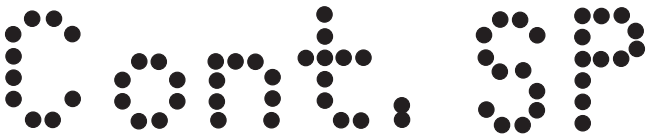
In Base Mode (i.e. with no program currently running or held), the MODE key gives "view only" access to Program Define Mode and Controller Define Mode.



3.7 ADJUSTING THE CONTROLLER SETPOINT

With the Setpoint Programmer in Base Mode (i.e. with the **RUN**, **HLD**, **SET**, and **PRG** indicators OFF), the two main displays will show the process variable value (upper display) and the setpoint value (lower display - Read Only). To change the setpoint value:

1. Press the SCROLL key, the Message Area will display:



2. Use the UP and DOWN keys to change the setpoint value (in the lower display) as required.

3. When the setpoint value is set as desired, press the SCROLL key again to return to the initial display.

3.8 MANUAL CONTROL

In any mode except Configuration Mode, the operator may select manual control of the process by simultaneously pressing the SCROLL and MODE keys, provided Manual Mode is enabled in Controller Define Mode. The instrument will then enter Base Mode or (if a program is currently running) Program Run Mode with the program held. The Message Display will show:

and the lower Main Display will show the power output value, which may then be adjusted using the UP and DOWN keys. While manual control is being used, the power output display is included in the displays available in Base Mode and Program Run Mode.

To cancel manual control, press the SCROLL and MODE keys simultaneously, wereupon the power out value display and the Power message display will disappear and the Setpoint Controller will remain in whatever mode prevailed when manual control was cancelled (if this is Program Run Mode, the currently-running program will be resumed from the point at which it was held).

3.9 USING THE PRE-TUNE FACILITY

The Pre-Tune facility is used to set the instrument's PID control parameters to values which are approximately correct in order to provide a base from which the Self-Tune facility may subsequently optimize tuning. Pre-Tune may be activated as follows:

1. With the instrument in Base mode (with the **RUN** and **HLD** indicators OFF), press the SCROLL key until the Message Display shows:

and the lower Main Display shows:

2. Press the MODE and UP keys to change the lower Main Display to:

indicating that the Pre-Tune facility is now activated. The **AT** indicator will flash.

NOTES:
1. If the process variable is within 5% of the input span from the setpoint, the Pre-Tune facility cannot be activated and any attempt to do so will have no effect.

2. Since the Pre-Tune facility is a single-shot operation, it will automatically de-activate itself once the operation is complete.

To de-activate the Pre-Tune facility manually (with the instrument in Base Mode), press the SCROLL key to obtain the same Message Displays above; then press the MODE and UP keys simultaneously to change the lower Main display from ON to OFF.

3.10 USING THE SELF-TUNE FACILITY

The Self-Tune facility is used to optimize tuning while the Controller part of the instrument is operating. Self Tune may be activated as follows:

1. With the instrument in Base Mode (with **RUN** and **HLD** indicators OFF), press the SCROLL key until the Message Display shows:

and the lower Main Display shows:

2. Press the MODE and UP keys to change the lower Main Display to:

indicating that the Self-Tune facility is now activated. The **AT** indicator is on continuously.

To de-activate the Self-Tune facility, press the SCROLL key to obtain the same Message Display as above; then press the MODE and UP keys simultaneously to change the lower Main Display from ON to OFF.

Section 4 - Configuration

4.1 ENTRY INTO CONFIGURATION MODE

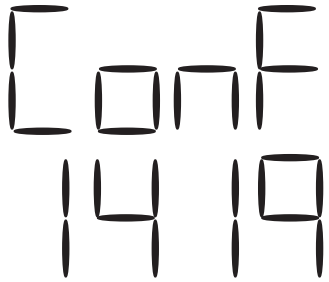
To enter Configuration Mode:

1. Ensure that the instrument is powered down.

2. Power-up the instrument and within 30 seconds of power-up, hold down the UP and SCROLL keys simultaneously for approximately five seconds.

NOTE: This must be the first key action after power-up.

The instrument will then enter Configuration Mode, whereupon the upper and lower main displays will initially be of the form:



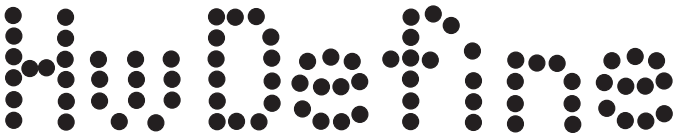
showing the current input code selected, and the Message Display will show:

The user may then step through the Configuration Mode parameters using the SCROLL key. For each parameter, the Message Display will show a legend identifying that parameter and the lower main display will show the current setting of that parameter. The setting may be adjusted using the UP/DOWN keys. As soon as the setting is changed, the lower main display will flash, indicating that the new setting has yet to be confirmed. When the setting is as required, it may be confirmed by pressing the MODE key, whereupon the upper display will stop flashing.

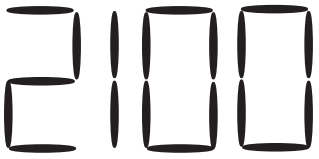
NOTE: Changes to the setting of certain Configuration Mode parameters (i.e. input range, output use and type) will cause the Program Define Mode and Controller Define Mode parameters to be automatically set to their default values.

4.2 HARDWARE DEFINITION CODE

This parameter is a special facility in Configuration Mode, which is used to specify the hardware fitted (input type, output types, etc); this must be compatible with the hardware actually fitted. It can be accessed, with the instrument in Configuration Mode, by simultaneously pressing the DOWN and SCROLL keys. The Message Display will then show:



and lower main display will be of the form:



Input Type
1 RTD/Linear (mV)
2 Thermocouple
3 Linear DC (mA)
4 Linear DC (V)

Output 1 Type
1 Relay Output
2 SSR Output
3 DC Output (0-10V)
4 DC Output (0-20mA)
5 DC Output (0-5V)
7 DC Output (4-20mA)

Output 2 Type
0 None
1 Relay Output (Control or Alarm Output)
2 SSR Output (Control or Alarm Output)
3 DC Output 0-10V (Control Output Only)
4 DC Output 0-20mA (Control Output Only)
5 DC Output 0-5V (Control Output Only)
7 DC Output 4-20mA (Control Output Only)

Output 3 Type
0 None
1 Relay Output (Alarm Output Only)
2 SSR Output (Alarm Output Only)
3 DC Output 0-10V (Recorder Output Only)
4 DC Output 0-20mA (Recorder Output Only)
5 DC Output 0-5V (Recorder Output Only)
7 DC Output 4-20mA (Recorder Output Only)

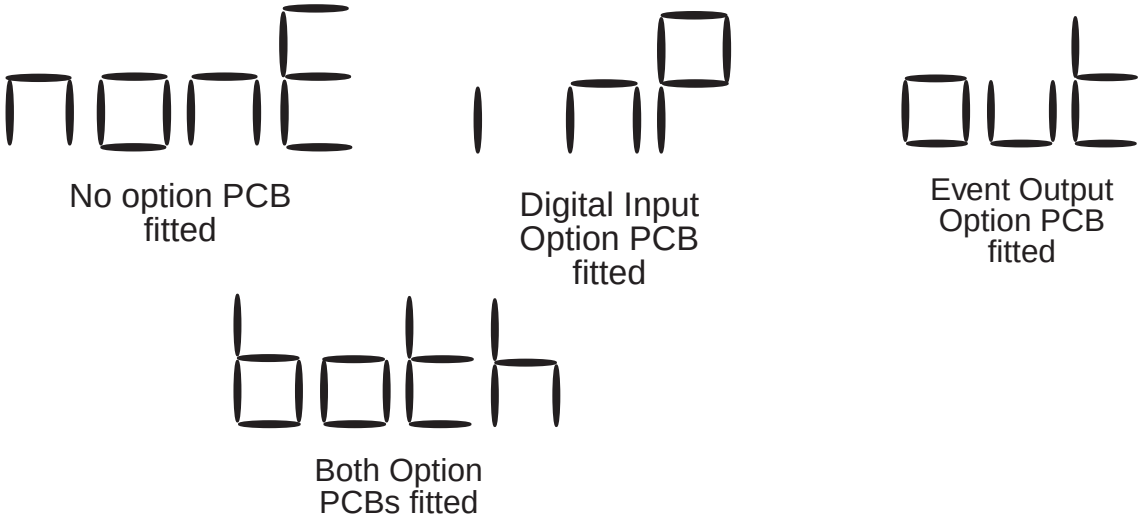
The displayed code may be incremented/decremented using the UP/ DOWN keys as required. The maximum setting available for this code is 4777. For example, the code for a thermocouple input, 4-20mA DC primary output (Output 1) and relay Output 3 would be 2701. When the code is first altered, the code display will flash, until the desired value is displayed and confirmed by pressing the MODE key.

NOTE: It is essential that this code is changed promptly whenever there is a change to the instrument's hardware configuration (change of input/output type, alarm/recorder output added/removed etc.). The instrument software depends upon this code to operate correctly.

Hardware Definitions may be viewed as Read Only displays in Base Mode by pressing the SCROLL and DOWN keys simultaneously.

While the Hardware Definition Code is displayed, pressing the SCROLL key will cause the Message Display to change to:

and the lower main display to change to one of:



The desired setting can be achieved using the UP/DOWN keys.

Press the SCROLL key to change the Message Display to:

and the lower main display to one of:

RS485 Communications Option PCB not fitted

RS485 Communications Option PCB fitted - Programmer acting as slave device

RS485 Communications Option PCB fitted - Programmer acting as master device

The desired setting can be achieved using the UP/DOWN keys.

To exit from the Hardware Definition Code facility, press the DOWN and SCROLL keys simultaneously (which will cause a return to the normal Configuration Mode). Alternatively, either of the methods of exit from Configuration Mode may be used here.

4.3 CONFIGURATION MODE PARAMETERS

The Configuration Mode parameters are presented for view/edit in the following sequence:

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
1	Primary Input Range[5]	Input	Code displayed defines input type/ range (see App. A)	See App. A
2	Control Action	Control	Specifies control action of Output 1[1]	dir - Direct Acting rEu- Reverse Acting

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTINGS
3	Alarm 1 Type	Alarm 1	Specifies Alarm 1 Operation	P_hi- Process High P_Lo-Process Low dE-Deviation bAnd-Band nonE-None
4	Alarm 2 Type	Alarm 2	Specifies Alarm 2 Operation	P_hi-Process High P_Lo-Process Low dE-Deviation bAnd-Band nonE-None
5	Alarm Inhibit	Inhibit	Specifies which alarms are inhibited	nonE-No inhibit ALA1-Alarm1 ALA2-Alarm 2 both-Both Alarms
6	Output 2 Usage	Out2 Use	Specifies use of Output 2[2]	out2-Control Output A2_d-Alarm 1 (direct) A2_r-Alarm 2 (reverse) Or_d-Alarm 1 OR 2 (direct)

(Continued on next page)

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTINGS
				Or_r-Alarm 1 OR 2 (reverse) Ad_d-Alarm 1 AND 2 (direct) Ad_r-Alarm 1 AND 2 (reverse) LP_d-Loop Alarm (direct) LP_r-Loop Alarm (reverse)
7	Output 3 Useage	Out3 Use	Specifies use of Output 3[3]	Al_d-Alarm 1 (direct) Al_r-Alarm 1 (reverse) Or_d-Alarm 1 OR 2 (direct) Or_r-Alarm 1 OR 2 (reverse) Ad_d-Alarm 1 AND 2 (direct) Ad_r-Alarm 1 AND 2 (reverse) LP_d-Loop Alarm (direct)

(Continued on the next page)

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTINGS
				LP_r-Loop Alarm (reverse) rEcS-Rcdr Output (SP) rEcP-Rcdr Output (PV)
8	Segment Mode	Seg Mode	Defines parameter used to specify duration of each segment (along with final SP value)	ti- Time rA-Ramp Rate
9	Baud Rate[6]	Baud Rate	Selects Baud Rate for RS485 Comms.	Numeric value: 1200, 2400, 4800 or 9600
10	Address[6,7]	Address	Selects RS485 comm. address	Numeric value in range 1-32
11	CJC[4] Enable/ Disabled	CJC	Enables/ disables cold junction comp.	EnAb-enabled diSA-disabled
12	Lock Code	Lock Code	Displays current lock code value	Read Only- no adjustment in Conf. Mode

For Notes on Configuration Mode Parameters, see next page.

Notes on Configuration Mode Parameters

1. If the secondary output is chosen as Output 2 (COOL) control output, its action is always the compliment of the action of Output 1.
2. The default setting for Output 2 Usage is Alarm 2 hardware output, direct-acting (if relay/SSR output) or Output 2 - COOL (if DC output).
3. The default setting for Output 3 Usage is Alarm 1 hardware output, direct-acting (if relay/SSR output) or Process Variable Recorder Output (if DC output)
4. This parameter does not appear in the sequence if the input type selected is not thermocouple. If the CJC is disabled, the initial display in Operator Mode will show horizontal bars flashing in the lower display.
5. The primary input default setting is dependent upon the hardware fitted, as indicated in the Hardware Definition Code.
6. These parameters do not appear if the Hardware Definition Comms parameters is set to nonE.
7. This parameter does not appear if the Programmer communications option is set to operate in Master mode.

4.4 ALARM INHIBIT FACILITY

On power-up, an "alarm" condition may occur, based on the alarm value, the process value and, if appropriate to the alarm type, the setpoint value. This would normally activate an alarm; however, if the pertinent alarm is inhibited, the alarm indication is suppressed and the alarm will remain inactive. This will prevail until the "alarm" condition returns to the "inactive" state, whereafter the alarm will operate normally.

4.5 EXIT FROM CONFIGURATION MODE

To leave Configuration Mode, depress the UP and SCROLL keys simultaneously.

Note: An automatic exit to Base Mode will be made if, in Configuration Mode, there is no front panel key activity for five minutes.

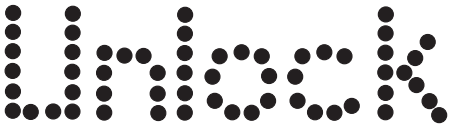
The exit is made via the power-up self-test routines which includes a lamp test.

Section 5 - Defining The Controller Parameters (Controller Define Mode)

Entry can be made into this mode from Program Define Mode, Program Run Mode or Base Mode.

To enter from Base Mode or Program Run Mode:

1. Press the SCROLL and UP keys simultaneously. The lower display will show **0** and the Message Display will show:



2. Use the UP and DOWN keys to set the value in the lower Main Display to the correct Lock Value (defined by the user in Controller Define Mode) and press the SCROLL key. The Setpoint Programmer is now in Program Define Mode.

Note: If an incorrect Lock Code value is entered, the instrument will return to the original mode (i.e. Base Mode or Program Run Mode)

3. Press the MODE key.

The instrument is now in the Controller Define Mode.

Upon entry into the Controller Define Mode, the **SET** indicator will then come ON and the first of the Controller parameters (Input Filter Time Constant) will be presented for editing/viewing. Using the SCROLL key, step through the sequence of Controller parameters, editing as required (using the UP/DOWN keys).

5.1 CONTROLLER PARAMETERS

The Controller parameters appear in the following sequence:

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
1	Input Filter Time Constant	Filter	Defines time constant for input filter (removes extraneous impulse from the process variable input.	0.0 seconds (filter OFF) to 100.0 seconds in 0.5 increments. Default = 2.0 seconds.
2	Process Variable Offset[1]	Offset	Modifies actual PV value: Offset PV + Actual PV = PV value used	For linear input, limited by Scale Range Max. and Scale Range Min. Default=0.
3	Output 1 Power	Out1	Indicates current Output1 power level	Not adjustable "Read Only"
4	Output 2 Power[2]	Out2	Indicates current Output2 power level	No adjustable "Read Only"
5	Proportional Band 1 (PB1)	P.Band 1	Defines portion of input span in which the Output 1 power level is proportional to the (offset) process variable value	0.0% (ON/OFF control) to 999.9% of input span. Default = 10.0%

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
6	Proportional Band 2[2] (PB2)	P.Band 2	Defines portion of input span in which the Output 2 power level is proportional to the (offset) process variable value	0.0% (ON/OFF control) to 999.9% of input span. Default = 10.0%
7	Reset[3]	Reset	Integral Time Constant	1 second to 99 minutes 59 seconds per repeat
8	Rate[3]	Rate	Derivative Time Constant	00 seconds to 99 minutes 59 seconds
9	Overlap or Deadband[4]	Overlap	Defines the portion of the proportional band (PB1 + PB2) over which both outputs are active (overlap) or neither output is active (deadband)	-20% to +20% (negative value = deadband, positive value = overlap) Default = 0%
10	Bias (Manual Reset)[3]	Bias	Bias applied to output power, expressed as a percentage of output power	0% to 100% (Output1 only) -100% to +100% (Output 1 & Output 2) Default=25%

MESSAGE STEP	DESCRIPTION	AVAILABLE DISPLAY	FUNCTION	SETTING
11	ON/OFF Differential[5]	Diff 1 Diff 2 Diff	Switching differential for 1 output (Diff 1 or Diff 2) or both outputs (Diff) set to ON/OFF control (PB1, PB2 or both = 0%)	0.1% to 10% of input span Default=0.5%
12	Setpoint High Limit[6]	SP High	The maximum limit for setpoint adjustment. Should be set to a value which prevents setpoint values causing damage to the process.	Current setpoint value to input Range Max. Default = Input Range Max.
13	Setpoint Low Limit[6]	SP Low	The minimum limit for setpoint adjustment. Should be set to a value which prevents setpoint values causing damage to the process.	Input Range Min. to current setpoint value. Default = Input Range Minimum.

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
14	Recorder Output Scale Maximum[7]	Rec High	The value of the process variable or setpoint (as applicable) for which the recorder output is a minimum.	-1999 to 9999 (decimal point as for the process variable input range). Default = Input Range Max.
15	Recorder Output Scale Minimum[7]	Rec Low	The value of the process variable or setpoint (as applicable) for which the recorder output is a minimum.	-1999 to 9999 (decimal point as for the process variable input range). Default = Input Range Min.
16	Output Power Limit[3]	Out High	Limits the power level of Output 1 (used to protect the process).	0% to 100%
17	Output 1 Cycle Time[8]	CycTime1	Limits frequency of operation of output relay to maximize relay life.	0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 or 512 seconds. Default = 32 seconds.

MESSAGE STEP	DESCRIPTION	AVAILABLE DISPLAY	FUNCTION	SETTING
18	Output 2 Cycle Time[8]	CycTime2	Limits frequency of operation of output relay to maximize relay life.	0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 or 512 seconds. Default = 32 seconds.
19	Process High Alarm 1 value	HiAlarm1	If Alarm 1 is a Process High Alarm, the value of process variable at or above which Alarm 1 will be active.	Input Range Max. to Input Range Min. Default = Input Range Max.
20	Process Low Alarm 1 value	LoAlarm1	If Alarm 1 is a Process Low Alarm, the value of process variable at or below which Alarm 1 will be active.	Input Range Max. to Input Range Min. Default = Input Range Min.
21	Band Alarm 1 value	BaAlarm1	If Alarm 1 is a Band Alarm, the band of process variable values (centered on the setpoint) outside which the process variable will cause this alarm to be active.	± (input span) from setpoint. Default = five input units.

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
22	Deviation (High/Low) Alarm 1 value	DeAlarm1	If Alarm 1 is a Deviation High/Low Alarm, gives a value above (positive value) or below (negative value) the setpoint. If the process variable deviates from the setpoint by a margin greater than this value, the alarm becomes active	± (input range) from setpoint Default = five input range units.
23	Alarm 1 Hysteresis value	Al1 Hyst	Value defines a hysteresis band on the "safe" side of the Alarm 1 value	1 LSD to 10% of input span (0 is an invalid value)
24	Process High Alarm 2 value	HiAlarm2	If Alarm 2 is a Process High Alarm, the value of process variable at or above which Alarm 2 will be active	Input Range Max. to Input Range Min. Default = Input Range Max.

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
25	Process Low Alarm 2 value	LoAlarm2	If Alarm 2 is Process Low Alarm, the value of process variable at or below which Alarm 2 will be active	Input Range Max. to Input Range Min. Default = Input Range Min.
26	Band Alarm 2 value	BaAlarm2	If Alarm 2 is a Band Alarm, the band of process variable values (centered on the setpoint) outside which the process variable will cause this alarm to be active.	± (input span) from setpoint. Default = five input units.

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
27	Deviation (High/Low) Alarm 2 value	DeAlarm2	If Alarm 2 is a Deviation High/Low Alarm, gives a value above (positive value) or below (negative value) the setpoint. If the process variable deviates from the setpoint by a margin greater than this value, the alarm becomes active.	± (input range) from setpoint. Default = five input range units
28	Alarm 2 Hysteresis value	Al2 Hyst	A non-zero value defines a hysteresis band on the "safe" side of the Alarm 2 value	1 LSD to 10% of input span
29	Loop Alarm Enable	Loop Alm	Enables/ disables Loop Alarm	0 (disabled)/ 1 (enabled) Default = 0 (disabled)

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
30	Loop AlarmTime	LpAtime	If ON/OFF control is selected (i.e. PB1=0) and Loop Alarm is enabled, this defines the duration of the saturation condition after which the Loop Alarm is activated	1 second to 99 minutes 59 seconds. Default = 99 minutes 59 seconds
31	Scale Range Decimal Point[9]	Range Pt	For linear inputs, defines the decimal point position	0 XXXX 1 XXX.X (default) 2 XX.XX 3 X.XXX
32	Scale Range Maximum[9]	Range Hi	For linear inputs, defines the scaled input value when the process variable input is at its maximum value.	-1999 to 9999 (decimal point as defined by Scale Range Decimal Point parameter). Default = 100.0

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
33	Scale Range Minimum[9]	Range Lo	For linear inputs, defines the scaled input value when the process variable input is at its minimum value.	-1999 to 9999 (decimal point as defined by Scale Range Decimal Point parameter). Default = 0.0
34	Auto Pre-Tune Enable/Disable	Auto PT	Determines whether the Pre-Tune facility is automatically activated on power-up	OFF = Disabled ON = Enabled Default = OFF
35	Manual Control Enable/Disable	A/M Enab	Enables/ disables operator selection of manual control	OFF = Disabled ON = Enabled Default = Off
36	Communications Write Enable/ Disable[10]	ComWrite	Enables/ disables changing of parameter values or settings via the RSs485 communications link.	OFF = Disabled ON = Enabled Default = Off

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
37	Lock value	Lock	Defines the four-digit code required to enter Program define Mode or Controller Define Mode	0 to 9999 Default = 10

Notes on Configuration Define Mode Parameters

1. The Process Variable Offset value should be chosen with care. Any adjustment to this parameter is, in effect, a calibration adjustment. Injudicious application of values to this parameter could lead to the dis played process variable value bearing no meaningful relationship to the actual process variable value. There is no front panel indication when this parameter is in effect (i.e. has been set to a non-zero value).
2. These parameters are applicable only if the secondary control (COOL) output is fitted.
3. These parameters are not applicable if Proportional band 1 is set to 0 (i.e. ON/OFF control).
4. This parameter is not applicable if Proportional band 1 is set to 0 or if Output 2 (COOL) is not fitted.
5. The message Display will show Diff1 for ON/OFF control on Output 1 only, Diff 2 for ON/OFF control on Output 2 only or Diff for ON/OFF control on both Output 1 and Output 2.
6. Internal software prevents (a) the Setpoint High Limit being given a value less than any setpoint value contained in currently-resident programs, and (b) the Setpoint Low Limit being given a value greater than any setpoint value contained in currently-resident programs.
7. These parameters are not applicable if the Recorder Output option is not fitted.
8. Output 1 cycle Time is not applicable if Proportional Band 1 is set to 0 or if Output 1 is a DC linear output. Output 2 cycle Time is not applicable if Proportional Band 1 is set to 0, if Output 2 is not fitted or if Output 2 is a DC linear output.

9. These parameters are applicable only if a linear input is fitted.
10. Applicable only if the RS485 Communications option is fitted.

FIGURE 5-1

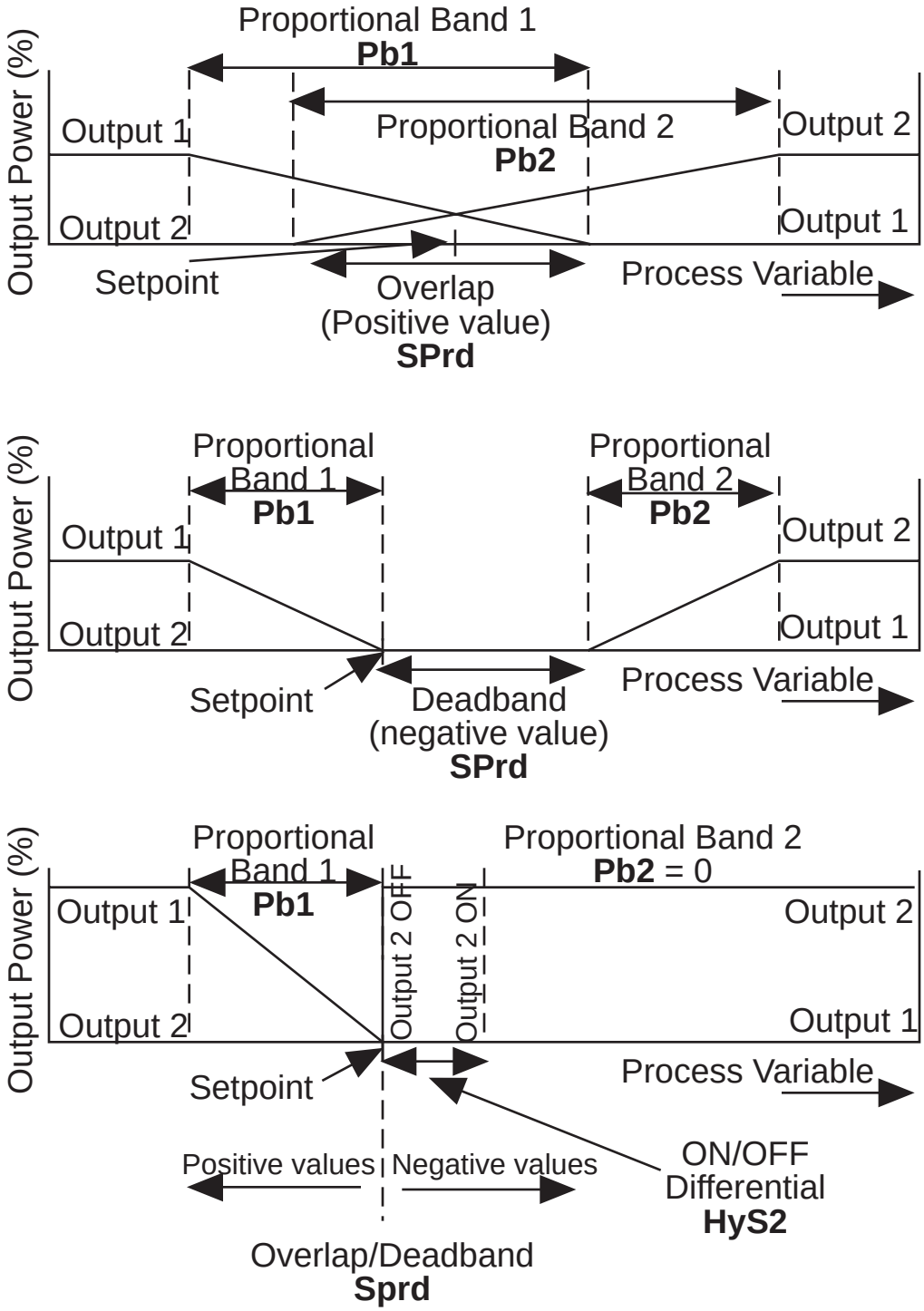
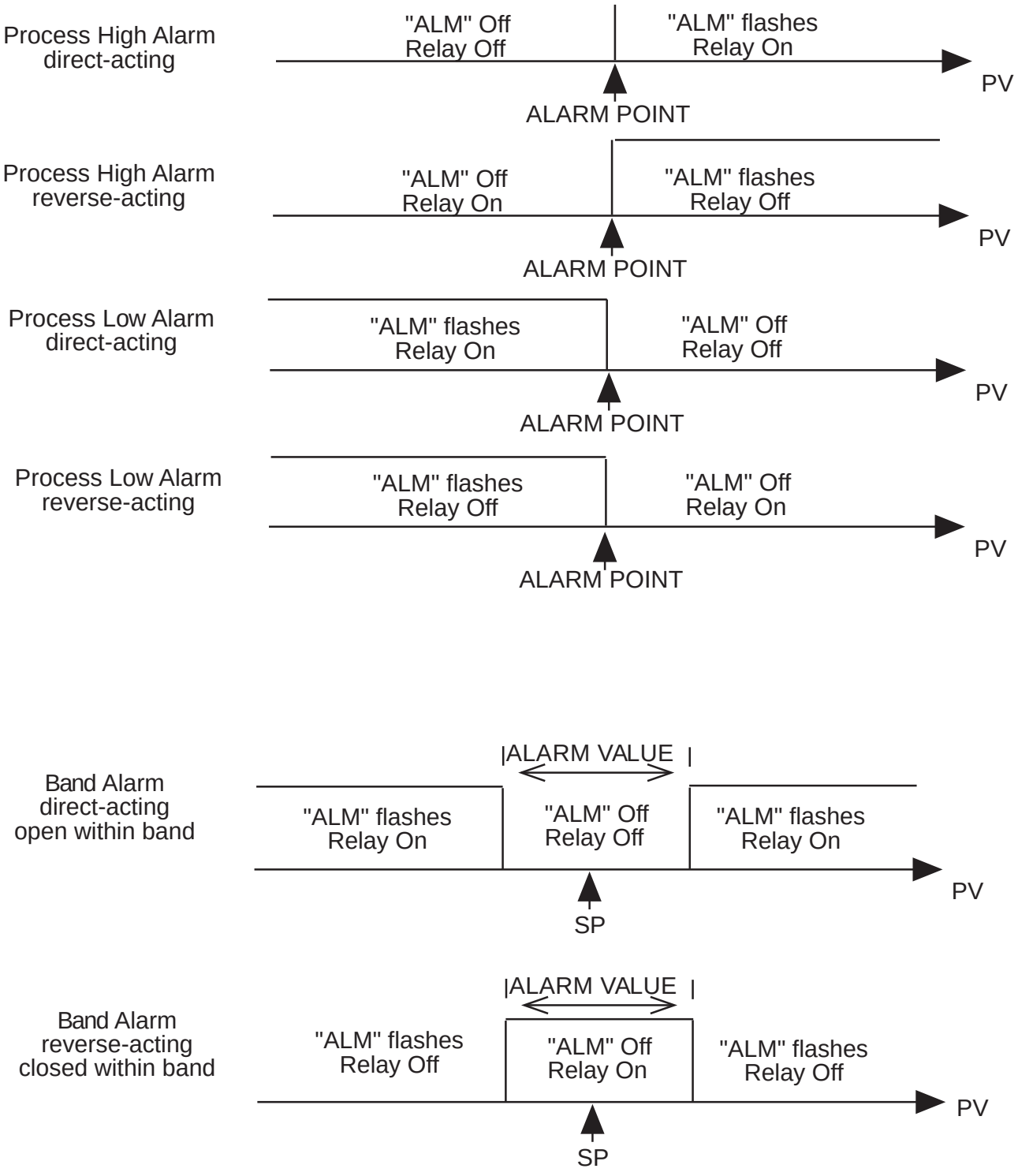


FIGURE 5-2



(Continued on next page)

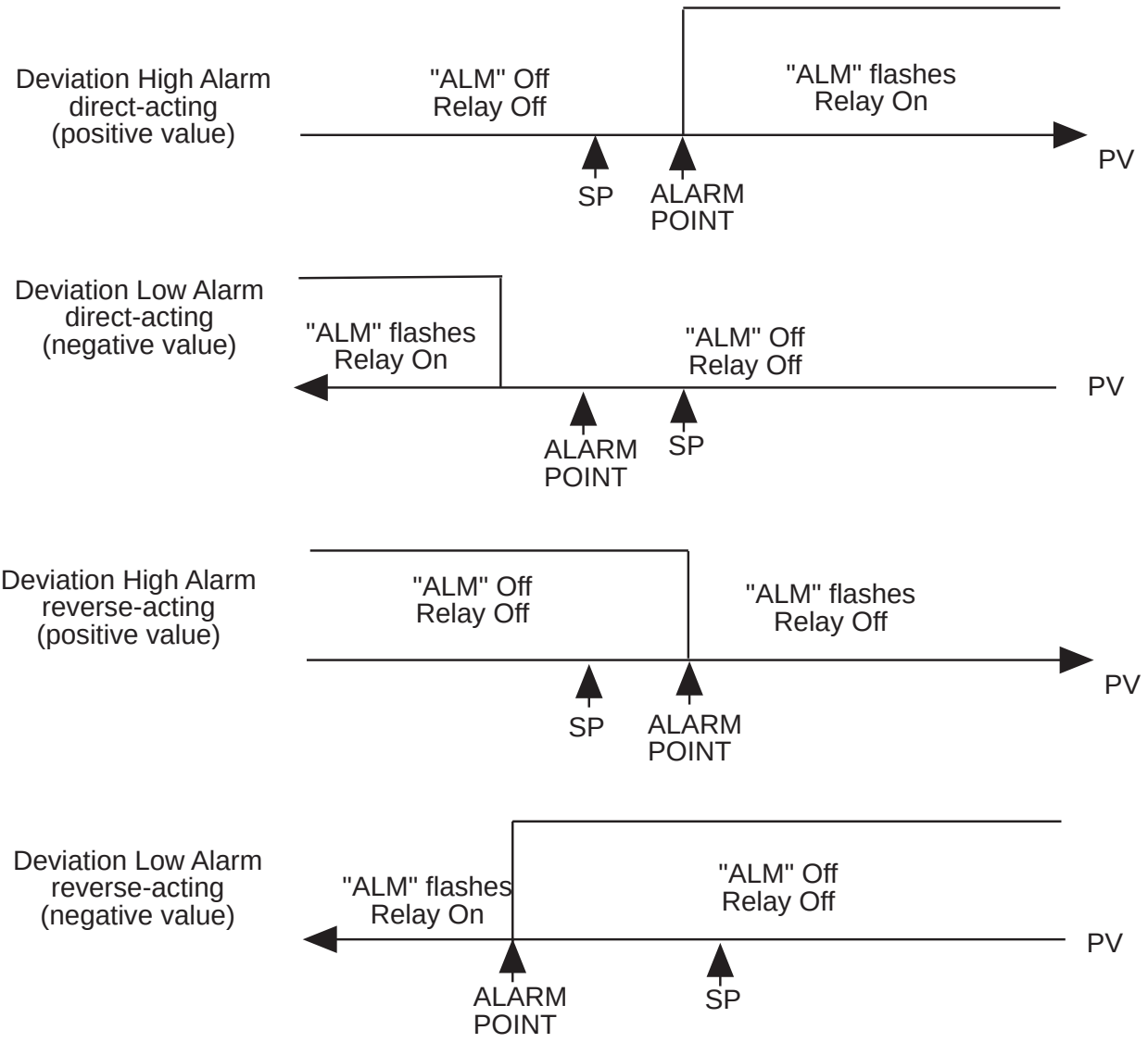
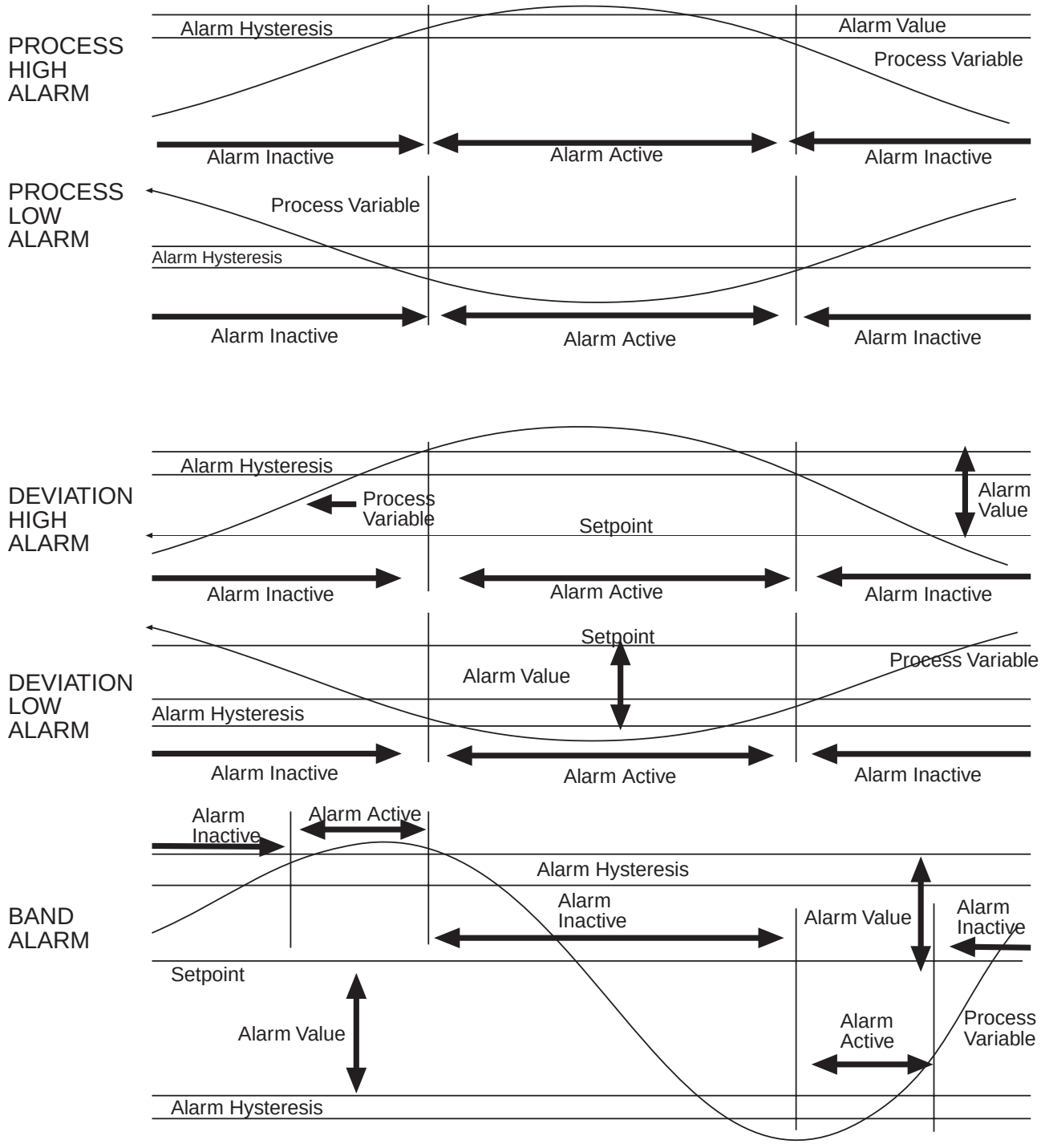

Deviation High Alarm
direct-acting
(positive value)
"ALM" Off
Relay Off
"ALM" flashes
Relay On
PV
SP
ALARM
POINT
Deviation Low Alarm
direct-acting
(negative value)
"ALM" flashes
Relay On
"ALM" Off
Relay Off
PV
ALARM
POINT
SP
Deviation High Alarm
reverse-acting
(positive value)
"ALM" Off
Relay Off
"ALM" flashes
Relay Off
PV
SP
ALARM
POINT
Deviation Low Alarm
reverse-acting
(negative value)
"ALM" flashes
Relay On
"ALM" Off
Relay Off
PV
ALARM
POINT
SP

FIGURE 5-3


PROCESS HIGH ALARM
Alarm Hysteresis
Alarm Value
Process Variable
Alarm Inactive
Alarm Active
Alarm Inactive
PROCESS LOW ALARM
Process Variable
Alarm Hysteresis
Alarm Inactive
Alarm Active
Alarm Inactive
DEVIATION HIGH ALARM
Alarm Hysteresis
Process Variable
Setpoint
Alarm Value
Alarm Inactive
Alarm Active
Alarm Inactive
DEVIATION LOW ALARM
Setpoint
Alarm Value
Process Variable
Alarm Hysteresis
Alarm Inactive
Alarm Active
Alarm Inactive
BAND ALARM
Alarm Inactive
Alarm Active
Alarm Hysteresis
Alarm Inactive
Alarm Value
Alarm Inactive
Setpoint
Alarm Value
Alarm Active
Process Variable
Alarm Hysteresis

5.2 BASE MODE DISPLAYS

Once the complete cycle of Controller Define Mode parameters has been displayed, the user may then step through the Base Mode displays (controller setpoint - alarm status - Self Tune - Pre-Tune), making adjustments where required, before re-starting the Controller Define Mode parameter cycle.

5.3 LOOP ALARM AND LOOP ALARM TIME

The Loop Alarm is a special alarm which detects faults in the control feedback loop by continuously monitoring process variable response to the control output(s).

The Loop Alarm facility, when enabled, repeatedly checks the control output(s) for saturation i.e. either or both outputs being at the maximum or minimum limit. If an output is found to be in saturation, the Loop Alarm facility starts a timer; thereafter, if the saturated output has not caused the process variable to be corrected by a pre-determined amount V after a time T has elapsed, the Loop Alarm goes active. Subsequently, the Loop Alarm facility repeatedly checks the process variable and the control output(s). When the process variable starts to change value in the correct sense or when the saturated output comes out of saturation, the Loop Alarm is deactivated.

For PID control, the Loop Alarm Time T is always set to twice the value of the Reset (Integral Time Constant) parameter. For On/Off control, the user defined value of the Loop Alarm Time parameter is used.

The value of V is dependent upon the input type:

°C ranges:	2°C or 2.0°C
°F ranges:	3°F or 3.0°F
Linear ranges:	10 least significant display units

For single output controllers, the saturation limits are 0% and Output Power Limit. For dual output controllers, the saturation limits are -100% and Output Power Limit.

Notes:

1. Correct operation of the Loop Alarm depends upon reasonably accurate PID tuning.
2. The Loop Alarm is automatically disabled during Manual Control Mode and during execution of the Pre-Tune facility. Upon exit from Manual Control Mode or after completion of the Pre-Tune routine, the Loop Alarm is automatically re-enabled.

When full ON/OFF control is selected (i.e. Proportional Band 1 is set to 0) and Loop Alarm is enabled, the Loop Alarm Time parameter determines the duration of the saturation condition after which the Loop alarm will be activated. It may be adjusted within the range 1 second to 99 minutes 59 seconds. This parameter is omitted from the display sequence if ON/OFF control is not selected or Loop Alarm is disabled. The default setting is 99:59.

5.4 EXITING CONTROLLER DEFINE MODE

The operator may exit from Controller Define Mode by pressing the MODE key until the **Exit ?** prompt appears in the Message Display, then pressing the SCROLL key, which will cause a return to the mode from which entry was made.

Note: An automatic return is made if there is no key activity in Controller Define Mode for five minutes.

Section 6 - Defining and Viewing a Program (Program Define Mode)

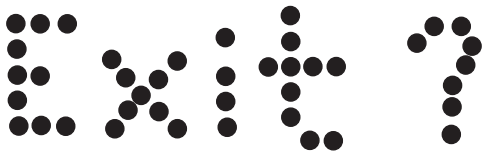
The instrument may be put into Program Define Mode from either Base Mode or Program Run Mode (i.e. with a program currently running).

6.1 ENTRY INTO PROGRAM DEFINE MODE

1. Press the SCROLL and UP keys simultaneously. The lower Main Display will show **0** and the Message Display will show:

2. Use the UP and DOWN keys to set the value in the lower Main Display to the correct Lock Value (defined by the user in Controller Define Mode) and press the SCROLL key.

The instrument will enter Program Define Mode, the **SET** and **PRG** indicators will go ON and the operator will be able to edit programs and segments. The MODE key can then be used (a) to switch to Controller Define Mode , and then (b) to show a Message display:



To return to Program Define Mode (and re-start the Program Define/Controller Define/Exit? display cycle), press the MODE key; to return to Base Mode, press the SCROLL key.

If an incorrect Lock Value is entered, the instrument will return to Base Mode.

Program parameters are divided into three categories:

(a) Those common to all programs - global parameters
(b) Those which apply to a specific program as a whole
(c) Those relevant to a specific segment in a specific program

In Program Define mode, the operator will be presented with the first of a sequence of parameter displays. The operator may then step through the sequence, using the SCROLL key. The parameter setting (in the lower Main Display) may be changed using the UP/DOWN keys. The displayed Program Number may be changed using the PROF key and the displayed Segment Number may be changed using the RUN/HOLD key.

Note: If entry is made from Program Run Mode and the Program Lock is ON, only Controller Define Mode will be accessible.

6.2 PARAMETERS COMMON TO ALL PROGRAMS

(Program Number = A, Segment Number = Blank)

The parameters common to all programs (global parameters) are presented for edit/viewing in the following sequence:

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
1	Start On	Start on	Defines setpoint value at start of each program	SEtP-Current Controller setpoint value Proc-Current Process variable value
2	End On	End on	Defines setpoint value at end of each program	F_SP-End on Final SP value value* SEtP-End on Controller SP value

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
3	Delay Time	Delay	Defines delay (in hours/min) between initiating the program and actually starting	Numerical value, with the decimal point acting as the delimiter between the two units (hours/min)
4	Program Lock	LockProg	Defines whether the operator is permitted to change program definitions while a program is running/held	On - No changes permitted OFF- changes permitted
5	Power Fail Recovery	Recovery	Defines response to restoration of power after	0 or 1 0=Cold Start (entry into Base Mode with Program No. set as when power failed and Segment Number blank. 1 = Warm Start (program resumed from point when power failed

6	External Selection	Ext. Sel	Defines functions which may be controlled externally	nonE = No external selection SEL=Program selection only run = Only Run, Hold, Abort, and x60 functions both = All program selection and run control functions

* The Final Setpoint value for the End Segment of each program.

6.3 PARAMETERS WHICH APPLY TO A SPECIFIC PROGRAM AS A WHOLE

(Program Number = 1 to 9, Segment = Blank)

Only the parameters relevant to the displayed program number (which can be changed using the PROG key) are presented. The parameter sequence is as follows:

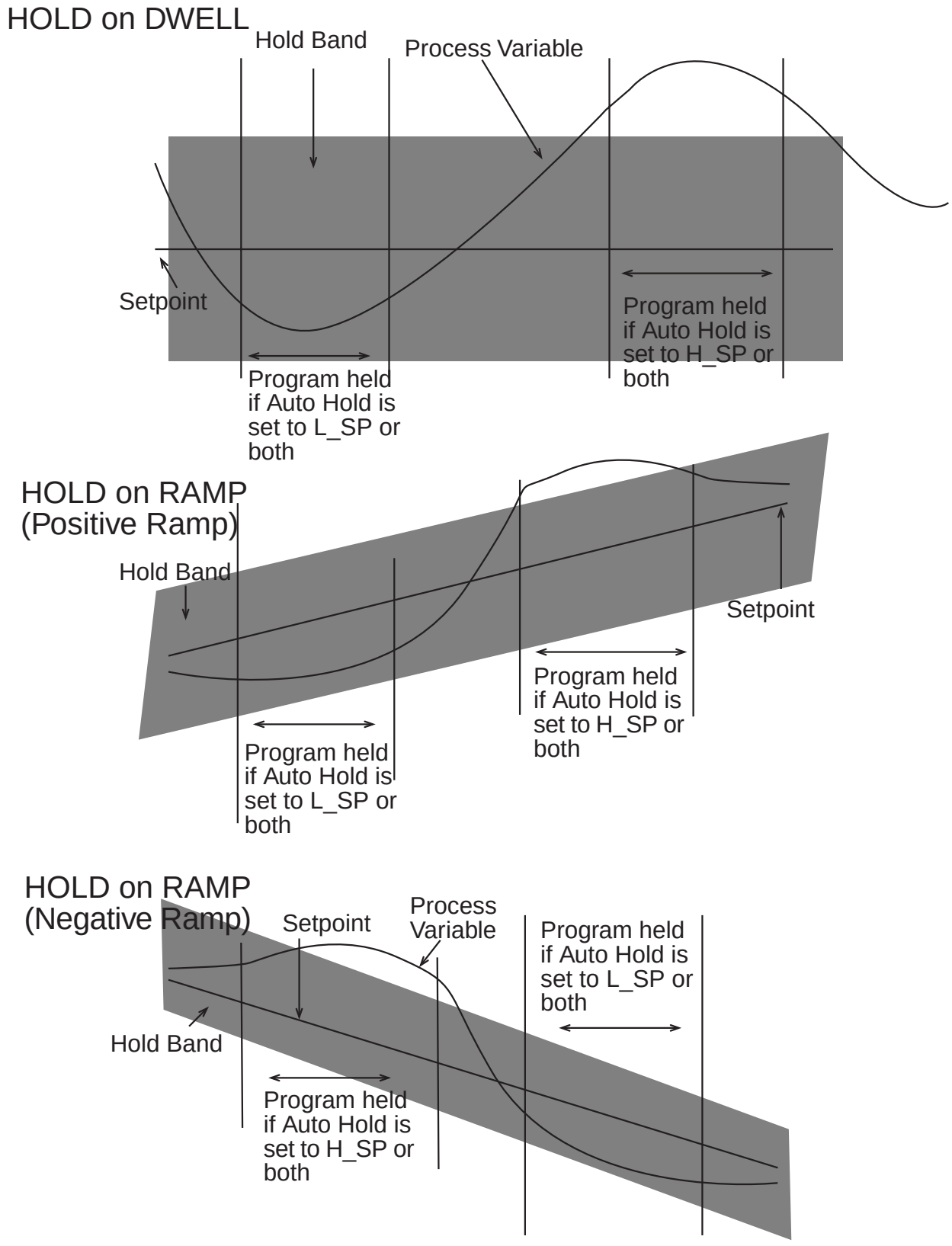
STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
1	Cycle Count	Cycles	Defines the number of times the program will be repeated	1 - 9999 Program will repeat the set number of of times inF = Program will repeat indefinitely

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
2	Auto Hold	AutoHold	Selects operation of Auto Hold facility (relative to setpoint)	OFF = No Auto Hold H_SP = Auto Hold above setpoint only L_SP = Auto Hold below setpoint only both = Auto Hold above and below setpoint
3	Hold Band	HoldBand	Defines the width of the Hold Band	Numerical value (0.0 to span)
4	Hold On	Hold on	Defines whether the Auto Hold facility is used on ramps only, dwells only or both	d_r = Auto Hold on ramps and dwells ___d = Auto Hold on dwells only ___r = Auto Hold on ramps only

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
5	Pre-x60	Pre-x60	Determines whether the timebase for the program is pre-selected to be hours/ minutes or minutes/ seconds	nonE = No pre-selection ON OFF

This parameter sequence may be viewed/edited for any program by simply changing the Program Number as required, using the PROF key, then stepping through the parameters with the SCROLL key.

FIGURE 6-1


HOLD on DWELL
Hold Band
Process Variable
Setpoint
Program held if Auto Hold is set to H_SP or both
Program held if Auto Hold is set to L_SP or both
HOLD on RAMP (Positive Ramp)
Hold Band
Setpoint
Program held if Auto Hold is set to H_SP or both
Program held if Auto Hold is set to L_SP or both
HOLD on RAMP (Negative Ramp)
Setpoint
Process Variable
Program held if Auto Hold is set to L_SP or both
Hold Band
Program held if Auto Hold is set to H_SP or both

6.4 EDITING/VIEWING PARAMETERS IN ANY/EACH SEGMENT IN A SPECIFIC PROGRAM

(Program Number = 1 to 9, Segment Number = 1-16)
Adjust the Program Number (using the PROF key) and the Segment Number (using the RUN/HOLD key) as required. The parameters presented will be these relevant to the program and segment whose numbers are displayed. The parameters sequence for each segment is as follows:

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
1	Final Setpoint Value	Final SP	Defines the final value of the setpoint for this segment, selects a dwell segment or indicates a Join, Repeat, or End Program segment	Numeric value (limited by SPHi and SPLo) or (by pressing the UP/ DOWN keys simultaneously) indicates a dwell with: – – – – or, if the segment is already a Join, Repeat, or End Program segment, as shown below

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
2	Segment Time or Ramp Rate as selected in Configuration Mode	Time or RampRate	Defines the duration/ramp rate of the of the segment or whether this is a Join, Repeat or End Program segment*	Four-digit number in the form nn.nn (hours. minutes or seconds) or negative values as follows: J01 - Join to Program 1 J02 - Join to Program 2 J03 - Join to Program 3 J04 - Join to Program 4 J05 - Join to Program 5 J06 - Join to Program 6 J07 - Join to Program 7 J08 - Join to Program 8 rEP - Repeat Segment End - End Program

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTING
3	Event †	Event	Defines the states of the four event outputs for this segment	Four-bit binary number (0=inactive, 1=active)

* If a segment is set to be a Join segment, a repeat segment or an End Program segment, the next depression of the SCROLL key will set the Segment Number to A and the parameter displayed will be the first in the sequence of parameters common to the whole program - Cycle Count. Otherwise, the next depression of the SCROLL key will display the next segment parameter - Event (for the current segment) if the Event Output hardware is fitted.

† This parameter appears in the sequence only if the Event Output hardware is fitted, in which case this parameter will be followed by the Final Setpoint Value parameter for the next segment. If this hardware is not fitted, this parameter will be omitted from the sequence and the segment number will be advanced, causing the Final Setpoint Value parameter for the next segment to appear immediately.

CANCELLING JOIN, REPEAT OR END PROGRAM SEGMENTS

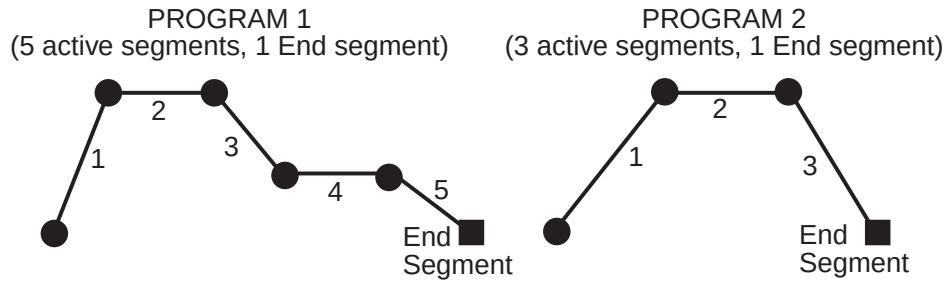
This can be achieved:
(a) at the Final Setpoint Value parameter, by simultaneously pressing the UP/DOWN keys to produce a Dwell segment, or
(b) at the Segment Time/Ramp Rate parameter, by incrementing the value to 0 or a positive value.

6.5 USING JOIN, REPEAT AND END SEGMENTS AND CYCLING PROGRAMS

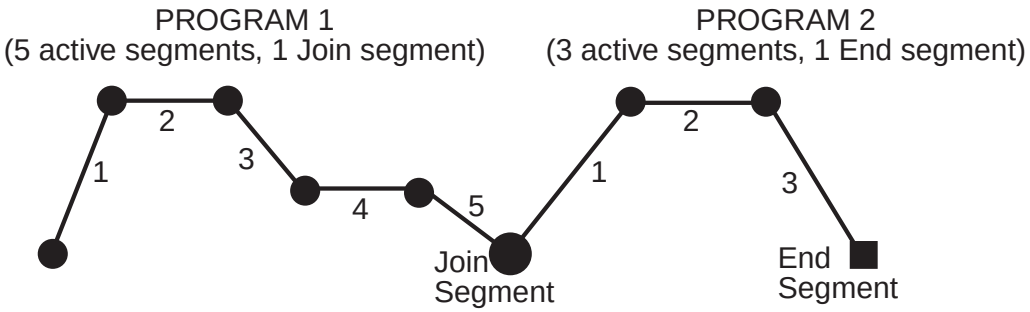
By default, the instrument has eight programs, each 16 segments long (all 16 segments are active and, at the end of Segment 16 is an implicit End Segment). These programs can be made shorter (using End segments) or longer (by creating program sequences with Join, Repeat and End segments). The only limit to the size of a program sequence is a maximum length of 121 active segments plus seven Join segments plus one End segment (i.e. all eight programs joined to make one program sequence).

Segments follow a free format in that ramp or dwell can be followed by dwell or ramp, completely as desired.

Consider two example programs:

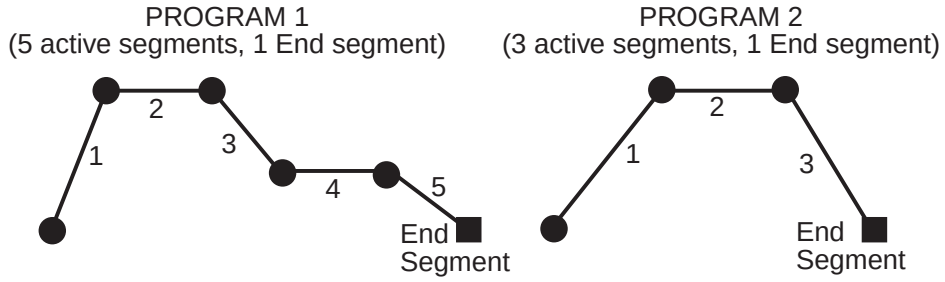


To join the two programs to form a program sequence, change the End segment of Program 1 to a Join segment (Segment Time or Ramp Rate set to J02 - Join Program 2):

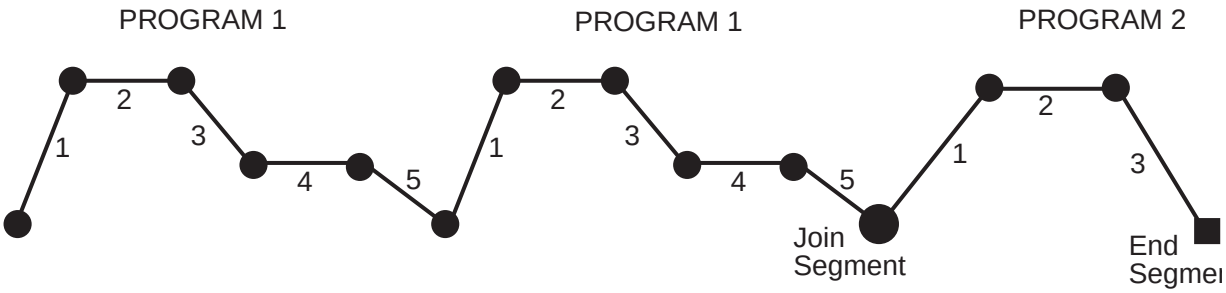


There are no restrictions on joining programs; several programs can be joined to one program (i.e.to prove user-selectable warm-up programs, depending upon which program is run first).

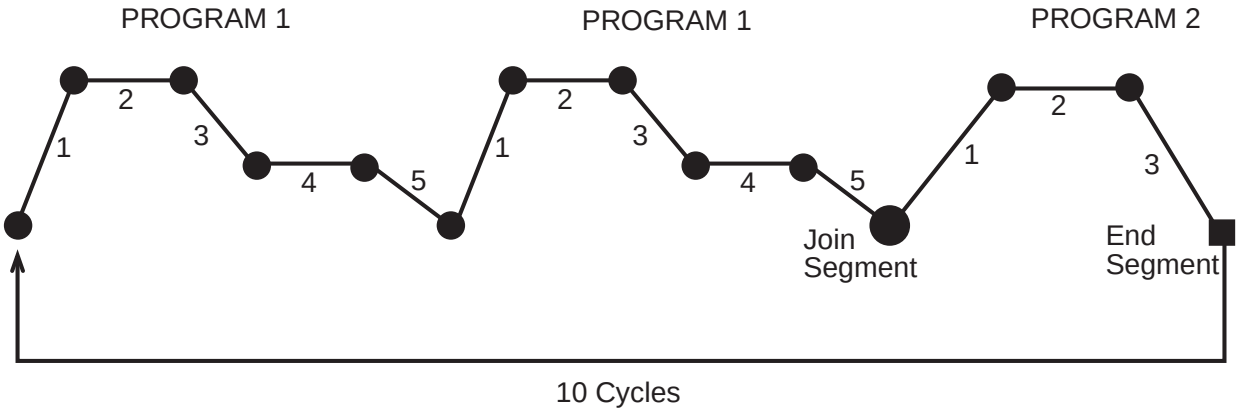
The Cycle feature can be used to make more complex program sequences. Consider the two simple example programs previously described:



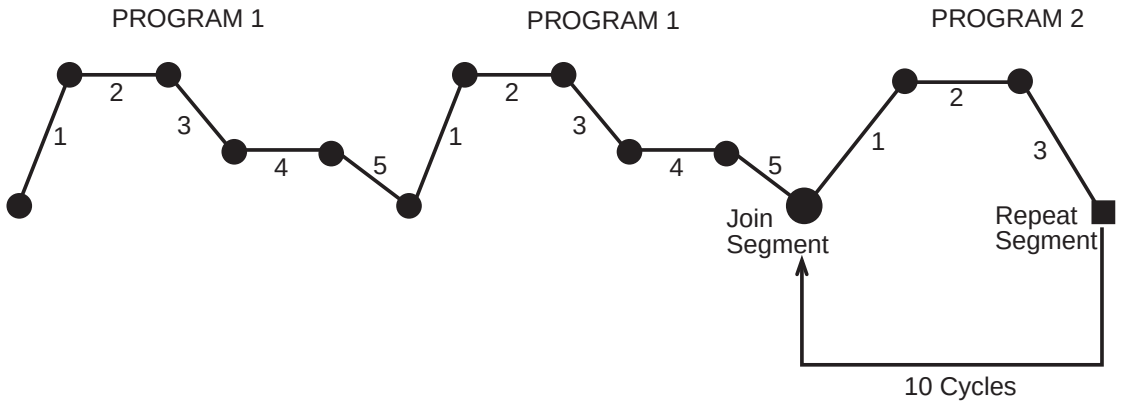
and consider the case where Program 1 is set to perform two cycles and Program 1 is joined to Program 2. When Program 1 is run, the result would be:



If Program 2 were now set to perform ten cycles, the result would be:



Now, with Program 2 set to perform 10 cycles, change its last segment to a Repeat segment (Segment Time or Ramp Rate set to REP); the result would be:



At the end of the tenth cycle of Program 2, the program sequence would end.

6.6 BASIC RULES TO REMEMBER

In any program sequence:

- A program ending in a Join segment will perform the required number of cycles of *itself* before joining the new program.

- A program ending in a Repeat segment (hence, by definition, the last program in the sequence) will perform the required number of cycles of *itself* before ending the sequence.

- A program ending in an End segment (hence, by definition, the last program in the sequence) will perform its cycle on the *entire program sequence* before ending that sequence.

6.7 EXITING PROGRAM DEFINE MODE

The operator may exit from Program Define Mode by pressing the MODE key until the **Exit ?** prompt appears in the Message Display, then pressing the SCROLL key, which will cause a return to the mode from which entry was made.

Note: An automatic return is made if there is no key activity in Program Define Mode for five minutes.

Section 7 - Programs

7.1 SELECTING AND RUNNING A PROGRAM

When no program is running, the instrument is in Base Mode and the RUN and HLD indicators are OFF. In this mode, select a program as follows:

1. Hold down the PROF key until the required program number is displayed.

2. Press the RUN/HOLD key once to start the program. The **RUN** indicator will then go ON; the instrument is now in Program Run Mode.

7.2 CHANGING THE PROGRAM TIMEBASE

While a program is running, the normal timebase is hours/minutes. To change to a timebase of minutes/seconds (i.e. select the x60 facility) press the UP key for more than five seconds, whereupon the **x60** indicator will go ON. To cancel operation on the **x60** timebase, press the DOWN key for more than five seconds, whereupon the **x60** indicator will go OFF.

7.3 HOLDING A PROGRAM MANUALLY

The operator may hold or freeze a program by momentarily pressing the RUN/HOLD key. The **HLD** indicator will then go ON (the **RUN** indicator staying ON) and the program will stop execution. The program may subsequently be restarted by momentarily pressing the RUN/HOLD key again.

HLD INDICATOR FLASHING: If before the operator holds the program manually, the **HLD** indicator start flashing, this indicates that the program is currently subject to an Auto-Hold. If the RUN/HOLD key is pressed (for a manual Hold), the **HLD** indicator will go ON continuously. When the operator removes the manual Hold (by pressing the RUN/HOLD key again), the **HLD** indicator will either flash (indicating that the Auto-Hold conditions still prevail) or go OFF (indicating that the Auto-Hold conditions no longer prevail).

RUN INDICATOR FLASHING: This indicates that the program is in a Delay state i.e. is timed to start after a user-defined delay has elapsed. When the delay period has elapsed, the program will run and the **RUN** indicator will come on continuously.

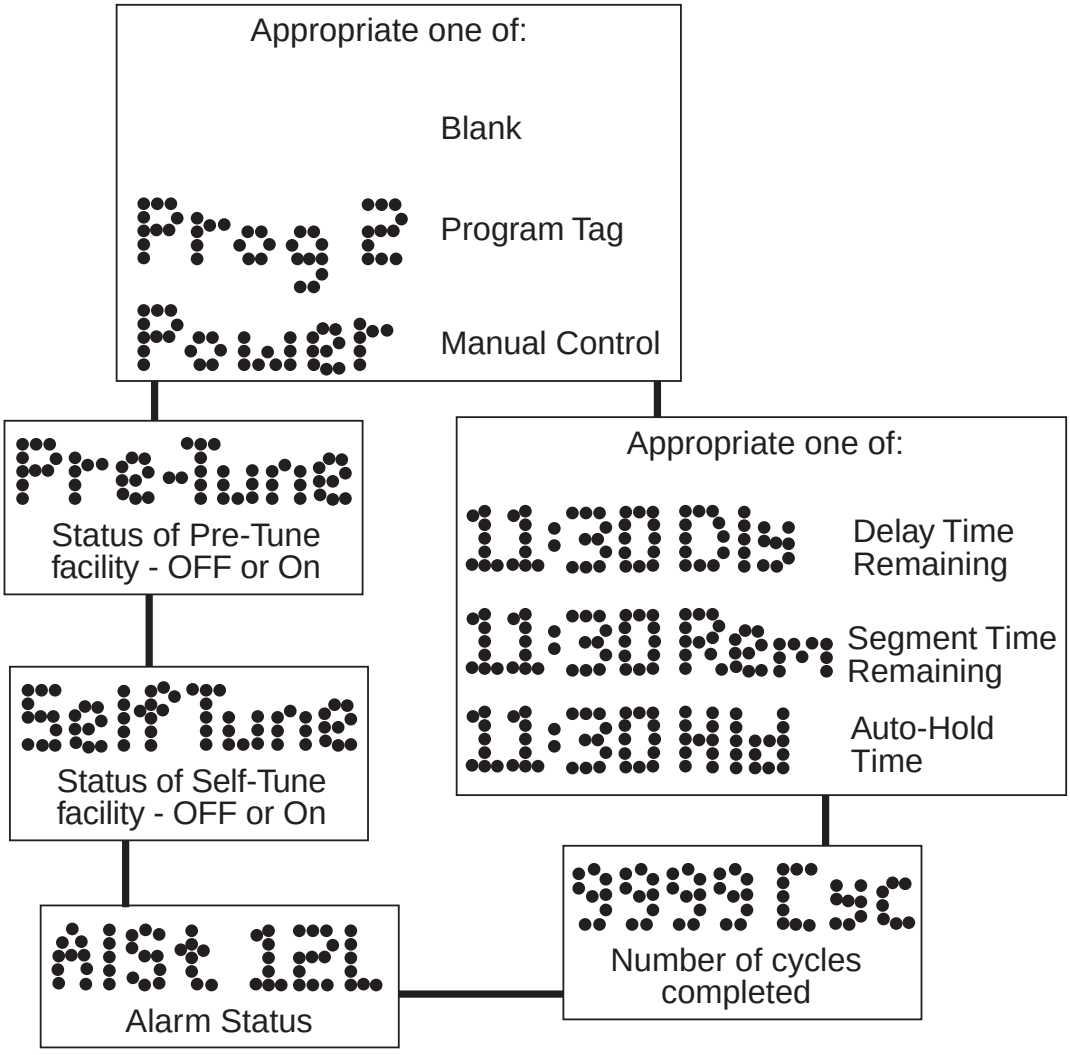
7.4 JUMPING TO THE NEXT SEGMENT

At any time during a program's execution, the operator may jump forward to the next segment by simultaneously pressing the PROF and UP keys.

Note that, since programs may be joined or set to cycle, jumping past the last segment in a program may result in changes in the Program Number and Cycle Count.

7.5 VIEWING PROGRAM PROGRESS/STATUS

In Program Run Mode, a number of displays are made available to the operator (in the Message Display area) which indicate program progress/ status. While the current program is running, held or delayed, press the SCROLL key to cycle through a sequence of program status displays with the following legends in the Message Display:



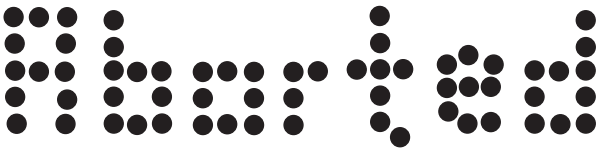
In the case of Segment Time Remaining or Auto-Hold Time display, the time is in hours/minutes (if the **x60** indicator is OFF) or minutes/seconds (if the **x60** indicator is ON). The Delay Time display is always in hours/minutes.

Note: If the SCROLL key is held for two seconds or longer, the instrument will auto-scroll through the above display cycle (with the exception of the Self-Tune and Pre-Tune displays). The auto-scroll can be stopped by pressing any key other than the SCROLL key.

After all applicable program status/progress displays have been shown, press the SCROLL key to return to the Base Mode displays.

7.6 ABORTING A PROGRAM

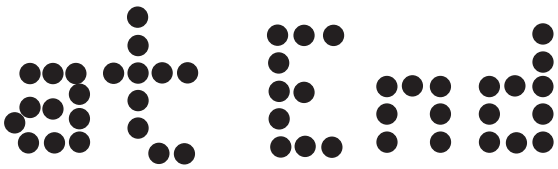
The operator may abort (i.e. terminate) the current program by holding down the RUN/HOLD key for more than five seconds. When the program is aborted, a return is made to the Base Mode and the Message area will show:



This message will be removed by the next key press.

7.7 "END OF PROGRAM" INDICATION

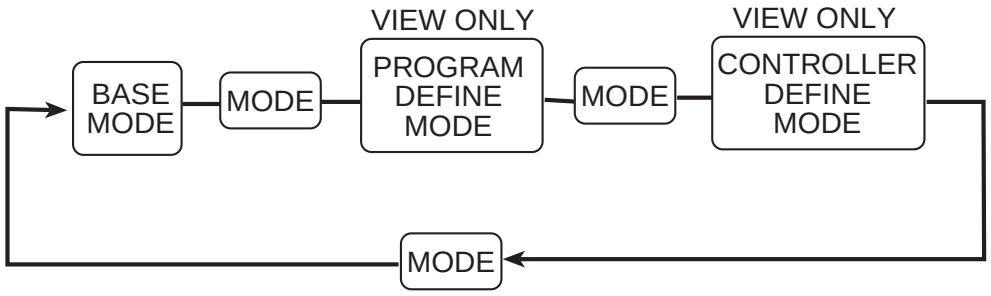
When the program has completed its End Segment (i.e. the last segment to be performed), the message display shows:



and a return is made to the Base Mode.

7.8 VIEWING PROGRAM AND CONTROLLER PARAMETERS

In Program Run Mode (i.e. with a program currently running or held), the MODE key gives "view only" access to Program Define Mode and Controller Define Mode:



Appendix A - Range Codes

The input ranges available (selectable via the front panel) are:

For Thermocouple Inputs

TYPE	INPUT RANGE	DISPLAYED CODE	TYPE	INPUT RANGE	DISPLAYED CODE
R	0 - 1650°C	1127	K	-200 - 760°C	6726
R	32 - 3002°F	1128	K	-328 -1399°F	6727
S	0 - 1649°C	1227	K	-200 - 1373°C	6709
S	32 - 3000°F	1228	K	-328 - 2503°F	6710
J	0.0 - 205.4°C	1415	L	0.0 - 205.7°C	1815
J	32.0 - 401.7°F	1416	L	32.0 - 402.2°F	1816
J	0 - 450°C	1417	L	0 - 450°C	1817
J	32 -842°F	1418	L	32 - 841°F	1818
J	0 - 761°C	1419	L	0 - 762°C	1819
J	32 - 1401°F	1420	L	32 - 1403°F	1820
T	-200 - 262°C	1525	B	211 - 3315°F	1934
T	-328 - 503°F	1526	B	100 - 1824°C	1938
T	0.0 - 260.0°C	1541	N	0 - 1399°C	5371
T	32.0 - 501.0°F	1542	N	32 - 2550°F	5324

For RTD Inputs

Note: Input conditioning jumper LJ1, LJ2, or LJ3 needs to be changed, see Appendix B.

INPUT RANGE	DISPLAYED CODE	INPUT RANGE	DISPLAYED CODE
0 - 800°C	7220	0.0 - 100.9°C	2295
32 - 1471°F	7221	32.0 - 213.6°F	2296
32 - 571°F	2229	-200 - 206°C	2297
-100.9 - 100.0°C	2230	-328 - 402°F	2298
-149.7 - 211.9°F	2231	-100.9 - 537.3°C	7222
0 - 300°C	2251	-149.7 - 999.1°F	7223

For DC Inputs

Note: Input conditioning jumper LJ1, LJ2, or LJ3 needs to be changed, see Appendix B.

INPUT RANGE	DISPLAYED CODE	INPUT RANGE	DISPLAYED CODE
0-20mA	3413	0-5V	4445
4-20mA	3414	1-5V	4434
0-50mV	4443	0-10V	4446
10-50mV	4499	2-10V	4450

Appendix B - Board Layout, Jumper Positioning

FIGURE B-1 PCB POSITIIONS

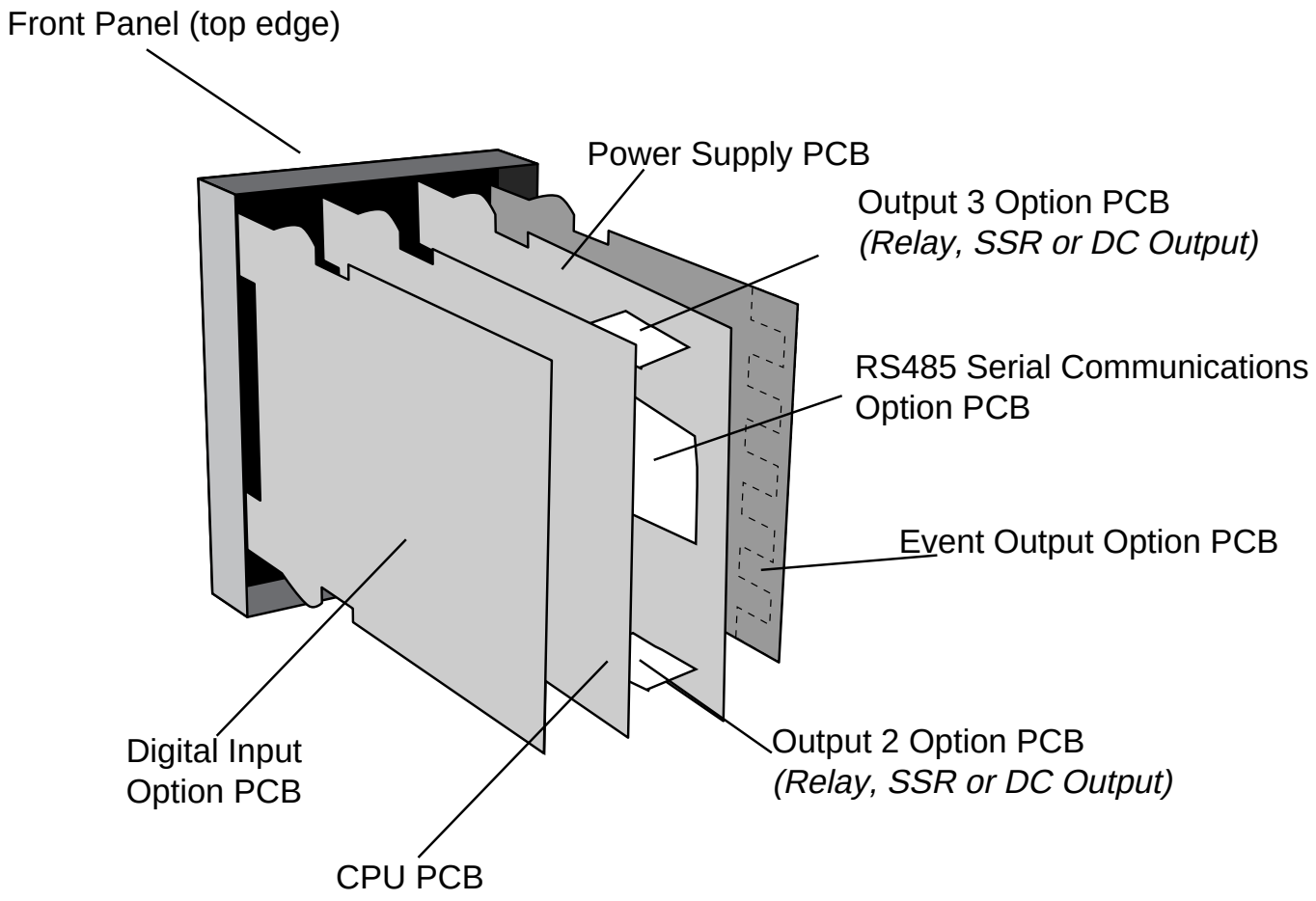


FIGURE B-2 OUTPUT 2, OUTPUT 3 REMOVAL

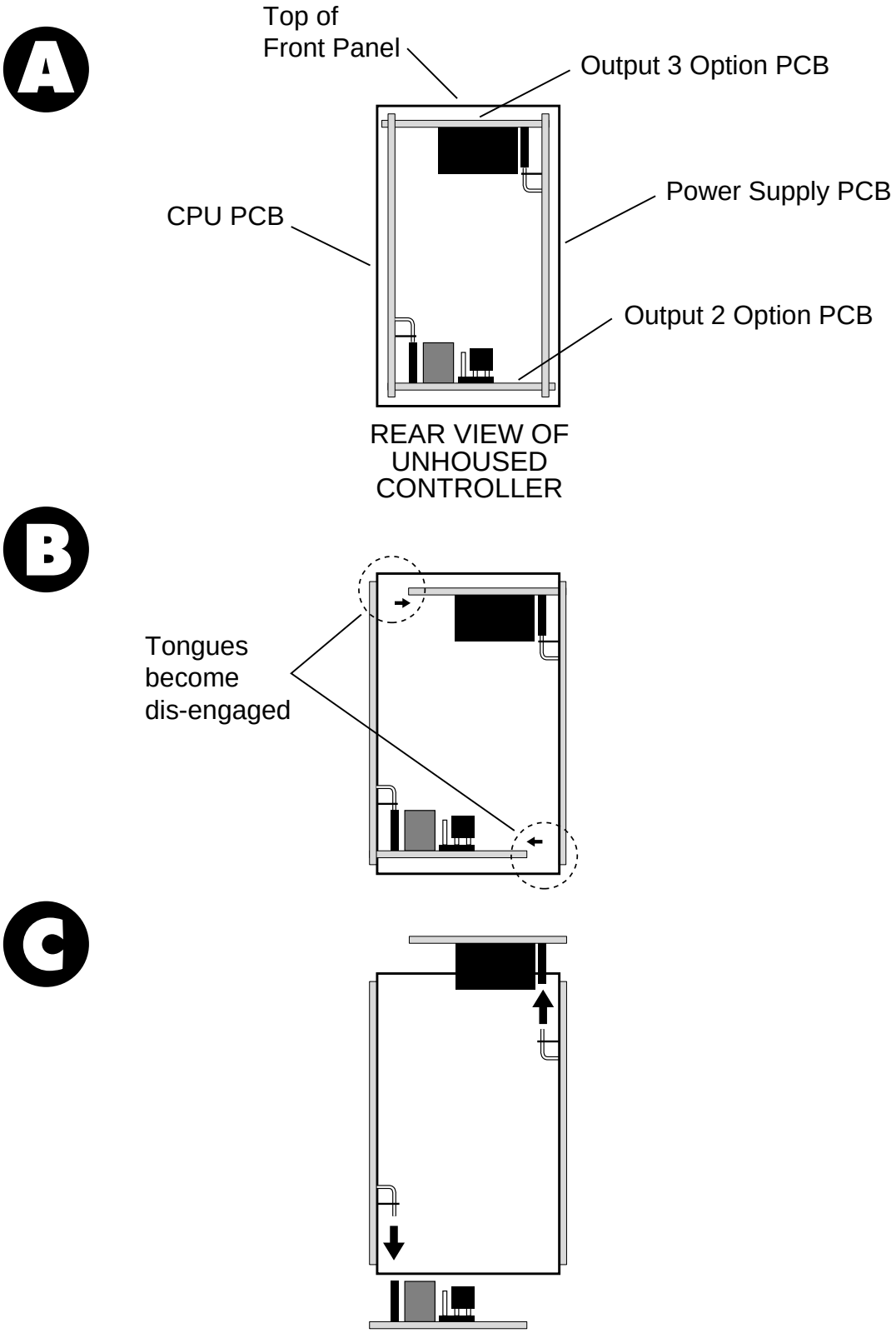


FIGURE B-3 CPU PWA

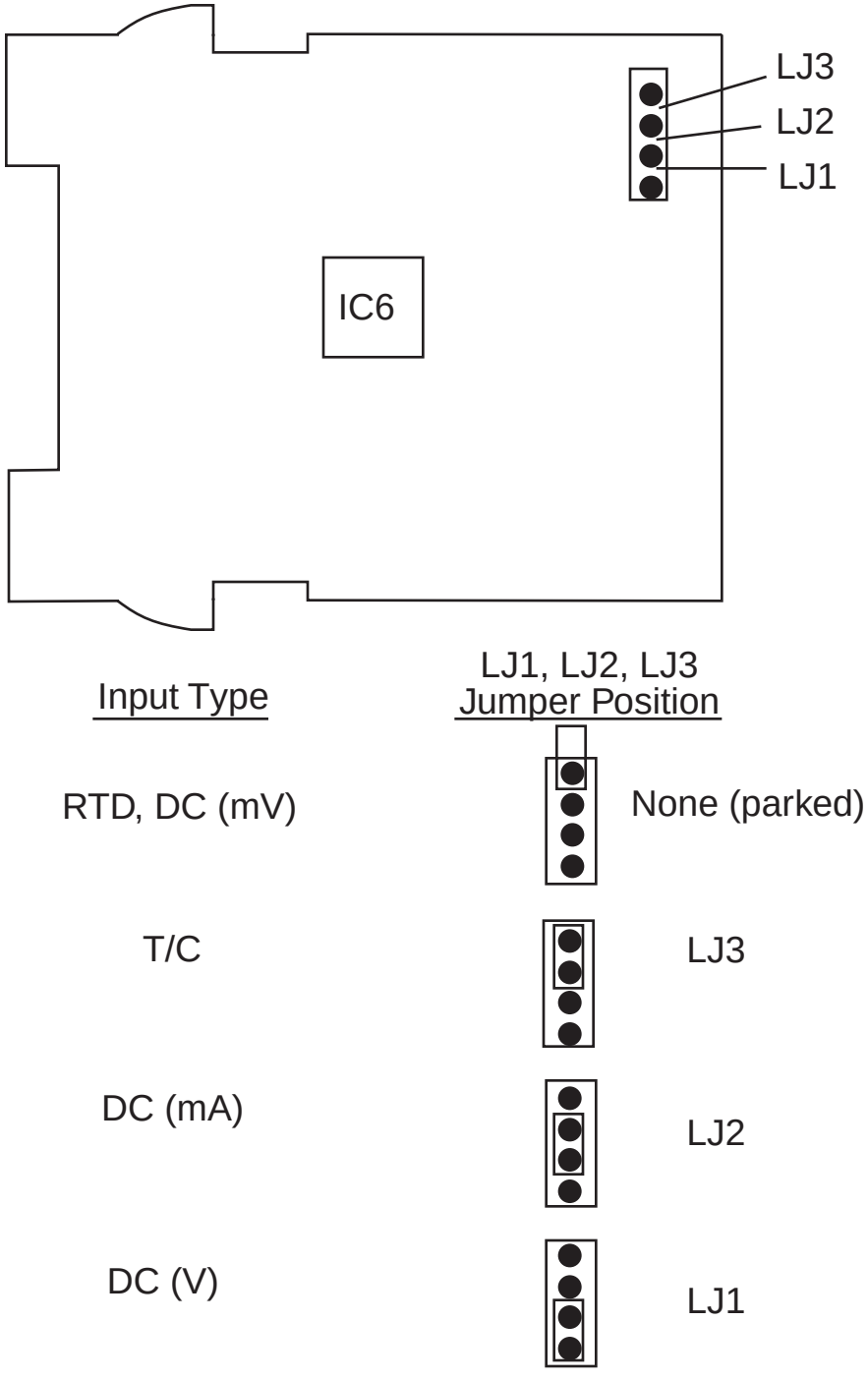
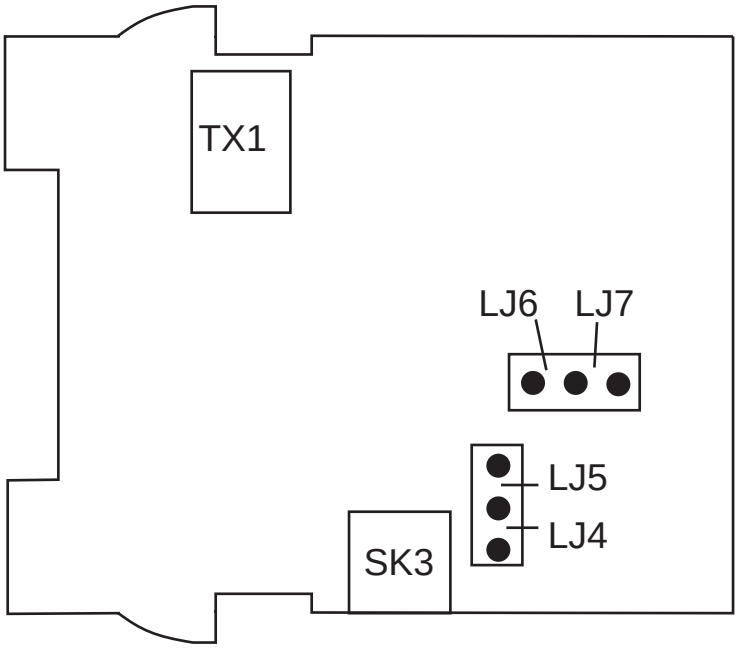
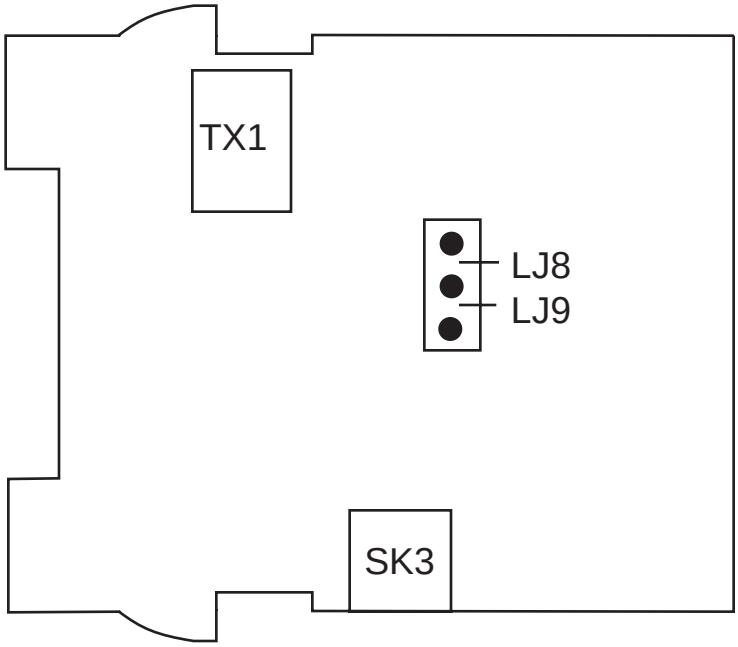


FIGURE B-4 PS PWA WITH RELAY OR SSR OUTPUT 1



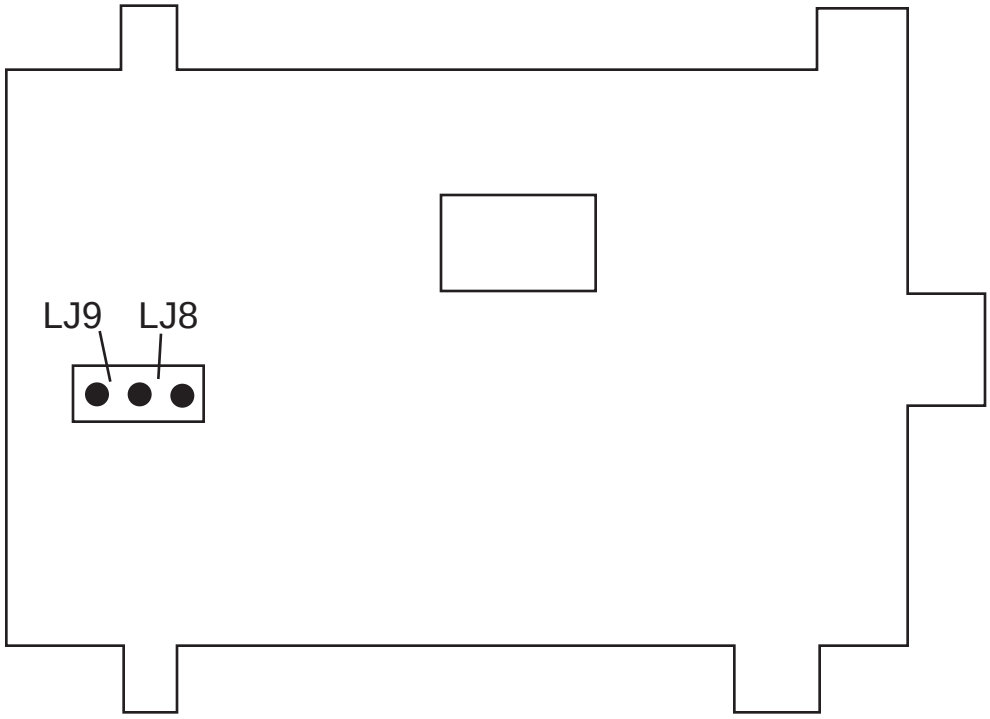
Output Type	LJ4, LJ5 Jumper Position	LJ6, LJ7 Jumper Position
Relay	LJ5	LJ6
SSR	LJ4	LJ7

FIGURE B-5 PWA WITH DC OUTPUT 1



Output Type	LJ8, LJ9 Jumper Position
DC (0-10V)	LJ8
DC (0-20mA)	LJ9
DC (0-5V)	LJ8
DC (4-20mA)	LJ9

FIGURE B-6 OPTION PWA DC OUTPUT 2/OUTPUT 3



Output Type	LJ8, LJ9 Jumper Position
DC (0-10V)	LJ8
DC (0-20mA)	LJ9
DC (0-5V)	LJ8
DC (4-20mA)	LJ9

Appendix C - Specifications

INPUT SPECIFICATIONS

General

Input Sample Rate:	Four per second
Input Resolution:	14 bits approximately
Input Impedance:	Greater than 100M ohm resistive (except for DC mA and V inputs)
Isolation:	Universal input isolated from all outputs except SSR at 240 VAC.

Thermocouple

Types:	R, S, J, T, K, L, B, and N
Calibration:	Complies with BS4937, NBS125 and IEC584.
Sensor Break Protection:	Break detected within 2 seconds. Control outputs set to OFF (0% power); alarms operate as if the process variable has gone over-range.

RTD and DC mV

Type and Connection:	Three-wire Pt100
Calibration:	Complies with BS1904 and DIN43760.
Lead Compensation:	Automatic
RTD Current:	150uA (approximately)
Sensor Break Protection:	Break detected within 2 seconds. Control outputs set to OFF (0% power); alarms operate as if the process variable has gone under-range.

DC mA and DC V

Scale Range Maximum:	-1999 to 9999
Scale Range Minimum:	-1999 to 9999
Minimum Span:	1 display LSD
Sensor Break Protection:	Applicable to 4-20mA, 1-5V, and 2-10V ranges only. Break detected within 2 seconds. Control outputs set to OFF (0% power); alarms operate as if the process variable has gone under-range.

OUTPUT SPECIFICATIONS

Output 1

General

Types Available:	Relay (standard), SSR Driver and DC as options.

Relay

Contact Type:	SPDT
Rating:	2A resistive at 120/240V AC
Lifetime:	> 500,000 operations at rated voltage/current
Isolation:	Inherent

SSR Driver/TTL

Drive Capability:	SSRD>4.2V DC into 1K ohm minimum
Isolation:	Not isolated from input or other SSR outputs.

DC

Resolution:	Eight bits in 250mS (10 bits in 1 second typical, >10 bits in >1 second typical).
Update Rate:	Four times per second
Ranges:	* 0-20mA, 4-20mA, 0-10V, and 0-5V
Load Impedance:	0-20mA: 500 ohm maximum 4-20mA: 500 ohm maximum 0-10V: 500 ohm minimum 0-5V: 500 ohm minimum
Isolation:	Isolated from all other inputs and outputs.

*Changes between V and mA ranges also require jumper movement.

OUTPUT 2

General

Types Available:	Relay, SSR Driver and DC

Relay

Contact Type:	SPDT
Rating:	2A resistive at 120/240V AC
Lifetime:	> 500,000 operations at rated voltage/current
Isolation:	Inherent

SSR Driver/TTL

Drive Capability:	SSRD>4.2V DC into 1K ohm minimum
Isolation:	Not isolated from input or other SSR outputs

DC

Resolution:	Eight bits in 250mS (10 bits in 1 second typical, >10 bits in >1 second typical)
Update Rate:	Four times per second
Ranges:	* 0-20mA, 4-20mA, 0-10V, and 0-5V
Load Impedance:	0-20mA: 500 ohm maximum
	4-20mA: 500 ohm maximum
	0-10V: 500 ohm minimum
	0-5V: 500 ohm minimum
Isolation:	Isolated from all other inputs and outputs

*Changes between V and mA ranges also require jumper movement.

OUTPUT 3

General

Types Available:	Relay, SSR Driver and DC linear (retransmit only)

Relay

Contact Type:	SPDT
Rating:	2A resistive at 120/240V AC
Lifetime:	> 500,000 operations at rated voltage/current
Isolation:	Inherent

SSR Driver/TTL

Drive Capability:	SSRD>4.2V DC into 1K ohm minimum
Isolation:	Not isolated from input or other SSR outputs

DC

Resolution:	Eight bits in 250mS (10 bits in 1 second typical, >10 bits in >1 second typical).
Update Rate:	Four times per second
Ranges:	* 0-20mA, 4-20mA, 0-10V, and 0-5V
Load Impedance:	0-20mA: 500 ohm maximum
	4-20mA: 500 ohm maximum
	0-10V: 500 ohm minimum
	0-5V: 500 ohm minimum
Isolation:	Isolated from all other inputs and outputs.

* Changes between V and mA ranges also require jumper movement.

CONTROL SPECIFICATIONS

Control Types:	PID, PID/ON-OFF2, ON-OFF
Automatic Tuning Types:	Pre-Tune and Auto-Tune
Proportional Bands:	0 (OFF), 0.5% - 999.9% of input span @ 0.1% increments
Auto Reset:	1s-99min 59sec/repeat and OFF
Rate:	0 (OFF) - 99min 59sec
Manual Reset (Bias):	Adjustable in the range 0-100% of output power (single output) or -100% to +100% of output power (dual output)
Deadband/Overlap:	-20% to +20% of proportional band 1 + proportional band 2
ON/OFF Hysteresis:	0.1% to 10.0% of input span
Auto/Manual Control:	User-selectable with "bumpless" transfer into and out of Manual control.
Cycle Times:	Selectable from 0.5sec to 512sec in binary steps
Setpoint Range:	Limited by Setpoint Maximum and Setpoint Minimum.
Setpoint Maximum:	Limited by Setpoint and Range Maximum.
Setpoint Minimum:	Limited by Range Minimum and Setpoint.

<u>Alarms</u>

Maximum Number:	Two "soft" alarms plus Loop Alarm
Maximum # Outputs:	Up to 2 outputs can be used for alarm purposes
Combination Alarms:	Logical OR or AND of alarms to an individual hardware output is available.
Hysteresis:	1 LSD to 10% of span.
Loop Alarm:	Detects faults in the control feedback loop by continuously monitoring process variable response to the control output(s).

PROGRAM SPECIFICATIONS

Programs:	Eight, each with free-form segments
Length of Programs:	Adjustable in the range 1 to 16 segments; programs cascadable - maximum length 121 segments.
Segment Types:	Ramp, Dwell, Join, Repeat, or End.
Program Cycling:	Range 1 to 9999, infinite.
Delayed Start:	May be set in the range 0 to 99:59 (hours:minutes). One setting applies to all programs.
Control:	Run, Hold, Abort, Time Base x60 (local or remote); Select Program (local or remote); Jump to next Segment.
Start From:	Either current process variable value or controller setpoint value.
End On:	Final Value or controller setpoint.
Auto/Hold:	Off, below setpoint only, above setpoint only or above and below setpoint. On ramps only, on dwells only, or on both ramps and dwells. Auto/ Hold band may be set from 0 to input span.
Time Base:	Either hours:minutes or minutes:secs (x60) pre-programmable or may be set during Program Run.
Segment Time:	May be set in the range 0 to 99:59 (hours:minutes or minutes:seconds).
Ramp Rate:	0 to 9999 least significant digits per hour or minute.

<u>End of Program Output</u>

Type:	Relay
Contact Type:	SPDT
Rating:	5A resistive @ 120/240V AC
Lifetime:	>100,000 operations @ rated voltage/current
Isolation:	Inherent

<u>Event Outputs - Option</u>

Type:	Relay (4)
Contact Type:	SPST
Rating:	5A resistive @ 120/240V AC
Lifetime:	>100,000 operations @ rated voltage/current.
Isolation:	Inherent
Programmability:	Each event is programmable to either OFF or ON for each segment.

Digital (Remote Program Control) Inputs, Outputs

Type:	Voltage-free contact and TTL compatible
Number available:	Six: Run/Hold, Time Base x60, Abort Three (binary-coded) Program Select.
Active State:	Max. Contact Resistance (closed) = 50 ohms Max. Voltage (TTL) for "0" = 0.8V Min. Voltage for "0" = -0.6V
Non-Active State:	Min. Contact Resistance (open) = 5,000 ohms Min. Voltage (TTL) for "1" = 2.0V Max. Voltage for "1" = 24.0V
Max. Input Delay (OFF-ON):	0.25 seconds
Min. Input Delay (ON-OFF):	0.25 seconds

PERFORMANCE

Reference Conditions

Ambient Temperature:	20°C ± 2°C
Relative Humidity:	60-70%
Supply Voltage:	90-264V AC 50Hz ±1%
Source Resistance:	<10 ohm for T/C input
Lead Resistance:	<0.1 ohm/lead balanced (Pt100)

Performance Under Reference Conditions

Common Mode Rejection:	>120dB at 50/60Hz giving negligible effect at up to 264V 50/60Hz
Series Mode Rejection:	>500% of span (at 50/60Hz) causes negligible effect

DC Linear Inputs

Measurement Accuracy:	± 0.25% of span ± 1 LSD

Thermocouple Inputs

Measurement Accuracy:	± 0.25% of span ± 1LSD (Note: Reduced performance with Type B T/C between 100-600 °C (212 - 1112 °F))
Linearization Accuracy:	Better than ± 0.2°C any point, any 0.1°C range (± 0.05°C typical). Better than ± 0.5°C any point, any 1°C range.
Cold Junction Comp:	Better than ± 0.7°C

RTD Inputs

Measurement Accuracy:		± 0.25% of span ± 1 LSD
Linearization Accuracy:		Better than ± 0.2°C any point, any 0.1°C range (± 0.05°C typical). Better than ± 0.5°C any point, any 1°C range.

DC Outputs

Output 1 Accuracy:	mA:	0-20mA ± 0.5% of span (20mA) @ 250 ohm
		4-20mA ± 0.5% of span (16mA) @ 250 ohm
	V:	0-10 ± 0.5% of span (10V) @ 2K ohm
		0-5V ± 0.5% of span (5V) @ 2K ohm
Output 2 Accuracy:	mA:	0-20mA ± 0.5% of span (20mA) @ 250 ohm
		4-20mA ± 0.5% of span (16mA) @ 250 ohm
	V:	0-10V ± 0.5% of span (10V) @ 2K ohm
		0-5V ± 0.5% of span (5V) @ 2K ohm
Output 3 Accuracy:	mA:	0-20mA ± 0.25% of span (20mA) @ 250 ohm
(Recorder Accuracy)		4-20mA ± 0.25% of span (16mA) @ 250 ohm
	V:	0-10V ± 0.25% of span (10V) @ 2K ohm
		0-5V ± 0.25% of span (5V) @ 2K ohm

OPERATING CONDITIONS

Ambient Operating Temperature:	0° C to 55°C
Ambient Storage Temperature:	-20°C to 80°C
Relative Humidity:	20% - 95% non condensing
Supply Voltage:	90 - 264VAC 50/60 Hz (standard)
	20 - 50V AC 50/60Hz or 22-65V DC (optional)
Source Resistance:	1000 ohm maximum (thermocouple)
Lead Resistance:	50 ohm per lead maximum balanced (Pt100)

Performance Under Operating Conditions

Temperature Stability:	0.01% of span/°C change in ambient temperature
Cold Junction Compensation:	Better than ±1°C (thermocouple only)
Supply Voltage Influence:	Negligible
Relative Humidity Influence:	Negligible

Sensor Resistance Influence:	Thermocouple 100 ohm:< 0.1% of span error Thermocouple 1000 ohm:< 0.5% of span error RTD Pt100 50ohm/lead: < 0.5% of span error
Radiated RF Field Influence:	Degradation of Output 1 accuracy to 3% at spot frequencies in the range 80 - 350MHz at field strength of 10V/m.

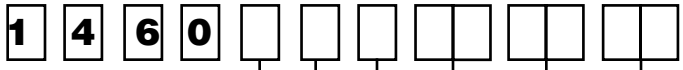
ENVIRONMENTAL

EMI Susceptibility:	Designed to meet EN50082-1:1992 and EN50082-2: 1995
EMI Emissions:	Designed to meet EN50081-1:1992 and EN50081-2:1994
Safety Considerations:	Designed to comply with EN61010-1:1993
Supply Voltage:	90-264 AC 50/60Hz (standard) 20-50V AC 50/60Hz or 22-65V DC (optional)
Power Consumption:	4 watts approximately
Front Panel Sealing:	NEMA4
Agency Approvals:	UL pending cUL certified for use in Canada pending

PHYSICAL

Dimensions:	1/4 DIN front panel 96mm x 96mm (3.78" x 3.78") 100mm deep (3.94")
Mounting:	Plug-in with panel mounting fixing strap. Panel cutout 92mm x 92mm (3.62" x 3.62")
Terminals:	Screw type (combination head)
Weight:	16 ounces maximum
Display Character Height:	Top : .4" Bottom: .36" Message: .19" Profile/Segment No.: .25"

Appendix D - Model Number Hardware Matrix



OUTPUT 1
1 Relay
2 SSR Driver
3 4-20mA*

OUTPUT 2
0 None
1 Relay
2 SSR Driver
3 4-20mA*

OUTPUT 3
0 None
1 Relay
2 SSR Driver
3 4-20mA**

OPTION 1
00 None
01 RS-485 Communications

OPTION 2
00 None
10 Event Outputs (4)
20 Remote Profile Control Inputs (6) ***
30 Both Event Outputs & Remote Profile Control Inputs

SUFFIX
Blank None
02 Line Voltage

* For control output only
** For retransmission only
*** Remote Control available - Run/Hold, Abort, Time Base Change (x60), and three (binary coded) Program Select.

Appendix E - Software Reference Sheet

HDW DEF	
OPTION	

Configuration Mode
Input
Control
Alarm 1
Alarm 2
Inhibit
Out2 Use
Out3 Use
Seg Mode
BaudRate
Address
CJC
LockCode

Controller Define Mode
Filter
Offset
Out1
Out2
P.Band 1
P.Band 2
Reset
Rate
Overlap
Bias
Diff 1
Diff 2
Diff
SP High
SP Low
Rec High
Rec Low
Out High
CycTime1
CycTime2
HiAlarm1
LoAlarm

Controller Define Mode (cont.)
BaAlarm1
DeAlarm1
Al1 Hyst
HiAlarm2
LoAlarm2
BaAlarm2
DeAlarm2
Al2 Hyst
Loop Alm
LpAtime
Range Pt
Range Hi
Range Lo
Auto PT
A/M Enab
ComWrite
Lock

Program Define Mode
(All Programs)
Start on
End on
Delay
ProgLock
Recovery
Ext. Sel

Specific Program as a Whole
Cycles
AutoHold
HoldBand
Hold on
Pre-x60

Each Segment in a Specific Program
Final SP
Time
RampRate
Event

Warranty and Return Statement

These products are sold by The Partlow Corporation (Partlow) under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to a purchase of these products, as new merchandise, directly from Partlow or from a Partlow distributor, representative or reseller, and are extended only to the first buyer thereof who purchases them other than for the purpose of resale.

Warranty

These products are warranted to be free from functional defects in materials and workmanship at the time the products leave the Partlow factory and to conform at that time to the specifications set forth in the relevant Partlow instruction manual or manuals, sheet or sheets, for such products for a period of two years.

THERE ARE NO EXPRESSED OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREIN AND ABOVE SET FORTH. PARTLOW MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCTS.

Limitations

Partlow shall not be liable for any incidental damages, consequential damages, special damages, or any other damages, costs or expenses excepting only the cost or expense of repair or replacement as described above.

Products must be installed and maintained in accordance with Partlow instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from corrosion, misapplication, improper specifications or other operating condition beyond our control. Claims against carriers for damage in transit must be filed by the buyer.

This warranty is void if the purchaser uses non-factory approved replacement parts and supplies or if the purchaser attempts to repair the product themselves or through a third party without Partlow authorization.

Returns

Partlow's sole and exclusive obligation and buyer's sole and exclusive remedy under the above warranty is limited to repairing or replacing (at Partlow's option), free of charge, the products which are reported in writing to Partlow at its main office indicated below.

Partlow is to be advised of return requests during normal business hours and such returns are to include a statement of the observed deficiency. The buyer shall pre-pay shipping charges for products returned and Partlow or its representative shall pay for the return of the products to the buyer.

Approved returns should be sent to:

PARTLOW CORPORATION
2 CAMPION ROAD
NEW HARTFORD, NY 13413 USA