WEST 2077
LIMIT CONTROLLER
Installation & Operating Instructions

Dynapar, Veeder Root, and Eagle Signal Brands:

Sales, Repair, and Application Support:
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Gurnee, IL. 60031
847-662-4150 Sales/Order Entry Fax
847-782-5277 Applications Support Fax
800-873-8731 Sales/Order Entry
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Please disregard all phone numbers and addresses in this manual. The phone numbers and address on this page are the correct phone number and addresses to use for sales, repair, and application support.

NOTE

Our policy is one of continued improvement, and subsequently the information contained in this publication may differ in some respects from the instrument in question. Therefore this document does not constitute an offer or part of an offer for sale.

CAUTION: REFER TO MANUAL

THE INTERNATIONAL HAZARD SYMBOL IS INSCRIBED ADJACENT TO THE REAR CONNECTION TERMINALS. IT IS IMPORTANT TO READ THE MANUAL BEFORE INSTALLING OR COMMISSIONING THE UNIT.

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WEST 2077 LIMIT CONTROLLER
INSTALLATION AND OPERATING INSTRUCTIONS
IM-0023 -DO

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CONTENTS

SECTION 1 - INTRODUCTION

The 2077 Limit Controller may be used as a "Policeman" or back-up alarm. The measuring system utilizes the same parts as the well-proven 2050/2070 series of controllers and programmer-controllers.

A wide range of inputs is available, including most types of thermocouple and RTD.

The output relay can be arranged to operate when a high or low limit is reached. When it operates it remains in the Limit Exceeded condition. Once the Process Temperature returns to within the Set-point Limit, the relay may be set to 'Normal' from the front panel.

As well as the basic limit relay, the 2077 can be supplied with one or two alarms, configured as deviation or process alarms.

The 4-digit numeric display shows either Process Temperature or Limit value, which cannot be adjusted in User mode. To make adjustments and to access other parameters it is necessary to go through the correct sequence to get into Setup mode.

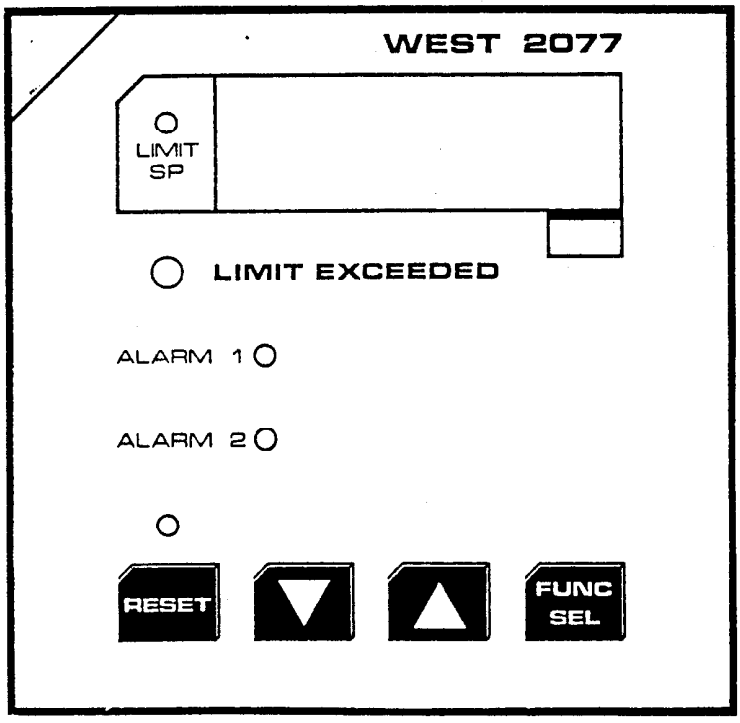


FIGURE 1-1 FRONT PANEL OF 2077

SECTION 2 INSTALLATION

2.1 UNPACKING THE 2077

The 2077 is supplied in its housing with two mounting bars and two mounting screws included in the transit package.

Remove the equipment from the transit package and check for damage. Notify the carrier immediately in case of any damage or deficiences.

2.2 MOUNTING

The instrument is contained in a housing which can be mounted on a rigid panel of up to 6mm (.25 inches) thickness with a cut-out 92mm, +0.8 -0mm (3.62in, +0.03 -0in) square.

The instrument is 210mm (8.3in) deep; the front panel is 96mm (3.8in) square.

For replacement or servicing the instrument can be easily removed from the housing, leaving the housing and back-wiring attached to the mounting panel.

WARNING

BEFORE WITHDRAWING THE INSTRUMENT FROM ITS HOUSING MAKE SURE THAT THE MAIN POWER SUPPLY AND ALL LIVE CONNECTIONS (INCLUDING FEEDS TO RELAY CONTACTS) ARE SWITCHED OFF OR DISCONNECTED.

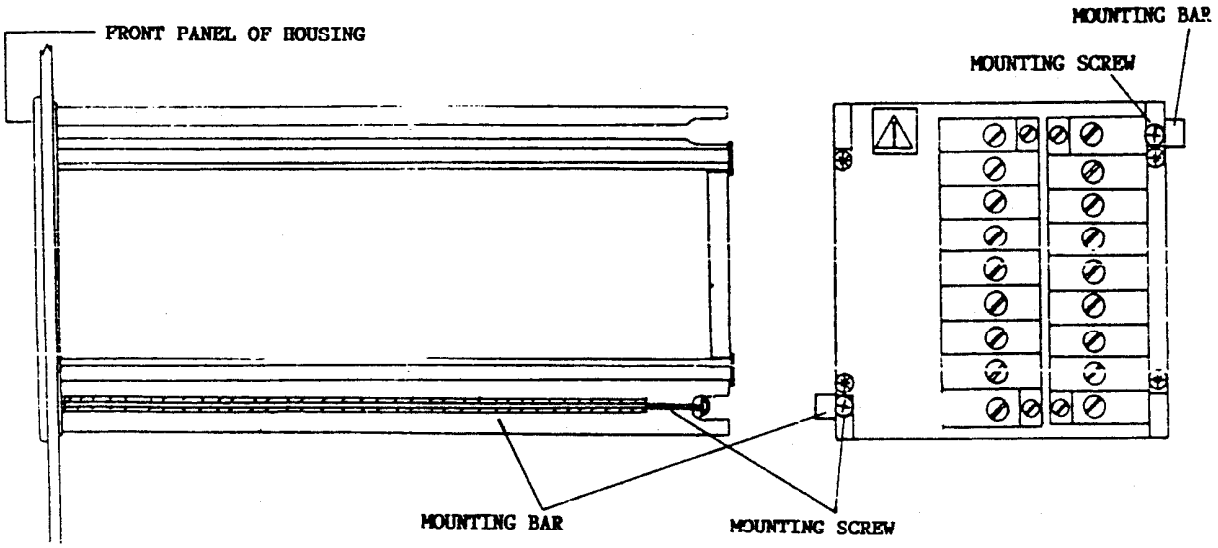


FIGURE 2-1 ATTACHMENT OF HOUSING TO MOUNTING PANEL

2.3.1 Attaching Housing to Mounting Panel

Insert the rear of the housing (or housing with instrument in it) through the cut-out and hold the instrument lightly against the front panel.

The instrument is held in place by two diagonally opposite mounting bars that slide into grooves along the side of the housing. The bars must be mounted in the positions shown in Figure 2-1.

Mounting screws hold the mounting bar against the rear of the mounting panel as shown in figure 2-1.

Slide the mounting bars along the diagonally opposite grooves and insert the screws along the grooves and gently tighten them to hold the housing securely against the panel.

2.3.2 Removal of Housing from Mounting Panel

Remove the mounting screws (shown in figure 2-1). Support the housing with one hand and remove the mounting bars by sliding them rearward out of the grooves.
Remove the housing out of the mounting panel by pulling the housing forward through the mounting hole.

2.3.3 Removal of Instrument from Housing

Insert a small screwdriver into the slot below the FUNC SEL pushbutton. Put a small amount of downward pressure on the handle to lift the small catch inside the slot.
The hinged lever to the left of the slot can now be pulled outward to 90^0 to the front panel which releases the instrument and also unjacks the rear connections. Carefully pull the instrument out from the housing.

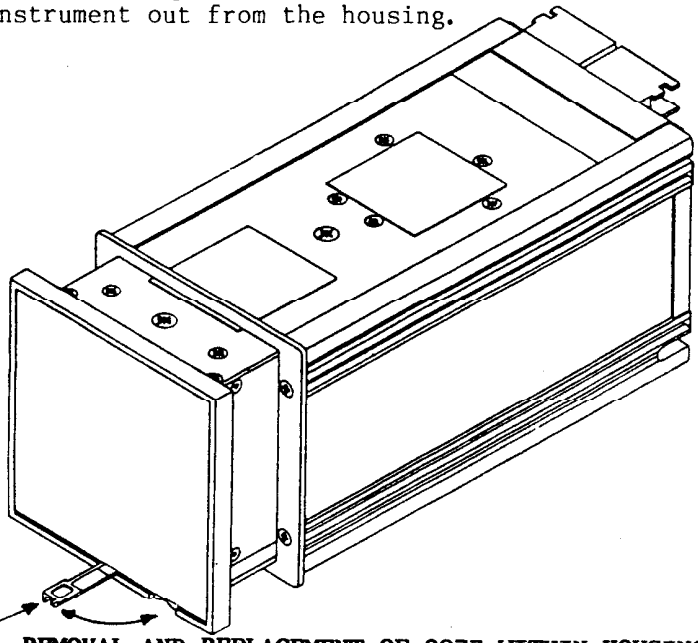


FIGURE 2-2 REMOVAL AND REPLACEMENT OF 2077 WITHIN HOUSING

2.3.4 Insertion of Instrument into Housing

The hinged lever must be at 90° to the front panel of the instrument as shown in figure 2-2.
Carefully slide the the instrument into the housing previously mounted on the mounting panel. Firmly push it home so that the rear connections of the circuit boards make a good connection with the rear terminals.

With instrument fully inserted lock it in to place by pushing the lever so that it is flush with the frame.

2.4 CONNECTIONS AND WIRING

The following inputs and outputs are provided on the rear of the instrument housing. (Depending on configuration, some of the connections may not be present).

a) Power Line Input
b) Thermocouple or RTD Input
c) Limit Relay Output
d) Alarm 1 Relay Output
e) Alarm 2 Relay Output

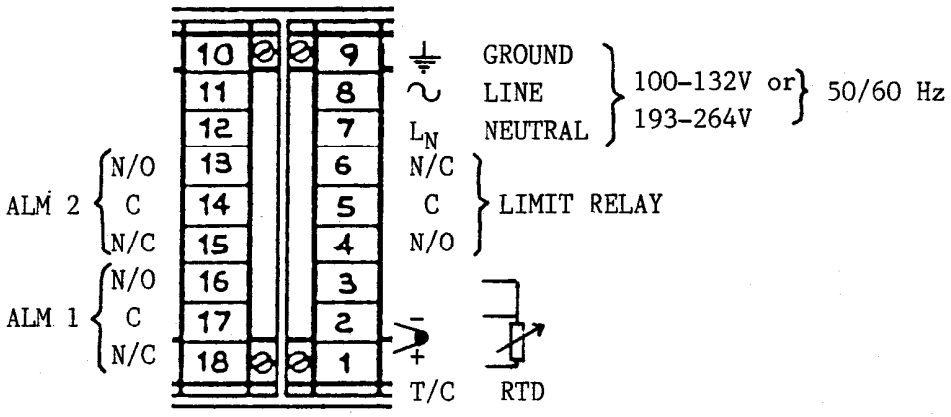


FIGURE 2-3 2077 REAR CONNECTIONS

2.5 POWER LINE CONNECTIONS

The instrument is configured for either 193V - 264V or 100V - 132V 50/60Hz as stated on the label attached to the top of the instrument.

Local requirements regarding electrical installation should be rigidly observed. Ground terminals must be separately connected and not made common to the neutral. Consideration should be given to the prevention of unauthorized personnel gaining access to power terminations.

The ground terminal 9 should be connected to a protective ground conductor before any wiring is made, and should remain connected at all times.

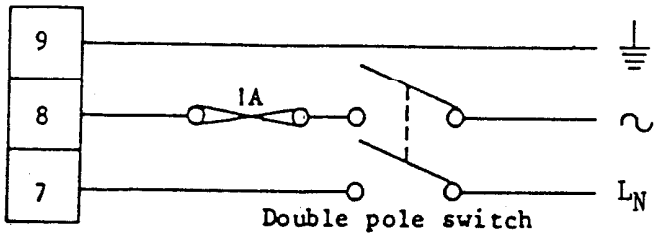


FIGURE 2-4 POWER LINE CONNECTIONS

2.6 INPUT

2.6.1 Thermocouples

Thermocouple connections are made to the terminals as shown in Figure 2-5.

An open circuit thermocouple will cause [ ] to be displayed and the limit relay to be de-energized, giving the Limit Exceeded condition.

Thermocouple leads should be connected to terminal 1 (positive) and terminal 2 (negative). The correct type of thermocouple extension leadwire or compensating cable must be used for the entire distance between the instrument and the thermocouple, ensuring that the correct polarity is observed throughout. Joints in the cable should be avoided if possible. All instruments supplied with a thermocouple input have a cold junction compensation bobbin fitted across terminals 2 & 3. This bobbin should never be removed.

DO NOT RUN THERMOCOUPLE LEADS ADJACENT TO POWER CARRYING CONDUCTORS.IF THE WIRING IS RUN IN A CONDUIT, USE A SEPARATE CONDUIT FOR THE THERMOCOUPLE WIRING. IF THE THERMOCOUPLE IS GROUNDED, THIS SHOULD BE DONE AT ONE POINT ONLY.

Thermocouple Extension Cable Color Codes (last color in each group refers to the overall sheath).

THERMOCOUPLE TYPE	CABLE MATERIAL	BRITISH BS	AMERICAN ASTM	GERMAN DIN	FRENCH NFE
T	Copper Constantan	+white -blue blue	+blue -red blue	+red -brown brown	+yellow -blue blue
J	Iron/Constantan	+yellow -blue black	+white -red black	+red -blue blue	+yellow -black black
K	Nickel Chromium Nickel Aluminium	+brown -blue red	+yellow -red yellow	+red -green green	+yellow -purple yellow
R S	13% Copper 10% Copper Nickel	+white -blue green	+black -red green	+red -white white	+yellow -green green
B	Platinum/ Rhodium		+grey -red grey		

TABLE 2-1

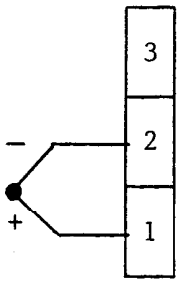


FIGURE 2-5 THERMOCOUPLE INPUT CONNECTIONS

2.6.2 3-Wire Resistance Temperature Detector

RTD connections are made as shown in Figure 2-6, with the compensating lead connected to terminal 3.

The extension leads should be of copper and the resistance of the wires connecting the resistance element should not exceed 100 ohms per lead. (The leads should be of equal length.)

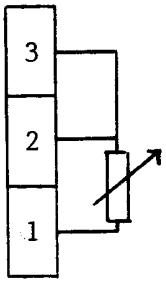


FIG. 2-6 3 WIRE RESISTANCE THERMOMETER INPUT CONNECTIONS

2.7 LIMIT RELAY OUTPUT

The Limit relay has contacts connected to the rear terminals. When the relay is de-energized the LIMIT EXCEEDED indicator on the front panel is illuminated. The contacts are rated at 5A with resistive load and 1A with inductive load.

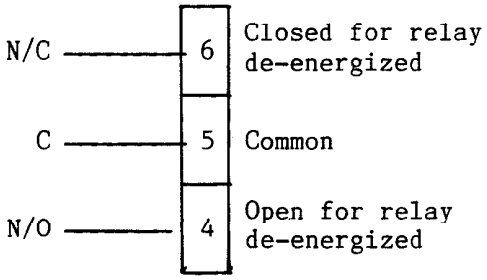


FIGURE 2-7 LIMIT RELAY CONNECTIONS

2.8 ALARM 1 OUTPUT (Optional)

The relay connections are shown in Figure 2-8. The relay is rated at 2A for resistive loads and 1A for inductive loads.

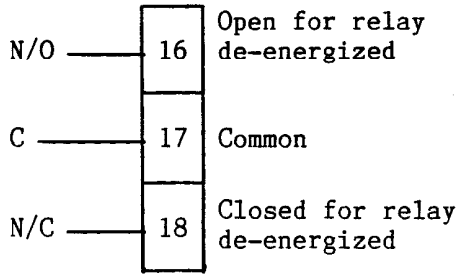


FIGURE 2-8 ALARM 1 CONNECTIONS

2.9 ALARM 2 OUTPUT (Optional)

The relay connections are shown in Figure 2-9. The relay is rated at 2A for resistive loads and 1A for inductive loads.

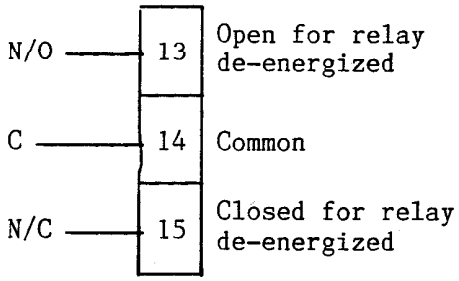


FIGURE 2-9 ALARM 2 CONNECTIONS

2.10 INDUCTIVE LOADS; EXTERNAL CONTACTORS AND LINE VOLTAGE OPERATED SOLID STATE RELAYS AS LOADS

WARNING: OPERATING THE INSTRUMENT WITH INDUCTIVE LOADS AND WITHOUT THE APPROPRIATE PROTECTION NETWORK MAY GIVE RISE TO A HAZARD DUE TO HIGH VOLTAGE TRANSIENTS WHICH MAY OCCUR DURING THE SWITCHING CYCLES.

REMOVAL OF THE INSTRUMENT'S INTERNAL SNUBBER COMPONENTS COULD GIVE RISE TO A SERIOUS HAZARD. GULTON LIMITED, GULTON INDUSTRIES INC. AND MARK IV INDUSTRIES INC. DO NOT ACCEPT RESPONSIBILITY FOR ANY DAMAGE WHICH MAY OCCUR AS A RESULT OF THE UNAUTHORIZED REMOVAL OF THESE COMPONENTS.

The standard relay contacts are suitable for a.c. supplies of 24V to 240V. The Limit relay is rated at up to 5A with a resistive load and up to 1A with an inductive load. The Alarm relays are rated at up to 2A with a resistive load and 1A with an inductive load.

The 2077 instruments contain protection components across all relay contacts. These components are voltage dependent resistors.

2.10.1 External Switch in Series with an External Inductive Load

Damage to the instrument may result if the contacts of a switch, relay or contactor are connected externally in series with the instrument relay contacts as shown in Figure 2-10.

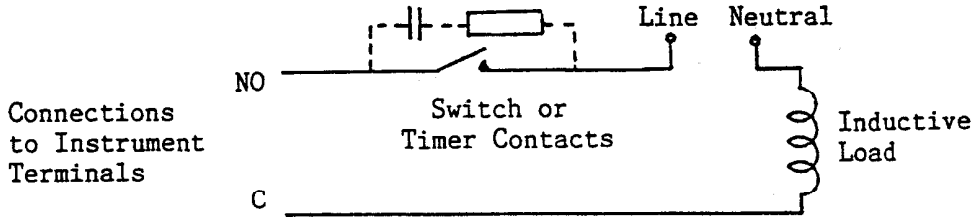


FIGURE 2-10
EXTERNAL SWITCH IN SERIES WITH AN EXTERNAL INDUCTIVE LOAD

Under these conditions the external contacts may operate while the instrument relay contacts are closed (i.e. the internal protection components short circuited and therefore ineffective).

In applications where it is necessary to install external switch, relay or contactor contacts in series with the instrument relay a snubber network must be installed either across the inductive load or across the unprotected contacts. The values given in Table 2-2 may be used, or a suitable Voltage Dependent Resistor.

LOAD CURRENT	VALUE OF C µF	VALUE OF R Ohms
<70mA	0.047	22
<150mA	0.1	47
<0.5A	0.22	47
<1A	0.47	47

NOTE: ALL CAPACITORS SHOULD CONFORM TO VDE (CLASS X) AND BE SUITABLE FOR OPERATION AT 260V A.C.

ALL RESISTORS (WIREWOUND OR ALLEN BRADLEY TYPE HB) SHOULD HAVE A MINIMUM RATING OF 2 WATTS

TABLE 2-2 VALUES OF PROTECTION NETWORK COMPONENTS

SECTION 3 - OPERATING INSTRUCTIONS

3.1 FRONT PANEL DISPLAY AND INDICATORS

3.1.1 Numeric Display

This shows the temperature of the process being monitored or the temperature limit set into the instrument. The display consists of four decimal digits with decimal point.

3.1.2 LIMIT SP LED Indicator

This LED is associated with the numeric display. When lit it indicates that the display is showing the Limit Set-point temperature. When out it indicates that the Process temperature is being displayed.

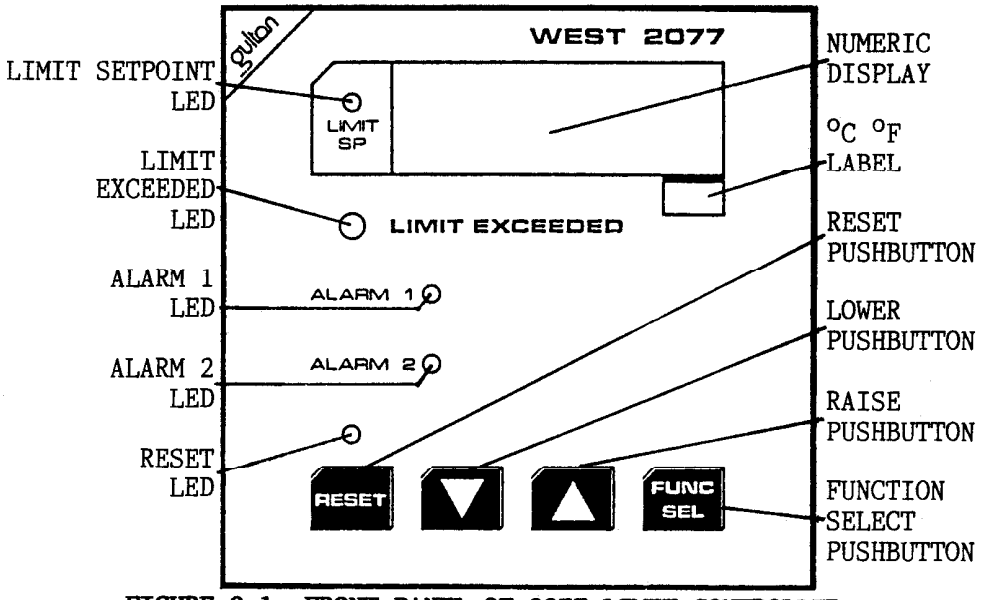


FIGURE 3-1 FRONT PANEL OF 2077 LIMIT CONTROLLER

3.1.3 LIMIT EXCEEDED LED Indicator

When lit this indicates that the process temperature is above the Limit Set-point for instruments set up for High Limit, and below the Limit Set-point for instruments set up for Low Limit. When it flashes it indicates that the Process Temperature is close to the Limit Set-point. (This function can be set by internal switches to operate at 5%, 10% or 15% from Limit Set-point, or may be switched off)

When the process temperature returns to within the Set-point Limit the LED flashes or goes out, depending on the internal switch settings.

3.1.4 RESET LED Indicator (Located above the RESET Pushbutton)

This shows the state of the Limit Relay. The LED is on after power-up, or when the Process temperature has gone outside the Set-point Limit.

3.1.5 **ALARM 1 LED Indicator** (Optional)

This lights when the Process Temperature is outside the limit set for Alarm 1.

3.1.6 **ALARM 2 LED Indicator** (Optional)

This lights when the Process Temperature is outside the limit set for Alarm 2.

3.2 PUSHBUTTON CONTROLS

3.2.1 FUNC SEL Button

The Function Select button changes the numeric display between Process Temperature and Limit Set-point temperature. It has further functions in Setup Mode. (See Setup Instructions, Section 4)

3.2.2 RESET Button

This is used to set the Limit Relay to 'normal'.

3.2.3 RAISE and LOWER Buttons

These are only functional in Setup Mode.

3.3 OPERATING THE CONTROLLER

3.3.1 Self-Test

When switched on the Limit Controller first performs a self-test routine. During this test it displays 9999 if configured as a HIGH LIMIT instrument, or 0000 if configured as a LOW LIMIT instrument.

3.3.2 Operation

After the self-test routine is completed the display shows the Process Temperature; the RESET LED is lit. Press the RESET Button to extinguish the LED and set the LIMIT relay to the 'Normal' condition. If the indicator will not go out this means that there is a fault or a Limit Exceeded condition, which is indicated by the LIMIT EXCEEDED LED being lit.

After a Limit Exceeded condition, when the Process Temperature returns to within the Set-point Limit the RESET LED will remain lit and the LIMIT relay will remain in the 'Limit Exceeded' condition until the RESET button is pressed.

If the FUNC SEL button is pressed it causes the display to change between Process Temperature and Limit Set-point.

SECTION 4 SETTING UP

4.1 USER MODE AND SETUP MODE

When switched on the instrument operates in User Mode; the operator can display the Process Temperature or the Limit Set-point by pushing the FUNC SEL button. If the RESET LED is lit the Limit Relay can be put into the 'Normal' condition by pushing the RESET button. No adjustments can be made and no other parameters displayed.

Setup Mode provides facilities for displaying and adjusting the Limit Set-point and the Alarm levels (if installed), and displaying the maximum or minimum Process Temperature which has been reached, and the duration of a period when the Process Temperature was outside the Limit setting.

4.2 SETTING INTERNAL SWITCHES FOR LOCK AND EARLY WARNING

4.2.1 Withdraw the Controller from its Housing

BEFORE WITHDRAWING THE INSTRUMENT FROM ITS HOUSING MAKE SURE THAT THE SUPPLY AND ALL LIVE CONNECTIONS (INCLUDING FEEDS TO RELAY CONTACTS) ARE SWITCHED OFF OR DISCONNECTED

1) Insert a small screwdriver into the slot at the lower right hand corner of the front panel, gently lever up the catch and pull out the lever until it is at 90°. See Figure 4-1.

2) Grasp the front panel of the controller and withdraw it from its housing.

This procedure leaves the connections made to the rear panel intact, and these need not be touched.

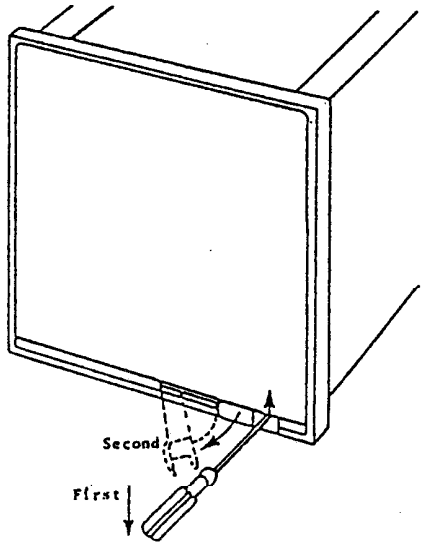


FIGURE 4-1 WITHDRAWING THE CONTROLLER FROM ITS CASE

4.2.2 Switches on CPU Board

The CPU Board is on the right hand side when viewed from the front of the instrument. Four switches are located on the board as shown in Figure 4-2.

Switch 1, Parameter Lock. With the switch in the Off position parameters may be adjusted or reset as described in Section 4.4. With switch 1 in the On position no adjustment or resetting is possible.

Switch 2 is not used on this instrument.

Switches 3 and 4, Early Warning Margin LIMIT EXCEEDED LED starts to flash when the Process Temperature approaches the Limit Set-point. Table 4-1 shows the effect of different switch settings.

Switch 3	Switch 4	Early Warning Margin
OFF	OFF	No Early Warning
ON	OFF	5% of Span from Limit Set-point
OFF	ON	10% of Span from Limit Set-point
ON	ON	15% of Span from Limit Set-point

TABLE 4-1 - EARLY WARNING SELECTION

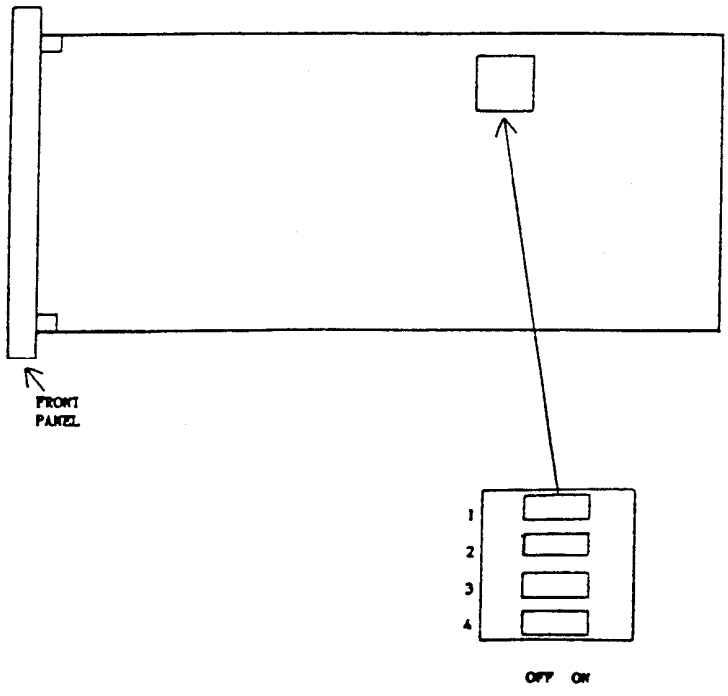


FIGURE 4-2 - SWITCHES ON THE CPU BOARD

4.2.3 Insert Controller into its Housing

1) Make sure that the retaining lever is at 90° to the front panel.

2) Push in the controller carefully but firmly into the housing so that the connections on the PCBs make a good connection with the rear sockets.

3) With the controller fully inserted push the retaining handle to the right until it is flush with the front panel.

4) Switch on main power supply to the instrument.

4.3 PUTTING THE INSTRUMENT INTO SETUP MODE

Check that the instrument is displaying the Process Temperature (LIMIT SP LED not lit); if not, press the FUNC SEL button.

Press both RAISE  and LOWER  , and hold them in for five seconds. The LIMIT SP LED will start flashing. Within 2 seconds of the start of flashing, release the RAISE and LOWER buttons and press the FUNC SEL button. The LIMIT SP LED will go out, and the numeric display will be blanked for a short time every second. This indicates that the instrument is in Setup Mode.

4.4 REVIEWING AND ADJUSTING PARAMETERS

With the instrument in Setup Mode, each time the FUNC SEL button is pressed a parameter label, C0 to C5, will be displayed, and when the button is released the display will show the value of the parameter. Provided the instrument is not locked (See Section 4.2.2) they can be adjusted or reset.

The sequence is as follows:-

LABEL	PARAMETER	ADJUSTABLE/ READ ONLY	OPTIONAL?
C0	Process Temperature	Read Only	
C1	Limit Set-point	Adjustable	
C2	Alarm 1 Value	Adjustable	Yes
C3	Alarm 2 Value	Adjustable	Yes
C4	Out of Limit Duration	Read Only*	
C5	Min/Max Process Temp	Read Only*	

* These parameters can be reset.

4.4.1 Limit Set-point (C1)

When the FUNC SEL button is released with C1 having been displayed, the display shows the value of the Limit Set-point. This can be adjusted by using the RAISE and LOWER buttons. The value is shown in degrees C or degrees F, depending on the configuration of the instrument, which is indicated by the label to the right of the numeric display.

PRODUCT CODE	TYPE		Early warning threshold		Limit Set-point
H1030	HIGH LIMIT	LIMIT LED	Off	Flashes	On
		LIMIT RELAY	Energized		De-energized

			Limit Set-point	Early warning Threshold	
H1031	LOW LIMIT	LIMIT LED	On	Flashes	Off
		LIMIT RELAY	de-energized	energized	

FIGURE 4-3 - OPERATION OF LIMIT RELAY AND LIMIT EXCEEDED LED

4.4.2 Alarm Settings (Optional) (C2, C3)

Alarm 1 and Alarm 2 are independent of each other, and their operation is defined by the Product Code shown on the instrument label. Where only Alarm 1 is installed the X Code will have two digits, and where both alarms are installed the X Code will have four digits, the first two referring to Alarm 1 and the second two referring to Alarm 2. Figure 4-4 illustrates the Alarm functions.

It is possible to change the function of the Alarms by moving Link Jumpers within the instrument, as described in Section 5, Range Changing and Re-configuring.

When an alarm value is being displayed (after C2 or C3), the value may be changed by using the RAISE or LOWER buttons (provided the instrument is not locked by the internal switch, see Section 4.2.2)

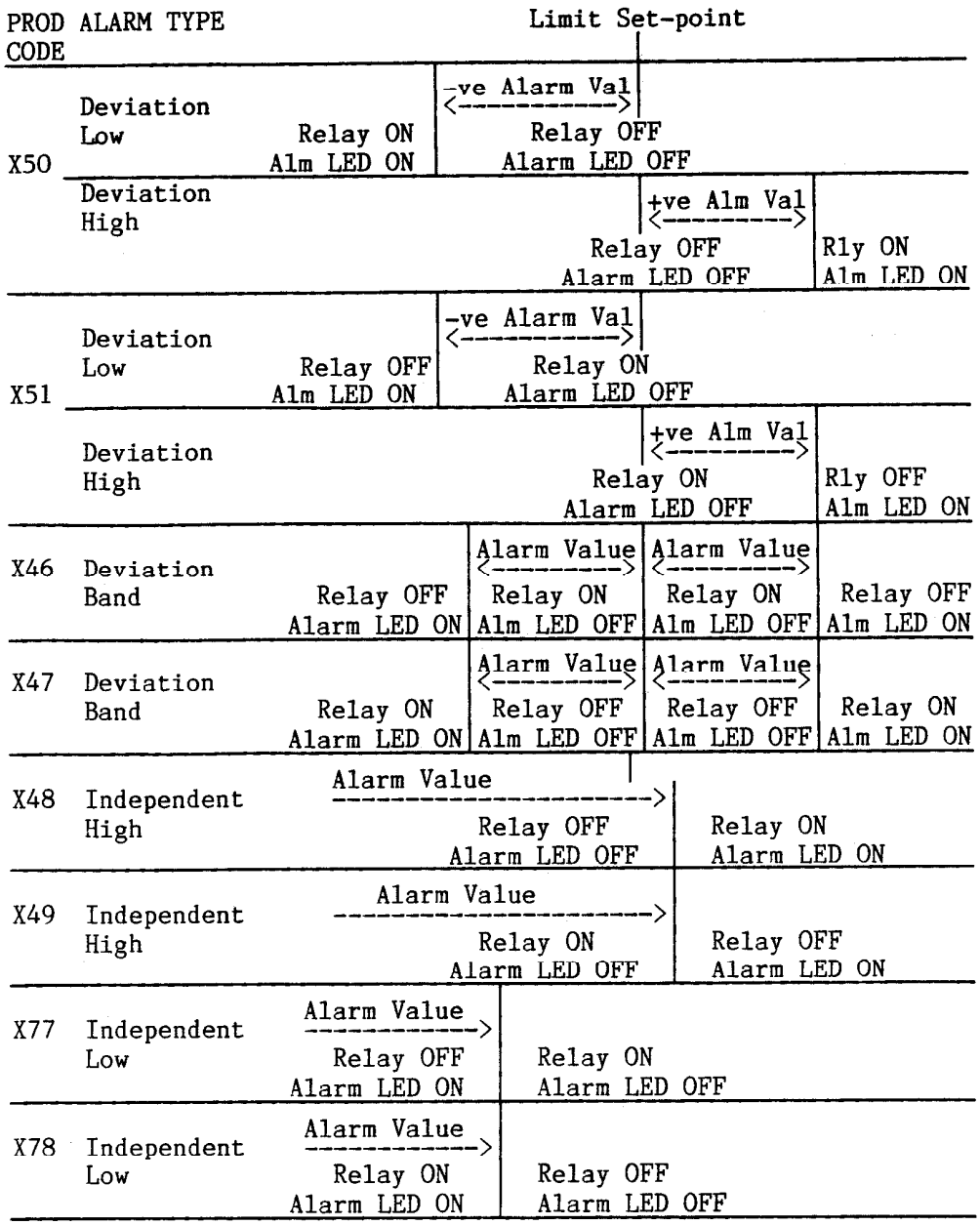


FIGURE 4-4 ALARM FUNCTIONS

4.4.3 Out of Limit Duration (C4) *

Whenever the Process Temperature goes above the Limit Set-point (HIGH LIMIT Instruments) or below the Limit Set-point (LOW LIMIT Instruments) the duration of the out-of-limit condition is recorded.

This value, up to a maximum of 999.9 minutes, is stored in a memory with battery backup, and retained when the instrument is switched off.

To reset this value to 0.0 minutes, hold the LOWER button in when the display is showing the Out of Limit Duration. At first the display will flash at about four times a second, as a warning, and after 5 seconds the value will be reset.

When the Limit Relay is reset the Out of Limit Duration value is retained. If the Process Temperature goes outside the Limit Set-point again, the timer will re-start from 0.0.

4.4.4 Min/Max Process Temperature (C5) *

This parameter shows the maximum temperature reached by the process for HIGH LIMIT instruments and the minimum temperature reached for LOW LIMIT instruments. The value is retained in memory when the instrument is switched off.

To reset this value, hold the LOWER button in when the display is showing the parameter. At first the display will flash at about four times a second, as a warning, and after 5 seconds the value will be reset.

The value is reset to range minimum for HIGH LIMIT instruments, and to range maximum for LOW LIMIT instruments. However the reset value is only present for a very short time, until the instrument replaces it with the current process temperature.

When the Limit Relay is reset the Min/Max Process Temperature value is retained. If the Process Temperature goes outside the Limit Set-point again, the Min/Max value will be reset to Range minimum (HIGH LIMIT Instruments) or Range Maximum (LOW LIMIT Instruments) until it is replaced with the current Process Temperature.

* Depending on the application, it may be desirable to reset both Out of Limit Duration and Max/Min Process Temperature at the same time.

4.5 EXIT FROM SETUP MODE

To exit from Setup Mode first select the Process Temperature display by pressing the FUNC SEL button, then press RAISE and LOWER and hold them in for five seconds. The LIMIT SP LED will start flashing, and within the next two seconds release the RAISE and LOWER buttons and press the FUNC SEL button. The instrument will then revert to User Mode.

When the instrument is in Setup Mode, it will automatically revert to User Mode if a minute elapses without a button being pressed.

SECTION 5 - RANGE CHANGING AND RE-CONFIGURING

5.1 TOOLS REQUIRED

1) Crosshead or Posidriv screwdriver

2) Small smooth jaw pliers

WARNING

BEFORE WITHDRAWING THE INSTRUMENT FROM ITS HOUSING MAKE SURE THAT THE MAIN POWER SUPPLY AND ALL LIVE CONNECTIONS (INCLUDING FEEDS TO RELAY CONTACTS) ARE SWITCHED OFF OR DISCONNECTED.

5.2 Withdraw the Controller from its Housing

1) Insert a small screwdriver into the slot at the lower right hand corner of the front panel, gently lever up the catch and pull out the lever until it is at 90°. See Fig. 5-1.

2) Grasp the front panel of the controller and withdraw it from its housing.

This procedure leaves the connections made to the rear panel intact, and these need not be touched.

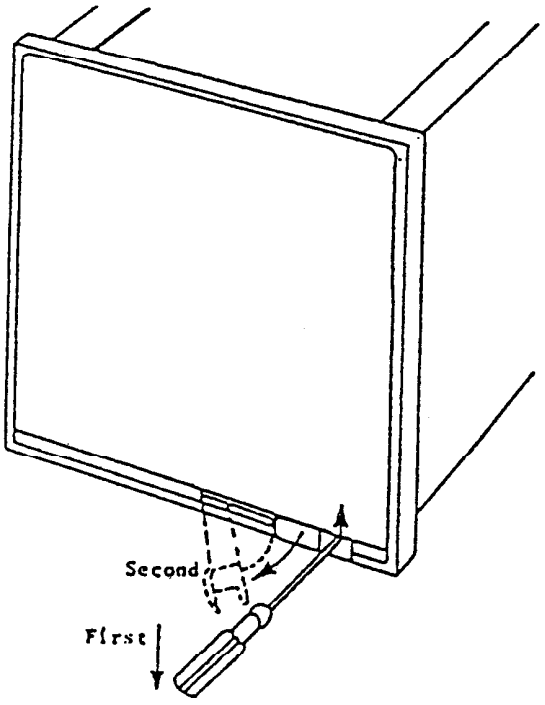


FIGURE 5-1 WITHDRAWING THE CONTROLLER FROM ITS CASE

5.3 SWITCHES ON CPU BOARD

The CPU has four switches located as shown in Figure 5-2.

Switch 1, Parameter Lock. With the switch in the Off position parameters may be adjusted or reset as described in Section 4.4. With switch 1 in the On position no adjustment or resetting is possible.

Switch 2 is not used on this instrument.

Switches 3 and 4, Early Warning Margin. LIMIT EXCEEDED LED starts to flashes when the Process Temperature approaches the Limit Set-point. Table 5-1 shows the effect of different switch settings.

Switch 3	Switch 4	Early Warning Margin
OFF	OFF	No Early Warning
ON	OFF	5% of Span from Limit Set-point
OFF	ON	10% of Span from Limit Set-point
ON	ON	15% of Span from Limit Set-point

TABLE 5-1 - EARLY WARNING SELECTION

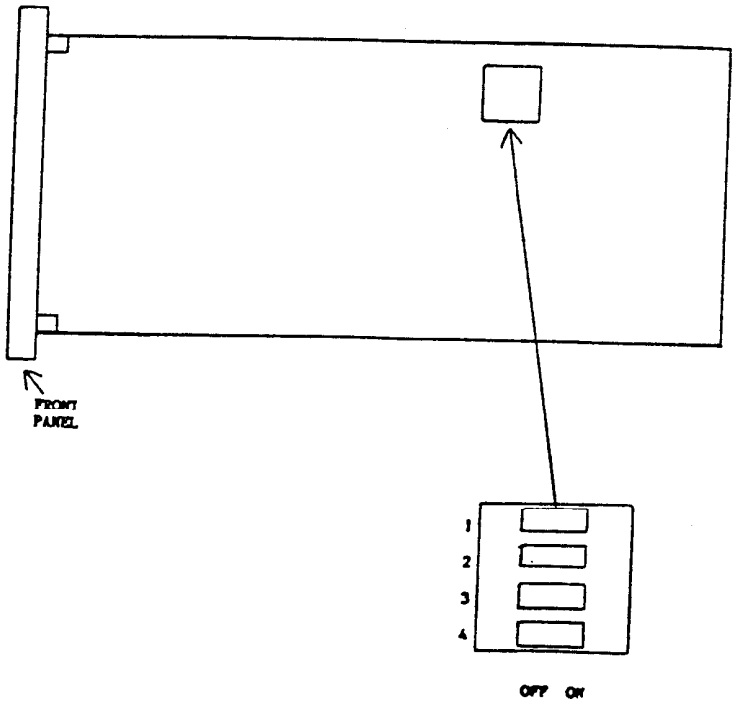


FIGURE 5-2 - SWITCHES ON THE CPU BOARD

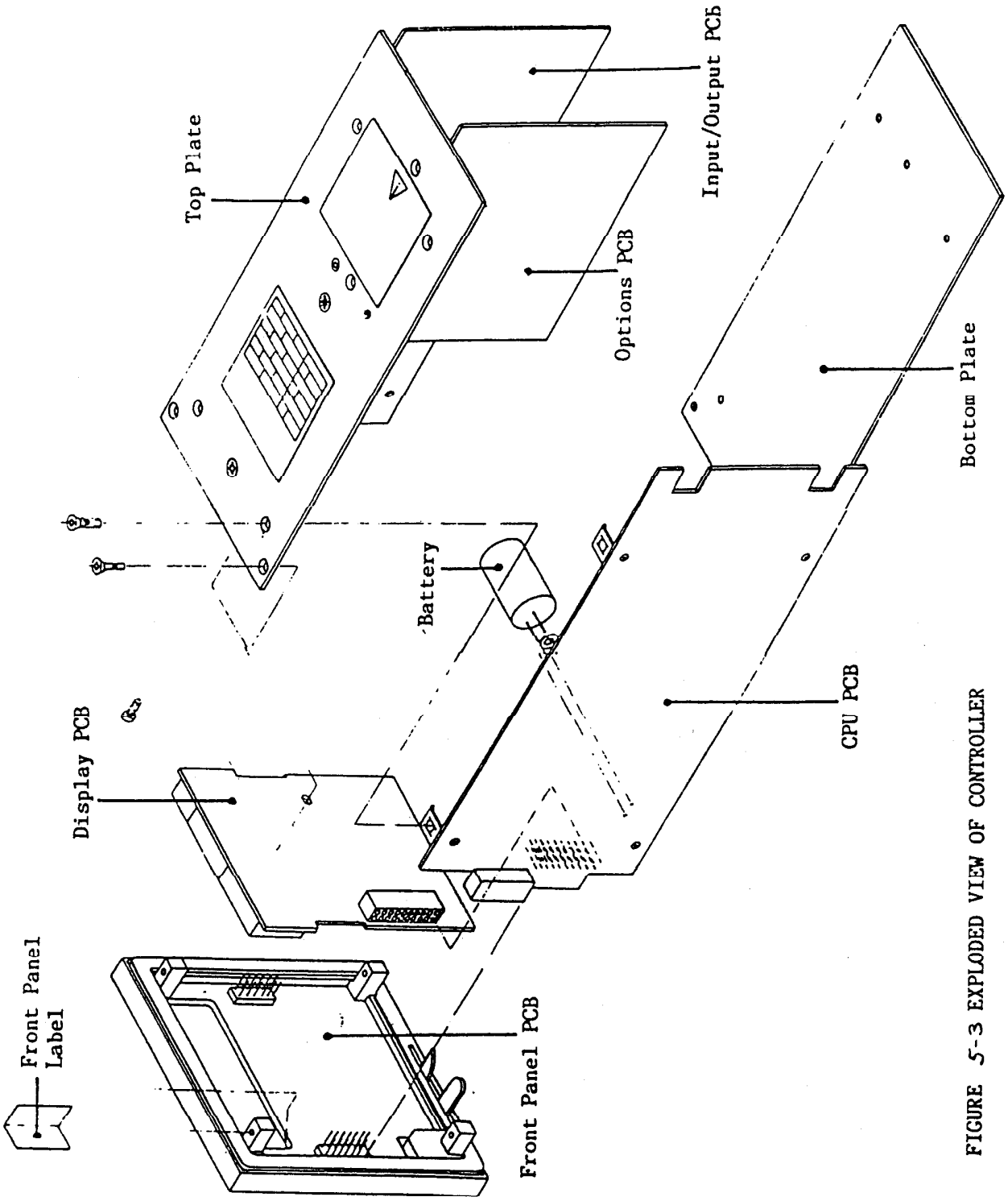


FIGURE 5-3 EXPLODED VIEW OF CONTROLLER

5.4 DISMANTLING THE CONTROLLER

5.4.1 Remove Front Panel

1) Remove the four screws holding the front bezel assembly. (two on the top plate and two on the bottom plate, marked "A" on Figures 5-4 and 5-5)

2) Unplug the front panel from the rest of the instrument.

3) The front panel label is now accessible from the back of the front bezel asembly. (This label may be replaced with a custom-made label or may require changing when the instrument range is changed between ^{o}C and ^{o}F.)

5.4.2 Remove Bottom Plate (See Figure 5-4)

1) The two screws "A" at the front of the plate should have already been extracted when removing the front panel.

2) Extract the four screws "B" holding the bottom plate to the CPU and I/O boards.

3) Extract screw "C", if an option board is fitted.

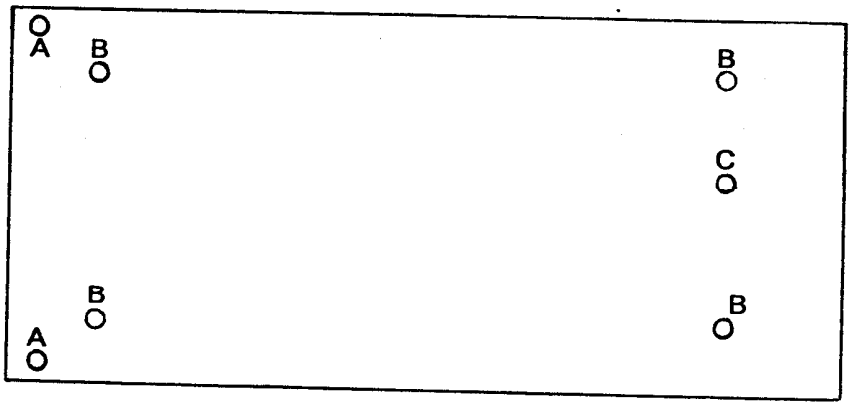


FIGURE 5-4 BOTTOM PLATE

5.4.3 Remove the CPU Board

1) The CPU board is the right hand board when looking at the front of the controller.

2) Extract the two screws marked "D" on the diagram of the top plate (Figure 5-5).

3) Pull the board away from the assembly, unplugging the ribbon connector from its socket and the plug connecting to the display board. **TAKE CARE THAT THE BOARD IS NOT PLACED ON ANYTHING WHICH MIGHT SHORT CIRCUIT THE BATTERY**

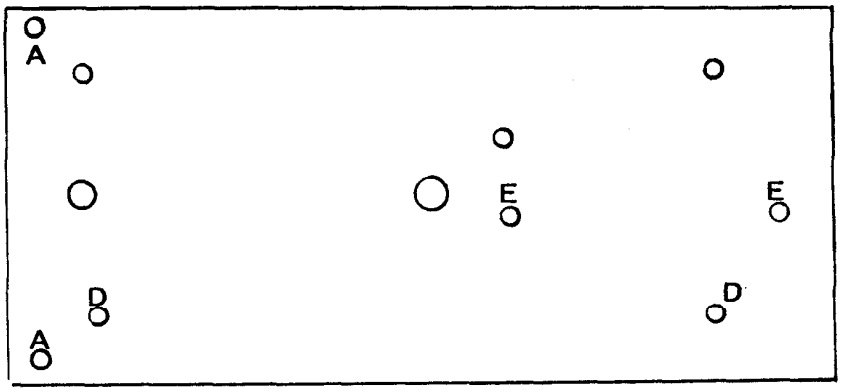


FIGURE 5-5 TOP PLATE

5.4.4 Remove the Option Board (if installed)

1) Extract screws on the top plate marked "E" on Figure 5-5. **DO NOT EXTRACT ANY OTHER SCREWS**

2) Unplug the ribbon connector from its socket.

5.5 LINK JUMPERS

Reranging and reconfiguring the instrument is by the use of link jumpers on the PCBs. Reconfiguration to another variant is possible only if the relevant hardware is installed.

5.6 LINE VOLTAGE CHANGE PROCEDURE

1) Find LJ20 and LJ21 on the I/O Board.

2) LJ21 should be fitted for 220 - 240V operation. (L01)
   LJ20 should be fitted for 110 - 120V operation. (L02)

3) Amend the product code on the top plate of the instrument as appropriate.

5.7 INPUTS

5.7.1 Thermocouple Input

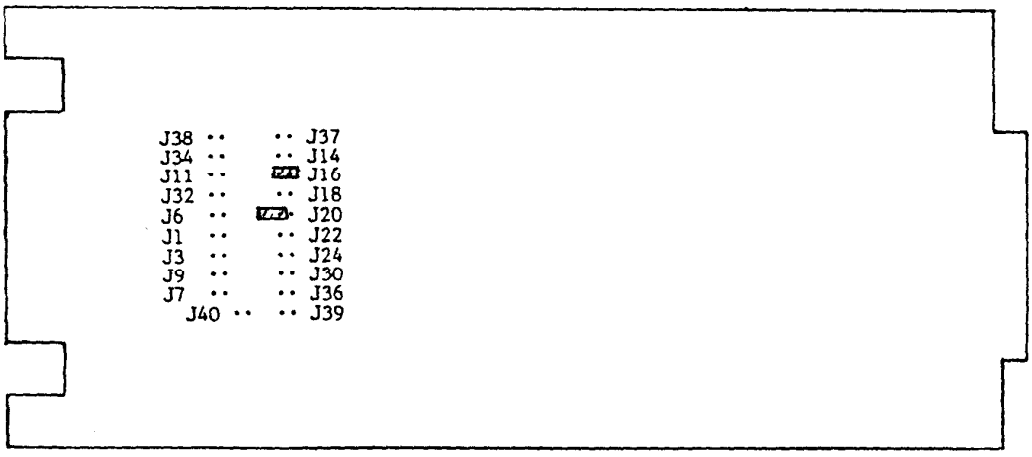
The range and type of Thermocouple may be changed if the appropriate link jumpers are selected on the I/O and CPU boards. Appendix 2 lists the Product Codes associated with available T/C inputs, and Table 5-2 shows which link jumpers to select. The position of the link jumpers is shown in Figures 5-6 and 5-7.

5.7.2 Resistance Temperature Detector Input

The range of Resistance Temperature Detector may be changed if the appropriate link jumpers are selected on the I/O and CPU boards. Appendix 2 lists the Product Codes associated with available RTD inputs, and Table 5-3 shows which link jumpers to install. The position of the link jumpers is shown in Figures 5-6 and 5-8.

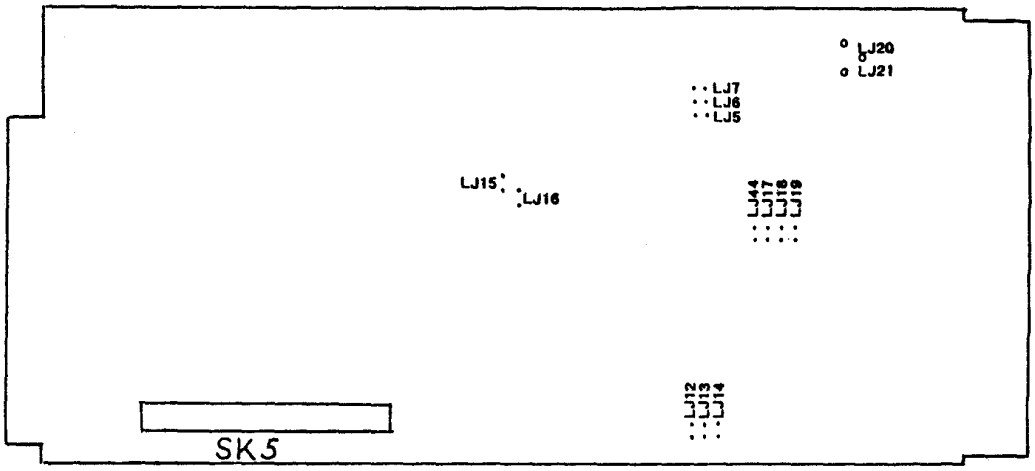
5.7.3 T/C to RTD Conversion

It is not possible to convert an I/O board from T/C to RTD or vice versa. If a board of the opposite type is to be installed, it is necessary to select the appropriate link jumpers on the I/O board and the CPU board, using the Tables and Figures described above.



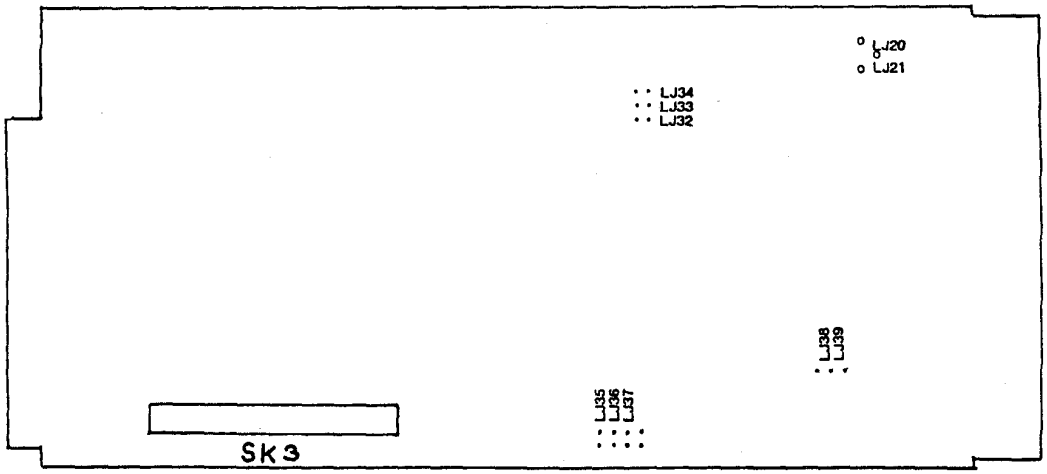
NOTE: Link jumpers which are not required for any specific instrument configuration should be installed in the parked position.
Link jumper 16 is shown in the active position.
Link jumper 20 is shown in the parked position.

FIGURE 5-6 CPU BOARD LINK JUMPERS



Board 739/462

FIGURE 5-7 I/O BOARD, THERMOCOUPLE INPUT - LINK JUMPER POSITIONS



Board 739/463

FIGURE 5-8 I/O/BOARD, RTD INPUT - LINK JUMPER POSITIONS

5.8 ALARMS

One or two independent alarms may be supplied with the instrument, and the hardware for these is on the Options board. Figure 4-4 in Section 4 shows the functions of the various types of alarms. The alarm(s) can be re-configured to another function by changing link jumpers on the Options board and CPU board. The link jumpers to be installed are shown in Table 5-4, and their position on the board shown in Figure 5-9.

It is not possible to add a second alarm to an options board with only one alarm. However it is possible to install a new Options board with one or two alarms, and in this case the appropriate link jumpers should be selected, including any necessary changes to link jumpers on the CPU board (See Figure 5-6).

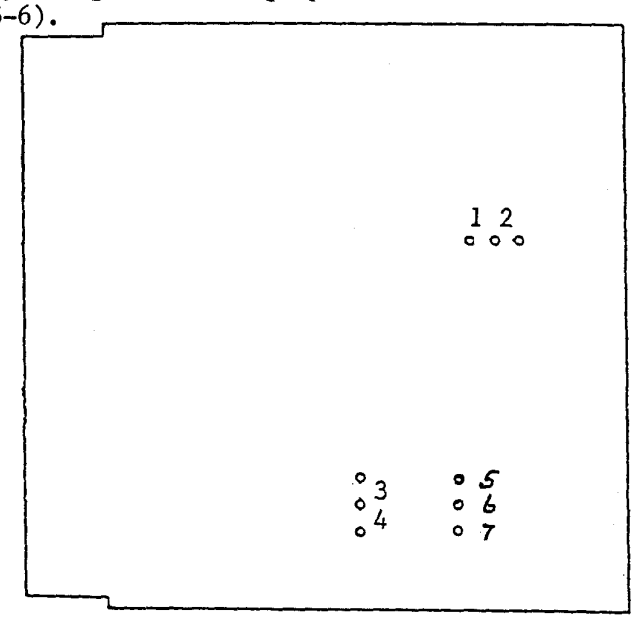


FIGURE 5-9 OPTIONS BOARD - LINK JUMPER POSITIONS (ALARMS)

5.9 HIGH LIMIT and LOW LIMIT Instruments.

Link Jumper 7 on the CPU board (See Figure 5-6) determines whether the instrument is a HIGH LIMIT or a LOW LIMIT. LJ 7 is active for HIGH LIMIT and parked for LOW LIMIT. On instruments with thermocouple input, for HIGH LIMIT the Upscale break protection link must be selected (LJ16 on I/O board 462); with a LOW LIMIT instrument the Downscale T/C break protection must be selected (LJ15 on I/O board 462). All other differences between the operation of the two types are effected automatically by software built into the instrument.

INPUT PROD.CODE	TYPE	RANGE SCALE	CPU LINK JUMPERS 14	16	18	20	22	24	INPUT/OUTPUT PCB LINK JUMPERS 5	6	7	12	13	14	17	18	19	44
T1127	R	0-1650°C		X	X					X		X					X	
T1128		32-3002°F		X	X		X			X		X					X	
T1227	S	0-1650°C				X				X		X					X	
T1228		32-3002°F				X	X			X		X					X	
T1983	B	100-1820°C				X		X		X		X					X	
T1984		212-3308°F				X	X	X		X		X					X	
T1415	J	0.0-205.0°C		X							X			X	X			
T1416		32.0-401.0°F		X			X				X			X	X			
T1417		0-450°C	X							X		X					X	
T1418		32-842°F	X				X			X		X					X	
T1419		0-760°C	X	X					X				X			X		
T1420		32-1400°F	X	X			X		X				X			X		
T1525	T	-200 to +260°C	X			X					X			X			X	
T1526		-328 to +500°F	X			X	X				X			X			X	
T1713	K	-200 to +600°C	X		X			X			X	X				X		
T1714		-328 to +1112°F	X		X		X	X			X	X				X		
T1715		0.0-205.0°C			X						X			X	X			
T1716		32.0-401.0°F			X		X				X			X	X			
T1721		0-600°C	X		X					X		X					X	
T1722		32-1112°F	X		X		X			X		X					X	
T1723		0-1371°C	X	X	X				X				X			X		
T1724		32-2500°F	X	X	X		X		X				X			X		
T5111	W-R	0-2316°C	X			X		X	X				X			X		
T5112		32-4201°F	X			X	X	X	X				X			X		
T5223 *	Ni-Moly	0-1372°C	X	X		X		X	X				X					X
T5224 *		32-2500°F	X	X		X	X	X	X				X					X

		CPU LJ 7	I/O BOARD LJs 15	16
H1030	HIGH LIMIT	X		X
H1031	LOW LIMIT		X	

X = LJ active (selected)
Blank = LJ not selected on I/O Board
= LJ parked on CPU Board. See note Figure 5-6)

TABLE 5-2 THERMOCOUPLE INPUT - CPU AND INPUT/OUTPUT BOARD LINK JUMPERS

* These ranges use a speecial I/O board, and cannot be re-configured.

INPUT			CPU LINK JUMPERS						INPUT/OUTPUT PCB LINK JUMPERS							
PROD.CODE	TYPE	RANGE	14	16	18	20	22	24	32	33	34	35	36	37	38	39
T2221	RTD	0 to +600°C		X		X		X		X		X				X
T2222	RTD	32 to 1112°F		X		X	X	X		X		X				X
T2230	RTD	-101.0 to +100.0°C		X		X					X			X	X	
T2231	RTD	-150.0 to +212.0°F		X		X	X				X			X	X	
T2232	RTD	-200.0 to +205.0°C	X	X		X				X			X		X	
T2233	RTD	-328.0 to +401.0°F	X	X		X	X			X			X		X	

X = LJ active (selected)

Blank { = LJ not selected on I/O Board
= parked on CPU Board. See note Figure 5-6)

PROD.CODE	TYPE	CPU LINK JUMPER 7
H1030	HIGH LIMIT	X
H1031	LOW LIMIT	

TABLE 5-3 RTD INPUT - CPU AND INPUT/OUTPUT BOARD LINK JUMPERS

PRODUCT CODE	ALARM 1 TYPE	CPU LINK JUMPERS 1	3	6	9	11	32	OPTION LINK JUMPERS 1	2	3	4	6
X50	DEVIATION HIGH/LOW (1)		X								X	X
X51	DEVIATION HIGH/LOW (2)		X							X		X
X46	DEVIATION BAND (2)	X								X		X
X47	DEVIATION BAND (1)	X									X	X
X48	INDEPENDENT HIGH (1)				X						X	X
X49	INDEPENDENT HIGH (2)				X					X		X
X77	INDEPENDENT LOW (2)	X	X							X		X
X78	INDEPENDENT LOW (1)	X	X								X	X
	ALARM 2 TYPE											
X--50	DEVIATION HIGH/LOW (1)						X		X			X
X--51	DEVIATION HIGH/LOW (2)						X	X				X
X--46	DEVIATION BAND (2)					X		X				X
X--47	DEVIATION BAND (1)					X			X			X
X--48	INDEPENDENT HIGH (1)			X					X			X
X--49	INDEPENDENT HIGH (2)			X				X				X
X--77	INDEPENDENT LOW (2)					X	X	X				X
X--78	INDEPENDENT LOW (1)					X	X		X			X

X = LJ active (selected)

Blank { = LJ not selected I/O Boards
= parked on CPU Board. See note Figure 5-6)

TABLE 5-4 ALARMS CPU AND OPTION BOARD LINK JUMPERS

NOTE: When both alarms are installed the link jumpers for both Alarm 1 and Alarm 2 should be selected, as shown in the two halves of the table.

See Figure 4-4 for details of Alarm functions.

(1) Relay energized in alarm condition

(2) Relay de-energized in alarm condition

5.10 RE-ASSEMBLY OF CONTROLLER

5.10.1 Replace the Option Board (if installed)

1) Plug in ribbon cable. If the ribbon cable has been removed completely make sure that the contact sides of the ribbon mate with the contact sides of the sockets. Also make sure that both ends are fully inserted.

2) Fix the board to the top plate by inserting screws "E" (See Figure 5-5)

5.10.2 Replace the CPU Board

1) Plug in ribbon cable. If the ribbon cable has been removed completely make sure that the contact sides of the ribbon mate with the contact sides of the sockets. Also make sure that both ends are fully inserted.

2) Align the plug on the board with the socket on the display board and push home.

3) Fix the CPU board to the top plate by inserting screws "D" (See Figure 5-5)

5.10.3 Replace the Bottom Plate

Fix bottom plate plate with four screws "B" (See Figure 5-4) and screw "C" if an option board is installed.

5.10.4 Replace Front Panel

1) Carefully align the plugs on the front panel with the sockets on the CPU and I/O boards, taking care that the retaining lever at the bottom of the front panel is outside the bottom plate. Then push in the front panel.

2) Insert the four screws "A" shown in Figures 5-4 and 5-5.

5.10.5 Insert Controller into its Housing

1) Make sure that the retaining lever is at 90° to the front panel.

2) Push in the controller carefully but firmly into the housing so that the connections on the PCBs make a good connection with the rear sockets.

3) With the controller fully inserted push the retaining handle to the right until it is flush with the front panel.

AFTER MAKING ANY CONFIGURATION CHANGES MAKE SURE THE PRODUCT LABEL IS CORRECT. ALTER IT IF NECESSARY.

APPENDIX 1 PRODUCT SPECIFICATION

INPUT

Input types: thermocouple and RTD
Common Mode Rejection: negligible effect at up to 240V 50/60 Hz
Series Mode Rejection: >1000% of span (at 50/60 Hz) causes negligible effect
Thermocouple Break Protection: upscale or downscale, internally selected for High Limit or Low Limit.
Thermocouple Calibration: complies with BS 4937, NBS 125 and IEC 584 standards
RTD (Pt 100) Calibration: complies with BS 1904 & DIN 43760 standards

OUTPUTS

Limit Relay

Relay: SPDT contact rating 5A resistive at 120/240V A.C. 50/56 Hz
Relay Life: $>10^6$ operations

Alarm 1(optional)

Relay: SPDT contact rating 2A resistive at 120/240V A.C. 50/60 Hz
Relay life: $>10^6$ operations

Alarm 2(optional)

Relay: SPDT contact rating 2A resistive at 120/240V A.C. 50/60 Hz
Relay life: 10^6 operations.

ENVIRONMENTAL REFERENCE CONDITIONS

Ambient Temperature: 20°C (±2°C)
Supply Voltage: 120/240V (±1%) 50/60 Hz
Thermocouple Resistance: <10 ohms
RTD (Pt 100) Resistance <0.1 ohm per lead

OPERATING CONDITIONS

Ambient Temperature 0-50°C operating; -20 to +80°C storage
Supply Voltage: 193-264V, 50/60 Hz or 100-132V, 50/60 Hz
Maximum Thermocouple Resistance: 1000 ohms
Maximum RTD (Pt 100) Resistance: <5 ohms per lead (equal resistance in each limb)

PERFORMANCE

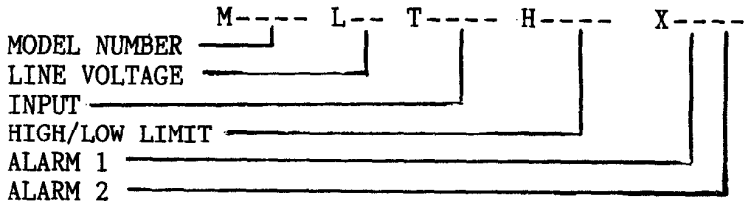
Reference Accuracy: ±0.25% of span ±1 least significant digit
Temperature Stability: 0.01% of span for 1°C change in ambient temperature
Cold Junction Compensation: <0.075°C change for 1° C change in ambient temperature
Effect of Thermocouple Resistance: <0.1% of span error for resistance 0 to 100 Ohms
Effect of RTD lead Resistance: <0.5% of span error for up to 50 Ohms lead resistance
Supply Voltage Influence on Accuracy: negligible effect within operating range

GENERAL

Digital Display: 4 digit, 7 segment, decimal point & negative sign display
Dimensions: 3.8" x3.8" x 8.7" (96mm x 96mm x 210mm)
Weight: 4.4 lbs (2kg) approx
Front Panel Protection: IEC 144 IP 54
Power Consumption: 10 VA maximum
Parameter and Data Retention: Lithium battery, 5 years typical.

APPENDIX 2 - PRODUCT CODES

The product codes define the configuration of the instrument and should be used for ordering and reference.



MODEL	**CODE**
European and USA	M2077
LINE VOLTAGE	**CODE**
220 or 240V nominal supply 50/60 Hz	L01
110 or 120V nominal supply 50/60 Hz	L02
INPUT	**CODE**
Thermocouple	
R 0-1650°C Pt 13%/Rh	T1127
32-3002°F Pt 13%/Rh	T1128
S 0-1650°C Pt 10%/Rh	T1227
32-3002°F Pt 10%/Rh	T1228
B 100-1820°C Pt 30%/Rh	T1983
212-3308°F Pt 30%/Rh	T1984
J 0.0-205.0°C I/C	T1415
32.0-401.0°F I/C	T1416
0-450°C I/C	T1417
32-842°F I/C	T1418
0-760°C I/C	T1419
32-1400°F I/C	T1420
T -200 to +260°C Cu/Con	T1525
-328 to +500°F Cu/Con	T1526
K -200 to +600°C C/A	T1713
-328 to +1112°F C/A	T1714
0.0-205.0°C C/A	T1715
32.0-401.0°F C/A	T1716
0-600°C C/A	T1721
32-1112°F C/A	T1722
0-1371°C C/A	T1723
32-2500°F C/A	T1724
0-2316°C W-R	T5111
32-4201°F W-R	T5112
0-1371°C Ni/Ni-Moly	T5223
32-2500°F Ni/Ni-Moly	T5224

INPUT (contd)

3 wire RTD (Pt 100)	**CODE**
-101.0 to +100.0°C	T2230
-150.0 to +212.0°F	T2231
-200 to +205°C	T2232
-328 to +401°F	T2233
0 to 600°C	T2221
32 to 1112°F	T2222

LIMIT RELAY	**CODE**
High Limit	H1030
Low Limit	H1031

ALARM 1	**CODE**
Deviation High/Low (1)	X50
Deviation High/Low (2)	X51
Deviation Band (2)	X46
Deviation Band (1)	X47
Independent High (1)	X48
Independent High (2)	X49
Independent Low (2)	X77
Independent Low (1)	X78

ALARM 2	**CODE**
Deviation High/Low (1)	X--50
Deviation High/Low (2)	X--51
Deviation Band (2)	X--46
Deviation Band (1)	X--47
Independent High (1)	X--48
Independent High (2)	X--49
Independent Low (2)	X--77
Independent Low (1)	X--78

(1) Relay energized in alarm condition
(2) Relay de-energized in alarm condition