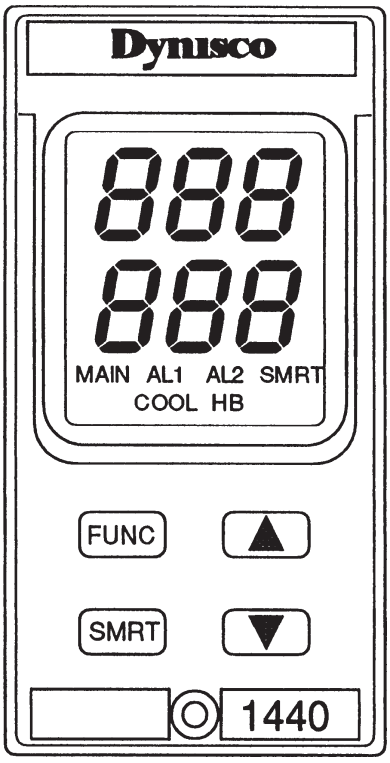
Model 1440
Microprocessor-based
Temperature Controller
Installation and Operation Manual



Dynisco
Instruments

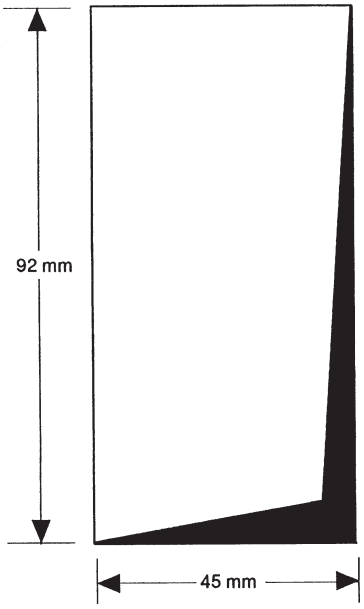
P/N 974073
06/02 Rev. C
ECO # 27007

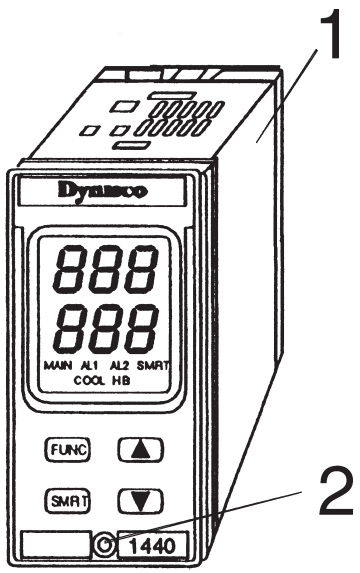
CONTENTS

MODEL 1440-2-3 QUICK START INSTRUCTIONS

1. MOUNTING

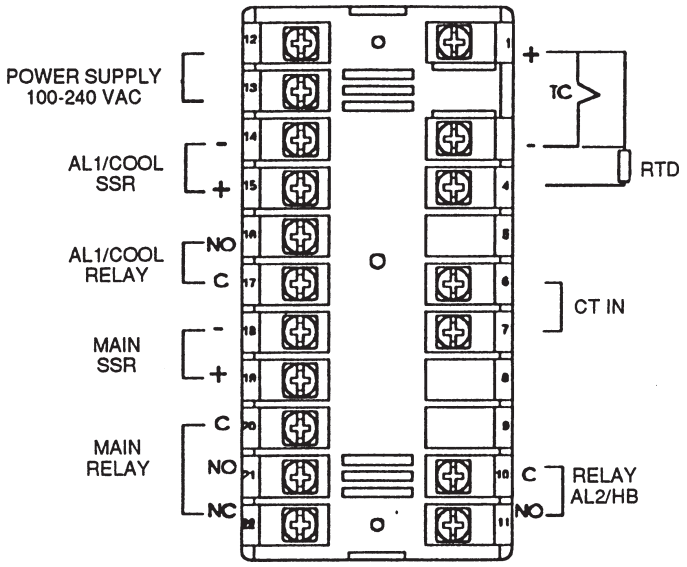
- Prepare panel cutout to dimensions shown below.
- Remove instrument from case by turning captive safety screw (2) counter clockwise.
- Grasp the bezel and slide the instrument out of its case (1).
- Slide the supplied rubber gasket over the case.
- Slide the instrument case (1) into the panel cutout.
- Slide the panel mounting bracket over the instrument case.
- Tighten two screws on panel mounting bracket until case is securely mounted in panel cutout.
- Slide the instrument back into the case and tighten safety screw.





2. WIRING

- Connect an appropriate length of either thermocouple extension wire (e.g.Type J), OR 3 wire RTD leads to the appropriate terminals as shown below.
- Connect Outputs for Heat/Cool. Note that Outputs are jumper selectable for Relay/SSR output. Refer to Figure 15, Page 22 for jumper location.
- If a current transformer option is to be used for Heater Breakdown Alarm, connect to appropriate terminals.
- Connect power to the appropriate terminals as shown below.



3. INSTRUMENT CONFIGURATION

- Remove instrument from case by loosening safety screw, grab bezel and slide out of case.
- Refer to Figure 15, Page 22, for jumper selection of Relay/SSR selection and AL1 Cool relay NO/NC selection. Default factory settings are Main/Relay, AL1 Cool/Relay Normally open.
- Locate jumper V2 in Figure 14, page 21 and place in the open position.
- Slide instrument back in case and apply power. Display will now show CnF.
- Press the FUNC button until P1 is displayed.
- Refer to Parameter List on page 23. Using the UP arrow, select appropriate P1 code for Input type and standard range.
- Press the FUNC button until next parameter is displayed.
- Repeat for each parameter to be changed.
- When configuration is complete, remove instrument from case, place jumper V2 in the closed position, return instrument into case and secure with safety screw.
- Apply power to instrument, Upper display will show process temperature, lower display will show setpoint.
- Using UP and DOWN arrows, temperature setpoint can be adjusted.
- Refer to Manual page 36 in for Control Parameters if PID tuning is required.
- Instrument is now ready for use.

NOTE: The preceding Quick Start instructions are the basic settings required to install, wire, and get the controller operating. It is assumed that the operator is familiar with PID temperature controllers. Please refer to the complete installation and operation manual for additional functions and instructions.

INDEX

1. INTRODUCTION

The Model 1440 is a highly flexible, field or laboratory reconfigurable controller. This product's design has been implemented with up-to-date technology and accurate engineering. The following is a summary of the features of the Model 1440:

- 1/8 DIN size (48 x 96 mm)
- IP 54 font protection
- SMART function for automatic self-tuning
- Measurement of the heater current consumption
- Heater breakdown alarm
- TC or RTD input with programmable range
- Programmable transfer ramp between the set points
- Programmable output maximum rate of change
- Output power limiter with programmable time duration
- Two independent alarms programmable as process, band or deviation alarms
- Control outputs: relay or solid state relay (SSR) drive programmable as heating or heating and cooling controls
- Output power-off
- Direct access to the set point modification
- Switching power supply (for 100 to 240 VAC sources)

2. SPECIFICATIONS

2.1 GENERAL

Case:	PC/ABS, black; self-extinguishing, level V-0, per UL94
Front panel:	IP 54 protection
Installation:	Panel mounting by means of tie rods; instrument removable from case with a screwdriver
Rear terminal block:	Screw terminals; terminal identification labels, connection diagrams and rear safety cover
Dimensions:	48 mm wide x 96 mm high x 89 mm deep (DIN 43700)
Cutout:	45 x 92 mm
Weight:	600 g maximum

Upper display:	3 green LED digits, 7 segments with decimal point 10 mm high
Lower display:	3 orange LED digits, 7 segments with decimal point 10 mm high
Front indication:	red LEDs for alarms and instrument status indication
Power supply:	100 to 240 VAC power source, 50/60 Hz
Power Supply Variations:	-15 to +10%
Power consumption:	6 VA maximum
Insulation resistance:	>100 MΩ for 500 VDC (IEC 348)
Insulation voltage:	1500 V according to IEC 348
Conversion:	Dual slope integration with autozero
Resolution	30,000 counts
Sampling time:	500 msec.
Accuracy (@25°C amb. temp.)	+0.2% of the input span or +1°C
Common mode rejection ratio:	120 dB
Normal mode rejection ratio:	60 dB
Noise rejection:	According to IEC 801-4 level 3
Temperature drift:	<200 ppm/°C (Rj excluded); <400 ppm/°C for RTD input with -19.9/99.9°C ranges
Operating temperature:	0 to +50°C
Storage temperature:	-30 to +70°C
Humidity:	20 to 85% RH non-condensing
Protections:	1) WATCH DOG circuit for automatic restart 2) Internal switch for protection against tampering of configuration and calibration parameters

2.2 INPUTS

Thermocouple

Type: L,J,K,N programmable by front pushbuttons

Line resistance: 100Ω max, with error <+0.1% of the input span

Temperature units: °C of °F programmable

Reference junction: Automatic compensation of the ambient temperature from 0 to +50°C

Burn-out: Up or down scale selectable

Calibration: According to IEC 584-1 and DIN 43710-1977 (TC type L)

Standard Ranges Table		
TC Type	**Measuring Ranges**	
L	0 to +800°C	0 to +999°F
J	0 to +800°C	0 to +999°F
K	0 to +999°C	0 to +999°F
N	0 to +999°C	0 to +999°F

RTD (Resistance Temperature Detector)

Type: Pt 100-3-wire connection

Current 135 mA

Line resistance: Automatic compensation up to 20Ω/wire with <+0.1% error of the input span for range -19.9 at 99.9°C; no measurable error for the other ranges

Engineering units: °C or °F programmable

Burn-out: Up scale

Calibration: According to DIN 43760

Standard Ranges Table		
RTD Type	**Measuring Ranges**	
RTD Pt 100	-199 to +500°C	-199 to +999°F
RTD Pt 100	-19.9 to +99.9°C	-21.6 to +217°F

Current Transformer Input (optional)

The 1440 controller is capable of measuring heater band current with the addition of a small remote transformer.

Ranges: 25A and 100A

Indication: Use P/N 820754 for 25A range; use P/N 820755 for 100 A range

2.3 CONTROL ACTIONS

Control action: PID or SMART

Proportional band: 0.1 to 99.9% of the input span

When setting Pb = 0: Hysteresis (for ON/OFF control action): 0.1 to 10.0% of the input span

Integration time: 10 seconds to 20 minutes; resolution 10 seconds; setting a value greater than 20 minutes will disable the integration action

Differential time: <10 minutes

Heating cycle time: 1 to 200 seconds

Cooling cycle time: 1 to 200 seconds

Relative cooling gain: 0.20 to 1.00 seconds

NOTE: The Pb, ti, tc and parameters may be limited when the SMART function is enabled.

Overlapping/dead band: -20 to 50%

Rate of rise for set point variations: 1 to 100 units/minute

2.4 OUTPUTS

Output 1 - Heating

Relay output with SPDT contact; contact rating 3 A/250 VAC with resistive load.
Logic voltages for SSR drive

Logic status 1:	24 V +20% @1 mA; 14 V + 20% @20 mA
Logic status 0:	<0.5 V
Option output:	Direct/reverse programmable

The selection between relay or SSR is made by internal jumper.

Output 2 - Cooling or Alarm 1

Relay output with SPST contact; contact rating 1.5 A/250 VAC with resistive load. Select the NC or NO contacts by internal jumper.

Logic voltages for SSR drive:

Logic status 1:	24 V ±20% @1 mA; 14 V ±20% mA
Logic status 0:	<0.5V

The selection between relay or SSR is made by internal jumper.

3. FRONT PANEL DESCRIPTION

Figure 1 illustrates the front panel of the Model 1440.

Fig. 1 1440 Temperature Controller Front Panel

3.1 INDICATOR DESCRIPTION

MAIN

Indicator ***OFF***	Main output is ***OFF***
Indicator lit	Main output is ***On***

AL1/COOL

Indicator ***OFF***	Cooling output is ***OFF*** or Alarm 1 ***is not*** in alarm condition
Indicator lit	Cooling output is ***On*** or Alarm 1 ***is in*** alarm condition

AL2/HB

Indicator ***OFF***	Alarm 2 and heater breakdown ***are not*** in alarm condition
Indicator lit	Alarm 2 ***is*** in alarm condition
Indicator flashing	Heater breakdown ***is*** in alarm condition

SMRT

Indicator ***OFF***	SMART function is disabled
Indicator flashing	First step of the SMART function is running
Indicator lit	Second step of the SMART function is running

3.2 DISPLAY DESCRIPTION

Upper Display

The upper display continuously shows the process variable in amperes. During the programming procedure, this display shows the numerical value of the selected parameters or functions.

Lower Display

The lower display continuously shows the current set point value. Pressing the ▲ pushbutton for less than 1.5 seconds causes the heater consumption in amperes to be shown. Pressing the ▲ pushbutton again causes the set point value to be re-shown. During configuration, calibration, and parameter setup, the lower display will show the code of the selected parameter.

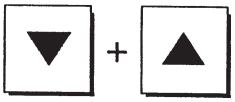
3.3 KEYBOARD DESCRIPTION

Selects the parameters. Pressing the FUNC pushbutton causes the parameters to be shown sequentially on the upper and lower displays. Simultaneously, the value of the previous parameter will be stored.

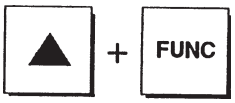
In operating mode, the SMRT pushbutton enables or disables the SMART function. In configuration and calibration mode it is used to scroll the configuration and calibration parameters backwards without storing the modified value.

Decreases the parameter value. When the instrument is in operating mode, it allows direct access to the set point modification.

Increases the parameter value. When the instrument is in operating mode, it allows the display of the heater consumption or direct access to the set point modification.



Loads the default control parameters.



Turns the control output ***OFF*** or ***On***.

4. ALARMS

4.1 MAIN ALARMS

Two independent alarms are available, each of which can be configured in one of three modes, as follows:

- Process alarm
- Band alarm
- Deviation high or deviation low

Action:	Direct or Reverse Action
Threshold resolution:	1 digit
Alarm hysteresis:	Programmable between 0.1% and 10.0% of the input span
Alarm indication:	Two LEDs (Al1, Al2) lit for alarm ON
	Alarm 1: See Outputs, page 18
	Alarm 2: Relay output with SPST contact;
	contract rating 2 A/250 VAC with resistive load

4.2 HEATER BREAKDOWN ALARM

This function uses a measurement (in amperes) of the main load consumption along with a user-set alarm threshold to indicate either a partial or complete heater malfunction. This alarm output is linked to Alarm 2 with a logical OR.

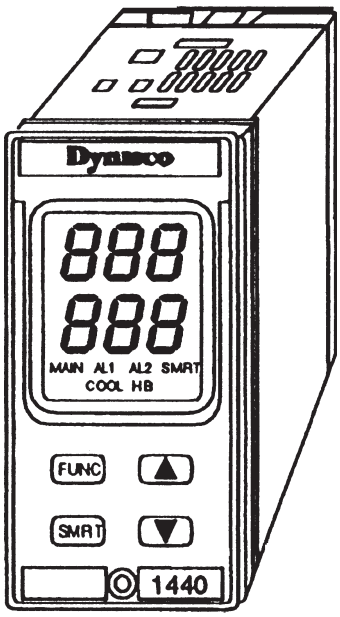
NOTE: This is supplied with the current transformer input option.

Threshold resolution:	1 digit
Alarm hysteresis:	1 digit
Alarm indication:	LED Al2/HB flashes when alarm is On
Alarm output:	See Alarm 2

5. MOUNTING

Select a mounting location where there is minimum vibration and the ambient temperature range is between 0 and 50°C. The instrument can be mounted in a panel up to 15 mm thick with a rectangular cutout of 45 x 92 mm. To mount the Model 1440, insert the instrument through the panel cutout. While holding the instrument against the panel, slide bracket over case and tighten the screws until the instrument is held tightly against the panel (see figure 2).

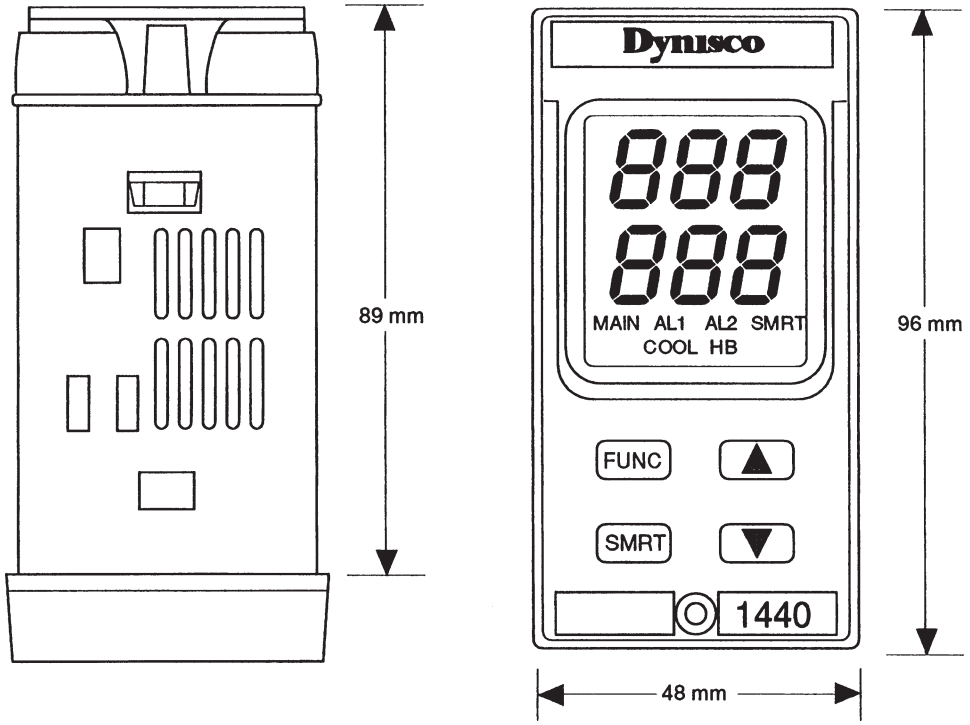
Fig. 2 Mounting the Model 1440



5.1 Outline Dimensions

Figure 3 shows the outline dimensions of the Model 1440.

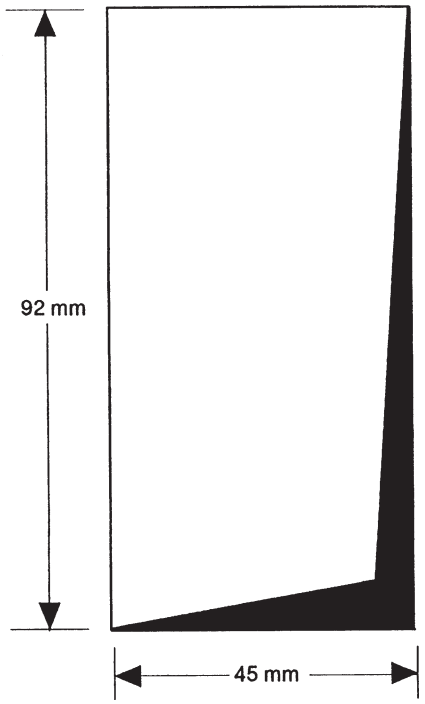
Fig. 3 Outline Dimensions



5.2 CUTOUT DIMENSIONS

Figure 4 shows the panel cutout dimensions of the Model 1440.

Fig. 4 Cutout Dimensions



5.3 VERTICAL PACKING

The minimum distance between cutouts is 20 mm.

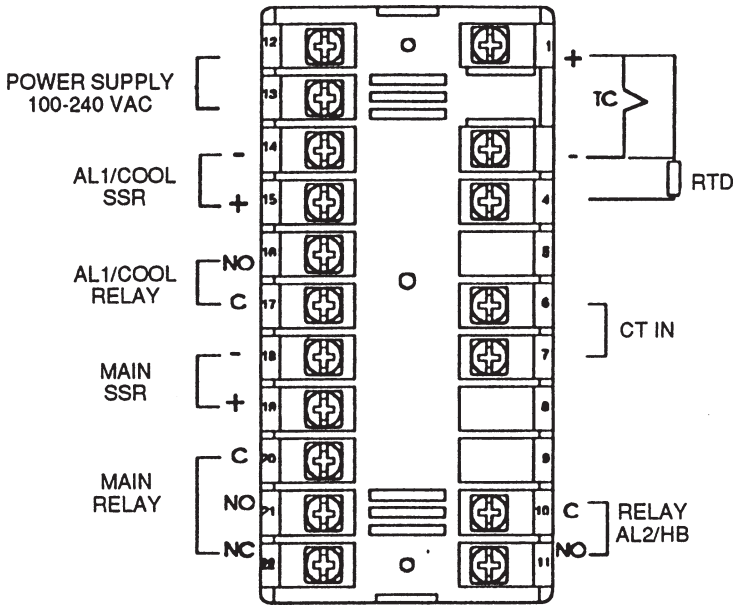
Horizontal Packing for More Instruments in a Single Cutout

The total dimension of the cutout is the addition of the front dimensions minus 3 mm. The horizontal dimension of the cutout equals (n x 48) - 3 mm, where n is the number if instruments to be packed (maximum 10 instruments).

6. WIRING GUIDELINES

Connections should be made with the instrument housing installed in its proper location. Figure 5 illustrates the rear terminal block of the Model 1440.

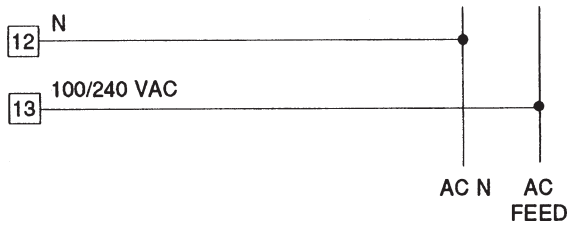
Fig. 5 Rear Terminal Block



6.1 Power Line and Earth Wiring

Figure 6 illustrates the power line wiring for the Model 1440.

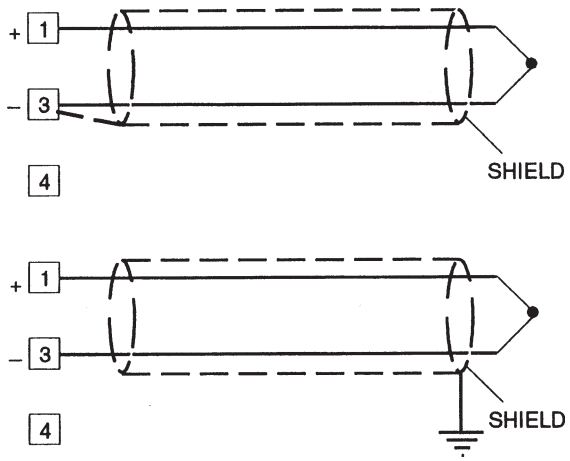
Fig. 6 Power Line Wiring



6.2 Inputs

Figure 7 illustrates the thermocouple input wiring for the Model 1440.

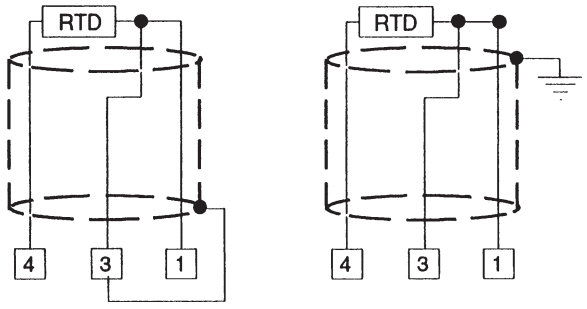
Fig. 7 Thermocouple Input Wiring



NOTE: DO NOT run input wires together with power cables. For TC wiring, use proper compensating cable, preferable shielded. If shielded cable is used, it should be grounded at one point only.

Figure 8 illustrates the RTD input wiring for the Model 1440.

Fig. 8 RTD Input Wiring

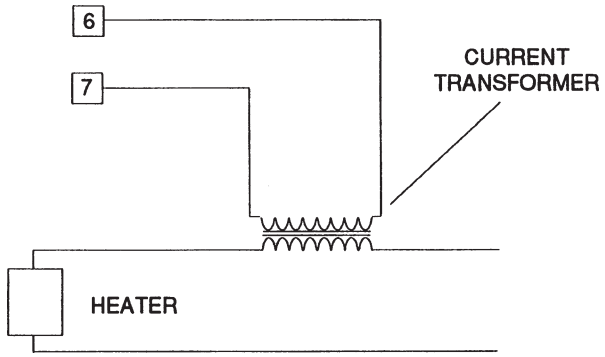


NOTE: DO NOT run RTD wires together with power cables. If shielded cable is used, it should be grounded at one point only. Use copper wires of appropriate size (see Product Specifications). The resistance of the three wires must be the same

Any external components (e.g., zener barriers) connected between sensor and input terminals may cause errors in measurement due to excessive and/or unbalanced line resistance or possible leakage currents.

Figure 9 illustrates the current transformer input wiring for the Model 1440.

Fig. 9 Current Transformer Input Wiring

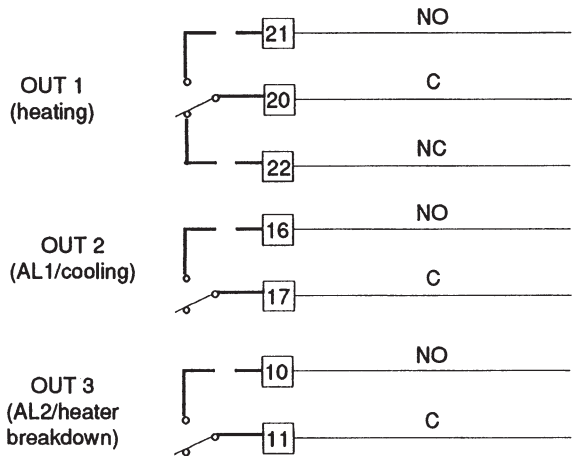


6.3 OUTPUTS

Relay Outputs

Figure 10 illustrates the relay output wirings for the Model 1440

Fig. 10 Relay Output Wirings



The relay output is not protected with a snubber network.

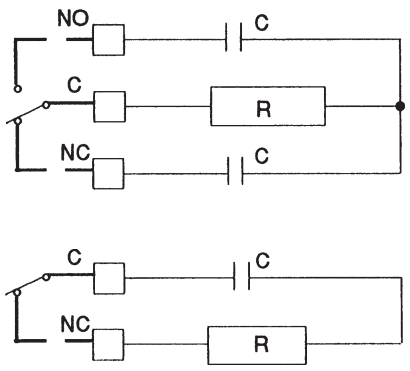
Relay Output	Contact Rating (Resistive Load)
1	3 A/250 VAC
2	1.5 A/250 VAC
3	2 A/250 VAC

Inductive Loads

NOTE: The following recommendations should be followed to avoid serious problems, which may occur when using relay outputs for driving inductive loads.

When switching inductive loads, high voltage transients may occur. These transients may introduce disturbances, which can affect the performance of the Model 1440 through the internal contact. Whenever an inductive load is switched by instrument contacts, an external network should be connected across the terminals as near as possible to the terminals (see Figure 11).

Fig. 11 External Protection for an Inductive Load

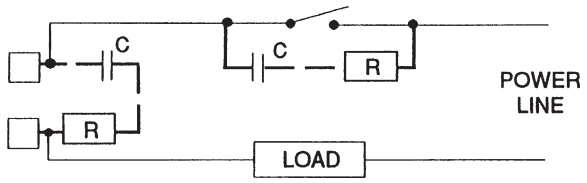


The values of capacitor [C] and resistor [R] are shown in the following table.

Load Current	C (μF)	R (Ω)	Resistance Power (Ω)	Resist. And Capac. Voltage
<40 mA	0.047	100	1/2	260
<150 mA	0.1	22	2	260
<0.5A	0.33	47	2	260
<1A	0.47	47	2	260

The same problem may occur when a switch is used in series with the internal contact, as shown in Figure 12.

Fig. 12 External Switch in Series with Internal Contacts

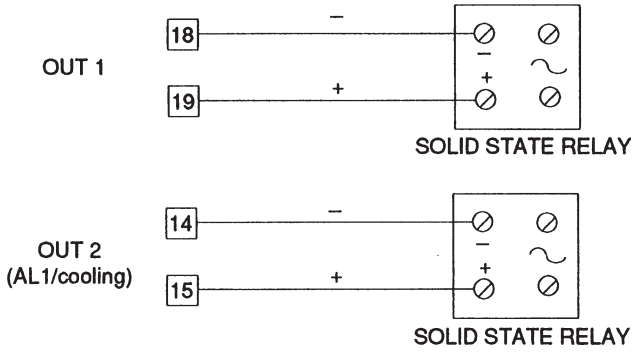


In this case, it is recommended that an additional RC network be installed across the external contact as shown in Figure 12. The cable involved in relay output wiring must be as far away as possible from input and communication cables.

6.4 VOLTAGE OUTPUTS FOR SSR DRIVE

Figure 13 illustrates the SSR drive output wiring for the Model 1440.

Fig. 13 SSR Drive Output Wiring



The voltage outputs for the SSR drive are time proportional outputs. Logic voltages for SSR drive:

Logic status 1: 24V ±20% @1 mA; 14 V ±20% @ 20 mA
Logic status 0: <0.5V

NOTE: These outputs are not isolated. Isolation between instrument outputs and power supply must be ensured by the external solid-state relay. The relay output and SSR output are mutually exclusive. To activate the SSR output, first deactivate the relay by setting dipswitches J304 and J305 as shown in Figure 15.

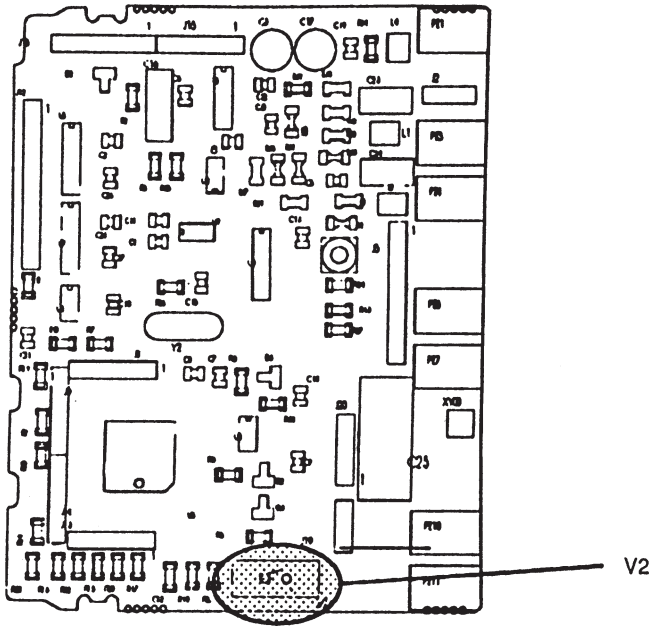
7. INSTRUMENT CONFIGURATION

7.1 PRELIMINARY

Before actual operation of the Model 1440 controller, an initial configuration of the unit is required. Proceed as follows:

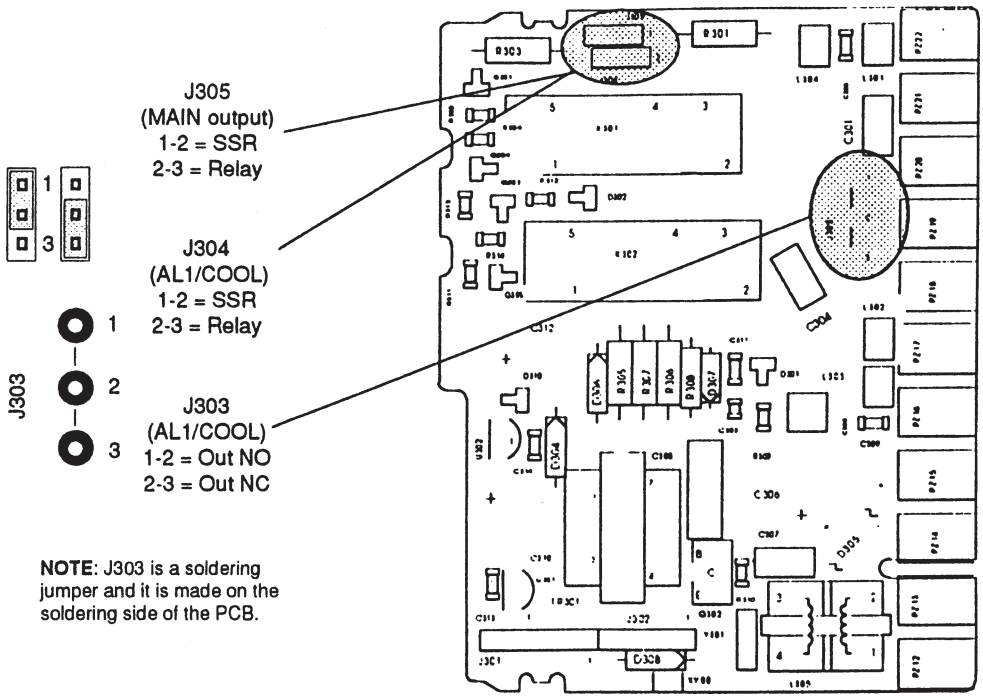
1. Remove the unit from its enclosure by removing the front panel captive screw and pulling the unit from the case.
2. Locate the internal dipswitch, V2 (Figure 14), and set the switch to the open condition.
3. Re-install the controller into its case and follow the Configuration Procedure.

Fig. 14 Internal Dip Switch Location



In the process of configuring or reconfiguring the Model 1440, the jumper shown in Figure 15 may have to be accessed.

Fig. 15 Jumper Locations



7.2 CONFIGURATION PROCEDURE

Once the internal dip switch has been set as described in Figure 14, proceed as follows:

1. Switch the instrument ***On***. The upper display should show ***CnF***.

NOTE: If ***CAL*** is indicated in the display, press the ▲ pushbutton to return to the configuration mode.

2. Press the **FUNC** pushbutton to start the configuration procedure.

3. The lower display will show the parameter code (e.g., P1 - P2) and the upper display will show the previously stored value.

4. To modify this value press ▲ or ▼ to obtain the desired setting.

5. When the upper display shows the new setting, press the **FUNC** pushbutton to store the value and go to the next parameter. (The values are stored only when the **FUNC** pushbutton is depressed.)

The SMRT pushbutton can be used to scroll backwards through the configuration parameters without affecting the previously modified value.

7.3 BASIC CONFIGURATION

The following is a list of the basic configuration parameters. Some of these parameters may be skipped, depending on the previous setting.

P1 - Input type and standard range

0	= TC type	L	Range 0/+800°C
1	= TC type	J	Range 0/+800°C
2	= TC type	K	Range 0/+999°C
3	= TC type	N	Range 0/+999°C
4	= RTD type	Pt100	Range -199/+500°C
5	= RTD type	Pt100	Range -19.9/+99.9°C
8	= TC type	L	Range 0/+999°F
9	= TC type	J	Range 0/+999°F
10	= TC type	K	Range 0/+999°F
11	= TC type	N	Range 0/+999°F
12	= RTD type	Pt100	Range -199/+999°F

P2 - Initial scale value

Not available when P1=5. The initial and full scale values are used by the PID algorithm to calculate the input span.

P3 - Full scale value

Not available when P1=5. The initial and full scale values are used by the PID algorithm to calculate the input span. The minimum input span (P3 - P2) is:

300°C or 600°F for TC input
100°C or 200°F for RTD input

P4 - Output configuration

H = Heating only
HC = Heating/cooling

P5 - Heating output type

rEL = Relay
SSr = SSR

The setting P5 = ***rEL*** forces the cycle time parameter to 20 seconds.
The setting P5 = ***SSr*** forces the cycle time parameter to 2 seconds.

P6 - Cooling element

Available only when P4 = ***HC***.

Air = air
OIL = Oil
H2O = Water

The setting P6 = ***Air*** forces the cooling cycle time to 10 seconds and the relative cooling gain to 1.
The setting P6 = ***OIL*** forces the cooling cycle time to 4 seconds and the relative cooling gain to 0.8.
The setting P6 = ***H2O*** forces the cooling cycle time to 2 seconds and the relative cooling gain to 0.4.

P7 - Alarm 1

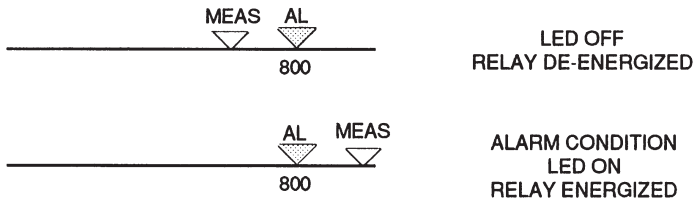
Available only when P4 = ***H***.

0 = Not provided
1 = Process Alarm
2 = Band alarm
3 = Deviation alarm

Pages 24 through 28 graphically represent the relay actions for the process band and deviation settings.

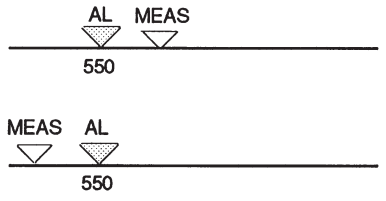
High alarm.
Direct Action.

Parameter Settings
P7 = *1*
P8 = *H*
P21 = *d*



Low alarm.
Direct action.

Parameter Settings
P7 = *1*
P8 = *L*
P21 = *d*

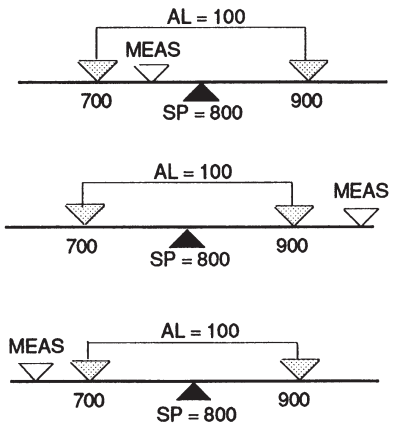


LED OFF
RELAY DE-ENERGIZED

ALARM CONDITION
LED ON
RELAY ENERGIZED

Band alarm with neutral zone off with respect to the set point.
Direct Action.
Threshold is expressed as Deviation.
(Measure - Set point = Deviation)

Parameter Settings
P7 = *2*
P8 = *H*
P21 = *d*



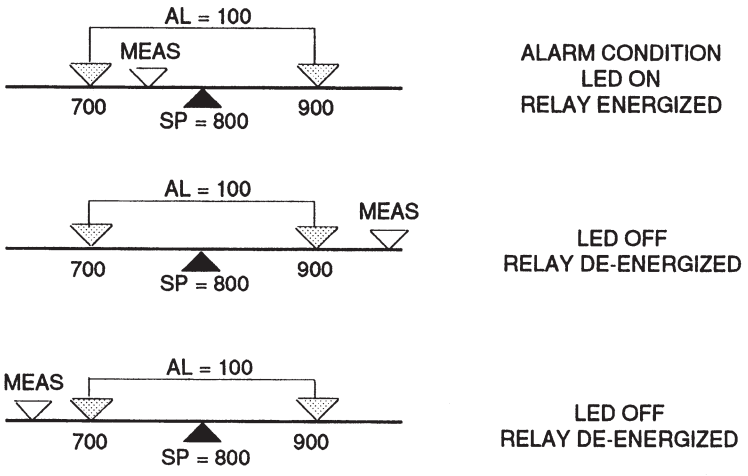
LED OFF
RELAY DE-ENERGIZED

ALARM CONDITION
LED ON
RELAY ENERGIZED

ALARM CONDITION
LED ON
RELAY ENERGIZED

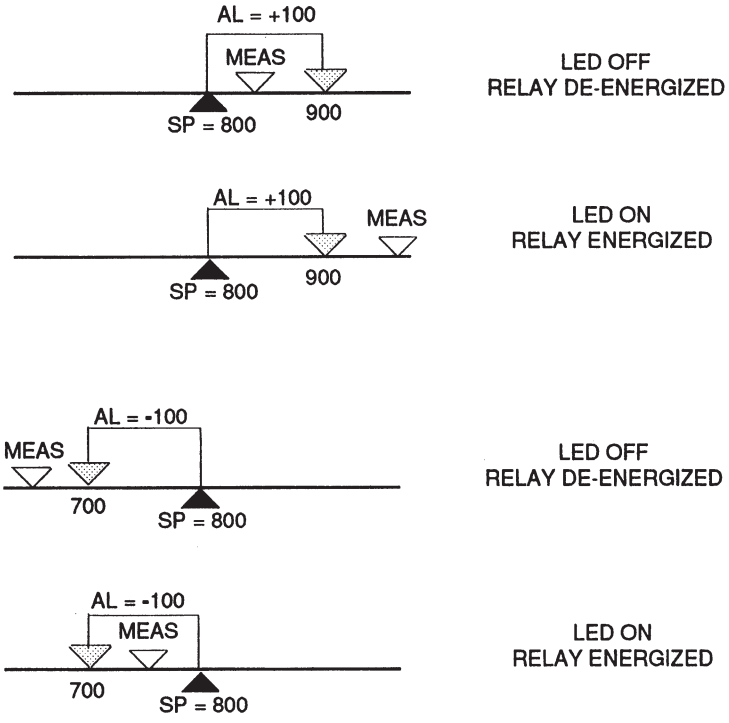
Band alarm with neutral zone on with respect to the set point.
Direct action.
Threshold is expressed as Deviation.
(Measure - Set Point = Deviation)

Parameter Settings
P7 = 2
P8 = L
P21 = d

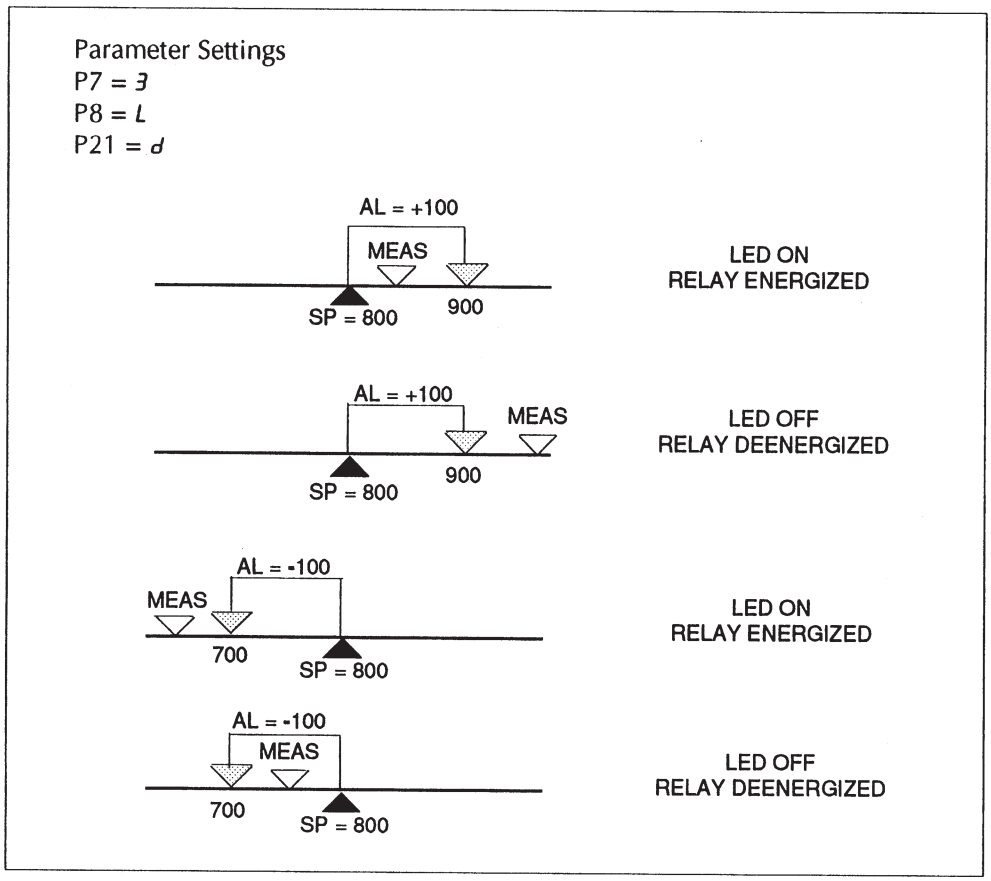


High deviation alarm.
Direct Action
Threshold is expressed as Deviation.
(Measure - Set Point = Deviation)

Parameter Settings
P7 = *J*
P8 = *H*
P21 = *d*



Low deviation alarm.
Direct Action.
Threshold is expressed as Deviation.
(Measure - Set Point = Deviation)



Reverse Action (P21 = ***r***) works only on the relay status:

	Indicator	Relay Status
DIRECT ACTION (P21 = ***d***)	***On***	ENERGIZED
	OFF	DE-ENERGIZED
REVERSE ACTION (P21 = ***r***)	***On***	DE-ENERGIZED (fail safe alarm)
	OFF	ENERGIZED

P8 - Alarm 1 operating mode

Available only when P7 is different from ***0*** and P4 = ***H***.

H = High alarm (external for band alarm)
L = Low alarm (internal for band alarm)

P9 - Alarm 1 standby

Available only when P7 is different from ***0*** and P4 = ***H***.

OFF = Standby disabled
On = Standby enabled

This function allows the alarms to be put in standby condition at the instrument start up or to impose a standby condition on the band alarms or deviation alarms after a set point modification.
In both situations, the instrument disables the alarm indication until the process variable is reached for the first time, under the following conditions:

- For the process alarm and start up, only the process variable must reach the alarm threshold.
- For the band alarm, the process variable must reach the alarm band (or the new alarm band generated by the new set point).
- For the deviation alarm, the process variable must reach the deviation area (or the new deviation area generated by the new set point).

P10 - Alarm 2

0 = Not provided
1 = Process alarm
2 = Band alarm
3 = Deviation alarm

The relay output of Alarm 2 is also used as a relay output by the heater breakdown function (OR condition).

P11 - Alarm 2 operating mode

Available only when P10 is different from 0.

H = High alarm (external for band alarm)
L = Low alarm (internal for band alarm)

For other details, see Alarm 1 examples.

P12 - Alarm 2 standby

Available only when P10 is different from 0.

OFF = Standby disabled
On = Standby enabled

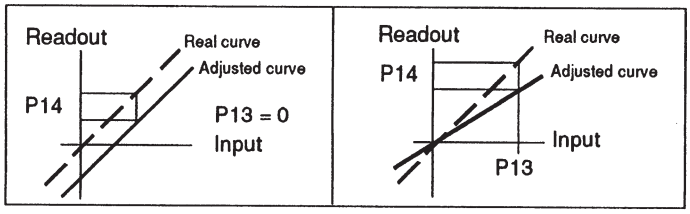
P13 - Type of offset applied on the measured value

When P13 = ***0***, the offset (P14) is constant over the entire range. When P13 is different from ***0***, P13 shows the application point of the offset value set by parameter P14. When P14 is set to ***0***, there is no offset.

P14 - Offset value

When P13 = ***0***, P14 is programmable in engineering units from -20% to +20% of the input range. ***0*** = no offset. When P13 is different from ***0***, P14 is programmable from -20% to +20% of the value of P13. Refer to Figure 16.

Fig. 16 Offset Values



P15 - Threshold of the Soft Start Function

Threshold value, in amperes, for the automatic start of the output power limiting Soft Start function. At instrument start up, if the measured value is lower than the threshold value, the Soft Start function will be enabled; otherwise it will be disabled. The instrument will not take into account this parameter when the ***LOL*** parameter (see Control Parameters) is set to infinity and the power limiting is always enabled.

P16 - Current measurement

OFF = Current measurement disabled
= The current measurement will be made during the ***On*** period (logic status 1 for SSR or relay energized for relay output)
= The current measurement will be made during the ***OFF*** period (logic status 0 for SSR or relay de-energized for relay output.

P17 - Current transformer range

Available only if P16 is different from ***OFF***.

10 = 10A
25 = 25A
50 = 50A
100 = 100A

P18 - Safety lock

0	=	Safety lock disabled (all the parameters can be modified)
1	=	Safety lock always enabled (only parameter ***SP*** may be modified)
2 to 499	=	Parameter ***SP*** is always modifiable and this code is the safety key used to access the other operating parameters' modification
500 to 999	=	Parameters ***SP***, ***A1*** and ***A1*** are always modifiable and this code is the safety key used to access the other operating parameters' modification

When the standard configuration procedure is completed, the instrument shows on both displays. If no other settings are required, press the FUNC pushbutton. The instrument returns to the beginning of the configuration procedure. This ends the basic configuration procedure. If a complete configuration is desired, press the ▲ or ▼ pushbutton and set the 217 code on the upper display.

NOTE: Setting the 217 code must be performed in order to perform an Advanced Configuration.

7.4 ADVANCED CONFIGURATION

Press the FUNC pushbutton. The instrument will go to the advanced configuration procedure and it will show the following additional parameters:

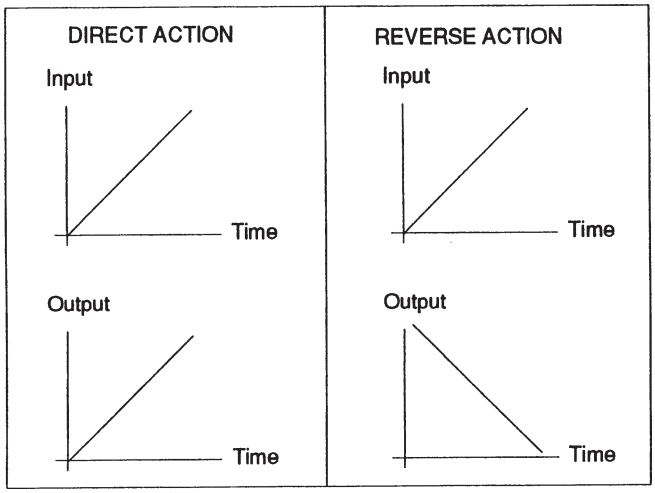
P19 - Main output action (see Figure 17 on next page)

Available only when P4 = ***H***.

r = Reverse (heating)
d = Direct (cooling)

When P4 = ***HC***, this parameter is forced to ***r***.

Fig. 17 Actions of the Alarm Relays



P21 - Action of the Alarm 1 relay (see Figure 17)

This parameter is available only if P7 is different from 0 and P4 = ***H***.

r = Reverse (relay de-energized in alarm condition)
d = Direct (relay energized in alarm condition)

P22 - Action of the Alarm 2 relay (see Figure 17)

This parameter is available only if P10 is different from ***0*** and P16 is different from ***OFF***.

r = Reverse (relay de-energized in alarm condition)
d = Direct (relay energized in alarm condition)

P23 - Automatic modification of relative cooling gain

OFF = The SMART function will not modify the relative cooling gain parameter
On = The SMART function will modify the relative cooling gain parameter

P24 - Output maximum rate of change

This parameter allows the maximum rate of change of the power output to be set. P24 is programmable from 1 to 10% of the control output. If set over 10%, the instrument blanks the upper display and the output variations have no limit.

P25 - Protect parameter visualization

This parameter is available only if P18 is different from ***0***.

OFF = All the protected parameters cannot be displayed
On = The parameter values can be displayed

P26 - SMART enabled/disabled

0 = The SMART function is always disabled (manual PID adjustment)
1 = The SMART function enabling/disabling ***is not*** protected by the safety key
2 = The SMART function enabling/disabling ***is*** protected by the safety key

P27 - Maximum value of the proportional band set by the SMART function

This parameter may be programmed over the range of the P28 or P29 value to ***99.9***.

P28 - Minimum value of the proportional band set by the SMART function in heating control only

This parameter may be programmed from 1.0% to the P27 value

P29 - Minimum value of the proportional band set by the SMART function in heating/cooling only

This parameter may be programmed from 1.5% to the P27 value.

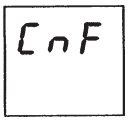
The advanced configuration procedure is now complete and the instrument should show ***CnF*** on the upper display.

7.5 Default Configuration Parameters

The configuration parameters can be loaded with predetermined default values. These data are the typical values loaded in the instrument prior to shipment from the factory. To load the default values, proceed as follows:

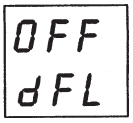
1. The internal dip switch, V2, (see figure 14) should be open.

2. The upper display will show:



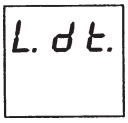
3. Press the ▼ pushbutton; the lower display will show the firmware version:

4. While maintaining pressure on the ▼ pushbutton, press the ▲ pushbutton. The display will show:



5. Press the ▲ pushbutton again; the display will show:

6. Press the **FUNC** pushbutton; the display will show:



Appearance of the previous display means that the loading procedure has been initiated. After about 3 seconds the loading procedure is terminated and the instrument reverts to the display shown in step 2 (above).

The following are the default parameters loaded during the above procedure:

Parameter	Value	Default Value
P1	***1***	J-type thermocouple with °C indication
P2	***0***	0°C
P3	***400***	400°C
P4	***H***	Heating
P5	***rEL***	Relay
P6	***Air***	Air
P7	***1***	Process alarm
P8	***H***	High alarm
P9	***OFF***	Standby disabled
P10	***0***	Not provided
P11	***H***	High alarm
P12	***OFF***	Standby disabled
P13	***0***	Constant offset
P14	***0***	No offset
P15	***0***	Soft Start threshold
P16	***OFF***	Current measurement disabled
P17	***10***	10A
P18	***0***	Safety lock disabled
P19	***r***	Main output with Reverse Action
P21	***d***	Direct Action of the alarm 1 relay
P22	***d***	Direct Action of the Alarm 2 relay
P23	***OFF***	Relative cooling gain will not be modified by the SMART function
P24	***10***	Power output rate of change is 10% per second
P25	***On***	All the parameters are displayed
P26	***2***	SMART function enabling/disabling is protected by the safety key
P27	***30.0***	30%
P28	***1.0***	1.0%
P29	***1.5***	1.5%

8. Operating Instructions

NOTE: To operate this unit as a controller, the internal dip switch, V2, located on the input card (see figure 14) must be closed.

It is assumed at this point that the Model 1440 has been correctly configured as detailed in Instrument Configuration. In most applications as a controller, the Model 1440 will operate in the normal display mode, where the upper display shows the measured variable and the lower display shows the set point. If selected by the ▲ pushbutton, the lower display will show the heater current amperes.

By pressing the **FUNC** pushbutton it is possible to scroll through all the parameters; their abbreviated names will be shown on the lower display while their value is shown on the upper display. To modify a parameter, first select the desired parameter with the **FUNC** pushbutton, then set the new value with the ▲ or ▼ pushbuttons. Press the **FUNC** pushbutton to record the new value and proceed to the next parameter.

The access time for parameter scrolling is limited to 10 seconds. Therefore, if no pushbutton is pressed within this time, the instrument will automatically revert to the normal display mode.

The instrument does not always display all parameters. It selects the parameter in accordance with the following:

- Instrument configuration in general (see Instrument Configuration)
- Parameter P25 in particular (see Configuration Procedure)
- The setting of the proportional band (see Control Parameters)

8.1 CONTROL PARAMETERS

The following is a list of all the available control parameters. Note that some parameters may not be visualized according to the specific instrument configuration.

***SP* - Set Point**

Lower display:	***SP***
Upper display:	Set point value
Range:	From parameter ***rL*** value to parameter ***rH*** value

***nnn* - Safety Lock**

Lower display:	***nnn***
Upper display:	***On*** (safety lock is enabled) ***OFF*** (safety lock is disabled)

To enable the safety lock, set a value different from P18 (see Parameters List) and press the **FUNC** pushbutton. To disable the safety lock, set a value equal to P18 and then press the **FUNC** pushbutton.

***A1, A2* - AlarmsThreshold**

These parameters are present only if the relative alarm is configures.

Lower display: ***A1, A2***
Upper display: Alarm threshold value
Process alarm range: From P2 to P3 value
Band alarm range: 0 to 500 (F/C
Deviation alarm range: -199 to 500(F/C

***h1, h2* - Alarms Hysteresis**

Lower display: ***h1, h2***
Upper display: Value of alarm 1 or Alarm 2 hysteresis
Range: 0.1% (minimum 1 digit) to 10.0% of the input span (P3 - P2)

The instrument will use a hysteresis equal to the band alarm by setting a band alarm out of band indication and an alarm hysteresis larger than the band alarm (minus 1 digit).

***Pb* - Proportional band**

Lower display: ***Pb***
Upper display: Value of proportional bank
Range: 1.0 to 99.9% of span for heating output;
1.5 to 99.9% of span for heating/cooling output

When parameter ***Pb*** is set to ***0***, the control action becomes ON/OFF and parameters ***t, td, C, C2, rC, OLP, Olh*** and ***tOL*** are skipped.

***HS* - Hysteresis**

This parameter is present if parameter ***Pb*** is equal to ***0***.

Lower display: ***HS***
Upper display: Hysteresis for ON/OFF control action
Range: 0.1 to 10.0% of input span (P3 - P2)

***ti* - Integral time**

This parameter is present only if parameter ***Pb*** is different from ***0***.

Lower display: ***ti***
Upper display: Integral time defined in minutes and seconds
Range: 1 minute and 20 seconds to 20 minutes; above the upper value, the display

blanks out and the integral action is disabled.
Resolution: 10 seconds

***td* - Differential time**

This parameter is present only if parameter ***Pb*** is different from ***0***.

Lower display: ***C***
Upper display: Cycle time value for output 1
Range: 1 to 200 seconds

***C2* - Output 1 (cooling) cycle time**

This parameter is present only if P4 = ***HC*** and parameter ***Pb*** is different from ***0***.

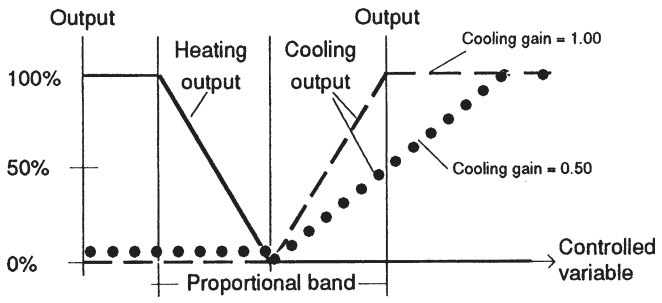
Lower display: ***C2***
Upper display: Cycle time value for output 2
Range: 1 to 200 seconds

***rC* - Relative output 2 (cooling gain)**

This parameter is present only if P4 = ***HC*** and parameter ***Pb*** is different from ***0***.

Lower display: ***rC***
Upper display: Gain in proportional cooling band
Range: 0.20 to 1.00

Fig. 18 Gain in the Proportional Cooling Band



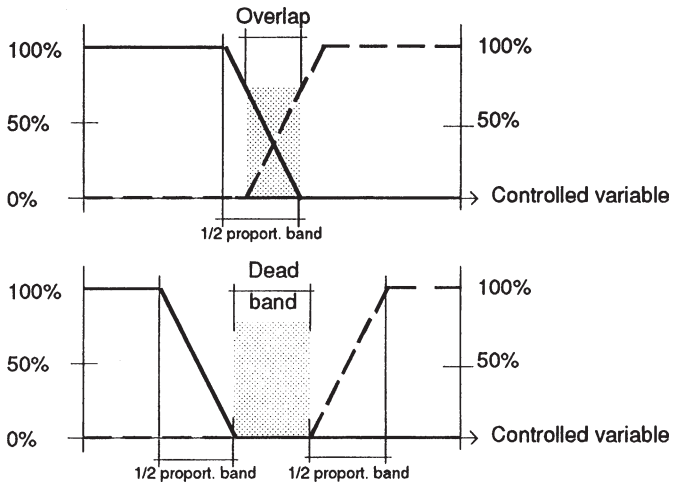
***OLP* - Overlap/dead band between heating and cooling outputs**

This parameter is present only if P4 = ***HC*** and parameter ***Pb*** is different from ***0***.

Lower display: ***OLP***
Upper display: A positive value means overlap between heating and cooling outputs; A negative value means dead band between the two outputs
Range: -20 to 50% of the proportional band

See Figure 19 on the next page.

Fig. 19 Overlap/Dead Band Between Heating and Cooling Outputs



***rL* - Set point low limit**

Lower display: ***rL***
Upper display: Value of set point low limit
Range: From the initial scale value (P2) to ***rH*** value

***rH* - Set point high limit**

Lower display: ***rH***
Upper display: Value of set point high limit
Range: From ***rL*** value to the full scale value (P3)

***rP* - Rate of change for set point variations**

Lower display: ***rP***
Upper display: Value of the rate of change imposed to set point variations
Range: 1 to 100 units per minute; above the maximum value, the display blanks so that the transfer is a step transfer

***OLH* - Control limit high limiter**

This parameter is present only if parameter ***Pb*** is different from ***0***.

Lower display: ***OLH***
Upper display: Value of control output maximum limit
Range: 0 to 100% for heating output: -100 to 100% for heating/cooling output

***t0L* - Time for Soft Start enabling**

t0L is a programmable time where the output level is limited to the value of parameter ***0LH***. These time counts begin at instrument start up if the measured variable is less than the threshold value programmed (parameter P15). This parameter is present only if parameter ***Pb*** is different from ***0***.

Lower display: ***t0L***
Upper display: Value of control output limiter time duration
Range: 1 to 100 minutes; above 100 minutes, the upper display blanks out and the limiter will be enabled.

NOTE: Parameter ***t0L*** may always be modified but the new value will be active only at the next start up.

***Hdb* - Threshold for the heater breakdown function**

This parameter is present only if parameter P16 is different from ***OFF***.

Lower display: ***Hdb***
Upper display: Value in amperes of the heater breakdown threshold
Range: Within the current transformer input span

8.2 DEFAULT CONTROL PARAMETERS

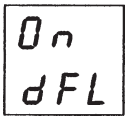
The control parameters can be loaded with predetermined default values. These data are the typical values loaded in the instrument prior to shipment from the factory. To load the default values, proceed as follows:

1. Close the internal dip switch (V2, Figure 14).

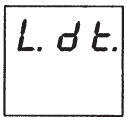
2. Disable the SMART function. The upper display will show the process variable while the lower display will show the set point value or the current measurement.

3. Hold down the ▼ pushbutton and press the ▲ pushbutton; the display will show:

4. Within 10 seconds press the ▲ or ▼ pushbutton; the display will show:



5. Press the **FUNC** pushbutton; the display will show:



This means that the loading procedure has been initiated. After about 3 seconds, the loading procedure is terminated and the instrument reverts to normal display mode.

The following is a list of the default parameters loaded during the above procedure.

Parameter	Default Value
SP	Minimum range-value
nnn	***OFF***
A1, A2	Minimum range-value for process alarms; 0 for deviation or band alarms
h1, h2	0.1%
Pb	4.0%
h5	0.5%
ti	04.0 (4 minutes)
td	1.00 (1 minute)
C	20 seconds for relay output; 2 seconds for SSR output
C2	10 seconds if P6=***Air***; 4 seconds if P6=***OIL***; 2 seconds if P6=***H20***
rC	1.00 if P6=***Air***; 0.80 if P6=***OIL***; 0.40 if P6=***H20***
DLP	0
rL	Initial scale value
rH	Full scale value
rP	Blank display (step transfer)
OLH	100%
tOL	Blank display
Hbd	50% of the full scale value

8.3 SMART ALGORITHM

The SMART algorithm is a new self-tuning function of the instrument. It is used by the instrument to automatically calculate and set the proportional band, the reset time, the derivative time and the relative cooling gain values. The SMART algorithm can always be operative; in this case it will adapt the control parameters continuously in order to perform the best control action.

To start the SMART function, depress the **SMRT** pushbutton when the instrument is in normal display mode. The **SMRT** indicator will go blank or light according to the special function that is being performed. When it is desired to use a fixed set of control parameters, press the **SMRT** pushbutton again; the **SMRT** indicator will turn off.

During SMART function operation, the relative cooling gain (if present) is limited to the following ranges:

Cooling Element	Range
Air	0.85 to 1.00
Water	0.80 to 0.90
Oil	0.30 to 0.60

The SMART function uses a derivative action equal to 1/4 of the integral action.

The limits of the proportional band set by the SMART function are programmed by parameters P27, P28 and P29.

8.4 OUTPUT POWER *OFF*

This feature allows the Model 1440 control to be temporarily turned ***OFF***. To turn ***OFF*** the control output, depress the ▲ pushbutton, and while keeping it depressed press the function button. Keep them depressed for more than 3 seconds. The upper display will show the measured value while the lower display will show ***OFF***.

When it is desired to return to the normal display mode, depress the ▲ pushbutton, and while keeping it depressed, press the **FUNC** pushbutton. Keep them depressed for more than 3 seconds. The instrument then goes automatically to the normal display mode.

NOTE: If the output is turned ***OFF*** while the ***SMART*** function is performing the first part of the algorithm (the **SMRT** indicator is flashing), the ***SMART*** function will be aborted. When the instrument comes back to normal display mode, the ***SMART*** function will be disabled.

If the output is turned ***OFF*** while the ***SMART*** function is performing the adaptive part of the algorithm (the **SMRT** indicator is lit), the ***SMART*** function will be stopped. When the instrument comes back to the normal display mode, the ***SMART*** function will be activated.

8.5 HEATER BREAKDOWN ALARM (OPTION)

This alarm allows continuous monitoring of the main load consumption and generation of an alarm condition when the main load consumption is outside (either lower or higher than) the programmed threshold. See parameter ***Hbd***. To display the main load consumption, momentarily press the ▲ pushbutton when the instrument is in normal display mode. The upper display will show the measured value while the lower display will show the main load consumption (in amperes) followed by the engineering units (A). To return to the normal display mode, press the ▲ pushbutton. When an alarm condition is detected, the AL2/HB indicator will be flashing and the relay of the output 3 (Alarm 2 or heater breakdown alarm) will be activated.

8.6 DIRECT ACCESS TO THE SET POINT MODIFICATION

The instrument allows modification of the set point value without the use of the **FUNC** pushbutton. When a rapid set point modification is required, proceed as follows:

1. Press and hold the ▲ or ▼ pushbutton for more than 5 seconds; the set point value, shown on the lower display will start to change.

2. Using the ▲ and ▼ pushbuttons, set the desired value.

3. When the desired value is reached, do not depress any pushbutton for more than 3 seconds; the new set point will become operative after 3 seconds from the last pushbutton depression.

If during this procedure, it is desired to return to the previous set point value, press the **FUNC** pushbutton; the instrument returns automatically to the normal display mode without storing the new set point.

8.7 GENERAL GUIDELINES FOR CALIBRATION

CAUTION: The Model 1440 is calibrated at the factory. Calibrating in the field is not normally required. If calibration is required, return the unit to the factory for calibration or adhere to these calibration steps using only the equipment designated.

For a good calibration, observe these precautions:

- The instrument under calibration should be mounted in its case in order to keep the internal temperature constant.
- The ambient temperature should be stable. Avoid any drift (e.g., due to air conditioning).
- The relative humidity should not exceed 70%.
- Minimum warm-up time must be 20 minutes.
- Operate in a noise-free environment, if possible.
- During calibration, connect one input at a time to the rear terminal block.

For this calibration procedure it is necessary to use calibrators with the following accuracy and

resolution:

Accuracy

- TC input: +0.005%; output +0.001%; range: +5 mV
- RTD input: ±0.02%; ±0.0025 Ω/decade
- Cold junction compensation: better than 0.1°C
- Current transformer input: 0.1 mA AC RMS

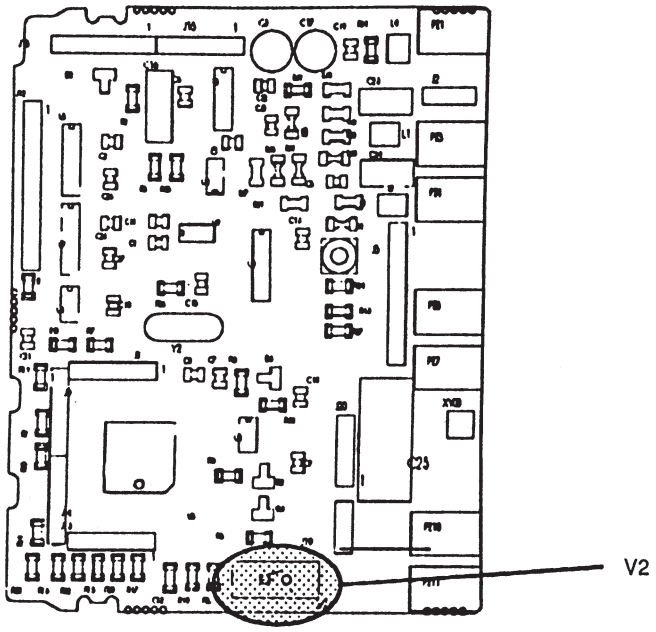
Resolution

- TC input: 1 mV
- RTD input: 10 mΩ
- Cold junction compensation: better than 0.1°C
- Current transformer input: 0.1 mA AC RMS

8.8 INTERNAL DIP SWITCH LOCATION

To start the calibration procedure, the internal dipswitch, V2, must be open as shown in Figure 20.

Fig. 20 Internal Dip Switch Location



8.9 CALIBRATION PROCEDURE

8.9.1 FOREWORD

Calibration parameters are logically divided into groups of two parameters each:
Initial and final scale value. After each group, the calibration check is called for, but it also possible to proceed without making a new calibration.

When only a calibration check is required, press the **FUNC** pushbutton twice when ***OFF*** is shown on the display. The instrument will go directly to the specific group check. The lower display will show the parameter code while the upper display will show ***On*** or ***OFF***. Use the ▲ and ▼ pushbuttons to select between ***On*** and ***OFF***.

To go to the next parameter without modifying the calibration, press the **FUNC** pushbutton when the display is showing ***OFF***.

To set the parameter for calibration, press the **FUNC** pushbutton when the display shows ***On***.

NOTE: By pressing the **SMRT** pushbutton, it is possible to go back to the previous parameter without storing the new calibration.

8.9.2 CALIBRATION CODES

The Model 1440 is originally calibrated by means of calibrators with high accuracy and resolution (see General Guidelines for Calibration). The following is a complete list of calibration codes:

Code	Parameter
tL	TC input initial scale value (0 mV)
tH	TC input full scale value (50 mV)
t	TC input check
rj	Cold junction compensation
rj.	Cold junction compensation check
PL	RTD input initial scale value (0 Ω)
PH	RTD input full-scale value (300 Ω)
P.	RTD input check
AL	Current transformer input initial scale value (0 mA AC)
AH	Current transformer input full-scale value (50 mA AC)
A.	Current transformer input check

8.9.3 HOW TO PROCEED

1. Switch the instrument ***On***. The upper display will show ***CnF***.

2. Press the ▲ pushbutton. The upper display will show ***CAL***.

3. Press the **FUNC** pushbutton to show the first calibration code on the lower display. Depress the **FUNC** pushbutton until the desired calibration code is reached.

***tL* - TC input initial scale value**

1. Provide connections between the RTD/thermocouple calibrator and the instrument under test as shown in Figure 21.

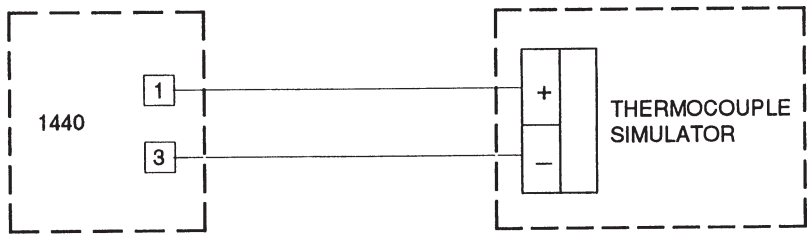
2. The upper display will show ***OFF***, while ***tL*** will appear on the lower display.

3. Set calibrator to 0.000 mV. Press the ▲ pushbutton; the display will change to ***On***.

4. After a few seconds, start the calibration by pressing the **FUNC** pushbutton.

The display blanks out to indicate that it is performing the calibration routine. At the end of this calibration routine, the instrument will go to the next parameter.

Fig. 21 Connections from a Calibrator to an Instrument Under Test



***tH* - TC input full scale value**

1. Set the calibrator to 50.000 mV (see Figure 21).

2. Press the ▲ pushbutton; the upper display will show ***On***.

3. After a few seconds, start calibration by pressing the **FUNC** pushbutton.

The display blanks out to indicate that it performing the calibration routine. At the end of the calibration routine, the instrument will go to the next parameter.

***t.* - TC input check**

The display will show t. followed by a number showing the measured value in counts.

The calibration is correct if the indication is ***t. 30 000*** ± 10 counts.

1. Check the zero calibration by setting the calibrator to 0.000 mV. The readout must be ***t. 0 0 000*** ± 10 counts.

2. Check linearity at half scale by setting the proper value on the calibrator. The readout must be ***t.15 000*** ± 10 counts.

3. Press the **FUNC** pushbutton. ***OFF*** and ***rJ*** will appear on the displays.

rJ - Cold junction compensation

NOTE: Make sure that parameters ***tL*** and ***tH*** are correctly calibrated before ***rJ*** calibration.

1. Measure the temperature close to terminals 1 and 3 using an appropriate measuring device (see figure 22).

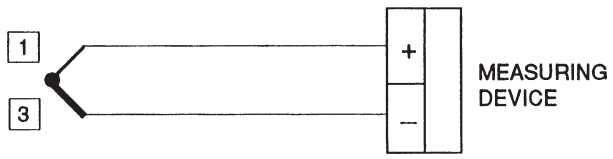
2. Wait a few minutes to allow temperature stabilization of the entire system (compensation cable, sensor, calibrator and instrument).

3. Using the ▲ or ▼ pushbuttons, set a value equal to the temperature as measured in tenths of °C.

4. After a few seconds, start calibration by pressing **FUNC** pushbutton.

The display blanks out to indicate that it performing the calibration routine. At the end of this calibration routine, the instrument will go to the next parameter.

Fig. 22 Measuring the Temperature Close to Terminals 1 and 3



***rJ* - Cold junction compensation check**

The display will show ***rJ***. And the temperature in tenths of °C, measured by the ***CJ*** compensator. Make sure that the display readout is equal to the value read on the thermocouple. Press the **FUNC** pushbutton, the instrument will go to the next parameter.

***PL* - RTD input initial scale value**

1. Connect a resistor box as shown in Figure 23.

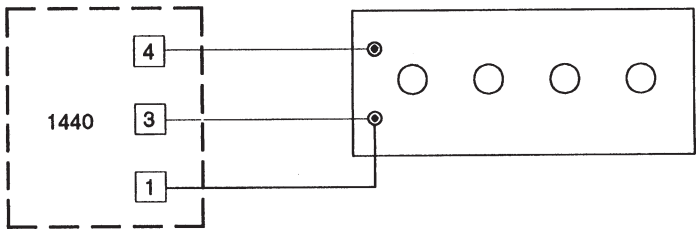
2. Set 0.00 Ω on the resistor box.

3. Press the ▲ pushbutton. The instrument will show ***On*** and ***PL***.

4. After a few seconds, start calibration by pressing the **FUNC** pushbutton.

The display blanks out to indicate that it is performing the calibration routine. At the end of this calibration routine, the instrument will go to the next parameter.

Fig. 23 Connections to a Resistor Box



***PH* - RTD input full scale value**

1. Set the resistor box to 300.00 Ω (see Figure 23).

2. Press the ▲ pushbutton. The displays will show ***On*** and ***PH***.

3. Wait a few seconds, then press the **FUNC** pushbutton.

The display will go blank to indicate that it is performing the calibration routine. At the end of this calibration routine, the instrument will go to the next parameter.

***P.* - RTD input check**

1. The display will show P. followed by a number showing the measured value in counts. Set the resistor box to 300.00 Ω (see Figure 23). The calibration is correct if the indication is ***P. 30 000*** ±10 counts.

2. Check the zero calibration by setting 0.00 Ω on the resistor box; the display should show ***Pt.00 000*** ±10 counts.

3. Check linearity.

The ratio between input signal and counts for RTD input is not linear. The correct ratio is shown in the following table:

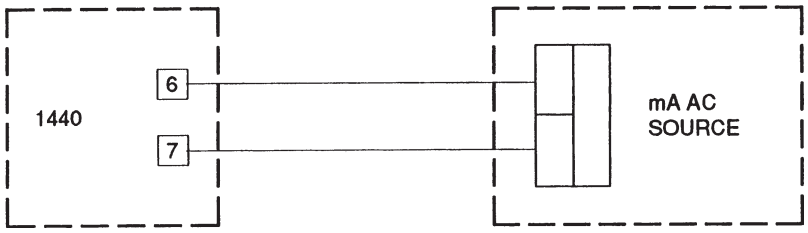
Resistor Box Ω	Display Counts
0	0 ±10 counts
100	10153 ±10 counts
200	20151 ±10 counts
300	30000 ±10 counts

5. Press the **FUNC** pushbutton to proceed to the next parameter.

***AL* - Current transformer input initial scale value**

1. Connect the instrument to a 0-5- mA AC source as shown in Figure 24.

Fig. 24 Connections from a Calibrator to an Instrument Under Test



2. The display will show ***AL*** and ***OFF***.

3. Set 0.00 mA on the mA AC generator.

4. Depress the ▲ pushbutton until the display changes to ***On***.

5. After a few seconds, start calibration by pressing the **FUNC** pushbutton.

The display will go blank to indicate that it is performing the calibration routine. At the end of this calibration routine, the instrument will go to the next parameter.

***AH* - Current transformer input full scale value**

1. The display shows ***AH*** and ***OFF***.

2. Set 50.00 mA RMS on the mA AC generator.

3. Press the ▲ pushbutton until the display changes to ***On***.

4. After a few seconds, start calibration by pressing the **FUNC** pushbutton.

The display will go blank to indicate that it is performing the calibration routine. At the end of this calibration routine, the instrument will go to the next parameter.

***A.* - Current transformer input check**

1. The display should show A.. followed by a number of counts. The calibration is correct if the indication is ***A. 1000*** ± 10 counts.

2. Check the zero calibration by setting 0.00 mA on the mA AC generator; the readout should be ***A. 0 000*** ±10 counts.

3. Check linearity at half scale by setting 25.00 mA on the calibrator. The readout must be ***A. 500*** ± 10 counts.

4. Press the **FUNC** pushbutton.

The calibration procedure is now complete.

If it desired to go to the configuration procedure, press the ▲ pushbutton. The upper display will show ***CnF*** and the instrument will be in configuration mode. If the previous configuration is correct, switch the instrument ***OFF*** and set the V2 switch according to the Preliminary Operating Instructions.

8.10 Out of Range Indications

The instrument shows Under Range and Over Range conditions with the following messages on the upper display:

Over Range

Under Range

Burn-out conditions will be shown as Over Range.

For TC input it is possible to select an Under Range indication. See Open Input Circuit for more information.

NOTE: When an Over Range or an Under Range condition is detected, the instrument operates as if in the presence of the maximum or the minimum measurable value, respectively.

To eliminate the Out of Range condition, proceed as follows:

1. Check the input signal source and the connecting line.

2. Make sure that the input signal is in accordance with instrument configuration. Otherwise, modify the input configuration (see Instrument Configuration).

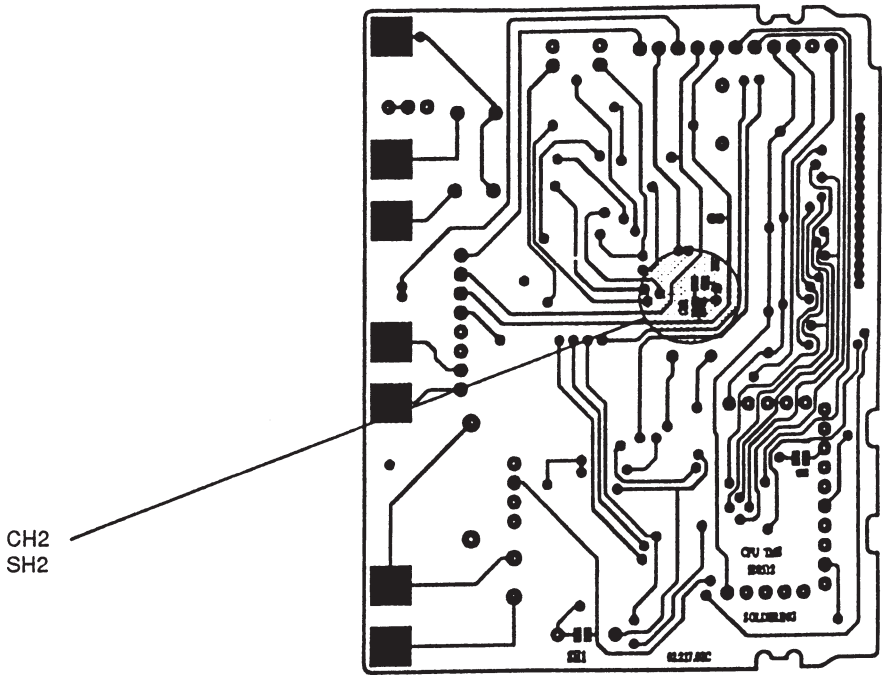
3. If no errors are detected, send the instrument back to the supplier for examination.

8.11 OPEN INPUT CIRCUIT

The Model 1440 is able to identify an open circuit for TC and RTD inputs. The open input circuit condition for RTD input is shown by an Over Range indication.

For TC input, it is possible to select an Over Range indication (standard) by setting CH2 closed and SH2 open; otherwise it is possible to select the Under Range indication by setting CH2 open and SH2 closed. Both solder pads are located on the solder side of the CPU board (Figure 25).

Fig. 25 CH2 and SH2 Locations



9. ERROR CODES

Diagnostics are made at instrument start up and during the normal mode of operation. If a fault condition (error) is detected, the lower display will show the message ***Err*** while the upper display

shows the relative error code. Some errors reset the instrument; if the error persists, send the instrument back to the supplier.

The following is a list of possible errors, their causes, instrument output conditions and possible remedies, in numerical order.

Err 100 - EEPROM memory writing error.
After 2 seconds the instrument restarts automatically.
Send the instrument back to the supplier.

Err 150 - General hardware error on the CPU card.
Send the instrument back to the supplier.

Err 200 - Protect register memory error.
The instrument repeats this check every 2 seconds.
Set the V2 switch in open condition.
Switch on the instrument.
Set the V2 switch in closed condition; this error must be deleted.
If this error persists, send the instrument back to the supplier.

From ***Err 201 to Err 229*** - Wrong configuration parameter value.
The two less significant digits show the number of the wrong configuration parameter.
Return to the configuration procedure and check the values.

Err 301 - RTD calibration error.
Return to the calibration procedure and check the ***PL*** and ***PH*** calibrations.

Err 305 - Thermocouple input calibration error.
Return to the calibration procedure and check the ***tl*** and ***th*** calibrations.

Err 307 - Reference junction calibration error.
Return to the calibration procedure and check the ***rJ*** calibration.

Err 310 - Current transformer input calibration error.
Return to the calibration procedure and check the ***AL*** and ***AH*** calibrations.

Err 400 - One or more control parameters are Out of Range with respect to the allow values.
This error may appear at instrument start up.
Press the ▲ and ▼ pushbuttons momentarily and load all the default parameters.
Reset the parameter settings.

Err 500 - Autozero error.
The instrument measures an internal autozero value too negative or too positive.
The instrument makes this check every 30 seconds.
If this error persists, send the instrument back to the supplier.

Err 502 - Cold junction measurement errors.
The instrument cannot make the cold junction compensation.
This error may appear during the operative mode.
Check the ambient temperature and, if necessary, recalibrate the unit.
If this error persists, send the instrument back to the supplier.

Err 510 - Wrong measured value during the calibration procedure.
This error may appear during the calibration procedure.
Check the input value and, if necessary, recalibrate the unit.
If this error persists, send the instrument back to the supplier.

10. REPAIR

Questions concerning warranty, repair cost, delivery, and requests for a RA# should be directed to the Dynisco Repair Department, 508-541-9400 or email: repair@dynisco.com. Please call for a return authorization number (RA#) before returning any product. Damaged products should be returned to:

DYNISCO INSTRUMENTS
Attn: RA # _____
38 Forge Parkway
Franklin, MA 02038

For technical assistance please call 800-221-2201 or 508-541-9400 or fax 508-541-9436.

11. WARRANTY

This Dynisco product is warranted under terms and conditions set forth in the Dynisco Web Pages. Go to www.dynisco.com and click on “Warranty” at the bottom of any page for complete details.

NOTES:

WARRANTY REGISTRATION CARD

Dynisco Instruments

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SERIAL NUMBER _____

DATE PURCHASED _____

PURCHASED FROM _____

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DIVISION _____

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