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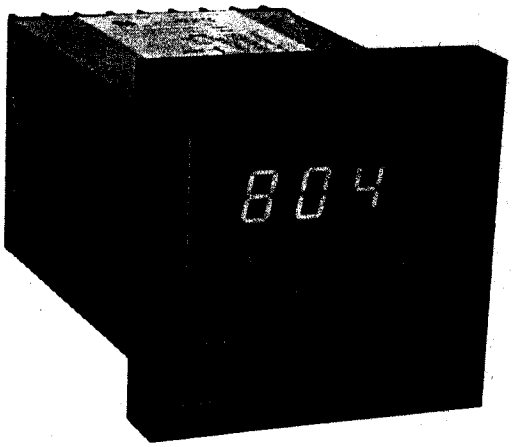
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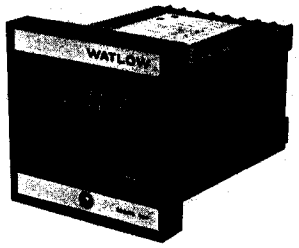
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Find the *Watlow 804B-1600-0000* at our website: *Click HERE*

Series 804



WW Faceplate



00 Faceplate

1/4 DIN Digital Temperature Controller

User's Manual

WATLOW

Watlow Controls, 1241 Bundy Blvd., Winona, MN 55987 507/454-5300, Fax: 507/452-4507

W804-DA30-9014
April, 1990
Supersedes:
W804-DA20-8833

$5.00
Made in the U.S.A.

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General Description

The Watlow Series 804 is a 1/4 DIN digital indicating temperature control. The control features a plug-in design to facilitate installation and service. The control mode is factory selectable for ON/OFF, or time proportioning with manual reset.

Input options include the selection of thermocouple ranges, RTD ranges, or electrical voltage or current inputs. There are many output options to select from including mechanical relay and solid state output switching devices.

Front panel accessible adjustments include the push-to-set assembly for the main set point, and proportional band and manual reset adjustments.

Specifications

Control Mode

- Time proportioning with manual reset.
  - Proportional band front panel adjustable. Typically from 5 to 50°F/°C (3 to 30°F/°C for 0.1° RTD range). Manual reset front panel adjustable over 100% of the proportional band.
  - Cycle time internal adjust: Typically 2 to 30 seconds with relay or solid state switch output. Typically 1 to 10 seconds with triac output.
- ON/OFF.
  - Sensitivity adjust: Internal, typically 1° to 5° switching hysteresis.
  - Offset of control point, internally adjustable to ± 50°F/°C from set point (± 30°F/°C for 0.1° RTD range).
- Indicating only.
  - None, indicating only; no control functions.

Operator Interface

- 1/2" (13 mm) LEDs displaying process input value and, when setpot knob is depressed, set point value.
- LED indication of output energized (load light).

Input

- Thermocouple, RTD, or electrical process input available. See the note on Page 7 concerning thermocouples.
- Automatic cold junction compensation for thermocouple input. Thermocouple may be grounded or ungrounded.
- Lead resistance effect for type J, K, or T thermocouple input: 200Ω of lead resistance will cause less than 1°F error. Refer to the lead wire manufacturer's specification on ohms per double foot for the type and gauge of wire used.
- RTD input 2 or 3 wire, platinum, 100 ohms @ 0°C calibrated for choice of two curves:
  #3916 (JIS): 0.003916 Ω/Ω/°C.
  #3850 (DIN): 0.003850 Ω/Ω/°C.
- Electrical process input: 4-20mA or 0-5VDC. User selectable decimal point enable; 100 Ω input impedance for 4-20mA.
- MV set point input, (from programmer or another control).
- Sensor break protection: De-energizes output to protect system. Display indicates output action.

	3 Digit	4 Digit
Upscale:	EEE	OFL
Downscale:	- - -	OOO

- No sensor break protection is provided when the 0-5V input is used (Electrical Process #701) since 0V is a valid input.

Output

Control

- Mechanical Relay, Form C, 10A, SPDT Plug in: 10A @ 120VAC, 5A @240VAC, 10A @ 28VDC, 1/3 hp @ 120 or 240VAC, 345VA pilot duty @ 120 or 240VAC. See Figure 1 on the facing page.
- Triac, 1A @ 240VAC, zero-crossed switching 50mA min load. Resistive ratings only.
- Triac, 15A @ 240VAC, zero-crossed switching 100mA min load. Resistive ratings only.
- Switched DC, open collector, 30 volts maximum, 10 volts minimum. Load impedance: 1KΩ minimum. Non-isolated.

Indication

- MV output of linearized process input signal, 5mv/digit for 3 digit ranges. 2mv/digit for 4 digit ranges.

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Accuracy
- Calibration Accuracy: ± 0.25% of span ± 1 digit at 77°F ± 5°F (25°C ± 3°C) ambient & rated line voltage ±1%.
- Linearization Accuracy: ± 0.25% of span, ± 1 digit at 77°F ± 5°F (25°C ± 3°C) ambient & rated line voltage ± 1%.
- MV Signal I/O: ± 0.25% of span.
- Accuracy Span: 1000°F or 540°C minimum.
- Temperature Stability: ± 2µV / °F (±3.6µV/°C) ambient, referred to the input.
- Voltage Stability: ± 0.01% of span / % of rated line voltage.

Agency Approval
- UL recognized, File #E43684, UL873.
- In UL applications, the relay output version is rated 10A @ 120VAC for ambient temperature up to 100°F. Over 100°F, the rating decreases linearly to 6A @ 130°F. See Figure 1 below.

Terminals
- #6 screws on barrier strips.

Power
- 120/240VAC ± 10%, 60Hz ±5%.
- 50/60Hz ±5%.
- 6 VA power consumption.

Operating Environment
- 30 to 130°F/0 to 55°C.
- 0 to 90% RH, non-condensing.

Dimensions

• Height:	3.8 in.	(97 mm)
• Width:	3.8 in.	(97 mm)
• Behind panel depth:	4.9 in.	(125 mm)
with 15A triac:	7.6 in.	(193 mm)
• Weight:	1.5 lb.	(0.680kg)

UL873 recognized models
804A-X1XX-0000,00WW
804A-X6XX-0000.00WW
804B-X1XX-0000,00WW
804B-X6XX-0000,00WW
804C-X1XX-0000,00WW
804C-X6XX-0000,00WW
804D-X1XX-0000,00WW
804D-X6XX-0000,00WW

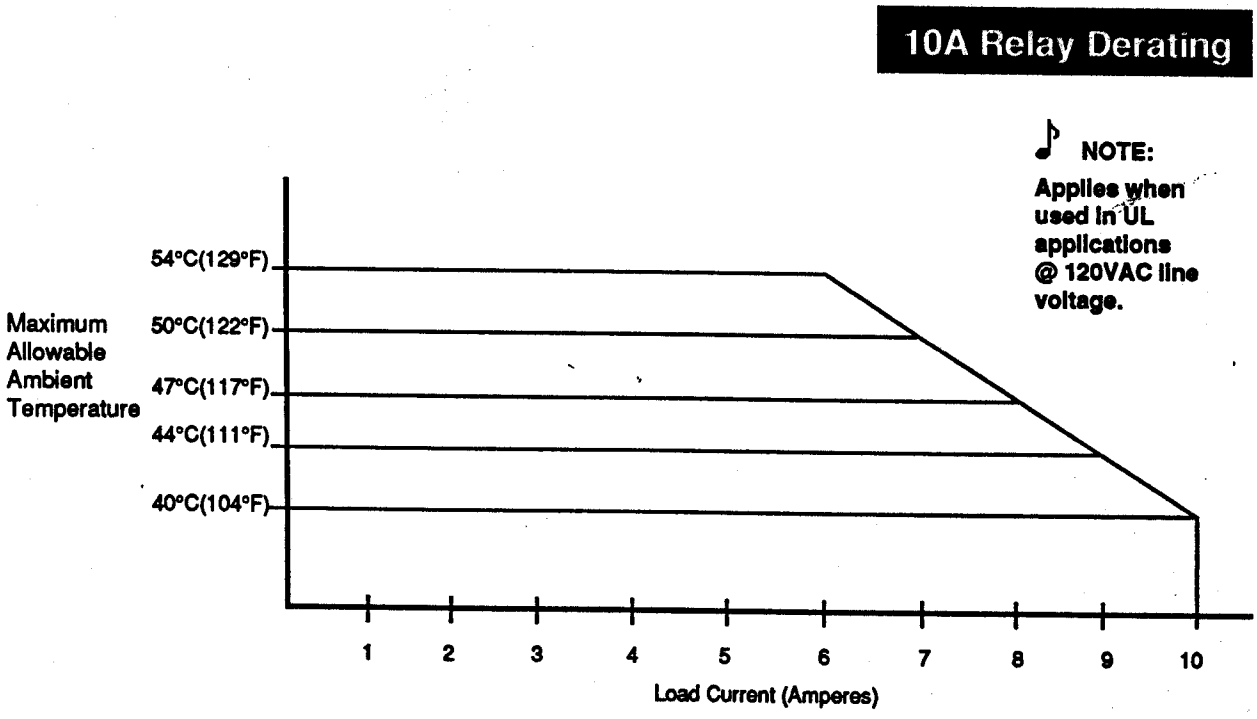
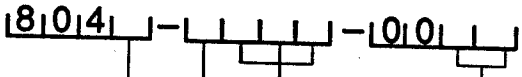


Figure 1 - Temperature Derating Curve for 10A Relay

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Ordering Information



Control

Series 804= Digital indicator; closed loop temperature control with TP/MR or ON/OFF; T/C, RTD, or electrical input and interface capability; 1/4 DIN.

Output

- 0 = None, indicating only.
- A = Mechanical Relay, Form C, 10A.
- B = Triac, 1A, resistive.
- C = Triac, 15A, resistive.
- D = Switched DC, open collector, non-isolated.

Control Mode

- 0 = None, indicating only.
- 1 = ON/OFF.
- 2 = Time proportioning with manual reset.

Input & Range

RTD

100 =	#3916	-99	to	999°F
101 =	#3916	-99	to	540°C
108 =	#3916	0.0	to	399.9°F
109 =	#3916	0.0	to	399.9°C
120 =	#3850	-99	to	999°F
121 =	#3850	-99	to	540°C
128 =	#3850	0.0	to	399.9°F
129 =	#3850	0.0	to	399.9°C

Thermocouple

600 =	J	-99	to	999°F
601 =	J	0	to	1600°F
602 =	J	0	to	850°C
603 =	K	0	to	999°C
604 =	K	0	to	2500°F
605 =	T	-99	to	600°F
606 =	K	0	to	1370°C

Electrical

701 = Process, 4-20mA/0-5VDC

0	to	999	or
0.0	to	99.9	

Faceplate

- 00 = Gray with white bars.
- WW = Black with white lettering.

Related Devices

- Extender, #Z100-0421-0000 to facilitate installation tuning.
- Mechanical Relay, 10A, Plug-in: #0003-0073-0000.
- Triac, 15A: #0802-0291-0000.

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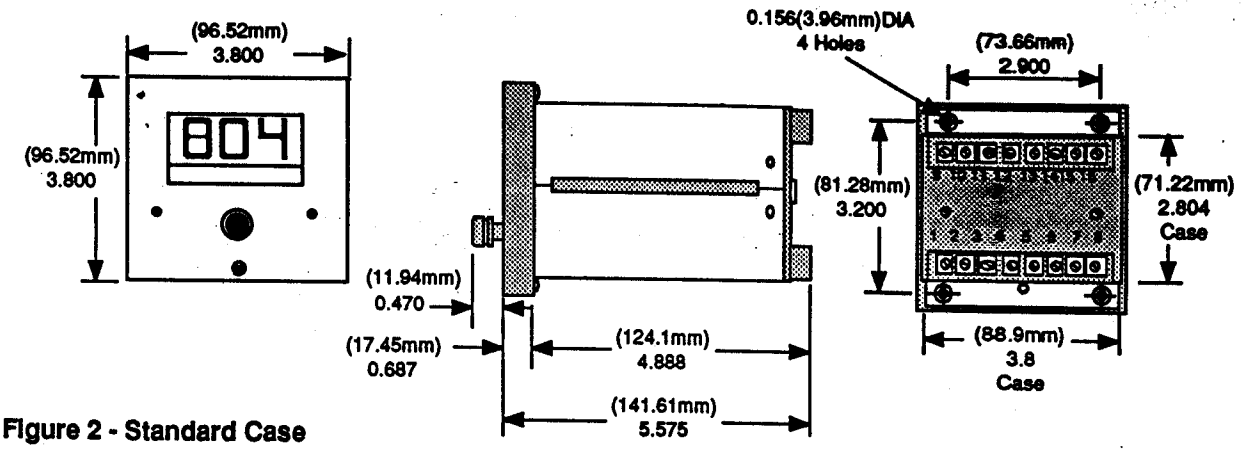


Figure 2 - Standard Case

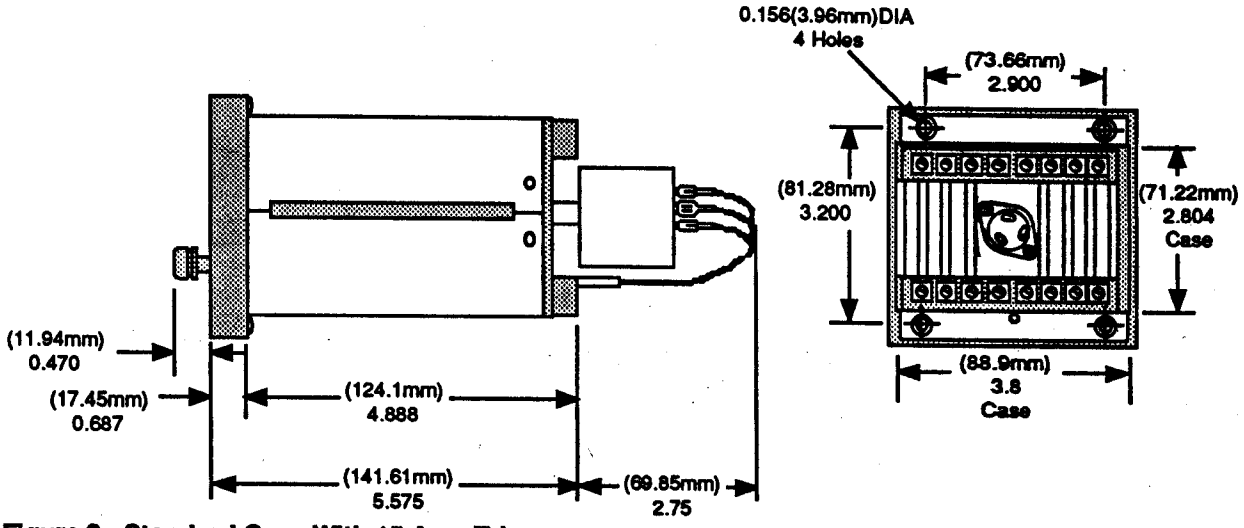


Figure 3 - Standard Case With 15 Amp Triac

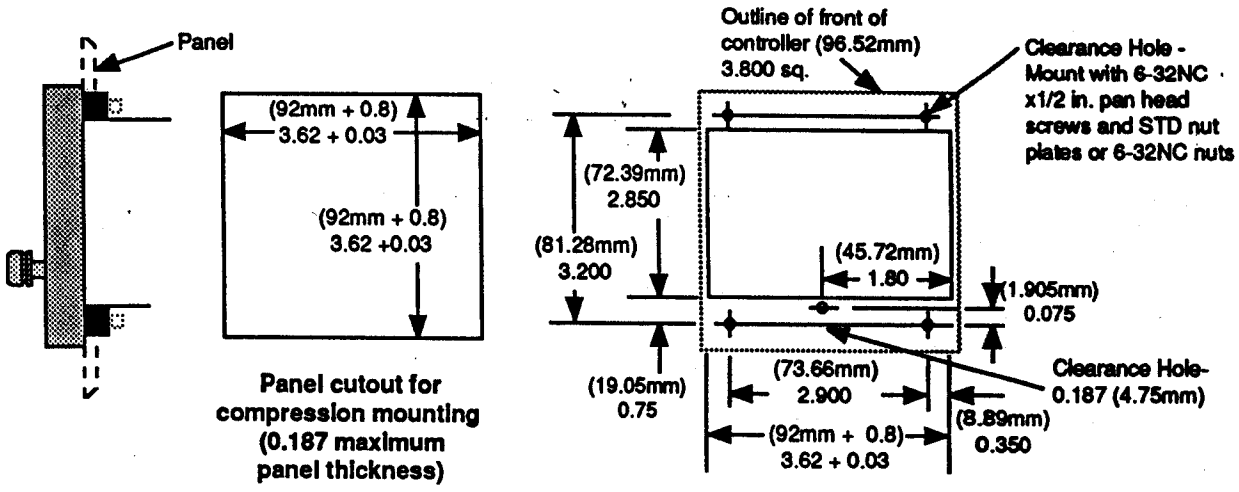


Figure 4 - Mounting Requirements

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Line Voltage

WARNING:

To avoid potential electric shock, use National Electric Code safety practices when wiring and connecting this unit to a power source and to electrical sensors or peripheral devices.

All wiring and fusing should conform to the National Electric code and to any locally applicable codes also.

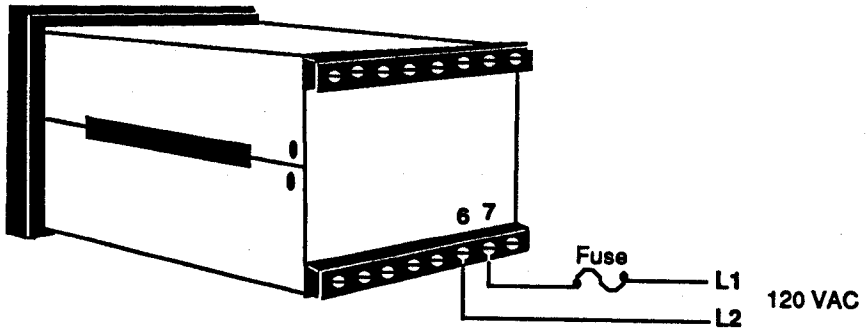


Figure 5 - 120 VAC Power Wiring

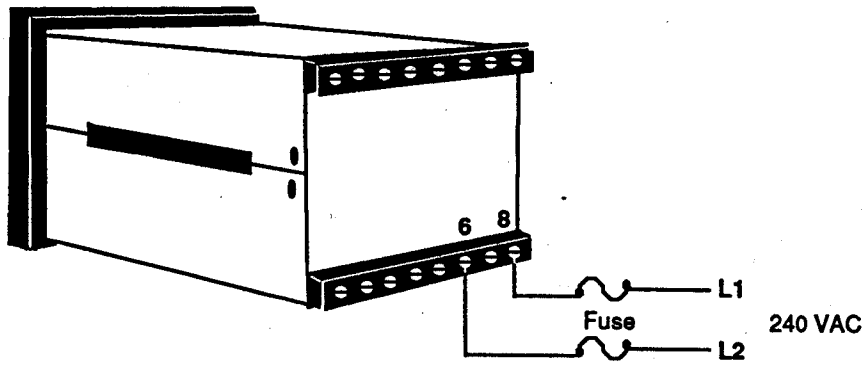


Figure 6 - 240 VAC Power Wiring

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Input - Terminals 9 through 16

Wire your unit according to the figures showing the correct input and output.

For models with **Electrical Process Input** (Range #701) see Pages 11 & 12.

Thermocouple Input
Terminal Designations

9. T.C. (+)	Sensor
10. Not used	
11. T.C. (-), Red	
12. Not used	
13. Set point (+) out	
14. Programmer (+) in	
15. Signal conditioner (+) out	
16. Circuit common	

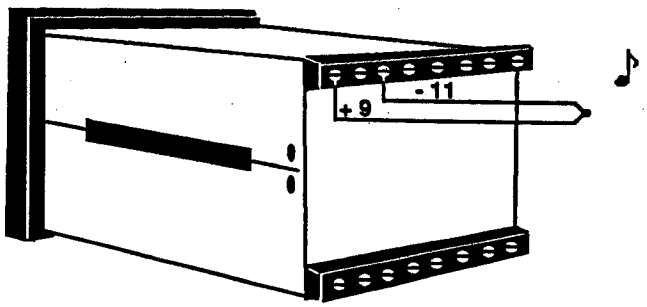


Figure 7 - Thermocouple Input (804X-X6XX-00XX)

For programmer input refer to
Pages 9 and 10, Figures 13, 14, and 15.

NOTE:
You must use an isolated or ungrounded thermocouple if programmer circuit common is not isolated from earth ground. Extension wire for thermocouples must be of the same alloy, as the thermocouple itself, to limit errors.

Platinum RTD Input
Terminal Designations

9. S1
10. Not used
11. S2
12. Not used
13. Set point (+) out
14. Programmer (+) in
15. Signal conditioner (+) out
16. Circuit common, S3

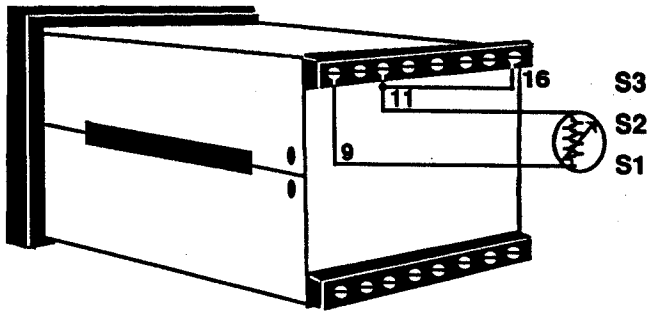


Figure 8 - RTD Input (2 wire) (804X-X1XX-00XX)
Jumper S2 (Terminal 11) to S3 (Terminal 16)

For programmer input refer to
Pages 9 and 10, Figures 13, 14, and 16.

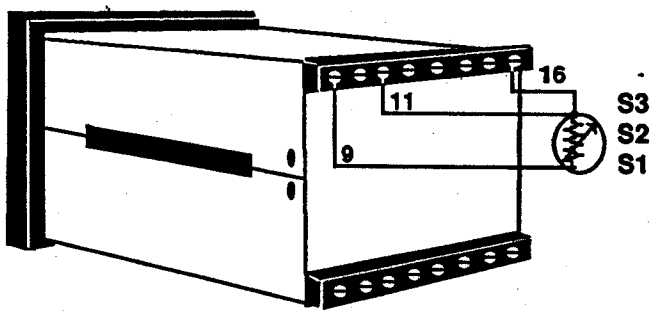


Figure 9 - RTD Input (3 wire) (804X-X1XX-00XX)

NOTE:
Long lead lengths create electrical resistance. There will be approximately +2°C input error for every 1Ω of lead length resistance, when using a two wire RTD. That resistance, when added to the resistance of the RTD element, can result in erroneous input to the instrument. To overcome this problem, use a three wire RTD sensor, which compensates for lead length resistance. When extension wire is used for a three wire RTD, all three extension wires must have the same electrical resistance. (i.e. same gauge, copper stranded).

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Output Wiring

Output - Terminals 1 through 8

NOTE:

8040 Indicator - Terminals 1 through 5 not used.

WARNING:

All wiring and fusing must conform to the National Electric Code NFPA70. Contact your local board for additional information. Failure to observe NEC safety guidelines could result in injury to personnel.

Terminal Designations

1. Not used
2. Not used
3. N.C. ┐ Contact Rated
4. N.O. ├ 240V Max.,
5. C. ┘ 5amp R.M.S.
6. AC line common, L2
7. 120V line, L1
8. 240V line, L1

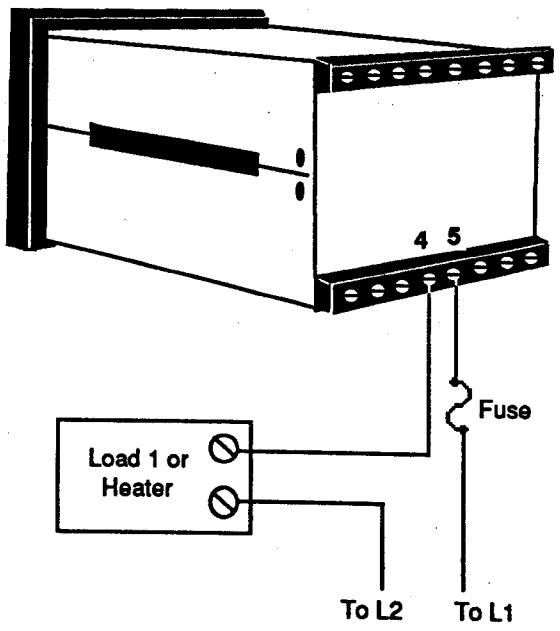
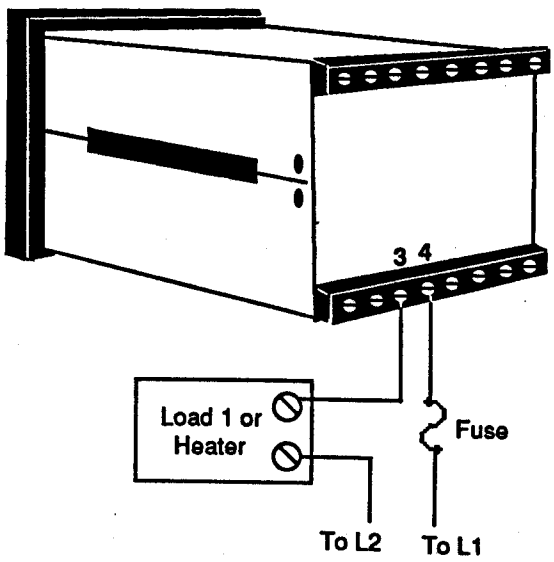


Figure 10 - 10A Mechanical Relay Output (804A-XXXX-00XX)

Terminal Designations

1. Not used
2. Not used
3. T1 ┐ N.O. Solid State
4. T2 ┘ Output
5. Gate (for external triac)
6. AC line common, L2
7. 120V line, L1
8. 240V line, L1



CAUTION:

Terminal 5, Gate (for external triac) is for internal use only. Any external wiring to terminal 5 may damage the control.

Figure 11 - Triac Output, 1A or 15A (804B-XXXX-00XX or 804C-XXXX-00XX)

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Output Wiring

Terminal Designations

1. Not used
2. Not used
3. + ┐ Switched
4. - ┘ DC output
5. Not used
6. AC line common, L2
7. 120V line, L1
8. 240V line, L1

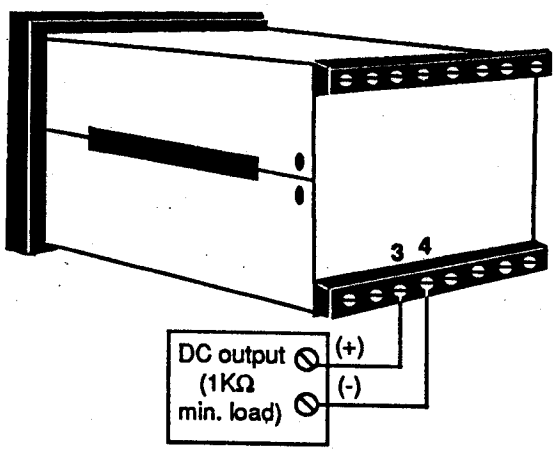


Figure 12 - Switched DC (open collector) Output (804D-XXXX-00XX)

Programmer Input Wiring

Programmer Input
Terminal Designations

12. Not used
13. Set point (+) out
14. Programmer (+) in
15. Signal conditioner (+) out
16. Circuit common

NOTE:

Remove appropriate internal jumper wire if you are using the programmer input. They must be removed, or the Series 804 will not function correctly. See Pages 10 and 11, Figures 15, 16 or 18.

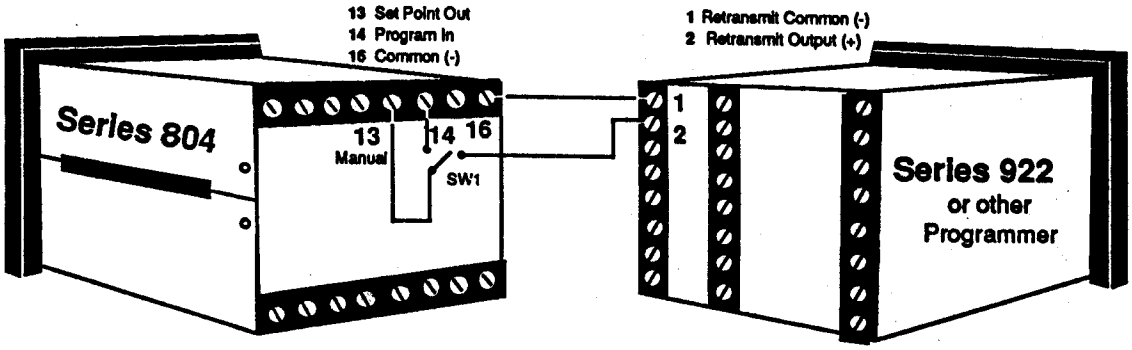
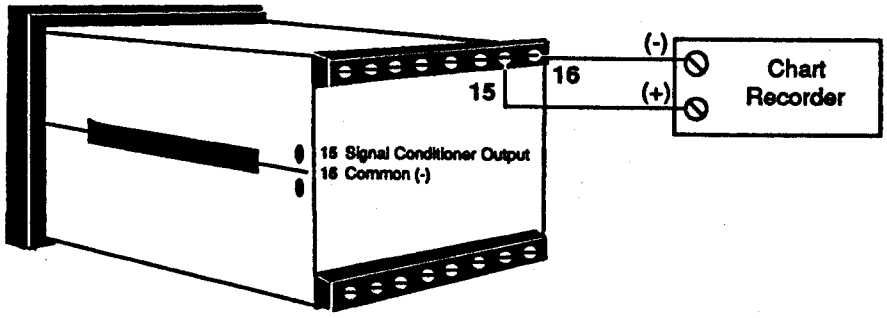


Figure 13 - Local/Remote Set Point With Programmer



NOTE:
Use dry circuit for SW1
(SW1 customer supplied)

Figure 14 - Signal Conditioner Output With Chart Recorder

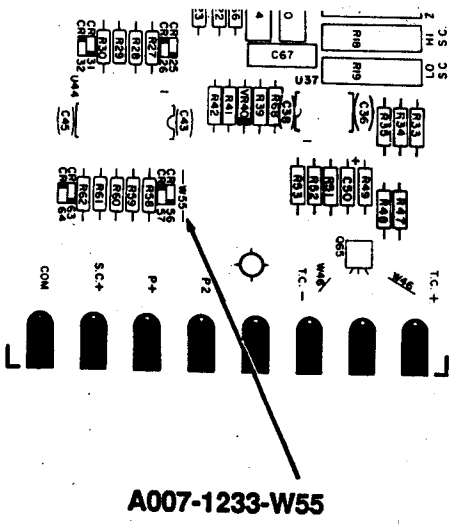
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Programmer Input Jumper Locations

CAUTION:

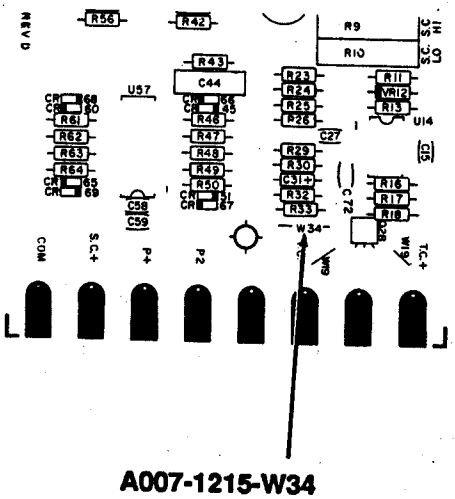
These jumpers are soldered onto the printed circuit board. They must be removed when using a programmer input, or the 804 will not function correctly. The jumper may be a white insulated wire or a zero ohm resistor with 1 black band.

3 Digit Display Unit



A007-1233-W55

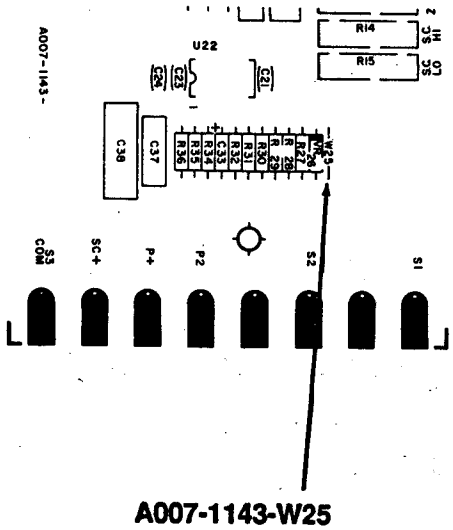
4 Digit Display Unit



A007-1215-W34

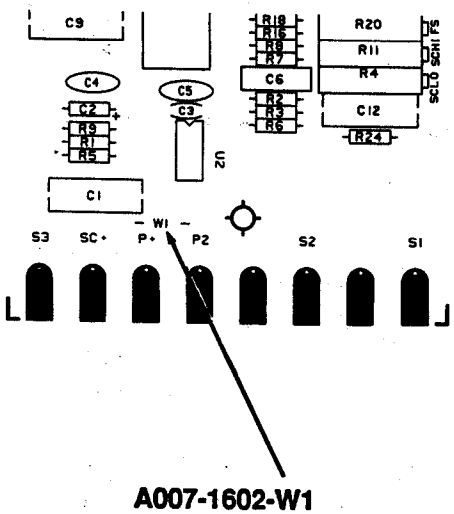
Figure 15 - Thermocouple Unit

3 Digit Display Unit



A007-1143-W25

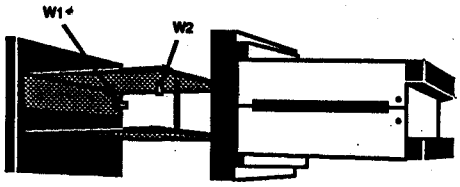
4 Digit Display Unit



A007-1602-W1

Figure 16 - RTD Unit

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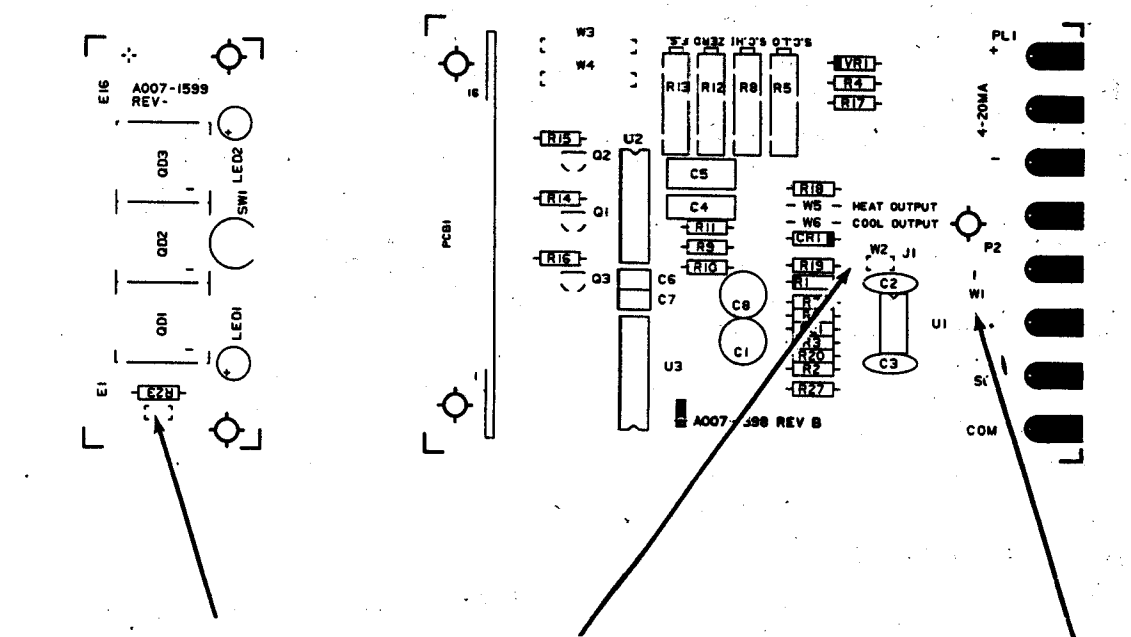


Three dimensional drawing of Range #701 removable jumper block positioning.

Electrical Process Input Terminal Designations

9. 4-20mA, (+) in
10. Not used
11. (-) in
12. Not used
13. Set point (+) out
14. Programmer (+) in
15. Signal conditioner (+) 0-5VDC
16. Circuit common

Figure 17 - Decimal Display Jumper Positioning



A007-1599-W1
Decimal
removable jumper block

A007-1598-W2
4-20mA/0-5VDC
removable jumper block

A007-1598-W1
Programmable
Soldered in

Figure 18 - Electrical Process Range #701 Jumper Locations

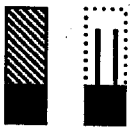
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Electrical Process Input Wiring

To use the Electrical Process Input, you must set jumper W1 for decimal display or no decimal display, and you must set Jumper W2 for 4-20mA input or 0-5VDC input. Figure 17 on Page 11 shows you where the jumpers are located. Figures 19 - 21 shows you how to place the jumpers.

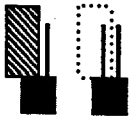
Decimal Display

Decimal Display:
Install Jumper W1



Jumper
Installed

No Decimal Display:
Remove Jumper W1

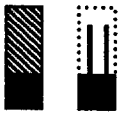


Jumper Removed
(Save Cap)

Figure 19 - Decimal Display Options

4-20mA Input

Install Jumper W2



Jumper
Installed

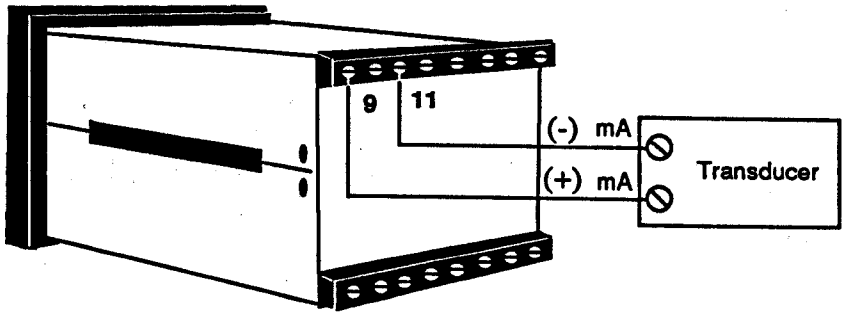
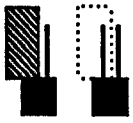


Figure 20 - 4-20mA Electrical Process Input

NOTE:
For 0-5VDC Input, you must remove Jumper W2.

0-5VDC Input

Remove Jumper W2



Jumper Removed
(Save Cap)

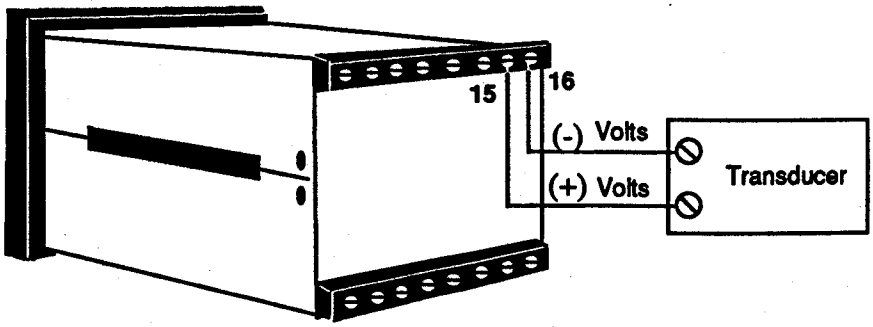


Figure 21 - 0-5VDC Electrical Process Input

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Single Phase 120VAC Application

WARNING:

Install high or low temperature limit control protection in systems where an overtemperature or undertemperature fault condition could present a fire hazard or other hazard. Failure to install temperature limit control protection where a potential hazard exists could result in damage to equipment and property, and injury to personnel.

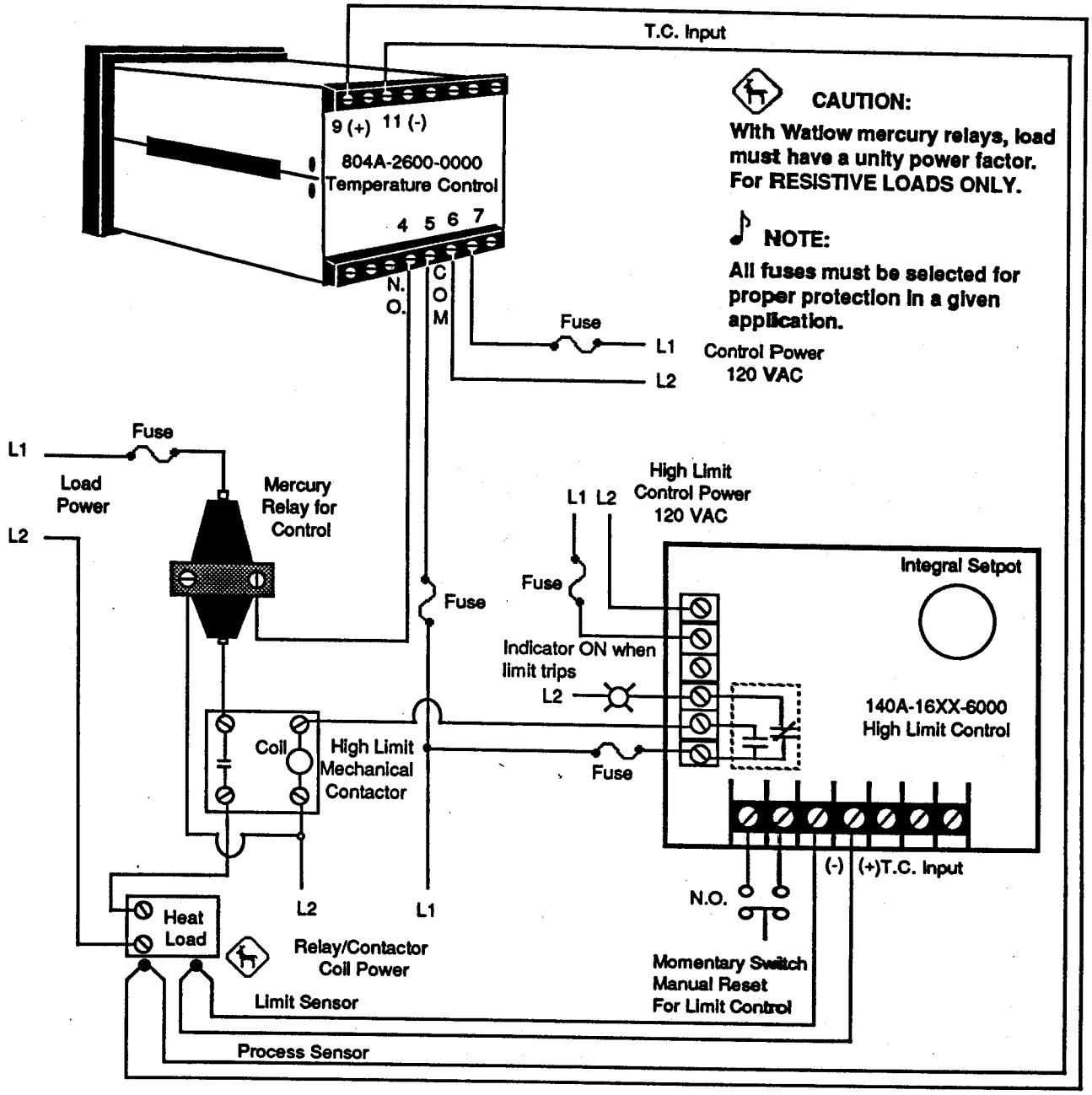


Figure 22 - Series 804 System Wiring Example

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RTD Field Calibration Procedure

NOTE: All pots are on the upper board.

NOTE:

This calibration information is provided as a service. Proper field calibration can be achieved by following this procedure. If your control is in warranty, that warranty will be void if this field calibration procedure is performed improperly.

Platinum RTD Input

Equipment Required:
- 100Ω decade resistance box.
- Digital voltmeter (DVM).
- Extender board may be used for ease of servicing, Watlow P/N Z100-0421-0000. (Optional)

Procedure:
Refer to Table 1 below for the values that apply to your unit's range code.

1. Connect the decade resistance box to input terminals 9 and 11, with 11 jumpered to 16. Connect the digital voltmeter to terminals 15 (+) and 16 (-). Install the extender board into the case if one is in possession.

   Connect power to the control. Let the control stabilize before calibration begins.

2. Set the decade box to _____ Lo ohms. Adjust SC Lo pot for _____ SC Lo volts on the digital voltmeter. Adjust the Zero pot for _____ Lo Temp on the display of the control.

3. Set the decade box to _____ Hi ohms. Adjust SC Hi pot for _____SC Hi volts on the digital voltmeter. Adjust the FS pot for _____ Hi Temp on the display of the control.

4. Repeat Steps 2 and 3 until all of the readings are correct with no further adjustments necessary.

5. Check the midpoint of the temperature range ± 0.25% of span.

Table 1- RTD Input Calibration Values

Range			Ohms vs.Temperature							
Code	Low/High	Cal. Curve	Lo Ohms	SC Lo Volts	Lo Temp	Mid Ohms	Mid Temp	Hi Ohms	SC Hi Volts	Hi Temp
100	-99 - 999°F	#3916	92.93Ω	.000V	0°	199.37Ω	500°	294.91Ω	4.95V	990°
101	-99 - 540°C	#3916	100.00Ω	.000V	0°	195.70Ω	250°	297.50Ω	2.70V	540°
108	0.0 - 399.9°F	#3916	97.35Ω	.40V	20°	136.59Ω	200°	176.73Ω	7.80V	390°
109	0.0 - 399.9°C	#3916	107.93Ω	.40V	20°	177.14Ω	200°	246.08Ω	7.80V	390°
120	-99 - 999°F	#3850	93.03Ω	.000V	0°	197.69Ω	500°	291.56Ω	4.95V	990°
121	-99 - 540°C	#3850	100.00Ω	.000V	0°	194.07Ω	250°	294.11Ω	2.70V	540°
128	0.0 - 399.9°F	#3850	97.39Ω	.40V	20°	135.97Ω	200°	175.43Ω	7.80V	390°
129	0.0 - 399.9°C	#3850	107.79Ω	.40V	20°	175.84Ω	200°	243.59Ω	7.80V	390°

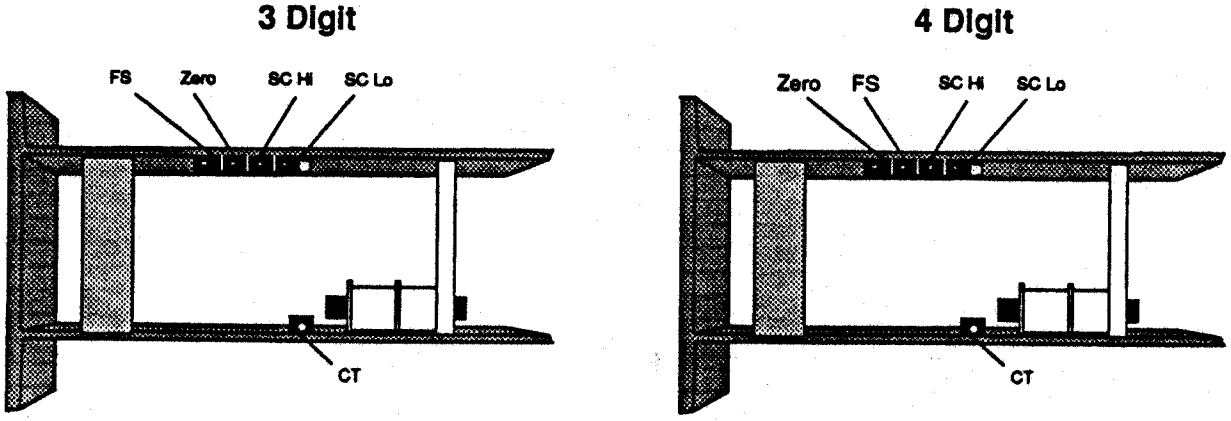


Figure 23 - Series 804 RTD Potentiometer Locations (left side)

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T/C Field Calibration Procedure

NOTE: All pots are on the upper board.

NOTE:

This calibration information is provided as a service. Proper field calibration can be achieved by following this procedure. If your control is in warranty, that warranty will be void if this field calibration procedure is performed improperly.

Thermocouple Input

Equipment Required:
- Precision millivolt source.
- Digital voltmeter (DVM).
- Appropriate type reference compensator with reference junction at 32°F/0°C.
- Extender board may be used for ease of servicing, Watlow P/N Z100-0421-0000. (Optional)

Procedure:
Refer to Table 2 below for the values that apply to your unit's range code.

1. Connect the millivolt source to the reference compensator and compensator leads to the T/C inputs, terminals 9 (+) and 11 (-). Connect a digital voltmeter to terminals 15 (+) and 16 (-). Install the extender board into the case if one is in possession.

   Connect power to the control. Let the control stabilize before calibration begins.

2. Set the millivolt source to _____ Lo mV. Adjust SC Lo pot for _____ SC Lo volts on the digital voltmeter. Adjust the Zero or Lo pot for _____ Lo Temp on the display of the control.

3. Set the millivolt source to _____Hi mV. Adjust SC Hi pot for _____ SC Hi volts on the digital voltmeter. Adjust the FS or Hi pot for _____ Hi Temp on the display of the control.

4. Repeat steps 2 and 3 until all of the readings are correct with no further adjustment necessary.

5. Check the midpoint of the temperature range ± 0.25% of span.

Table 2 - Thermocouple Input Calibration Values

Range			Millivolt vs. Temperature							
Code	Low/High	TC Type	Lo mV	SC Lo Volts	Lo Temp	Mid mV	Mid Temp	Hi mV	SC Hi Volts	Hi Temp
600	-99 - 999°F	"J"	0mV	.160V	32°	14.11mV	500°	29.20mV	4.95V	990°
601	0 - 1600°F	"J"	0mV	.064V	31°	23.32mV	800°	50.05mV	3.20V	1600°
602	0 - 850°C	"J"	0mV	.000V	0°	21.85mV	400°	42.28mV	3.75V	750°
603	0 - 999°C	"K"	0mV	.000V	0°	20.64mV	500°	40.88mV	4.95V	990°
604	0 - 2500°F	"K"	0mV	.064V	32°	26.96mV	1200°	54.85mV	5.000V	2500°
605	-99 - 600°F	"T"	0mV	.160V	32°	6.647mV	300°	15.77mV	3.000V	600°
606	0 - 1370°C	"K"	2.02mV	.100V	50°	29.13mV	700°	54.13mV	2.70V	1350°

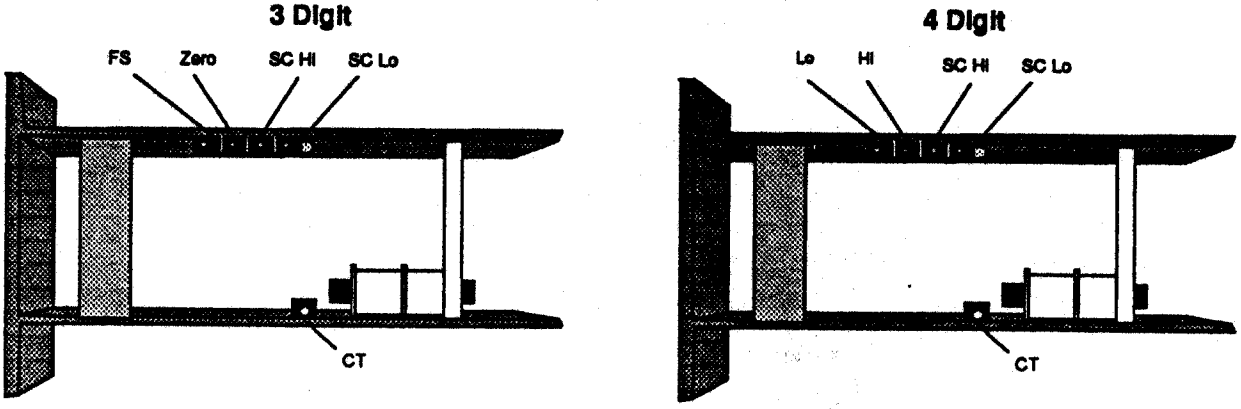


Figure 24 - Series 804 T/C Potentiometer Locations (left side)

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Glossary

1. **ON/OFF** - The output is turned full ON below set point and stays turned on until the process temperature reaches set point, then the controller turns the output full OFF. At this point depending on the design of the thermal system, the process temperature will overshoot the set point temperature by some degree.

   As the load cools down below set point (an amount equal to the switching sensitivity or differential) the output is once again turned full ON.

2. **Switching Sensitivity or Differential** - The output will de-energize when the actual temperature reaches the set point temperature. The switching sensitivity or differential is the drop in temperature (°F/°C) required to re-energize the output.

3. **Proportional Band** - In a straight time proportional control system when the actual process temperature is below set point and outside the proportional band limit, 100% power is applied to the load.

   When the actual process temperature is above set point and outside the proportional band limit, 0% power is applied to the load.

   When the actual process temperature is within the proportional band, the controller will proportion the amount of power applied to the load, 0 to 100%.

4. **Temperature Droop** - Phenomenon that occurs in a proportional control system without reset. As the proportional band is increased, the average process temperature may drop to a point that is not the set point temperature. This action takes place even though the load has stabilized.

5. **Manual Reset or Offset** - Adjustment used in control systems to offset any temperature droop and obtain agreement between actual process temperature and controller set point.

6. **Time Proportioning w/Manual Reset** - The output is turned full ON until the process temperature reaches the proportional band. Once in the proportional band the output is cycled ON/OFF in proportion to the degree of difference between actual process temperature and controller set point.

   When the process temperature is just entering the proportional band the output may cycle 90% ON and 10% OFF. When the process temperature is near set point the output may cycle 10% ON and 90% OFF. When the process temperature is above the proportional band the output is turned full OFF.

   After the system has stabilized a phenomenon occurs in a proportional control system called droop. This happens in virtually all proportional control systems. The manual reset adjustment is used to compensate for any temperature droop and obtain agreement between set point temperature and desired actual process temperature.

7. **Temperature Oscillation or Hunting** - Occurs when the proportional band is too narrow or the system is upset by some outside source. The actual process temperature is not controlled within the proportional band on its extreme temperature excursions.

   Load temperature may never stabilize. Control is either full ON or full OFF, not within the proportional band.

8. **Cycle Time** - Time interval between consecutive turn ons.

9. **Zero Switching** - Load is activated only during the time period that the sine wave is going through zero. This eliminates RFI and EMI radiation (applies to solid state outputs only).

10.  or  - Musical notes are used to alert you to important details.

11.  The Stop Sign alerts you to a **"WARNING,"** a safety hazard which could affect you and the equipment.

12.  The Deer Crossing Sign alerts you to a **"CAUTION,"** a safety or functional hazard which could affect your equipment or its performance.

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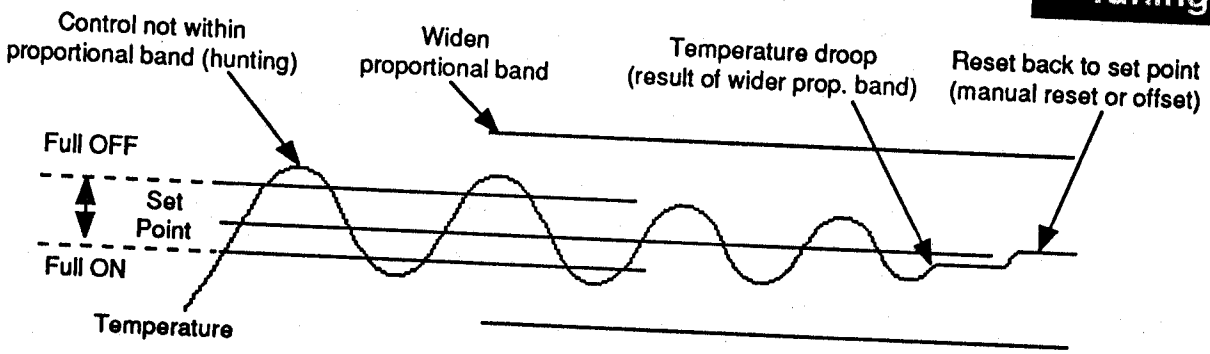


Figure 25 - Adjustment Graph

Tuning Procedure for Time Proportioning Controls w/Manual Reset

Initial Settings:

1. Proportional Band: Turn maximum clockwise; CW (widest setting)
2. Manual Reset: Turn to mid-range
3. Cycle Time: Turn maximum counterclockwise; CCW (fastest time)

Energize the system and allow the process temperature to stabilize. When the system is stable, the load light will cycle at a constant rate.

Proportional Band Adjustment:
Rotate the proportional band pot CCW 1/4 turn and observe system stability. Repeat until the process temperature begins to hunt (becomes unstable). When hunting is observed, rotate pot CW, in small increments, until the system becomes stable. Some systems may be stable enough to allow minimum proportional band setting (maximum CCW).

Manual Reset:
In virtually all proportional control systems the average process temperature may drop to a point that is not the set point temperature. This action takes place even though the process temperature has stabilized.

Monitor the actual process temperature on the digital indicator. Adjust the manual reset pot slowly CW if the process temperature stabilized below set point temperature. Adjust CCW if the process temperature stabilized above set point temperature. If large changes in set point temperature are made, readjustment of the manual reset may be required.

Cycle Time:
Set as required. Best control is always achieved with faster cycle times. However, if a mechanical contactor or solenoid is used to switch power to the load, slower cycle times may be desirable to minimize the wear on the mechanical components.

Cycle time pot is located internally on the bottom board, right side.

Tuning Procedure for ON/OFF Control w/Sensitivity and Offset

Initial Settings:

1. Switching sensitivity: Turn to mid-range
2. Offset: Turn to mid-range

Energize the system and allow to stabilize. When stable the load light cycles at a constant rate.

Switching Sensitivity Adjustment:
May be adjusted from 1°F/°C(CCW) to 5°F/°C(CW). Set the sensitivity adjustment maximum CCW if a narrow temperature differential is desired. Adjust the sensitivity maximum CW to increase the life of a mechanical contactor if the temperature differential is not critical.

Offset Adjustment:
Adjust the offset pot slowly CW until agreement is obtained if the average process temperature is lower than the set point temperature indicated on the display. Adjust the offset pot slowly CCW until agreement is obtained, if the average process temperature is above the set point temperature.

NOTE: Both pots are located internally on the bottom board, right side.

NOTE: For ease of adjusting, order extender board - Watlow P/N Z100-0421-0000.

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Troubleshooting Chart

Problem	Probable Cause	Action
No display.	The A.C. input is not connected or is connected improperly.	Check the A.C. input connections. If not present or correct, connect per Wiring outputs. See Page 6, Figures 5 & 6. If present and correct, return the unit to the factory.
The display indicates EEE or OFL.	1. An open thermocouple or RTD.	Repair or replace.
	2. For a 2 wire RTD - A jumper is not being used between S2 and S3.	Connect per Wiring inputs. See Page 7, Figure 8.
A Display Error.	The sensor is connected improperly	Check the sensor location, connections, and the sensing element. Repair or replace the sensor as required. A. Thermocouple - Place a jumper wire across theTC terminals. Indicator is functioning correctly if the display indicates room temperature. B. RTD - Place a 100Ω resistor across the sensor terminals. The indicator is funtioning properly if the display indicates approximately 0°C/32°F.
Poor temperature control.	Control parameters are not adjusted properly.	Adjust the proportional band, cycle time, and the manual reset per Tuning. See Page 17.
The load will not turn ON.	1. An open thermocouple or RTD.	Repair or replace the sensor.
	2. The load circuit is open.	Check the fuses, circuit breakers and the load.
	3. A faulty unit.	Contact the factory.
The load will not turn OFF.	1. The polarity is reversed on the TC.	Connect per the Wiring Inputs. See Page 7, Figure 7.
	2. A short ciruit between T1 and T2.	With the power OFF, measure the resistance from T1 to T2 (Pins 3 & 4); if it is short circuited, order P/N 0802-0291-0000 for a 15A triac. For 1 amp units, contact the factory.
Cannot control the unit with an external programmer.	The internal jumper wires are not removed.	Remove the correct jumper wires depending on your unit. See Jumper Locations Pages 10 or 11, Figures 15, 16, or 18.

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Warranty

The Watlow Series 804 is warranted to be free of defects in material and workmanship for 18 months after delivery to the first purchaser for use, providing that the units have not been misapplied.

Since Watlow has no control over their use, and sometimes misuse, we cannot guarantee against failure. Watlow's obligations hereunder, at Watlow's option, are limited to replacement, repair or refund of purchase price, and parts which upon examination prove to be defective within the warranty period specified. This warranty does not apply to damage resulting from transportation, alteration, misuse or abuse.

Shipping Claims

When you receive your Watlow control, examine the package for any signs of external damage it may have sustained enroute. If there is apparent damage either outside the box or to its contents, make a claim with the shipper immediately. Save the original shipping carton and the packing material.

Returns

The following procedure applies for any products returned to the factory:

1. Call Watlow Customer Service, 507/454-5300, for a Return Material Authorization (RMA) number before returning any item for repair. We need this information:
   - Ship to address
   - Bill to address
   - Contact name
   - Phone number
   - Ship via
   - Your P.O. number
   - Symptoms and/or special instructions
   - Name and phone number of person returning the material.

2. Prior approval and an RMA number, from the Customer Service Department, is needed when returning any unused product for credit. Make sure the RMA number is on the outside of the carton, and on all paper work returned. Ship on a Freight Prepaid basis.

3. After we receive your return, we will examine it to determine the cause for your action.

4. In cases of manufacturing defect, we will enter a repair order, replacement order or issue credit for material. There is a 20% restocking charge on all controls and accessories returned within 120 days after shipment from Watlow. We cannot accept any product after that time period.

5. If the unit is unrepairable, we will return it to you with a letter of explanation. Repair costs will not exceed 50 percent of the original cost.

Watlow Controls

Watlow Controls is a division of Watlow Electric Manufacturing Company of St. Louis, Missouri. Watlow is an established manufacturer of industrial electric heating products, in business since 1922. Watlow boasts the ability to begin with a full set of specifications and to complete an industrial product that is manufactured totally in-house, in the U.S.A. Products designed and manufactured by Watlow are electric heating elements, sensors, electronic temperature controls and power switching devices.

The Watlow Controls operation has been designing solid state electronic control devices since 1962, and has earned the reputation as an excellent supplier to original equipment manufacturers. These OEMs depend upon Watlow Controls to provide compatibly engineered controls which they can incorporate into their products with confidence.

Watlow Controls resides in a 100,000 square foot marketing, engineering and manufacturing facility in Winona, Minnesota.

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