
MIC 1462

1/4 DIN SETPOINT PROGRAMMER

OPERATORS MANUAL

FORM 3806

EDITION 1 © Jan.1998

PRICE \$10.00



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.

Copyright © January 1998, The Partlow-West Company, all rights reserved. No part of this publication may be reproduced, transmitted, transcribed or stored in a retrieval system, or translated into any language in any form by any means without the written permission of the Partlow-West Company.

This is the First Edition of the MIC 1462 manual. It was written and produced entirely on a desk-top-publishing system. Disk versions are available by written request to the Partlow-West Company 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 1462 setpoint programmer.

NOTE:

It is strongly recommended that Partlow Brand 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.

Table of Contents

Section 1 - General	Page
1.1 Product Description	1
Section 2 - Installation & Wiring	
2.1 Unpacking Procedure	3
2.2 Panel Mounting	3
2.3 Preparation for Wiring	5
2.4 Input Connections	12
2.5 Output Connections	15
Section 3 - Operation	
3.1 Power-up Procedure	23
3.2 Keypad Operation	23
3.3 Indicators	25
3.4 Displays	26
3.5 Alarm Status Indication	26
3.6 Viewing Operating Modes	27
3.7 Adjusting the Setpoint	27
3.8 Viewing Input Values	28
3.9 Base Mode/Off Mode Outputs	29
3.10 Viewing the Time and Day	29
3.11 Manual Control	29
3.12 Using the Pre-Tune Facility	30
3.13 Using the Self-Tune Facility	31
Section 4 - Configuration	
4.1 Entry into Configuration	32
4.2 Hardware Definition Mode	33
4.3 Configuration Mode Parameters	36
4.4 Exit from Configuration Mode	41
Section 5 - Tune Mode	
5.1 Tune Parameters	43
5.2 Exiting Tune Mode	48
Section 6 - Alarm Mode	
6.1 Alarm Parameters	49
6.2 Alarm Inhibit	53
6.3 Loop Alarm and Loop Alarm Time	53

Section 7 - Profile Define Mode	
7.1	Entry into Profile Define 58
7.2	Parameters Common to All Profiles 59
7.3	Parameters which apply to a Specific Profile 62
7.4	Parameters in any/each Segment 66
7.5	Using Join, Repeat, and End Segments 69
7.6	Basic Rules to Remember 71
7.7	Exiting Program Define Mode 71
Section 8 - Programs	
8.1	Selecting and Running a Program 72
8.2	Changing Timebase 72
8.3	Holding Manually 72
8.4	Jumping to Next Segment 73
8.5	Viewing Program Status 73
8.6	Aborting a Program 74
8.7	End of Program Indication 74
8.8	Accessing Modes of the Controller 75
Section 9 - Test Mode	76
Section 10- Calibration Mode	
10.1	Calibration Procedure 77
10.2	Exit From Calibration 80
10.3	Calibration Check 80
Appendices	
A -	Input Range Codes 81
B -	Board Layout - Jumper positioning 83
	Figure B-1 PCB Positions 83
	Figure B-2 Output 2/Output 3 Removal 84
	Figure B-3 CPU PWA 85
	Figure B-4 PSU PWA with Relay or SSR Out.1 86
	Figure B-5 PSU PWA with DC Output 1 87
	Figure B-6 Option PWA DC Output 2/Output 3 88
C -	Specifications 89
D -	Model Number Hardware Matrix 98
E -	Software Reference Sheet 99

Figures

Figure 1-1	Front Panel	2
Figure 2-1	Panel Cut-Out Dimensions	3
Figure 2-2	Main Dimensions	4
Figure 2-3	Panel Mounting the controller	5
Figure 2-4	Noise Suppression	8
Figure 2-5	Noise Suppression	8
Figure 2-6	Rear Terminal Connections	10
Figure 2-6A	Rear Terminal Connections	11
Figure 2-7	Main Supply	12
Figure 2-7A	24V Nominal AC/DC Supply	13
Figure 2-8	Thermocouple (T/C) Input	13
Figure 2-9	RTD Input	13
Figure 2-10	Volt, mV Input	14
Figure 2-11	mA DC Input	14
Figure 2-12	Remote Digital Communications	15
Figure 2-13	Relay Output 1	15
Figure 2-14	SSR Driver Output 1	15
Figure 2-15	mADC Output 1	16
Figure 2-16	Relay Output 2	16
Figure 2-17	SSR Driver Output 2	16
Figure 2-18	mADC Output 2	17
Figure 2-19	Transmitter Power Supply Out 2	17
Figure 2-20	Relay Output 3	17
Figure 2-21	SSR Driver Output 3	18
Figure 2-22	mADC Output 3	18
Figure 2-23	Transmitter Power Supply Out 3	18
Figure 2-24	End of Program Output	19
Figure 2-25	Event Outputs	19
Figure 2-26	Remote Program Output	20
Figure 2-27	Valve Motor Drive	21
Figure 2-28	VMD with Interlock	22
Figure 5-1	Proportional Band and Deadband/Overlap	47
Figure 6-1	Alarm Operation	55
Figure 6-2	Alarm Hysteresis Operation	57
Figure 7-1	Auto Hold Operation	65
Figure 10-1	Jumper Positions Calibration	79
Figure 10-2	Connections for Calibration	80

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 inches)
- Power Failure Recovery

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.
- Real Time Clock

The Setpoint Programmer has numerous operating modes:

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

Profile 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.

Profile 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.

Tune: Used to adjust tuning parameters

Alarm: Used to define and set alarms

Enable: Provides a means of enabling or disabling access to setpoint changes and each of the non-control modes.

FIGURE 1-1
Front Panel



Section 2 - Installation & Wiring

2.1 UNPACKING PROCEDURE

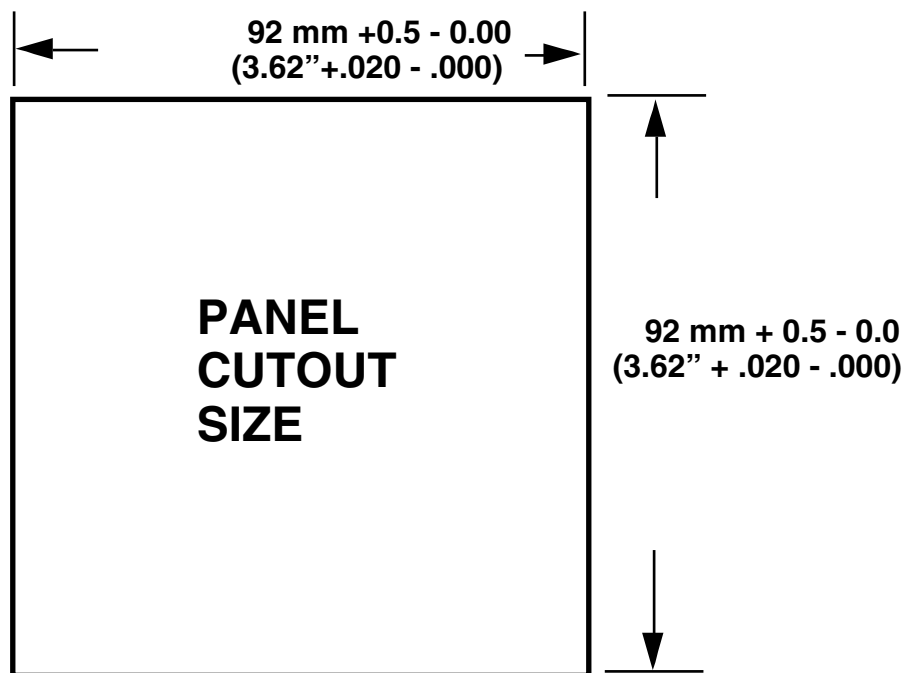
1. Remove the instrument from its packing. The instrument is supplied with a panel gasket and push-fit strap. Retain the packing for future use, should it be necessary to transport the instrument to a different site or return it to the factory for repair/testing.
2. Examine the delivered items for damage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

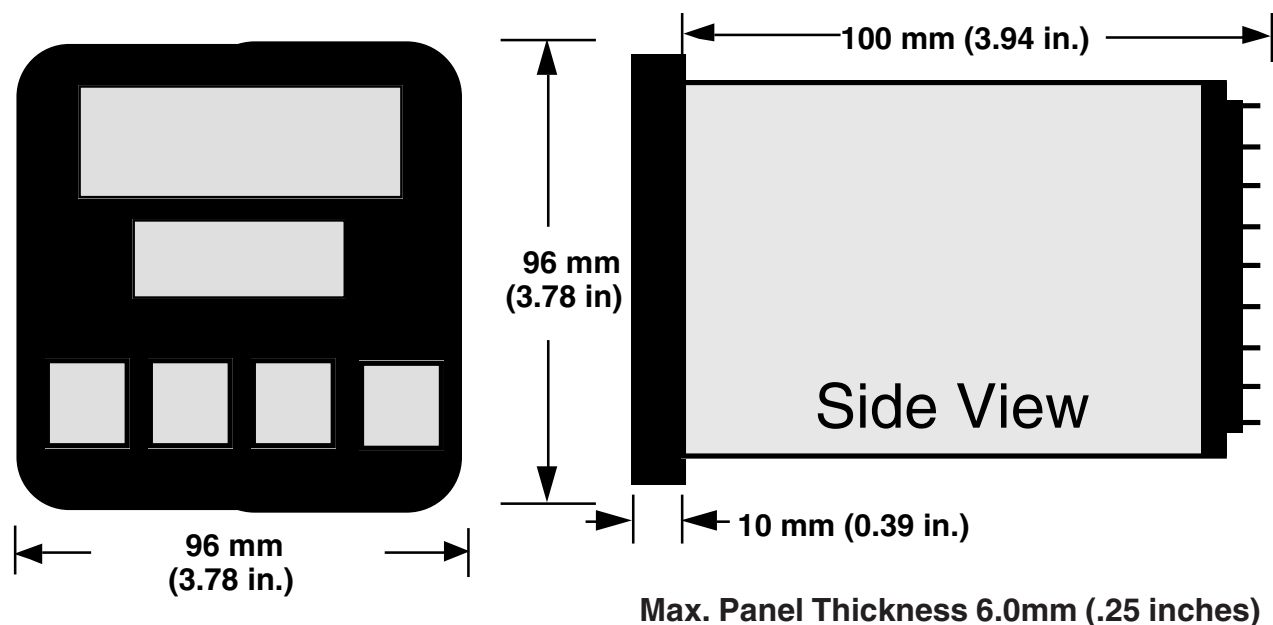
FIGURE 2-1

Cut-Out Dimensions



The main dimensions of the instrument are shown below.

FIGURE 2-2
Main Dimensions



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.

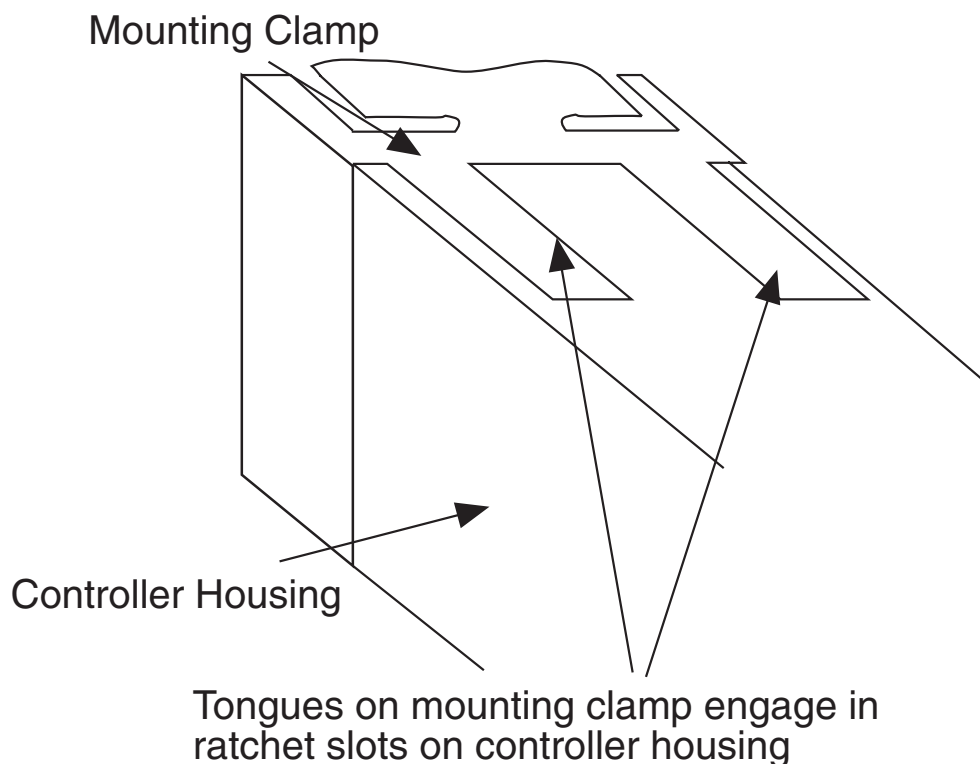
Caution: Do not remove the panel gasket, as this may result in inadequate clamping of the instrument in the panel.

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 ratchet 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.

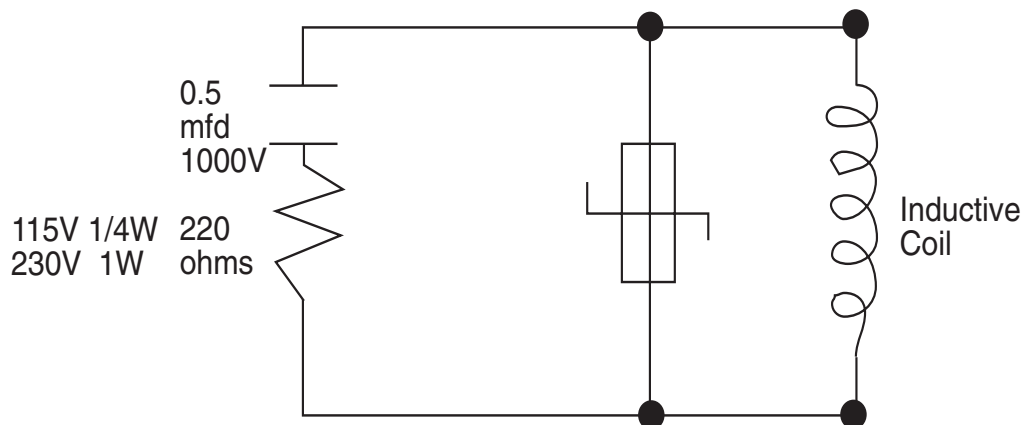
2.3.5 NOISE SUPPRESSION AT THE SOURCE

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.

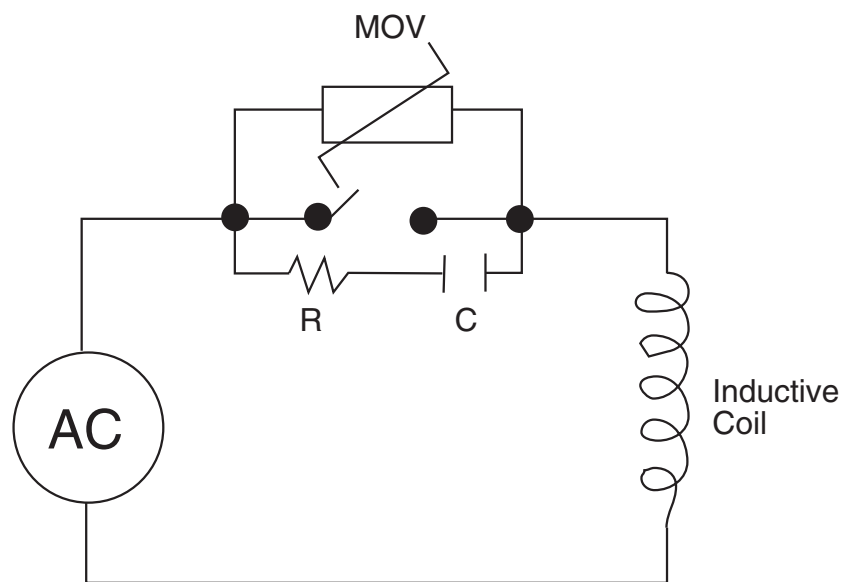
FIGURE 2-4



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

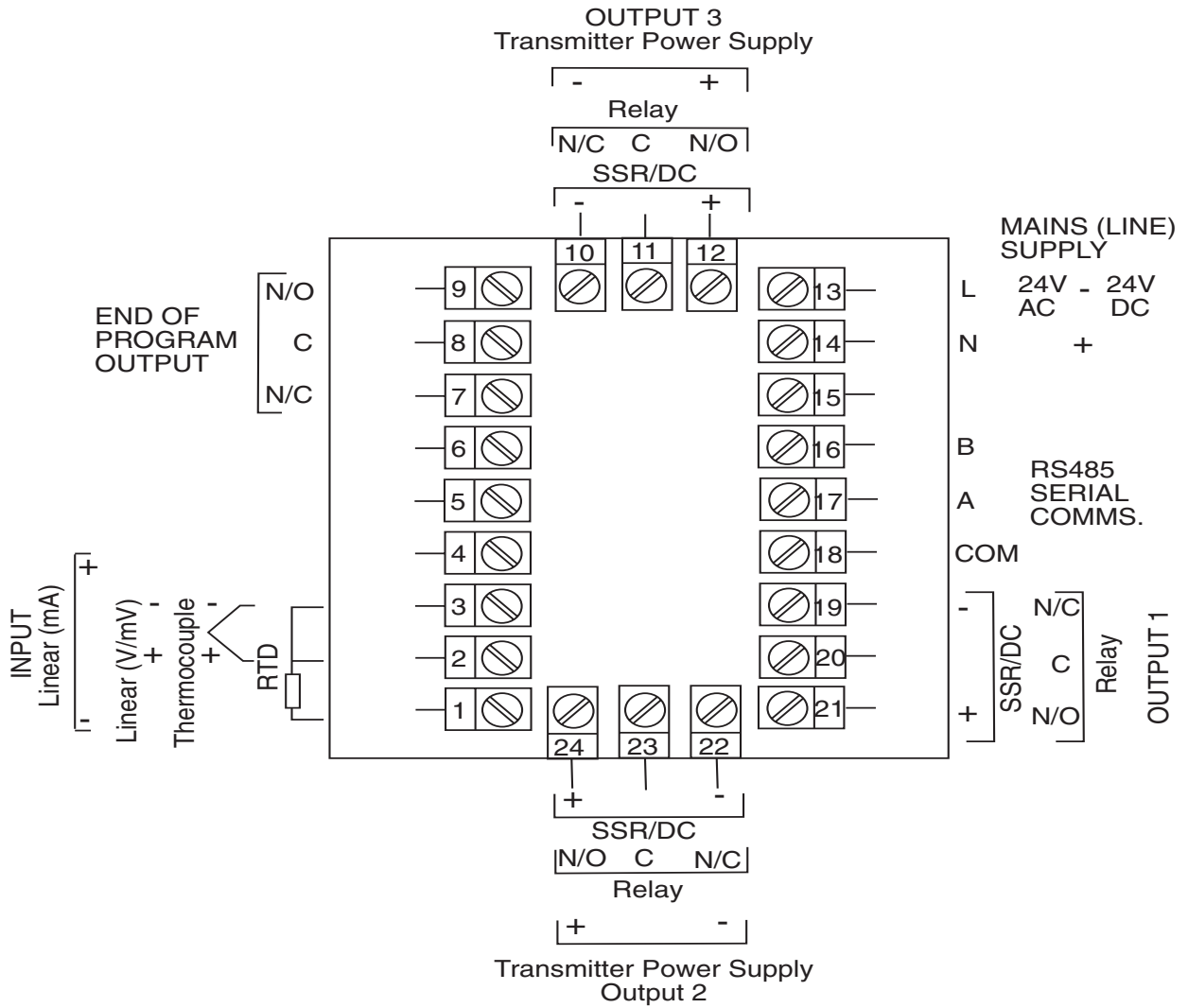
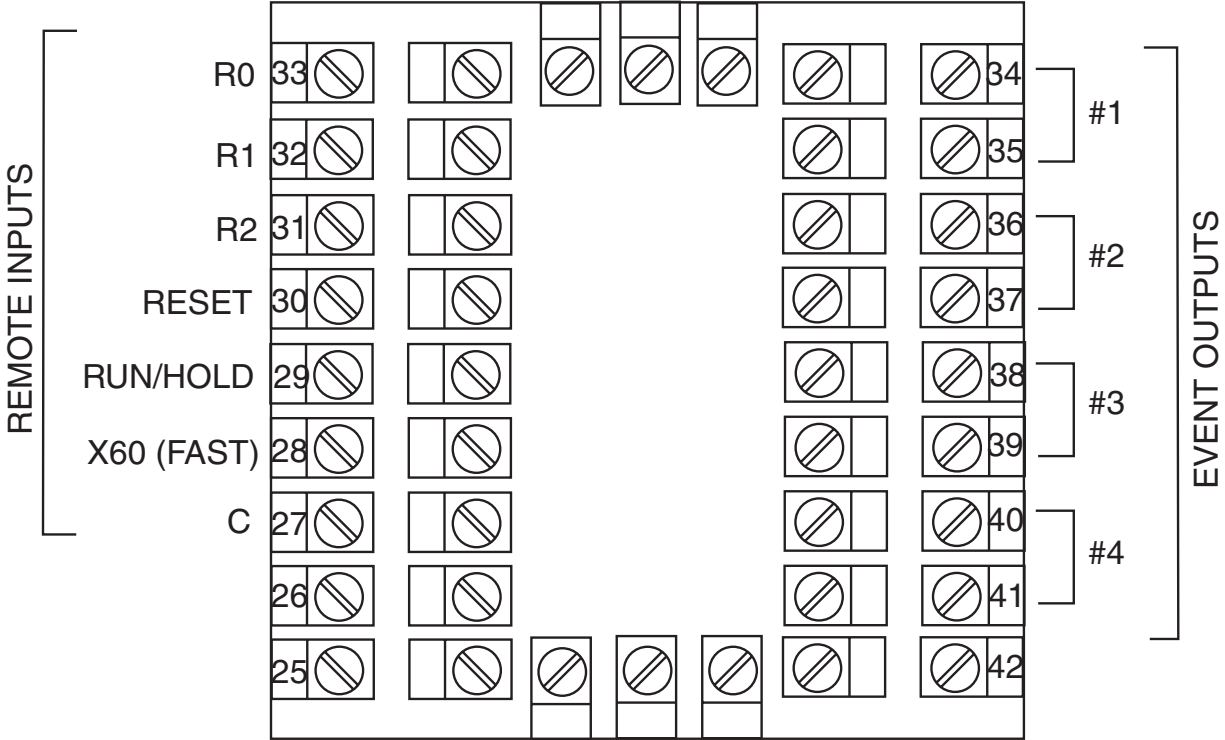


FIGURE 2-6A



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.

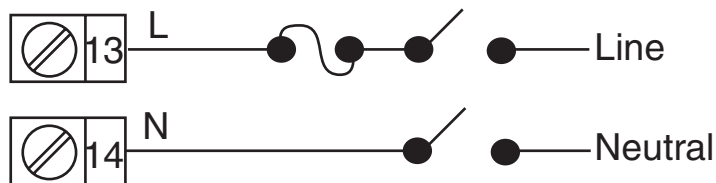


FIGURE 2-7A

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

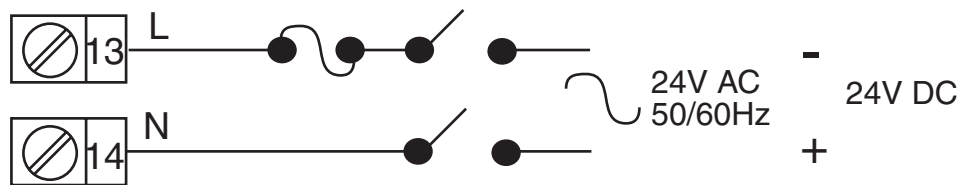


FIGURE 2-8

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.

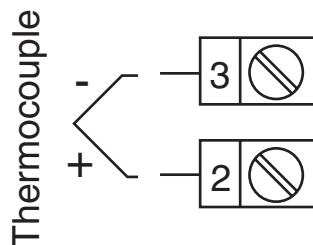


FIGURE 2-9

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).

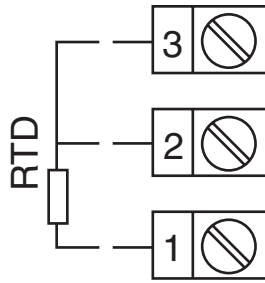


FIGURE 2-10

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).

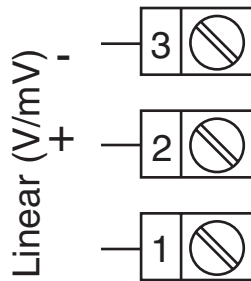


FIGURE 2-11

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).

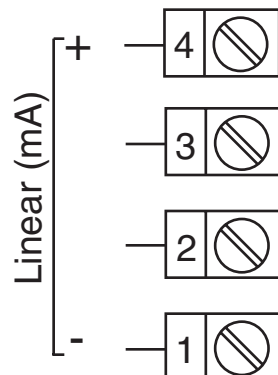
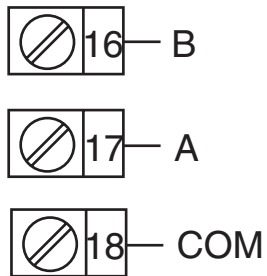


FIGURE 2-12

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 .

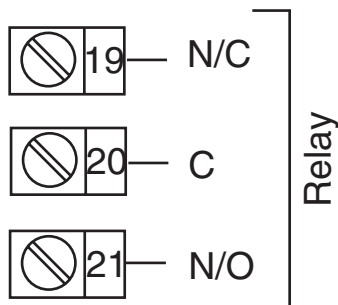


FIGURE 2-14

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.

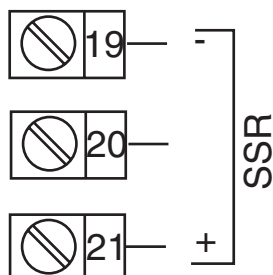


FIGURE 2-15

mADC Output 1 (Control Output 1)

Make connections for DC Output 1 as illustrated below.

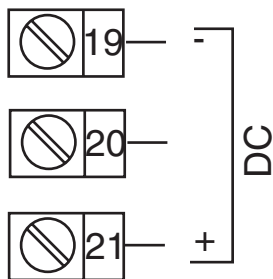


FIGURE 2-16

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.

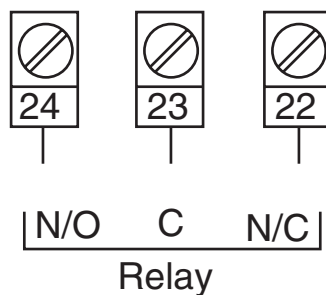


FIGURE 2-17

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.

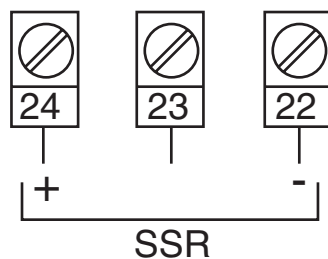


FIGURE 2-18

mADC Output 2 (Control Output 2)

Make connections for DC Output 2 as illustrated below.

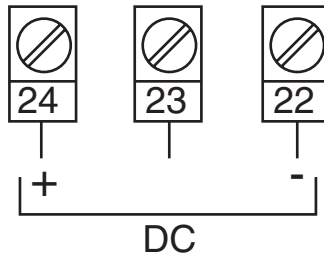


FIGURE 2-19

Transmitter Power Supply Out 2

Make connections for 24V DC transmitter power supply as illustrated below

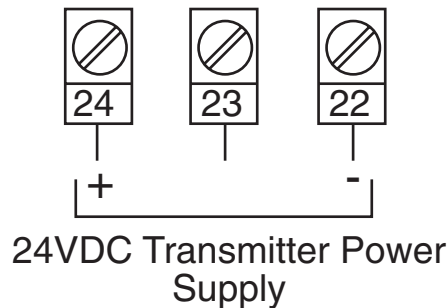


FIGURE 2-20

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.

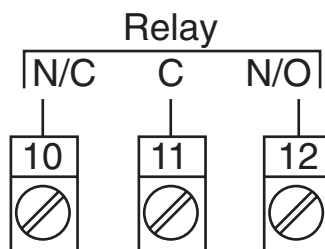


FIGURE 2-21

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.

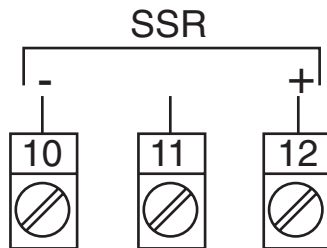


FIGURE 2-22

mADC Output 3 (Recorder Output Only)

Make connections for DC output 3 as illustrated below.

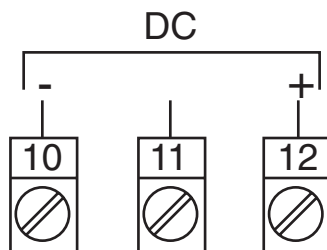


FIGURE 2-23

Transmitter Power Supply Out 3

Make connections for 24V DC transmitter power supply as illustrated below.

24VDC Transmitter Power Supply

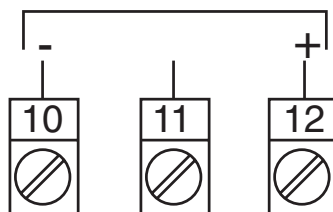


FIGURE 2-24

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.

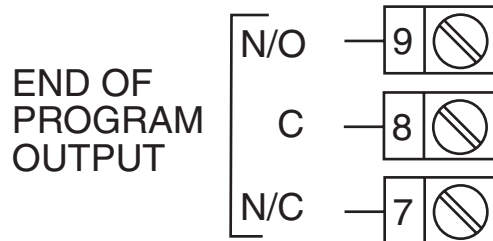


FIGURE 2-25

Event Outputs (optional)

If the Event Outputs have been specified and if the External Option parameter in Hardware Definition is set to either OUT or BOTH, Event Outputs are available. Make connections as shown on top of next page. The contacts are rated at 5 amps, 120/240 VAC.

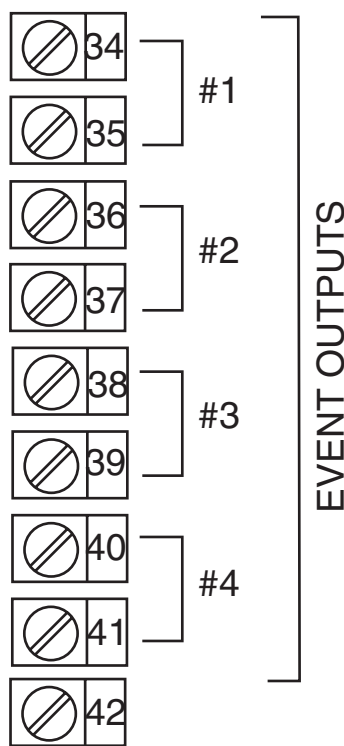


FIGURE 2-26

Remote Program Outputs (optional)

If the Remote Program Control Inputs has been specified, make connections as shown. These inputs can be either TTL or switch contact, selectable in Hardware Definition. The following applies:

Terminals 31 (R2) to 33 (RO) provide a binary-coded input which is used to select the program:

Digital Inputs=TTL Level				Digital Inputs=Contacts (switches)			
R0	R1	R2	Program Select	R0	R1	R2	Program Select
0	0	0	Program 1	Closed	Open	Open	Program 1
1	0	0	Program 2	Open	Closed	Open	Program 2
0	1	0	Program 3	Closed	Closed	Open	Program 3
1	1	0	Program 4	Open	Open	Closed	Program 4
0	0	1	Program 5	Closed	Open	Closed	Program 5
1	0	1	Program 6	Open	Closed	Closed	Program 6
0	1	1	Program 7	Closed	Closed	Closed	Program 7
1	1	1	Program 8	Open	Open	Open	Program 8

For the Program Control Inputs, the following convention has been adopted: for TTL inputs OFF=logic 0, ON=logic 1; for contacts (switch) inputs OFFG=open, ON=closed.

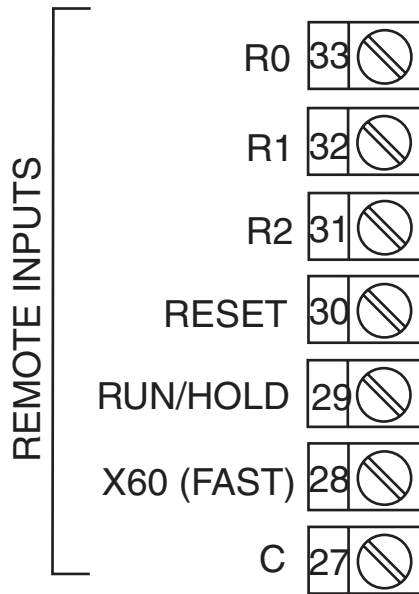
Terminal 30 is the Program Abort control. It is **EDGE SENSITIVE**; an OFF-ON transition at any time will cause an immediate Program Abort.

Terminal 29 provides the Remote Run/Hold Program control and has an identical effect to that of the Run/Hold key on the front panel. An OFF-ON transition will cause the currently selected program to be run (or to be resumed if it is currently held); AN ON-OFF transition will cause the currently running program to be held. Powering up the instrument with this terminal ON will not cause a program to run.

Terminal 28 provides the "x60" program time base selection. This terminal is **LEVEL SENSITIVE** (ON=minutes/seconds, OFF=hours/minutes). When the instrument is powered up, the initially powered time base will be according to the level on this terminal at power-up.

NOTE: All remote selection/control functions except the Abort function have

precedence over the corresponding front panel controls. The "x60" function will also take precedence over any present x60 parameter settings.

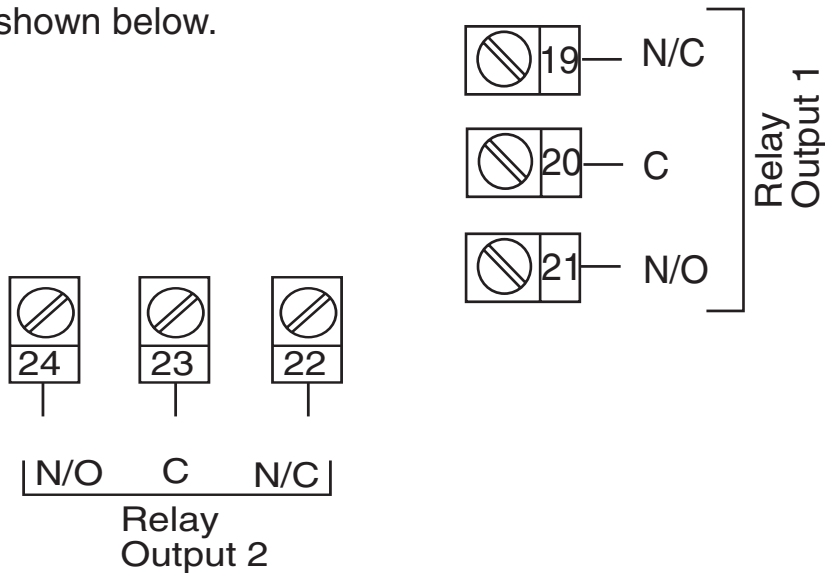


Note: Only one remote connection shown for clarity.

FIGURE 2-27

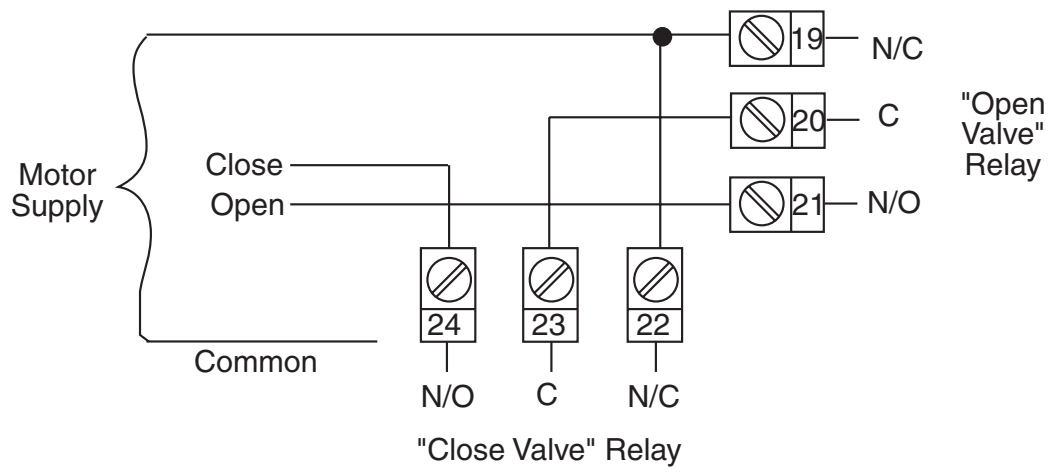
Valve Motor Drive (VMD) Control Relay Outputs 1 & 2

The contacts are rated at 2A resistive at 120V (motor drive). Connections are made as shown below.



NOTE: With VMD control, the controller is designed to switch on either Output 1 or Output 2 (to open or close the valve). However, under fault conditions, both Output 1 and Output 2 relays could be switched on simultaneously. For safety purposes, an interlock can be included which connects the supply to the motor via the "normally closed" relay contacts on the Output 1 and Output 2 relays (see Figure 2-26)

FIGURE 2-28



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.

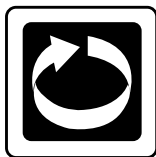
Note: When power is first applied, a delay of approx. 3 seconds will be seen before the displays light up.

3.2 KEYPAD OPERATION



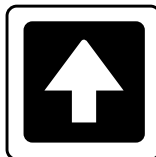
Mode Key

Cycles through modes available in the instrument.



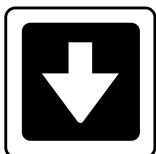
Scroll Key

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.



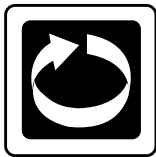
RUN/HOLD Key
Runs, holds or aborts current program (profile).



+



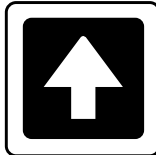
Jumps to next segment, when program is running.



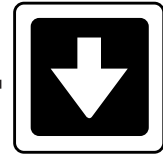
+



Selects/de-selects Manual Control



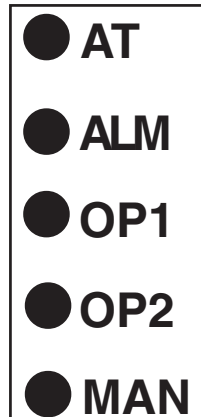
+



Sets a segment to Dwell when defining a program.

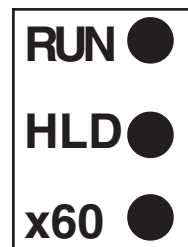
3.3 INDICATORS

Control Status Indicators



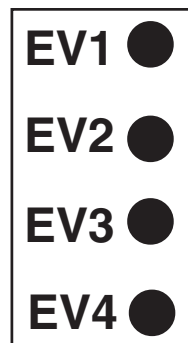
- AT - ON when Self-Tune is active; flashes when Pre-Tune is active.
- ALM - Flashes when any alarm is active.
- OP1 - ON when primary control output is active.
- OP2 - ON when secondary control output (if fitted) is active.
- MAN - ON when Manual Control is selected.

Run Status Indicators



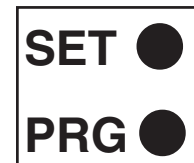
- RUN - ON - Program running or (if HLD ON also) held
Flashing - Program in Delayed state
- HLD - ON - Program held
Flashing - Program in Auto-Hold
- x60 - OFF - timebase = hours/minutes
ON - timebase = minutes/seconds

Event Indicators



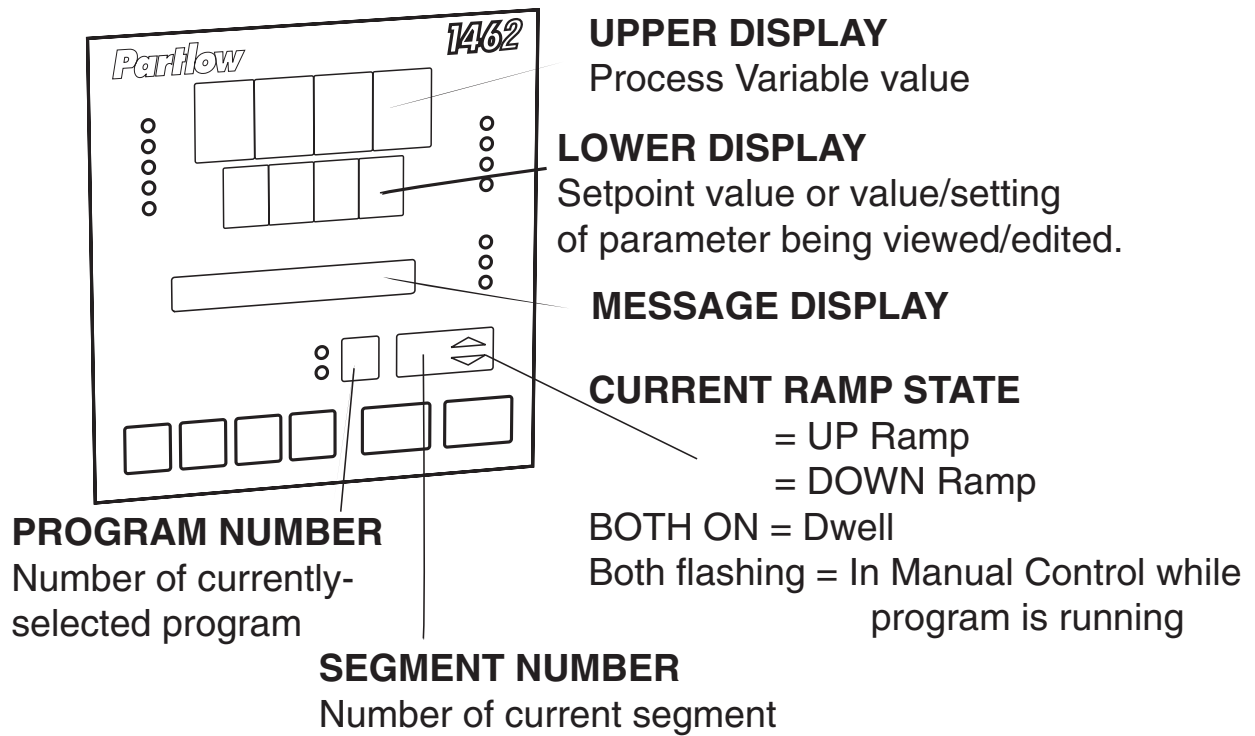
- Each indicates the status (active or inactive) of a user-defined event (OFF = inactive, ON = active)

Mode Indicators



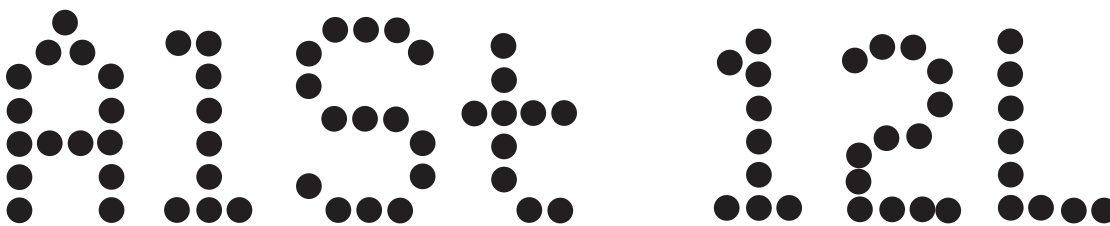
- SET - ON when any mode is entered; flashes when in Controller Parameter Mode.
- PRG - ON when Profile Set Mode is entered.

3.4 DISPLAYS



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:



Appears only if Alarm 1 is active

Appears only if Alarm 2 is active

Appears only if the Loop Alarm is active

3.6 VIEWING PROGRAM AND CONTROLLER PARAMETERS

In Base Mode (i.e. with no profile currently running or held), pressing the SCROLL key will cause the instrument to display various information. The operator may view and change the setpoint, view the units the instrument is using, whether the outputs are on or off, the alarm status, the present time and day (if the real time clock is fitted), and the percent output of the control instrument if operating in Manual Mode.

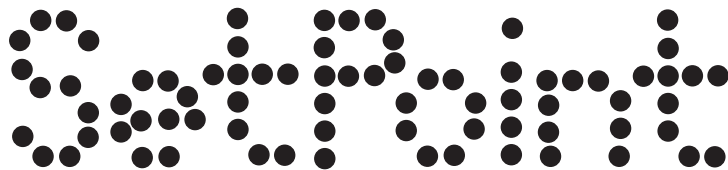
NOTE: If the SCROLL key is held for longer than two seconds, the instrument will automatically scroll through the displays.



3.7 ADJUSTING THE CONTROLLER SETPOINT

With the Setpoint Programmer in Base Mode (i.e. with the **RUN**, **HLD**, **SET**, **MAN** 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. If Setpoint has been enabled in the Enable mode, 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 view other Base mode parameters.

3.8 VIEWING THE INPUT UNITS

To see what type of input the control is using press the SCROLL key until the Units display is shown. The Units display shows the temperature scale for thermocouple and RTD inputs <DEGF> or <DEGC> or unspecified engineering UNITS for other input types. This display can be deactivated, if desired.

OVER-RANGE/UNDER-RANGE DISPLAY

If the process variable attains a value higher than the input scale maximum limit, the upper display will show:



The upper display shows the characters 'OHLO' in a seven-segment font, indicating an over-range condition.

If the process variable attains a value lower than the input scale minimum, the upper display will show:



The upper display shows the characters 'OLLO' in a seven-segment font, indicating an under-range condition.

If a break is detected in the sensor circuit, the upper display will show:



The upper display shows the characters 'SnSr' in a seven-segment font, indicating a sensor break condition.

If the CJC facility in the Configuration Mode is disabled, the initial display in Operator Mode will show:



The upper display shows four dashes '----' in a seven-segment font, indicating that the CJC facility is disabled.

flashing in the lower display.

3.9 BASE MODE AND OFF MODE OUTPUTS

The Base Mode allows for the process and event outputs to be turned on or off. When all outputs are off, the Base Mode becomes Off Mode. In Base Mode the process output is adjusted by the controller based on the process input and setpoint. The event outputs for the Base Mode are set in the Configuration Mode. To view the present status of the outputs, press the SCROLL key until **OUTPUTS** is displayed in the message display. Use the UP and DOWN keys to turn the outputs **ON** or **OFF** (toggle between Base Mode and Off Mode).

3.10 VIEWING THE TIME AND DAY

If the real time clock option is fitted, the operator may view the present time and day. Press the SCROLL key until **HH:MM Tim** is displayed. This is the present time of day in hours and minutes. Press the SCROLL key again and **Day: XXX** is displayed with **XXX** being an abbreviation for the present day of the week. If **TIME BAD** is displayed, the time and day must be set in the Profile Mode (see sec. 6)

3.11 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:



The lower Main Display will show the power output value, which may then be adjusted using the UP and DOWN keys and the MAN indicator will be lit. 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, whereupon 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).

3.12 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 MODE key until the Message Display shows:



and the lower Main Display shows:



2. Press the UP key 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 MODE key to obtain the same Message Displays above; then press the DOWN key simultaneously to change the lower Main display from ON to OFF.

3.13 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 MODE key until the Message Display shows:

The image shows the text "Self Tune" rendered in a dot-matrix font, where each character is composed of a grid of small black dots.

and the lower Main Display shows:

The image shows the text "OFF" rendered in a seven-segment font, where each character is composed of rectangular segments.

2. Press the UP key to change the lower Main Display to:

The image shows the text "On" rendered in a seven-segment font, where each character is composed of rectangular segments.

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

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

Section 4 - Configuration

4.1 ENTRY INTO CONFIGURATION MODE

To enter Configuration Mode:

1. Press the MODE Key until Conf Par appears in the message display.
2. Press the SCROLL Key to enter the Configuration Mode

The instrument will then enter Configuration Mode, whereupon the main display 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 certain Configuration Mode parameters (i.e. input range, output use and type) will cause other mode parameters to be automatically set to their default values. Items affected include Tune Mode, and Pretune and Auto Tune Facilities. Until the Tune Mode setting have been verified by changing at least one parameter, the upper main display will show decimal points to indicate that the values are in their default condition.

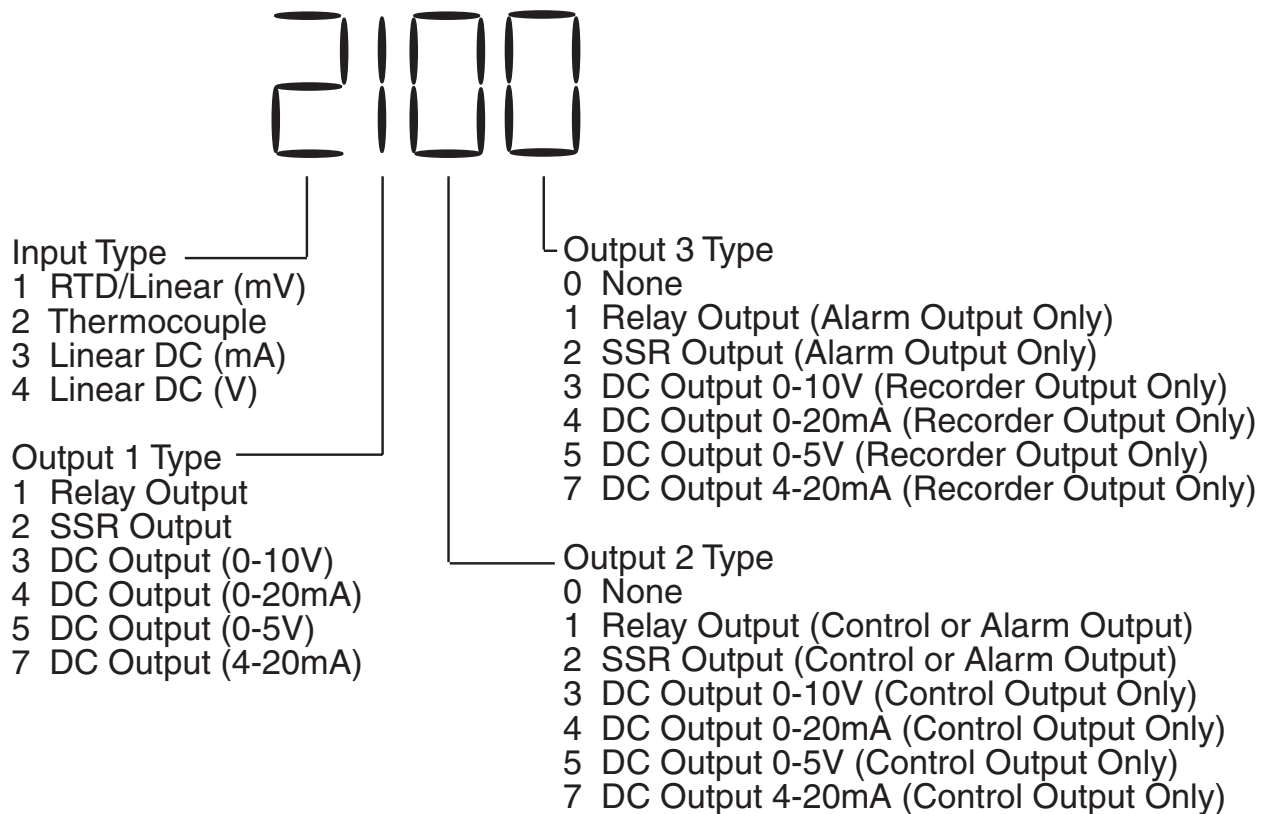
Changes to Configuration Mode parameters will not be accepted until they have been verified with the PROF key.

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:

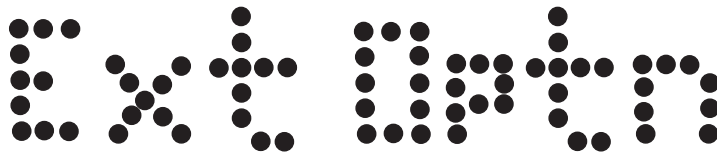


The displayed code may be incremented/decremented using the UP/DOWN keys as required. The maximum setting available for this code is 4777. For example, the code for a thermocouple input, 4-20mA DC primary output (Output 1) and relay Output 3 would be 2701. When the code is first altered, the code display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



No option PCB fitted



Digital Input Option PCB fitted



Event Output Option PCB fitted



Both Option PCBs fitted

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.

Pressing the SCROLL key again will display Inputs in the Message Display. Press the UP and DOWN keys to select from contact (cont) and low voltage (ttl) type inputs.

Pressing the SCROLL key again will display the desired function of the remote input wired to terminal 28 (see Sec. 2). Press the UP and DOWN keys to select from X60 timebase (60) or jump to next segment (SEGJ). This input can be used to remotely control the appropriate function in the Program Run Mode.

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 rEV- Reverse Acting *Mdr-Motor Drive Reverse *Mdd-Motor Drive Direct
* Not available if Output 1 AND Output 2 are Not Relay Outputs				
3	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) Or_r-Alarm 1 OR 2 (reverse) Ad_d-Alarm 1 AND 2 (direct) Ad_r-Alarm 1 AND 2 (reverse)

NOTE: This parameter not available if Control Action is set to Mdr or Mdd-Output 2 automatically used as control output

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTINGS
4	Output 3 Useage	Out3 Use	Specifies use of Output 3 ³	LP_d-Loop Alarm (direct) LP_r-Loop Alarm (reverse) 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) LP_r-Loop Alarm (reverse) rEcS-Rcdr Output (SP) rEcP-Rcdr Output (PV)

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTINGS
5	Segment Mode	Seg Mode	Defines parameter used to specify duration of each segment (along with final SP value)	ti- Time rA-Ramp Rate
6	Baud Rate ⁶	Baud Rate	Selects Baud Rate for RS485 Comms.	Numeric value: 1200, 2400, 4800 or 9600
7	Protocol ⁶	Protocol	Select protocol and parity for RS-485 Comms	Mbn-Modbus, no parity Mbo-Modbus, odd parity Mbe-Modbus, even parity WES-ASCII
8	Address ^{6,7}	Address	Selects RS485 comm. address	Numeric value in range 1-32
9	CJC ⁴ Enable/ Disabled	CJC	Enables/ disables cold junction comp.	EnAb-enabled diSA-disabled
10	Events ¹⁰	Events	Set event status in Base Mode	Binary with LSD=Event 1 0100=Event3 on, all other events off

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTINGS
11	Scale Range Decimal Point ⁹	DecPos	For Linear Inputs, defines decimal point position	0 XXXX 1 XXX.XDefault 2 XX.XX 3 X.XXX
12	Scale Range Maximum ⁹	EngU UP	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)
13	Scale Range Minimum ⁹	EngU 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)
14	Setpoint High Limit ⁸	SP High	The Maximum limit for setpoint adjustment. Should be set to a value which prevents set- point values causing damage to the process	Current set- point value to input range max.

STEP	DESCRIPTION	MESSAGE DISPLAY	FUNCTION	AVAILABLE SETTINGS
15	Setpoint Low Limit ⁸	SP Low	The Minimum 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 min.
16	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 sec. in 0.5 increments.
17	Output Power Limit	Out PL	Determines max output setting instrument will provide	0 to 100 (%)
18	Engineering Units ³	Units	Sets units to be displayed in base mode	Unit CEnt FAHr
19	End of Program	EOPrelay	Sets action of relay	End=relay active at end of profile run=relay active during profile Default=End

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.
8. 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.
9. These parameters are applicable only if a linear input is fitted.
10. These parameters do not appear if features are not fitted.
11. When X60 in Profile Set = OFF, Time = hours/minutes and Ramp Rate = LSD/hour
When X60 in Profile Set = ON, Time = minutes/seconds and Ramp Rate - LSD/minute

4.4 EXIT FROM CONFIGURATION MODE

To leave Configuration Mode, depress and hold the MODE key for five seconds.

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

Section 5 - Defining The Tune Parameters

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 MODE key until the Message Display will show:

The word "TunePar" is displayed in a dot-matrix font, where each letter is formed by a grid of small black dots. The 'T' is the tallest, followed by 'u', 'n', 'e', 'P', and 'a', with 'r' being the shortest.

2. Press the SCROLL key.

The instrument is now in the Tune Mode.

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