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APPENDIX D-11 HEAT TRACE

- CHROMALOX 3290 Multiple Loop Temperature Controller
- Digitrace JBS-100-ECW-A

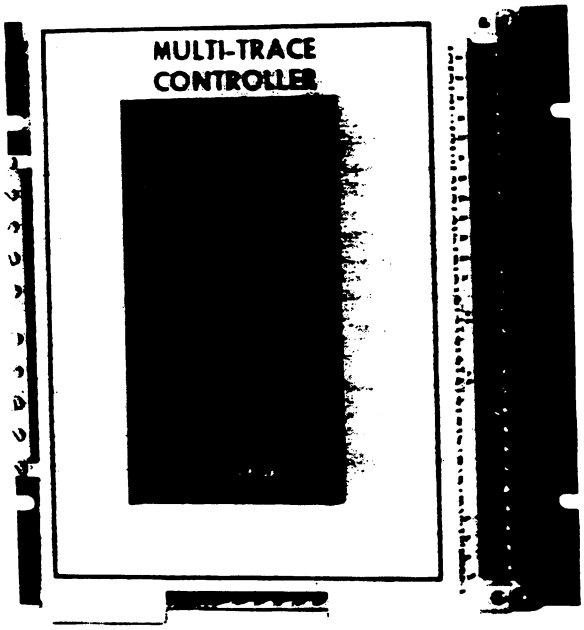
Chromalox®

SERVICE REFERENCE		
DIV.	SEC. 3290	NUMBER 1
SALES REFERENCE	0037-75087	
DATE January 1986		

Installation Instructions

START-UP and SERVICE MANUAL

3290 MULTIPLE LOOP ON-OFF TEMPERATURE CONTROLLER



INDEX

1.0 MODEL IDENTIFICATION

MODEL	MULTIPLE LOOP ON-OFF TEMPERATURE CONTROLLER
3290	10 Channel On-Off Controller, 120 or 230 VAC Input, Field Selectable
3295	5 Channel On-Off Controller, 120 or 230 VAC Input, Field Selectable

CODE	OUTPUT
2	Triac, 2 Amps at 25° C, 120 or 240 VAC line
7	Solid State Relay Drive Output, 20 Vdc at 20 mA

CODE	
00	Add to Complete Model Number

CODE	INPUT TYPE	SETPOINT RANGE	PROCESS RANGE
44	100 Ohm RTD	0 to 1000°F	– 100 to 1000°F
54	500 Ohm RTD	0 to 1000°F	– 100 to 1000°F

3290	— 2	00	54	Typical Model Number

FIGURE 1-1. MODEL TABLE

NOTE: The contents of this Instruction Manual refer to both the 10-Channel and 5-Channel models of the 3290 Series. Instructions and references are given for 10 control channels. The 5-Channel model (3295) is identical in function, however, control channels 6-10 and the associated program numbers for those channels are not operational and should be ignored.

2.0 GENERAL DESCRIPTION

The Chromalox Model 3290 Series Controller is an advanced, micro-processor-based instrument that allows maximum user flexibility through front panel display and convenient programming of all control parameters. It functions as a digital, ON/OFF multiple input-output controller, capable of accepting up to 10 RTD sensor inputs and providing up to 10 triac or solid state relay drive outputs. The individual channel Disable/Enable feature allows the operator to select operation of any of the 5 or 10 channels provided. Each individual channel can be programmed for process set point and high and low alarm set points, or the Gang Programming features can be used to program set points for all channels in one operation. Additionally, individual channel dead band can be selected. The menu listing of all programmable control parameters and features allows quick and easy field changes as user control needs change, making the 3290 Multi-Trace adaptable to most any multi-channel control application.

Control action is reverse acting (heating), and individual control channel "power on" is indicated by an LED. Two normally energized or normally de-energized (programmable) alarm relay outputs are provided; one high alarm common and one low alarm common. Individual channel latching alarm condition is indicated by LED's on the front panel, and if selected, the first channel to reach alarm condition will be indicated by a flashing LED.

Other flexible characteristics of the 3290 Multi-Trace include Temperature Scale Selection (°C or °F), selection of the control output rate of update, and the ability to establish process set point limits for sensitive control applications. Both standard and narrow range calibration can be performed from the front panel. All programmable control, alarm and calibration parameters are protected selectively by 2 password levels of security.

The reliability of the 3290 controller is enhanced by the incorporation of "watch dog" timer circuits in its design. All programmed information is stored in non-volatile memory (EE PROM), so no battery backup is required to retain information in the event of a power failure. False alarms do not occur on initial power up or re-power up after power failure.

The 3290 Multi-Trace is designed for either subpanel or panel mounting configurations. Subpanel mounting, with the controller enclosed inside a panel, gives the option of remote operation for explosion-proof or weatherproof applications. Panel mounting, with the Multi-Trace installed on the panel door, allows external operation and programming of all control parameters, while saving valuable internal panel space.

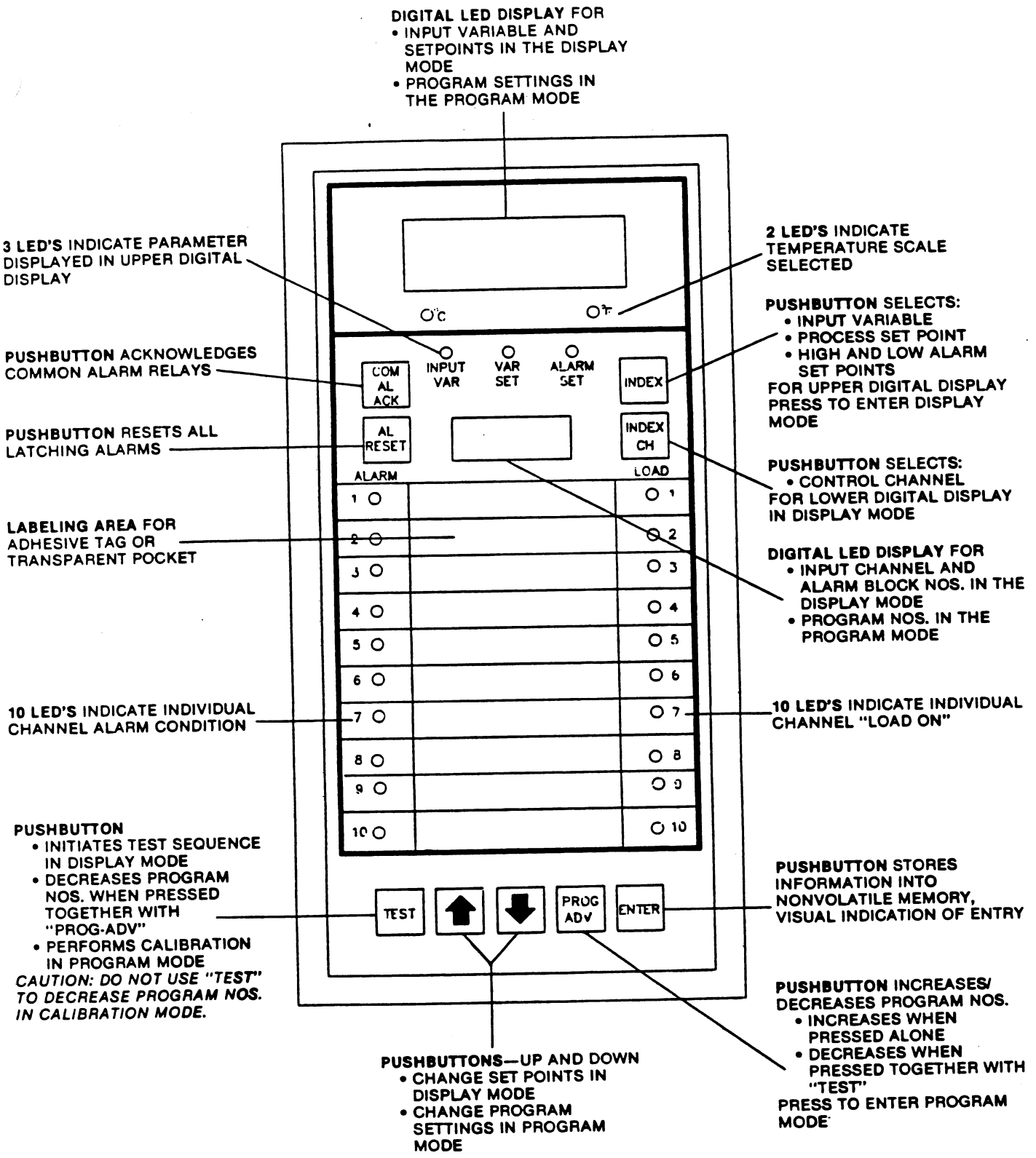


FIGURE 1-2. FRONT PANEL IDENTIFICATION

3.0 SPECIFICATIONS

INPUTS

OPTIONS	100 Ohm, 3 wire platinum RTD 500 Ohm, 3 wire platinum RTD
Temperature Stability	< 0.1 °F per 1 °F ambient change
Sensor Current	< 5 mA nominal
RTD Leadwire Compensation	< 3.0 °C for 20 Ohm balanced leadwire resistance
Common Mode Noise Rejection	< ± 1.0 °C with 230 V, 60 Hz applied from sensor to instrument case
Series Mode Noise Rejection	< ± 1.0 °C with 250 mV, peak-to-peak 60 Hz signal
Isolation	Triac output option provides optical isolation

CONTROL OUTPUTS

Triac Output	Zero crossover fired 2 amps at 120 or 230 VAC, 25 °C Derates to 1.5 amps at 130 °F (54 °C) 10 amp inrush
Solid State Relay Drive Output	20 Vdc nominal at 20 mA

ON/OFF CONTROL SPECIFICATIONS

Dead Band	Programmable, 0.5 to 50.0 (°F), 0.1° increments
Control Action	Reverse acting (heating), control output turns on with decreasing temperature
Open Sensor Protection	Control output turns off, high alarm activates

ALARM SPECIFICATIONS

Relays	Two (2) Form C, SPDT Relay Contacts — One (1) High Alarm Common and One (1) Low Alarm Common Normally energized or de-energized, programmable
Rating	5A at 115 VAC Resistive, 2.5A Inductive 3A at 230 VAC Resistive, 1.5A Inductive
Alarm Action	Latching
Reset Differential	2 °F
Alarm Response	2 Seconds (maximum)
Alarm Indication	Red LED indication of individual channel high/low alarm condition
First Out Flashing	First channel to reach alarm condition is indicated by flashing red LED until alarm is acknowledged
False Alarm Protection	No false alarm on start-up or on restoration of power after failure

PROCESS AND SET POINT INDICATION

Scale	°F or °C programmable
Resolution	1° (°F or °C)
Readout Accuracy	±2°F from −100 to 1000°F
Line Voltage Shift Effect	<0.1% of process readout span
Open Sensor/Overrange	"HHHH" displayed Output turns OFF High Alarm activities

REMOTE OPERATION

Screw terminals provided for remote selection to display Individual Channel Process Temperature, Process Set Point and Alarm Set Points, and for remote Alarm Acknowledge and Reset.

GENERAL

INSTRUMENT POWER

Requirements	115 or 230 VAC (+10%-15%) Single Phase, 50/60 Hz
Nominal Power Consumption	20 VA

OPERATING ENVIRONMENT

Ambient Temperature	30 to 130°F (0 to 54°C)
Relative Humidity	0 to 95%, non-condensing

MOUNTING DIMENSIONS

Subpanel Mount	10.9 width × 11.5 height × 3.9 depth (inches) 276 × 292 × 98 (mm)
Panel Cutout (optional)	3.3 width × 6.0 height (inches) 82 width × 152 height (mm)

4.0 INSTALLATION

4.1 INSPECTION

Upon receipt of the Multi-Trace Controller, immediately make note of any overt damage to the shipment packaging and note on the shipping documents. Unpack the controller and carefully inspect the unit for obvious damage due to shipment. If any shipping damage has occurred, YOU as the receiver must file a claim with the transporter. Chromalox Instruments and Controls, as the shipper, cannot file the damage claim.

If the controller is not to be immediately installed and placed into operation, it should be stored in a cool, dry environment until time for installation and operation. Temperature extremes and moisture can damage the instrument.

Read this instruction manual carefully in its entirety before attempting installation or operation of the unit. Failure to do so could result in erroneous programming and could require that the unit be returned to the factory for recalibration.

4.2 MOUNTING

The 3290 Controller should be mounted in an environment free from excessive dust, oil accumulation or moisture, at ambient temperatures of 30°F to 130°F (0°C to 54°C). Mounting instructions follow for both subpanel and panel door mounting.

4.2.1 Subpanel Mounting

Figures 4-1 and 4-2 illustrate subpanel mounting and mounting dimensions. Four mounting holes are located on the mounting brackets so that it may be bolted directly to the subpanel (¼" bolts and lockwashers recommended). After securing the unit to the subpanel, proceed to Section 4.3, Field Wiring.

4.2.2 Panel Door Mounting

The 3290 can be disassembled to allow mounting of the control front faceplate on the exterior of a panel door, with the electronics assembly mounted on the interior of the panel door. Figures 4-9 and 4-10 illustrate the interior and exterior panel views of the controller mounted on a panel door.

A. To detach the front faceplate from the electronics assembly:

1. Loosen the four **innermost** corner screws which secure the housing to the electronics module, as shown by the arrows in Figure 4-3. (Note: At each corner, there are two screws. Loosen the innermost screw. The outermost screw fastens the electronics assembly to the mounting brackets and should not be loosened.)
2. Gently lift the housing away from the electronics module and unplug the ribbon connector from the plug on the circuit board, as indicated by the arrow in Figure 4-4.
3. Loosen the upper and lower anchor screws which secure the faceplate into the controller housing, as indicated by the arrows in Figure 4-4.
4. Grasp the faceplate from the front and lift UP, then OUT, to remove from housing (Figure 4-5).
5. Place housing back over electronics assembly and fasten with screws at corners (reverse procedure performed in Step 1).
6. Place white cover plate over opening in housing and secure with two screws, upper and lower. (Cover plate and screws provided in Door Mounting Kit.)

B. To attach controller to panel door:

1. Make panel cutout in panel door (3.3" × 6.0") and drill four holes for mounting bolts (¼" bolts and lockwashers recommended). Refer to Figure 4-2 for Mounting Dimensions.
2. Hold the faceplate near the exterior of panel door. Pass ribbon cable through cutout, then position faceplate into cutout. Tighten upper and lower anchor screws on rear of faceplate to hold firmly on panel door (Refer to Figures 4-6 and 4-7.)
3. Reconnect ribbon cable connector to the plug on rear of electronics assembly/circuit board, as illustrated in Figure 4-7, **holding electronics assembly close to panel door interior to alleviate any stress on cable/connector.**
4. Bolt assembly to interior panel door as shown in Figure 4-8.
5. Mounting complete.

4.3 FIELD WIRING

All wiring must comply with local codes, regulations and ordinances. This instrument is intended for panel/subpanel mounting and terminals must be enclosed within the panel enclosure. Use NEC Class 1 wiring for all terminals except the sensor terminals. Maintain separation between wiring of all the sensor terminals and other wiring.

Check the serial number tag on the controller to verify the model number and note that 3290-2XXXX

indicates Triac Output, and 3290-7XXXX indicates Solid State Relay Drive Output. Wiring diagrams are provided for each of the two output models: Figure 4-11 for Solid State Relay Drive Output, and Figure 4-12 for Triac Output. The wiring decals on the side of the unit show proper field terminations for hook-up.

NOTES:

1. It is recommended that sensor leadwire and power leads are not run together in the same conduit or wire tray.

2. Shield GND strap has no electrical connection. Sensor leadwire shields should be terminated here and shield GND connected to terminal #54 or other suitable ground. If shielded extension wire is used, the shield must be connected at one end only, preferably at the instrument end and not at the sensor end.

3. Recommended Sensor Cable is Belden Beldfoil 8618 or equivalent.

4.4 TERMINALS #46 AND #47— FAULT MODE RELAY

The 3290 controller incorporates a self-diagnostic alarm feature to assure optimum performance and input multiplexing. This alarm feature consists of a normally open, form "A" contact that energizes and latches in the unlikely event of abnormal operation or internal failure, and is reset by pressing the "AL RESET" pushbutton. The relay may be used to drive a remote alarm annunciation device, or can serve as a check point if problems arise. Terminals #46 and #47 are provided for wiring of an annunication device (see Figures 4-11 and 4-12).

4.5 CHANNEL LABELING

An area for channel labeling and identification is provided on the face plate of the 3290 Controller (Refer to Figure 1-2, Front Panel Identification.) White stick-on tags are provided with each unit, or a transparent plastic pocket can be used to protect labels and permit changes as required.

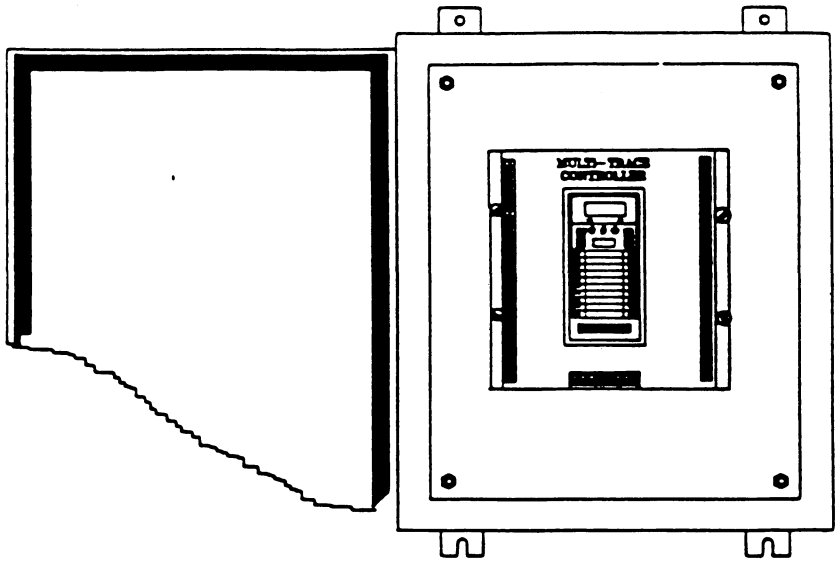


FIGURE 4-1. SUBPANEL MOUNTING ILLUSTRATION

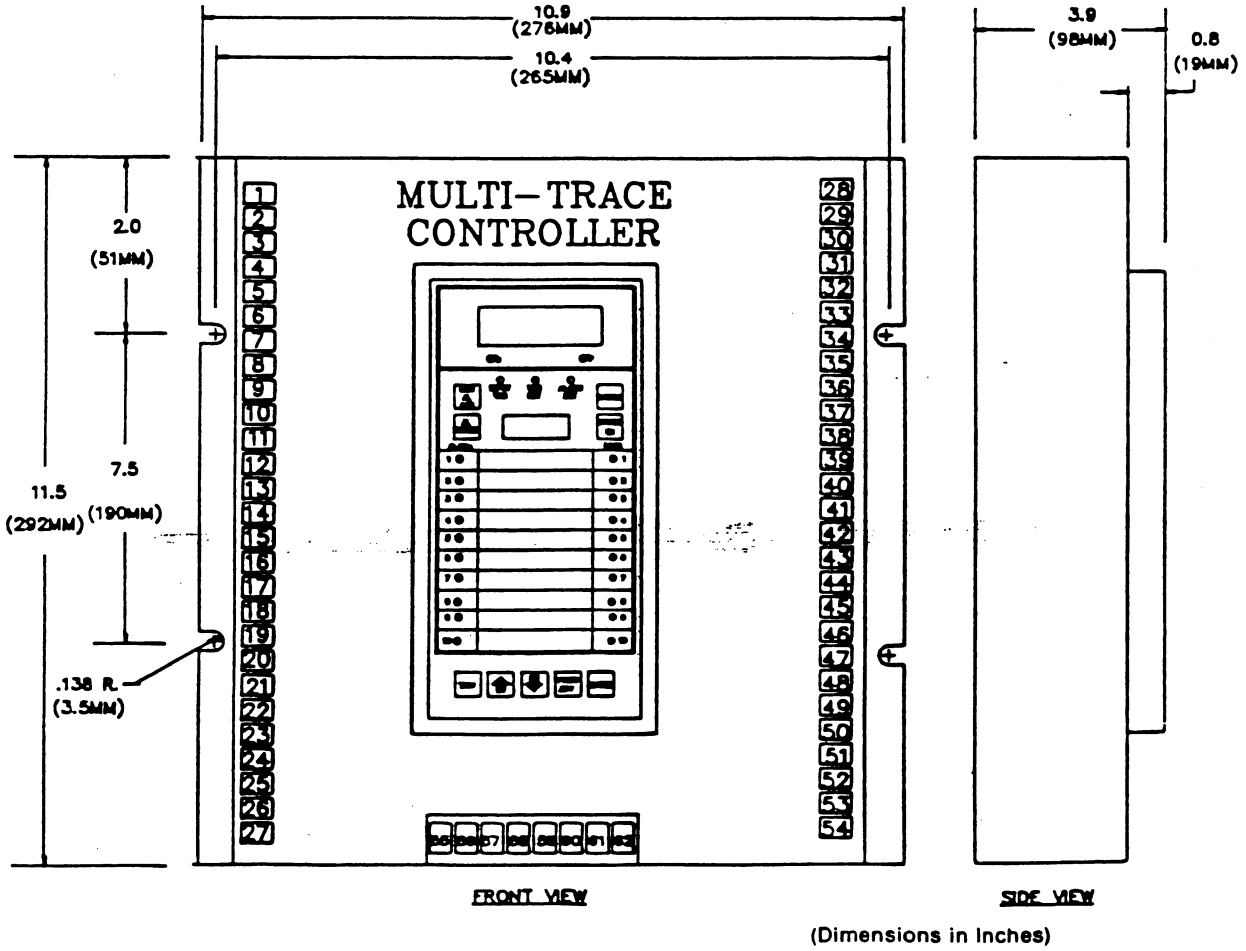


FIGURE 4-2. SUBPANEL MOUNTING DIMENSIONS

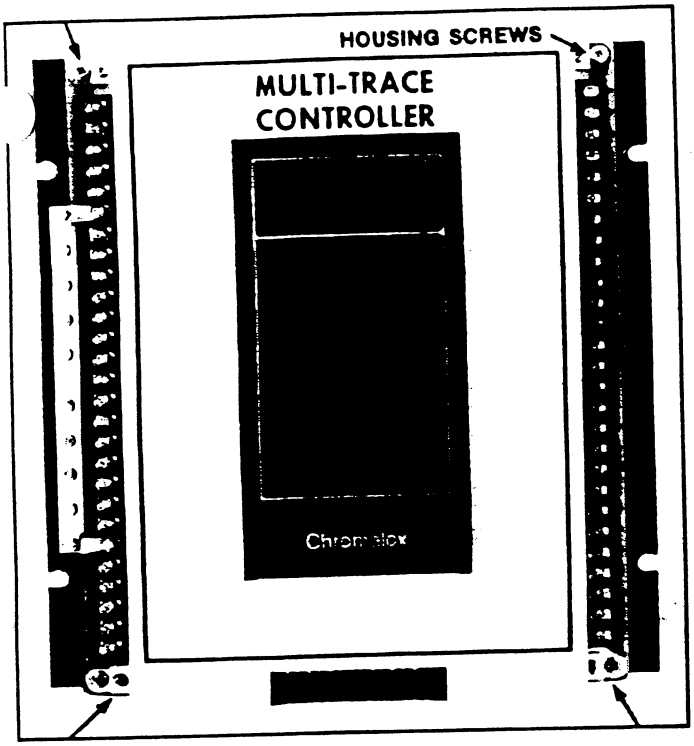


FIGURE 4-3

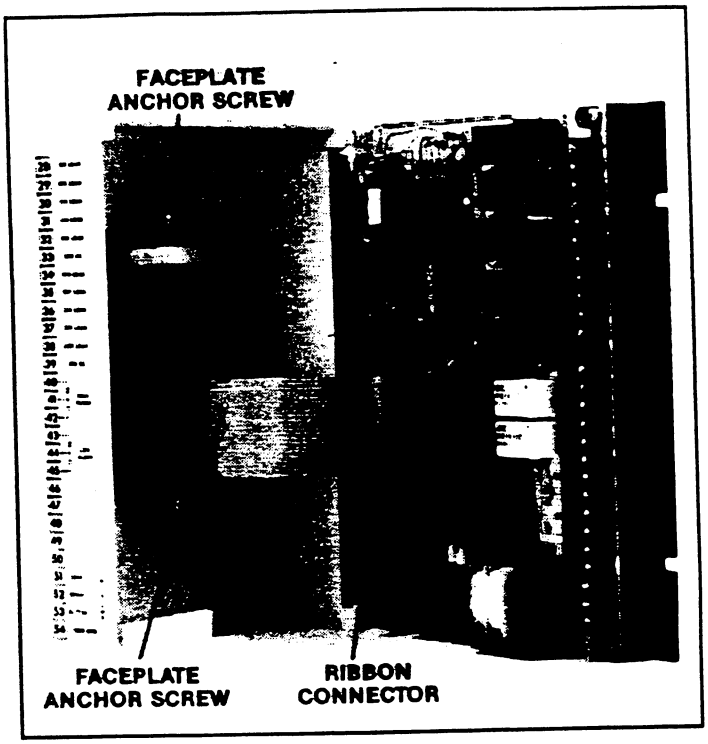


FIGURE 4-4

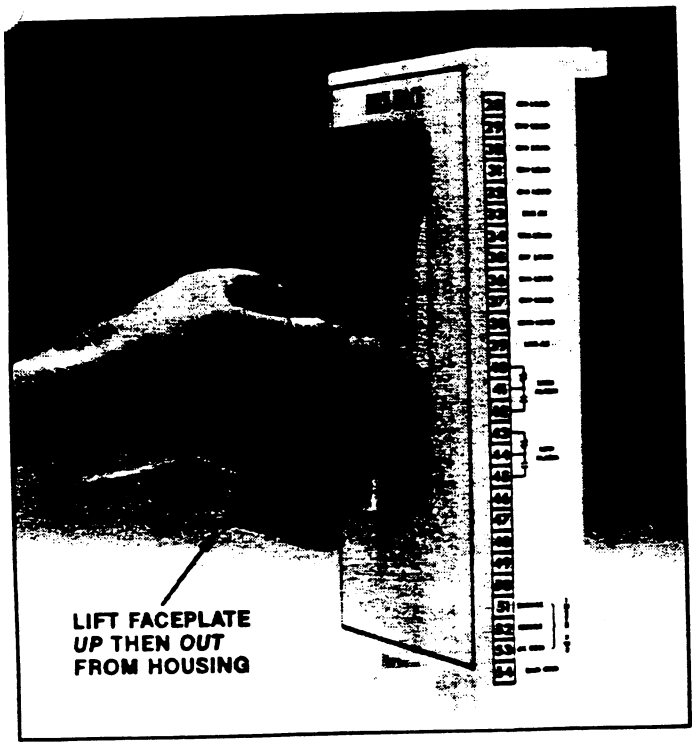


FIGURE 4-5

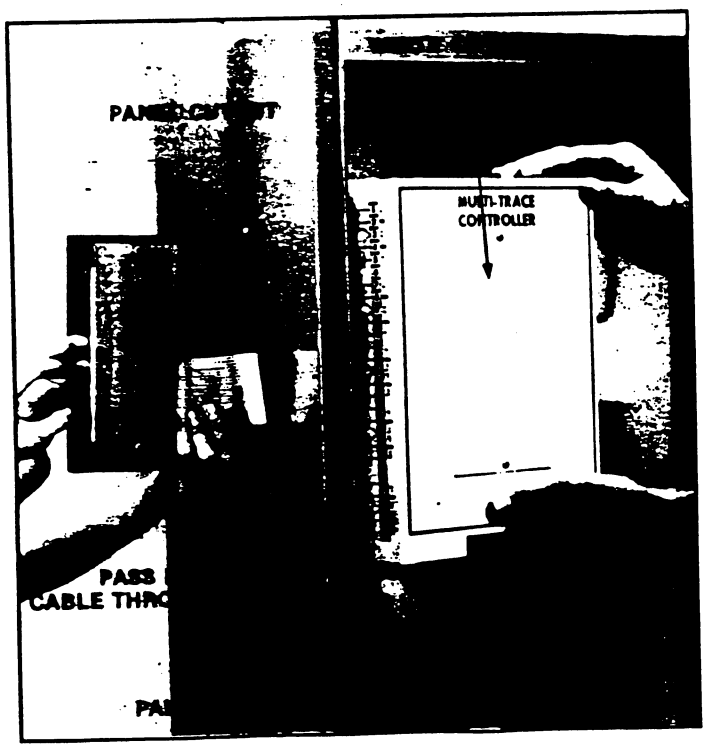


FIGURE 4-6

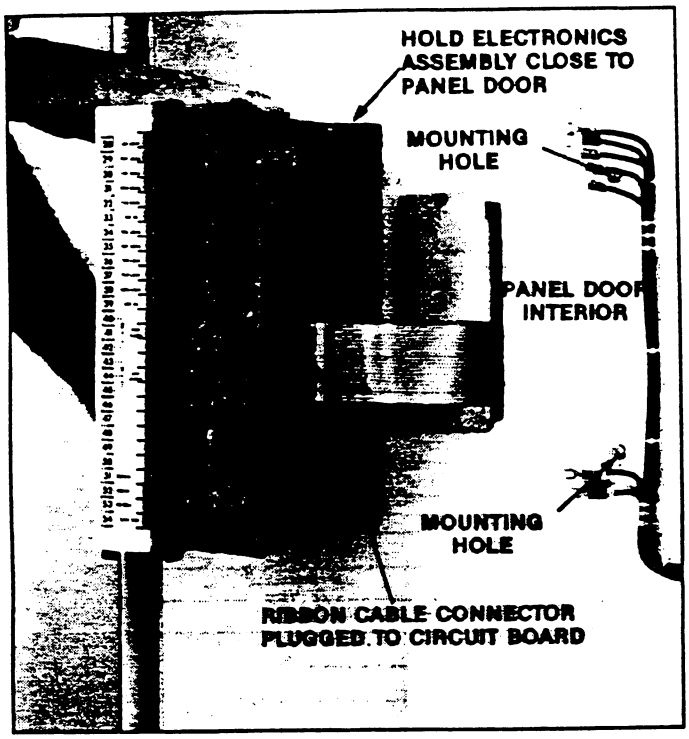


FIGURE 4-7

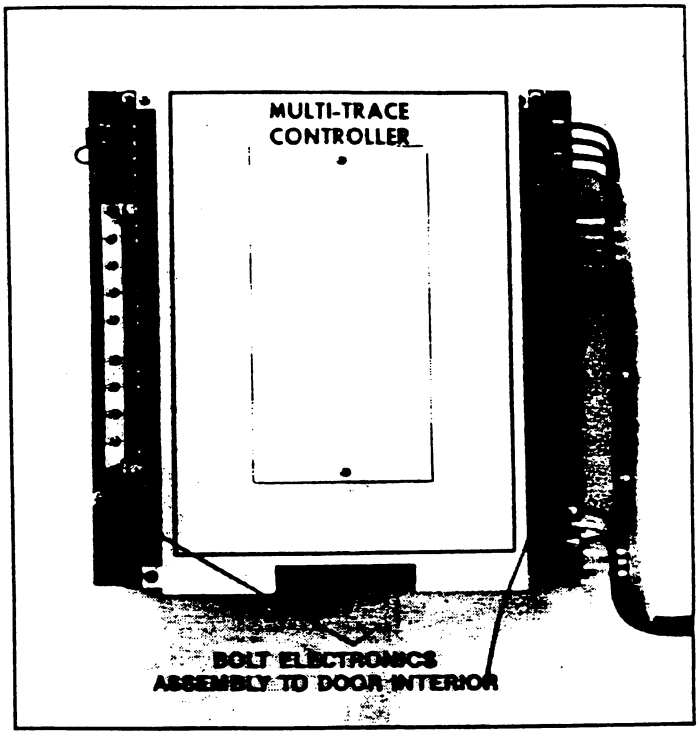


FIGURE 4-8

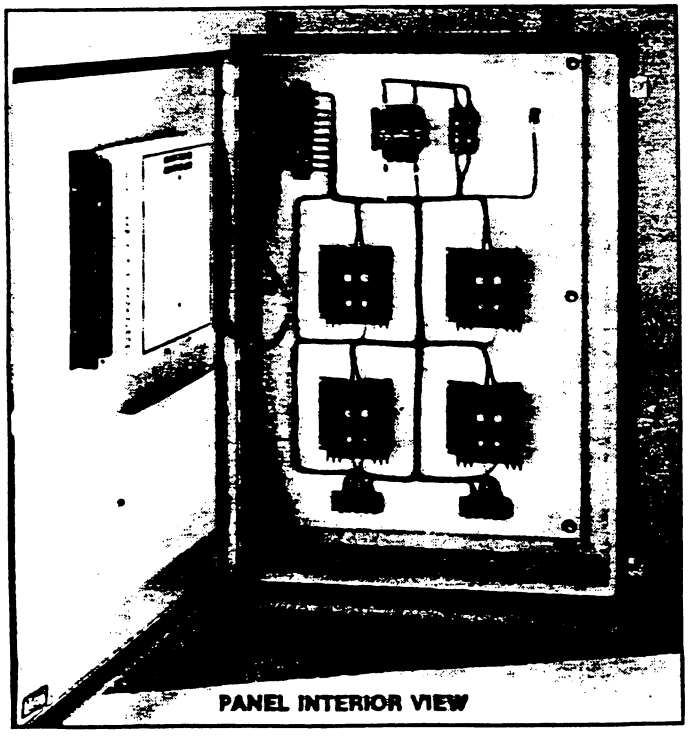


FIGURE 4-9

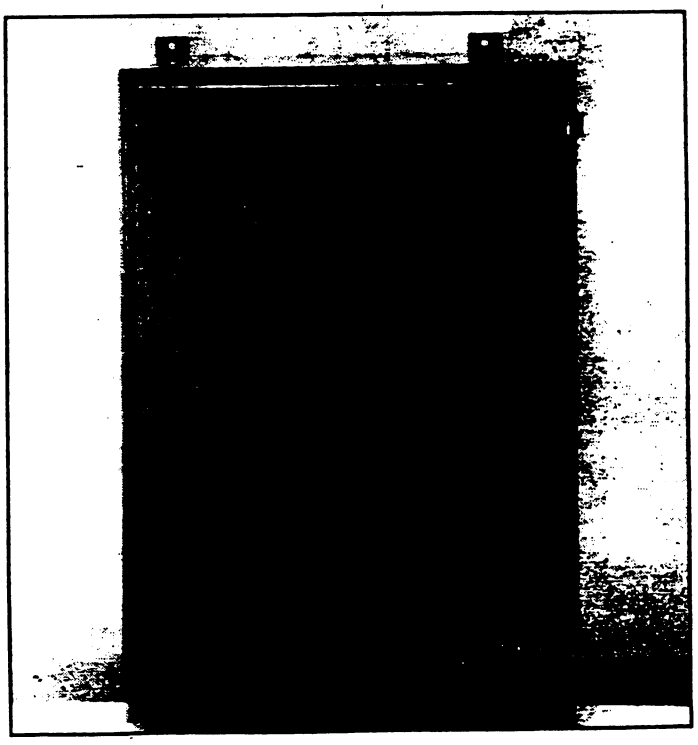


FIGURE 4-10

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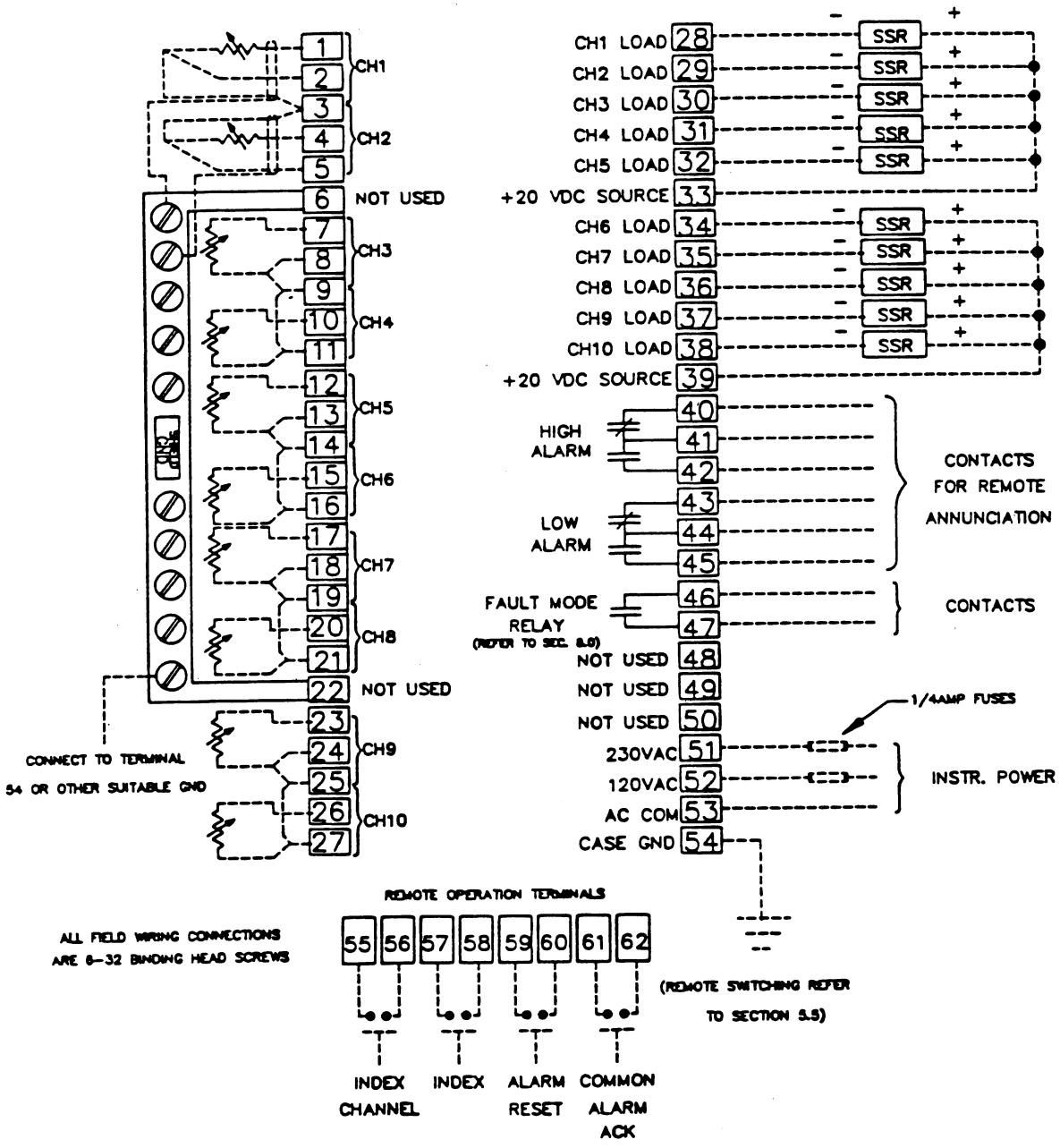


FIGURE 4-11. FIELD WIRING DIAGRAM
SOLID STATE RELAY DRIVE OUTPUTS

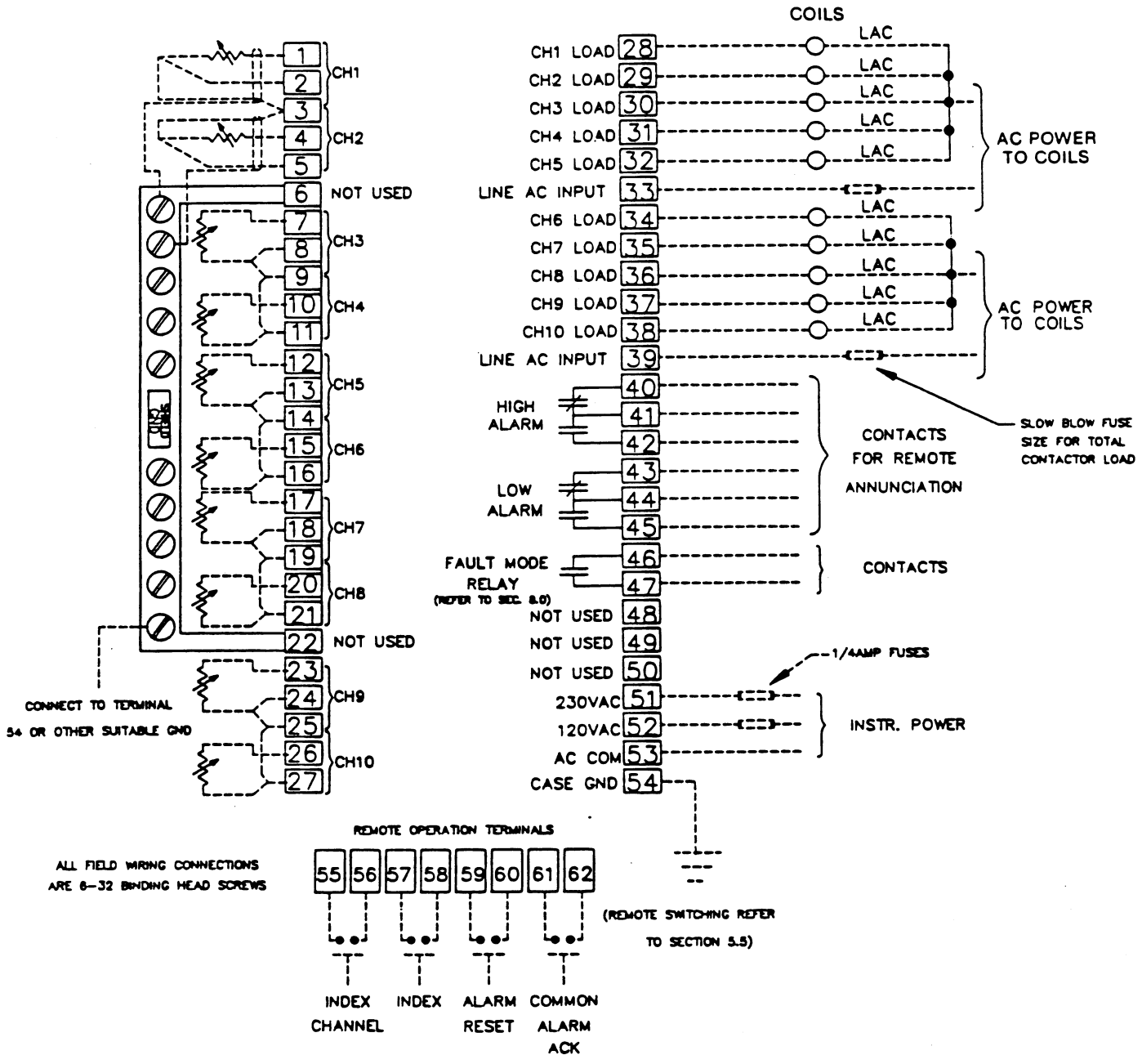


FIGURE 4-12. FIELD WIRING DIAGRAM TRIAC OUTPUTS

5.0 OPERATION AND START-UP

The 3290 has two modes of operation: the Display Mode and the Program Mode. The Display Mode is the normal operating mode and is intended for routine operator interface. The Program Mode is available to configure specific and selective parameters for each application and is accessed much less frequently. Regardless of the mode selected, the 3290 will continue its control functions. Refer to Figure 1-2 (page 4) for identification of the front panel indications and pushbuttons. To enter the Display Mode, press "INDEX." The lower display will indicate a channel number (1-10). To enter the Program Mode, "PROG ADV" is pressed and the lower display will indicate a Program Number (12-64).

The following indications and pushbutton functions remain in effect during both the Display and Program Modes (Figure 5-1 provided for reference):

Alarm and Load LED's—The 10 red Alarm LED's indicate individual channel alarm condition, and the 10 amber Load LED's indicate individual channel "LOAD ON." Alarm LED's remain illuminated until (1) alarm condition no longer exists and (2) "AL RESET" is pressed.

"COM AL ACK"—Pushbutton acknowledges high and/or low common alarm relays. If both high and low common alarm relays are activated, this pushbutton will acknowledge both in one operation.

"AL RESET"—Resets latching alarm LED's. Individual channel alarm LED's will remain illuminated until alarm conditions no longer exist and this pushbutton is pressed.

CAUTION: During the initial adjustment of alarm set points and Programming of the 3290, it is important that any load power connections or alarm outputs (if connected to shutdown device[s]) be disconnected or interrupted until all control parameters are set and programming is completed. (Failure to observe this could result in damage to metal sheath heaters, etc.)

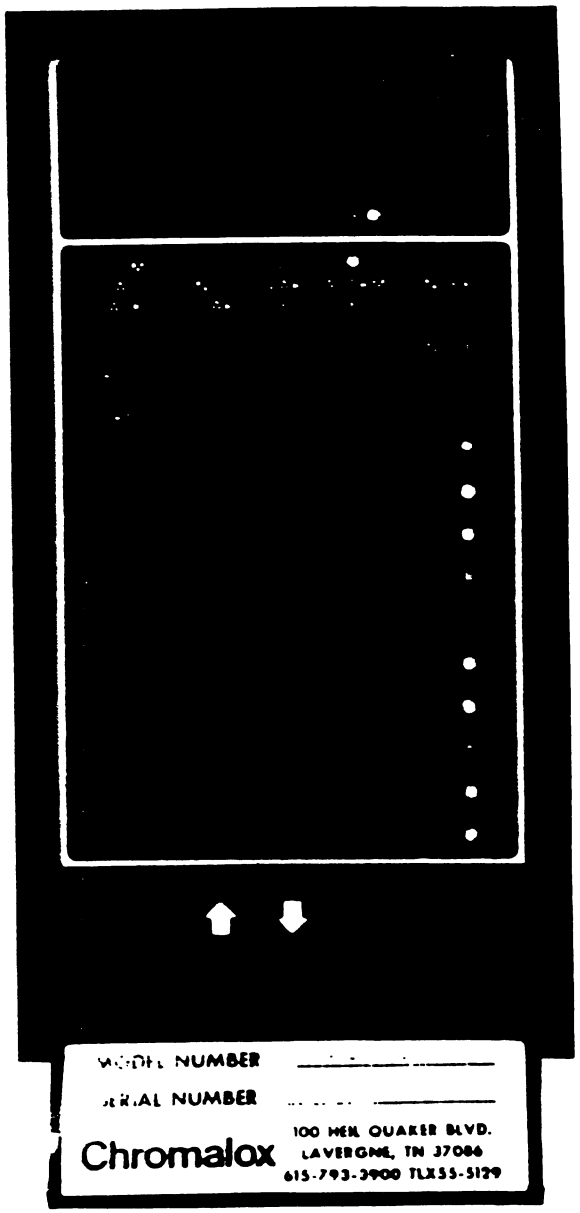


FIGURE 5-1. 3290 FRONT PANEL

5.1 DISPLAY MODE

In the Display Mode, the operator can display the following control parameters and adjust set points for each available control channel:

Value	LED Indication
Process Temperature	"INPUT VAR"
Process Set Point	"VAR SET"
Alarm Set Points, High and Low	"ALARM SET"

To select display of values,

1. Press "INDEX" to select value to be displayed—"INPUT VAR," "VAR SET" or "ALARM SET."
2. Press "INDEX CH" until desired channel (1-10), or alarm (1H-10H, 1L-10L) appears in lower digital display.
3. Current value appears in upper digital display.

To change a set point,

1. Press "INDEX" to select "VAR SET" or "ALARM SET." Current set point will appear in upper digital display.
2. Press "INDEX CH" until desired channel (1-10) or alarm (1H-10H, 1L-10L) appears in lower digital display.
3. Increase or decrease set point value with ⬆ or ⬇ until desired set point displayed.
4. Press "ENTER" to store new set point in memory. Display blanks momentarily to acknowledge entry.

5.2 PROGRAM MODE

The Program Mode enables selection and programming of numerous control parameters and features. Full and narrow range calibration can also be performed in the Program Mode (see Section 6.0). Figure 5-2, Programmable Function Descriptions, explains each Program Number, its function and a definition of that function. Note that all programming capabilities are protected by two coded security levels.

5.2.1 Security Levels

Level I. To enter Program Nos. 13 through 40, (Level I), press "PROG ADV" so that Prog. No. 12 appears in lower display. The code **"85"** must be entered at **Program No. 12.** Access to Level I Program Nos. remains in effect until any number other than "85" ($\neq 85$) is entered at Program No. 12 or instrument power is removed (Security Levels are not protected by nonvolatile memory). The 3290 is designed to facilitate quick and simple movement between the Display and Program Modes without re-entering security codes each time. After programming/changes are complete, it is important to exit Level I to assure that entry to programming is prohibited.

Level II. To enter Program Nos. 42 through 63, (Level II), access Level I and advance to Program No. 41. The code **"19"** must be entered at Program No. **41.** Access to Level II Program Nos. remains in effect until any number other than "19" ($\neq 19$) is entered at Program No. 41. After access to Level II is blocked, the programming access will fall back to Level I. It is important to then exit Level I to totally prohibit access to any programmable functions.

NOTE: Movement from the Program Mode to the Display Mode is accomplished by pressing "INDEX." If the Level access has not been blocked, the Program Mode is still in effect and may be accessed by merely pressing "PROG ADV" and does <u>not</u> require reentry of codes.

5.2.2 Operation in the Program Mode

In the Program Mode, there are four basic operations necessary to program and calibrate the controller.

"PROG ADV"—this pushbutton advances, or increases program numbers (displayed in the lower digital display).* Also, to enter the Program Mode from the Display Mode, press "PROG ADV."

⬆ and ⬇—these pushbuttons are used to increase and decrease values displayed in the upper digital display. (Example: Set Points, Dead Band, Control Output Rate of Update.)

"TEST"—used in calibration Program Nos. 43 through 63 to enter calibration information into memory.

"ENTER"—enters information (displayed in upper digital display) into nonvolatile memory. It must be pressed after each setting selection to enter new settings into memory.

* **"PROG ADV" and "TEST"—when pressed simultaneously, decreases Program Nos. and should only be performed in Level I programs, and not in Level II. Using this operation in Level II could result in erroneous programming and require reprogramming and calibration.**

5.2.3 Programming Instructions

Programming Instruction Table, Figure 5-3, lists each programmable function, channel numbers and corresponding program numbers, available settings and factory settings. To program a particular channel(s) for any given function, the following steps should be performed:

1. From Programming Instruction Table, located the item to be programmed under the column headings "FUNCTION" and "CHANNEL." Move to the right in the same row, locating "PROGAM NUMBER" and the desired setting from "AVAILABLE SETTINGS" column.
2. If in the Display Mode, press "PROG ADV" to enter Program Mode.
3. Access Level I (Prog. Nos. 12-40) or Level II (Prog. Nos. 41-63) as required.
4. "PROG ADV" until correct Prog. No. (selected from Instruction Table) appears in lower digital display.
5. Current settings will appear in upper digital display. ⬆ or ⬇ until desired setting appears in upper digital display.
6. "ENTER" setting into memory.
7. Proceed to next desired program number, ("PROG ADV") or exit Program Mode as instructed in Section 5.2.1.

PROGRAM NUMBER	FUNCTION	DESCRIPTION
		[illegible] to Program Mode. Code must be [illegible] programming capabilities.
13	GANG PROGRAM PROCESS SET POINT	Allows operator to program one (1) common set point for all ten (10) control channels. (Individual channel set points may be adjusted in Display Mode, see Sec. 5.1.)
14	GANG PROGRAM HIGH ALARM SET POINT	Allows operator to program one (1) common high alarm set point for all ten (10) control channels. (Individual channel set points may be adjusted in Display Mode, see Sec. 5.1.)
15	GANG PROGRAM LOW ALARM SET POINT	Allows operator to program one (1) common low alarm set point for all ten (10) control channels. (Individual channel set points may be adjusted in Display Mode, see Sec. 5.1.)
16-25	DISABLE/ENABLE CHANNEL	Allows operator to select individual control channels to be in operation (enabled) or not in operation (disabled).
26-35	CONTROL DEAD BAND	Allows operator to program individual channel control dead band from 0.5° to 50.0°F. (Refer to Appendix I for further discussion and illustration of dead band.)
36	FIRST OUT FLASHING ALARM INDICATION	Allows operator to select "first out flashing" feature. First channel to reach alarm condition is indicated by flashing red LED until Alarm Reset is depressed, allowing operator to determine which channel alarm condition occurred first.
37	TEMPERATURE SCALE SELECTION	Allows operator to choose °F or °C common for all ten (10) channels of control.
38	HIGH ALARM COMMON RELAY (RLY1) DE-ENERGIZE/ENERGIZE	Allows operator to select normally energized or normally de-energized high alarm common relay.
39	LOW ALARM COMMON RELAY (RLY2) DE-ENERGIZE/ENERGIZE	Allows operator to select normally energized or normally de-energized low alarm common relay.
40	OUTPUT UPDATE RATE	Allows operator to select the control output update rate (common for all 10 channels) in increments of 0, 1, 16, 30, 90, 150 seconds. (See Appendix II for further explanation.)
42	PROCESS SET POINT RANGE LIMIT	Allows operator to set maximum limits for process set points (°F): 0-150°, 0-300°, 0-600°, 0-1000°.
43-52	STANDARD CALIBRATION	Allows operator to perform individual channel calibration over the sensor's full temperature range.
53-62	NARROW RANGE CALIBRATION	Allows operator to perform individual channel calibration over a selected narrow range within the sensor range.
63	CALIBRATION REFERENCE	Updates internal reference values in controller memory.
64	NOT USED	

FIGURE 5-2. PROGRAMMABLE FUNCTION DESCRIPTIONS

5.3 INITIAL POWER UP

Upon initial power up, the letters "CIC" will appear momentarily in the upper display. After "CIC" is blanked, this display will indicate the Input Variable (process temperature) for Channel "1," as indicated in the lower display. The LED's labeled "INPUT VAR" and "°F" should be illuminated.

5.4 EXAMPLE INITIAL SET-UP AND PROGRAMMING

In the following steps, the 3290 will be configured and programmed for an example application. Assume that this is a freeze protection heat tracing application that uses 8 of the 10 available control channels, all of which will have identical control parameters (process set point, high and low alarm set points). Also assume that this unit is in "factory shipped" condition and no adjustments have been made to factory settings.

PARAMETERS: Process Set Point = 40°F
High Alarm Set Point = 60°F
Low Alarm Set Point = 35°F
Enable Channels 1 through 8—
Disable 9, 10
Control Dead Band = 2°F
Alarm Relays = De-energized
Output Update Rate = 30 sec.

DISPLAY MODE: In the Display Mode, individual channel set points can be adjusted (see Section 5.1.1). In this application, however, all 8 channels will have the same set point, so the Gang Programming features will be used (Prog. Nos. 13, 14 and 15) to select set point.

PROGRAM MODE: To access Level I programming, press "PROG ADV." Prog. No. 12 will be displayed in lower digital display. Increase upper display, ⬆, until Code "85" appears. Press "ENTER." Level I is accessed.

Gang Program Process Set Point, Prog. No. 13—Press "PROG ADV" until Prog. No. "13" displayed in lower digital display. Increase or decrease, ⬆ or ⬇, upper display until "40" appears. Press "ENTER."

Gang Program High Alarm Set Point, Prog. No. 14—Press "PROG ADV" until Prog. No. "14" displayed in lower digital display. Increase or decrease upper display, ⬆ or ⬇, until "60" appears. Press "ENTER."

Gang Program Low Alarm Set Point, Prog. No. 15—Press "PROG ADV" until Program No. 15 displayed in lower digital display. Increase or decrease, ⬆ or ⬇, upper display until "35" appears. Press "ENTER."

Disable/Enable Channel, Prog. Nos. 16-25—Factory setting on all channels is "1," enable. Since channels 1-8 will be in use, Prog. Nos. 16-23 may be left at factory setting "1." Since Channels 9 and 10 will not be used, "PROG ADV" until Prog. No. 24 displayed in lower digital display. Increase or decrease, ⬆ or ⬇, upper display until "0" appears. Press "ENTER." Repeat for Prog. No. 25.

Control Dead Band, Prog. Nos. 26-35—Press "PROG ADV" until Prog. No. 26 displayed in lower digital display. Increase or decrease, ⬆ or ⬇, until "2.0" displayed in upper digital display. Press "ENTER." Repeat for Prog. Nos. 27-33. (Not necessary to adjust setting of Prog. Nos. 34 and 35, since channels 9 and 10 are disabled.)

First Out Flashing, Prog. No. 36—If indication of first channel to reach alarm condition is desired, "PROG ADV" until Prog. No. 36 displayed in lower digital display. Increase or decrease, ⬆ or ⬇, upper digital display until "1" (enable) displayed. Press "ENTER."

Temperature Scale Selection, Prog. No. 37—In this application, temperatures are expressed in °F. Factory setting for temperature scale is "0" for °F, therefore, no adjustment is necessary.

High Common Alarm Relay, Prog. No. 38—Factory setting for high common alarm relay is "0," de-energized. No adjustment is necessary.

Low Common Alarm Relay, Prog. No. 39—Same as Prog. No. 38 above.

Control Output Update Rate, Prog. No. 40—Press "PROG ADV" until Prog. No. 40 displayed in lower digital display. Increase or decrease, ⬆ or ⬇ upper digital display until "30" displayed. Press "ENTER."

To Exit Level I Programming, "PROG ADV" until Prog. No. 12 displayed (Program increment sequence is 39, 40, 41, 12, 13 . . .). Increment or decrement, ⬆ or ⬇, upper display until any number **except** "85" is displayed. Press "ENTER." Level I Programming access blocked.

Programming and configuration for this example application complete.

LEVEL I

FUNCTION	CHANNEL	PROGRAM NUMBER	AVAILABLE SETTINGS	FACTORY SETTING	YOUR SETTING
Gang Program Process Set Point	1-10	13	0-1000 (°F)	0	
Gang Program High Alarm Set Point	1-10	14	0-1000 (°F)	1000	
Gang Program Low Alarm Set Point	1-10	15	0-1000 (°F)	0	
Disable/Enable Channel	1	16	0 = Disable 1 = Enable	1	
	2	17		1	
	3	18		1	
	4	19		1	
	5	20		1	
	6	21		1	
	7	22		1	
	8	23		1	
	9	24		1	
	10	25		1	
Control Dead Band	1	26	0.5 to 50.0 (°F)	5.0°	
	2	27		5.0°	
	3	28		5.0°	
	4	29		5.0°	
	5	30		5.0°	
	6	31		5.0°	
	7	32		5.0°	
	8	33		5.0°	
	9	34		5.0°	
	10	35		5.0°	
First Out Flashing Alarm	1-10	36	0 = Disable 1 = Enable	0	
Temp Scale Selection	1-10	37	0 = °F 1 = °C	0	
High Common Alarm Relay (RLY1)	1-10	38	0 = De-energize 1 = Energize	0	
Low Common Alarm Relay (RLY2)	1-10	39	0 = De-energize 1 = Energize	0	
Control Output Relay Cycle	1-10	40	0, 1, 10, 30, 60, 150 (seconds)	30	

Note: All temperature settings are entered in °F, regardless of temperature scale selected (Prog. No. 37)

FIGURE 5-3. PROGRAMMING INSTRUCTION TABLE

LEVEL II

FUNCTION	CHANNEL	PROGRAM NUMBER	AVAILABLE SETTINGS	FACTORY SETTING	YOUR SETTING
Process Set Point Range Limit	1-10	42	0-150, 0-300, 0-600, 0-1000 (°F)	1000	
Standard Calibration	1	43	See Calibration Instructions (Section 6.0)		
	2	44			
	3	45			
	4	46			
	5	47			
	6	48			
	7	49			
	8	50			
	9	51			
	10	52			
Narrow Range Calibration	1	53	See Calibration Instructions (Section 6.0)		
	2	54			
	3	55			
	4	56			
	5	57			
	6	58			
	7	59			
	8	60			
	9	61			
	10	62			
Calibration Reference		63			
Not Used		64			

* Program No. 64 is not currently in use. Press "PROG ADV" to by-pass 64 and exit at Program No. 41.

FIGURE 5-3. PROGRAMMING INSTRUCTION TABLE

5.5 REMOTE OPERATION

Remote operation connections are provided for sub-panel mounted explosion-proof and weatherproof applications of the 3290 Multi-Trace. Refer to Figure 4-11 or 4-12 for location of terminals 55 through 62. These remote operation features allow interrogation of:

Input Variable (process temperature)
Control Set Point
High/Low Alarm Set Points

for each channel, and remote operation of the alarm functions:

Alarm Acknowledge
Alarm Reset

Four customer-supplied remote switches (normally open, single pole momentary pushbuttons) are required. Wiring connections are shown in Field Wiring Diagram 4-11 or 4-12. **The total length of the cables from the controller to the remote switches must not exceed 20 ft. All cables should be shielded and separate from any other power wiring.**

6.0 CALIBRATION

The 3290 Series Controller design includes automatic calibration features. **Standard Calibration (Program Nos. 43-52)** allows the operator to calibrate each individual control channel over the full sensor range. **Narrow Range Calibration (Program Nos. 53-62)** allows calibration of a field-selected narrow range within the full sensor range. By selecting a "narrow" range in which the process temperature for a particular channel is most likely to remain and calibrating the control channel over this range, greater accuracy can be achieved.

Following are instructions for Standard and Narrow Range Calibration. Refer to Figure 5-3, Programming Instruction Table, to determine corresponding Program Numbers for individual channel standard and narrow range calibration. During calibration, a precision resistance decade box should be substituted for sensor inputs (recommend General Radio Model 1433T or equivalent). Actual sensor inputs are not connected. Appendix II (page 25) provides Sensor Temperature vs. Resistance Tables for both 100 ohm and 500 ohm RTD types, in °C and °F.

NOTE:

1. **Disconnect load power/control outputs prior to calibration.**
2. **Do not press "TEST" more than once per operation. (One operation can be defined as setting sensor simulator to zero, then pressing "TEST" once.)**
3. **If an error is made during calibration sequence, exit calibration section and restart.**
4. **Calibration should be performed in °F.**

6.1 STANDARD CALIBRATION INSTRUCTIONS

1. "PROG ADV" to Level I Programming (Prog. No. 12), enter code and access Level I.
2. "PROG ADV" to Level II Programming (Prog. No. 41), enter code and access Level II.
3. "PROG ADV" to Prog. No. 63*, Calibration Reference. Press "TEST" to enter internal component values into memory.
4. "PROG ADV" to correct Prog. No. for channel to be calibrated. Level II "PROG ADV" increment sequence is 62, 63, 64, 41, 42 . . . .
5. Set sensor simulator (decade box) to minimum sensor value (– 100°F). Wait 30 seconds to allow electronics to stabilize.
6. Press "TEST."
7. Advance sensor simulator to maximum sensor value (1000°F). Wait 30 seconds to allow electronics to stabilize.
8. Press "TEST."
9. Standard calibration for this channel is complete. Return to Display Mode and verify calibration before proceeding.
10. Repeat steps 4-9 for any other channels to be calibrated.

***Prog. No. 63, Calibration Reference operation should be performed only when calibrating all enabled control channels. If calibrating only select few channels, omit Calibration Reference Operation (Step 3).**

6.2 NARROW RANGE CALIBRATION INSTRUCTIONS

Following instructions assume that Level II Programming has been accessed.

1. "PROG ADV" to correct Prog. No. for channel to be calibrated.
2. Set sensor simulator at the minimum point of the selected narrow range. Wait 30 seconds to allow electronics to stabilize.
3. Upper digital display will indicate "0." Increase or decrease, ⬆ or ⬇, until minimum point of the selected narrow range is displayed.
4. Press "TEST."

5. Set sensor simulator to maximum point of selected narrow range. Wait 30 seconds to allow electronics to stabilize.

6. Increase upper digital display ⌂ until maximum point of narrow range is displayed.

7. Press "TEST."

8. Narrow Range Calibration for this channel is complete. Return to Display Mode and verify calibration before proceeding.

9. Repeat steps 1-8 for additional channels to be calibrated.

6.3 EXAMPLE CALIBRATION

In this example, Standard and Narrow Range Calibration will be performed on a single channel of control, channel 8. The sensor range is – 100 to 1000°F, and the selected narrow range for this particular process is 200 to 500°F.

NOTE:

1. **Disconnect load power/control outputs prior to calibration.**

2. **Do not press "TEST" more than once per operation.**

3. **If an error is made during calibration sequence, exit calibration section and restart calibration for that channel.**

Standard Calibration

1. Access Level II programming.

2. "PROG ADV" to prog. No. 50, as displayed in lower digital display (correct Prog. No. for channel 8 Standard Calibration, determined from Figure 5-3).

3. Set sensor simulator to minimum sensor value (– 100°F). Wait 30 seconds to allow electronics to stabilize.

4. Press "TEST."

5. Advance sensor simulator to maximum sensor (1000°F). Wait 30 seconds to allow electronics to stabilize.

6. Press "TEST."

7. Standard Calibration complete. Return to Display Mode and verify calibration.

Narrow Range Calibration

1. "PROG ADV" to Program No. 60 (correct Prog. No. for channel 8, Narrow Range Calibration).

2. Set sensor simulator at 200°F (minimum point of narrow range). Wait 30 seconds to allow electronics to stabilize.

3. Upper digital display will indicate "0." Increase ⌂ to "200."

4. Press "TEST."

5. Set sensor simulator to 500°F (maximum point of narrow range). Wait 30 seconds to allow electronics to stabilize.

6. Increase ⌂ upper digital display to "500."

7. Press "TEST."

8. Channel 8 Narrow Range Calibration complete. Return to Display Mode and verify calibration.

7.0 SELF TEST

To provide the most reliable control possible, the 3290 Controller has a 4 step automatic test feature that provides a five second power ON Test to LED's including both the upper and lower digital displays, followed by 3 internal circuitry test sequences. The test sequence is initiated by depressing "TEST" when the controller is in the Display Mode. Should any of the 3 circuitry tests fail, a failure code will appear. Figure 7-1 describes the test sequence and failure codes. Should a failure code appear during the test sequence, contact the factory.

FAILURE CODE	DESCRIPTION	RESULTS
1	LED Test	LED's illuminated for 3 seconds
2	PROM Check SUM Test	If test fails, "2" appears for 3 seconds
3	RAM Read/Write Test	If test fails, "3" appears for 3 seconds
4	EEPROM Test	If test fails, "4" appears for 3 seconds

FIGURE 7-1. AUTOMATIC TEST SEQUENCE TABLE

During the test sequence, the controller continues to provide control action. Control outputs and relays will remain in effect.

8.0 MAINTENANCE & TROUBLESHOOTING

TROUBLESHOOTING GUIDE

SYMPTOM	PROBABLE CAUSE	CORRECTION
POWER APPLIED, DISPLAY DOES NOT LIGHT AND CONTROLLER DOES NOT FUNCTION	a) No power applied b) Ribbon cable disconnected between control section & display section (refer to Fig. 4-4)	a) Check power wiring & fusing b) Check ribbon cable connection (refer to Fig. 4-4)
DISPLAY READS HHHH	a) Open SENSOR RTD b) Out of calibration	a) Check sensor wiring (refer to Fig. 4-11 or 4-12) b) Check sensor for correct resistance c) Attach precision decade box and verify calibration d) Check Fault Mode Relay (Section 4.4)
PROCESS DOES NOT HEAT UP	a) No power being applied to load	a) Verify load wiring & fusing (refer to Fig. 4-11 or 4-12) b) Verify variable set point has been stored in Memory (failure to depress "ENTER" button refer to Fig. 1-2) c) Verify that load is not open d) Check Fault Mode Relay (Section 4.4)
ERRATIC OPERATION	a) Controller failure (internal electronics)	a) See Test Section (section 7) b) Check Fault Mode Relay (Section 4.4)

9.0 WARRANTY AND RETURN

The warranty below complies with the Federal Law applicable to products manufactured after December 31, 1976. This warranty gives you specific legal rights. You may also have other rights which vary from state to state.

9.1 CHROMALOX WARRANTY

Chromalox Instruments and Controls' products are warranted against defects in workmanship and materials. No other express warranty, written or oral, applies with the exception of a written statement from an officer of Chromalox Instruments and Controls, Edwin L. Wiegand Division, Emerson Electric Co.

9.2 WARRANTY PERIOD

This warranty extends for twelve months from date of shipment from factory or authorized distributor.

9.3 LIMITATIONS

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

9.4 RETURNS

Items returned to Chromalox Instruments and Controls must be accompanied by a Return Authorization Number. This number may be obtained from Chromalox Instruments and Controls, Customer Service Department, Telephone Number (615)793-3900. Defective items will be repaired or replaced at our option, at no charge.

Return the defective part or product, freight prepaid to:

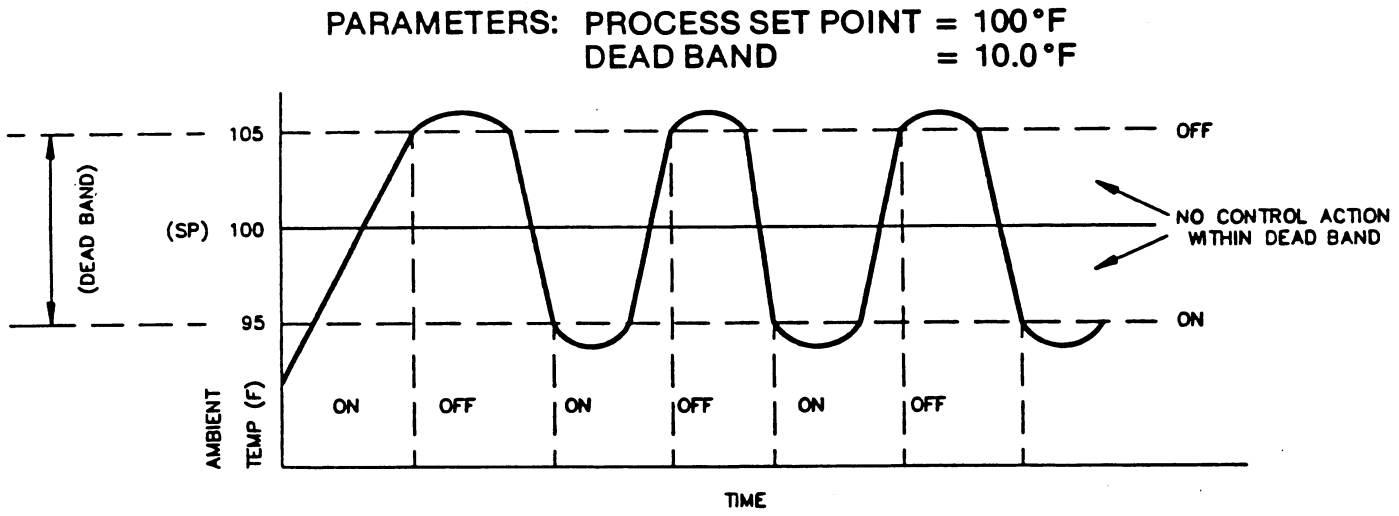
Chromalox Instruments and Controls
100 Heil Quaker Blvd.
LaVergne, TN 37086-3536

SUCH REPAIR OR REPLACEMENT IS THE EXCLUSIVE REMEDY AVAILABLE FROM CHROMALOX INSTRUMENTS AND CONTROLS, EDWIN L. WIEGAND DIVISION, EMERSON ELECTRIC CO. CHROMALOX INSTRUMENTS AND CONTROLS IS NOT LIABLE FOR LABOR COSTS INCURRED IN REMOVAL, REINSTALLATION OR UNAUTHORIZED REPAIR OF THE PRODUCT OR FOR DAMAGE OF ANY TYPE WHATSOEVER, INCLUDING INCIDENTAL OR CONSEQUENTIAL DAMAGE. Some states do not allow the exclusion or limitations of incidental or consequential damages, so the preceding limitation or exclusion may not apply to you.

APPENDIX I: ON-OFF CONTROL

The basic purpose of a controller is to regulate the energy input to a process so that the measured variable is maintained at a desired value (set point) within required limits. With ON-OFF control, such as the 3290 Series Controller, either full energy is applied to the process, or none. As illustrated below, there is a "region" about the set point in which there is no control action. This region is the dead band. The set point is always at the midpoint of the dead band. In this illustration, when the temperature reaches 105°, the controller output will turn off. The output will not turn on until the temperature drops down to 95°.

Note that the temperature is not completely maintained within the limits of the dead band. With ON-OFF control, the process temperature will always rise above the upper limits and below the lower limits of the dead band because the heater cannot respond instantaneously. The heater will continue to give off heat for a short while after being turned off. Similarly, there is a short time delay in heating after the heater turns on. Heater sizing and insulation will also affect the amount of "overshoot" and "undershoot." It should also be noted that the rate of heating of a process and the rate of cooling may differ.



DEAD BAND ILLUSTRATION

APPENDIX II

Control Output Update Rate - Program No. 40

The programmable feature "Control Output Update Rate" has two functions:

1. In both the 5- and 10-channel models, the output update rate allows the operator to limit the number of control power "ON" switches per time interval. For example, if the control output update rate "30 seconds" is selected, the control power will not turn "ON" more than once every 30 seconds. This holds true regardless of the relationship between the process temperature, set point and dead band (see illustration).

   The reason for selecting an output update rate is to prevent contactor "chatter" when driving electromechanical switching devices, which could result in damage or failure of the device. This feature is particularly effective in control applications where a small dead band is required.

2. In the 10-channel controller, the control output update rate serves a second purpose. In addition to limiting the frequency of control power "ON" switching, the 10-channel controller alternates the control channels switching "ON" to prevent load surges that could result from all 10 channels switching "ON" at once.

   The ten available control channels are divided into 2 groups: Group 1 (channels 1-5) and Group 2 (channels 6-10). The time interval for Group 1 always starts at 0 seconds (i.e., updates control output at 0, 30, 60, 90, etc., for a 30 second output update rate). The time interval for Group 2 starts at 15 seconds, (which is one-half the selected output update rate) (i.e., updates at 15, 45, 75, etc.).

Example: 30 Second Control Output Update Rate

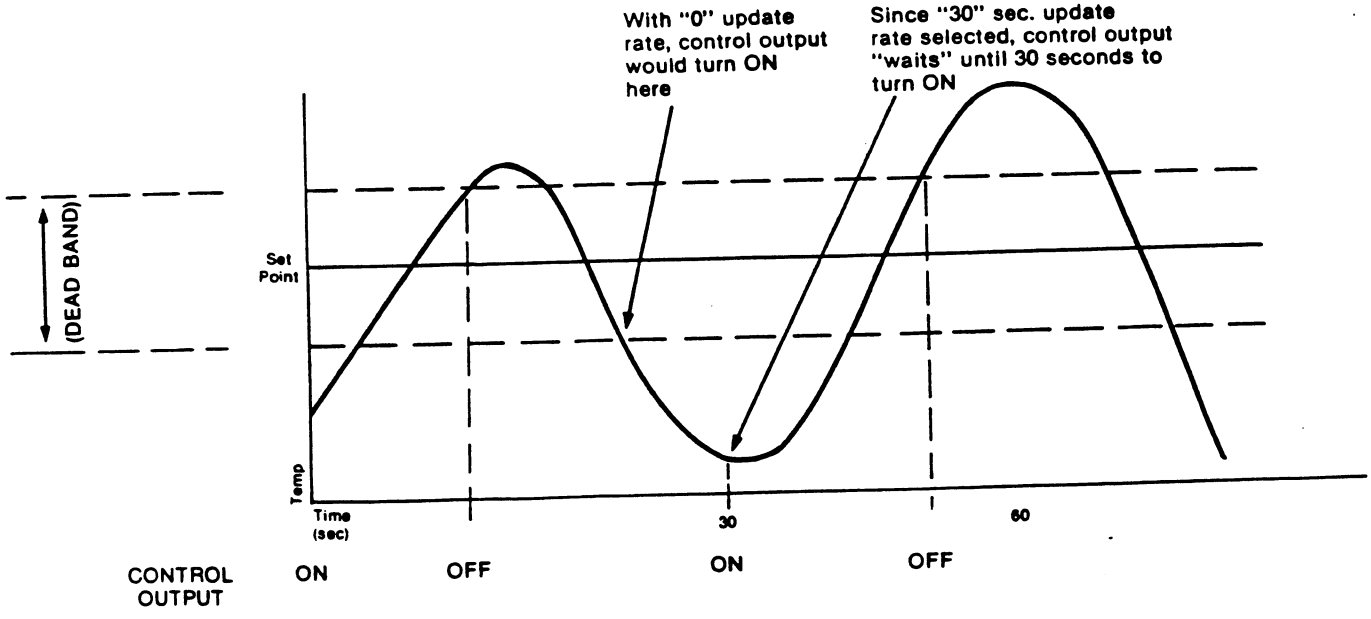
$$\text{Interval} = \frac{\text{Selected Rate}}{2}$$

Seconds	0	15	30	45	60
Group 1	Y ON	X	Y	X	Y
Group 2	X OFF	ON	X	Y	X

X = Control Output is inhibited from turning ON or OFF regardless of relationship between temperature, set point and dead band.

Y = Control Output can turn ON or OFF at this time, however, Output status (ON or OFF) is determined by relationship between temperature, set point and dead band.

NOTE: With the 10-channel controller, even though "0" seconds output update rate may be chosen, Group 1 and Group 2 will be alternated at 15 second intervals (same as shown above).



APPENDIX III: RTD CALIBRATION TABLES

SENSOR TEMPERATURE VERSUS RESISTANCE TABLE
100 Ohm Platinum RTD

°F	Ohms	°F	Ohms	°F	Ohms	°F	Ohms
-100	71.01	180	131.74	460	189.65	740	244.76
- 90	73.23	190	133.86	470	191.67	750	246.68
- 80	75.45	200	135.97	480	193.68	760	248.59
- 70	77.66	210	138.08	490	195.69	770	250.50
- 60	79.87	220	140.18	500	197.69	780	252.41
- 50	82.07	230	142.29	510	199.70	790	254.31
- 40	84.27	240	144.39	520	201.70	800	256.21
- 30	86.47	250	146.48	530	203.69	810	258.10
- 20	88.66	260	148.57	540	205.68	820	259.99
- 10	90.85	270	150.66	550	207.67	830	261.88
0	93.03	280	152.74	560	209.65	840	263.77
10	95.22	290	154.82	570	211.63	850	265.65
20	97.39	300	156.90	580	213.61	860	267.52
30	99.57	310	158.98	590	215.59	870	269.40
40	101.74	320	161.05	600	217.56	880	271.27
50	103.90	330	163.11	610	219.52	890	273.13
60	106.07	340	165.17	620	221.49	900	275.00
70	108.22	350	167.23	630	223.44	910	276.86
80	110.38	360	169.29	640	225.40	920	278.71
90	112.53	370	171.34	650	227.35	930	280.56
100	114.68	380	173.39	660	229.30	940	282.41
110	116.83	390	175.44	670	231.25	950	284.26
120	118.97	400	177.48	680	233.19	960	286.10
130	121.10	410	179.51	690	235.13	970	287.94
140	123.24	420	181.55	700	237.06	980	289.77
150	125.37	430	183.58	710	238.99	990	291.60
160	127.50	440	185.61	720	240.92	1000	293.43
170	129.62	450	187.63	730	242.84		

SENSOR TEMPERATURE VERSUS RESISTANCE TABLE
100 Ohm Platinum RTD

°C	Ohms	°C	Ohms	°C	Ohms	°C	Ohms
-100	60.28	80	130.89	260	197.69	440	260.75
- 90	64.32	90	134.70	270	201.30	450	264.14
- 80	68.34	100	138.50	280	204.89	460	267.52
- 70	72.34	110	142.29	290	208.46	470	270.89
- 60	76.33	120	146.06	300	212.03	480	274.25
- 50	80.31	130	149.82	310	215.59	490	277.60
- 40	84.27	140	153.58	320	219.13	500	280.93
- 30	88.22	150	157.32	330	222.66	510	284.26
- 20	92.16	160	161.05	340	226.18	520	287.57
- 10	96.09	170	164.76	350	229.69	530	290.87
0	100.00	180	168.47	360	233.19	540	294.16
10	103.90	190	172.16	370	236.67	550	297.44
20	107.79	200	175.84	380	240.15	560	300.70
30	111.67	210	179.51	390	243.61	570	303.96
40	115.54	220	183.17	400	247.06	580	307.20
50	119.39	230	186.82	410	250.50	590	310.43
60	123.24	240	190.46	420	253.93	600	313.65
70	127.07	250	194.08	430	257.34		

SENSOR TEMPERATURE VERSUS RESISTANCE TABLE
500 Ohm Platinum RTD

°F	Ohms	°F	Ohms	°F	Ohms	°F	Ohms
– 100	355.05	180	658.70	460	948.25	740	1223.80
– 90	366.15	190	669.30	470	958.35	750	1233.40
– 80	377.25	200	679.85	480	968.40	760	1242.95
– 70	388.30	210	690.40	490	978.45	770	1252.50
– 60	399.35	220	700.90	500	988.45	780	1262.05
– 50	410.35	230	711.45	510	998.50	790	1271.55
– 40	421.35	240	721.95	520	1008.50	800	1281.05
– 30	432.35	250	732.40	530	1018.45	810	1290.50
– 20	443.30	260	742.85	540	1028.40	820	1299.95
– 10	454.25	270	753.30	550	1038.35	830	1309.40
0	465.15	280	763.70	560	1048.25	840	1318.85
10	476.10	290	774.10	570	1058.15	850	1328.25
20	486.95	300	784.50	580	1068.05	860	1337.60
30	497.85	310	794.90	590	1077.95	870	1347.00
40	508.70	320	805.25	600	1087.80	880	1356.35
50	519.50	330	815.55	610	1097.60	890	1365.65
60	530.35	340	825.85	620	1107.45	900	1375.00
70	541.10	350	836.15	630	1117.20	910	1384.30
80	551.90	360	846.45	640	1127.00	920	1393.55
90	562.65	370	856.70	650	1136.75	930	1402.80
100	573.40	380	866.95	660	1146.50	940	1412.05
110	584.15	390	877.20	670	1156.25	950	1421.30
120	594.85	400	887.40	680	1165.95	960	1430.50
130	605.50	410	897.55	690	1175.65	970	1439.70
140	616.20	420	907.75	700	1185.30	980	1448.85
150	626.85	430	917.90	710	1194.95	990	1458.00
160	637.50	440	928.05	720	1204.60	1000	1467.15
170	648.10	450	938.15	730	1214.20		

SENSOR TEMPERATURE VERSUS RESISTANCE TABLE
500 Ohm Platinum RTD

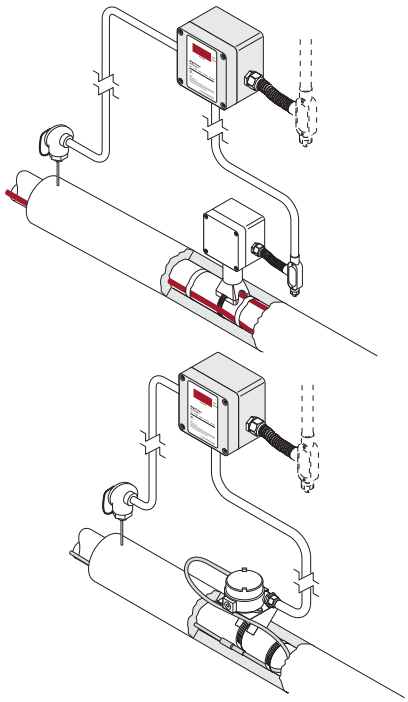
°C	Ohms	°C	Ohms	°C	Ohms	°C	Ohms
– 100	301.40	80	654.45	260	988.45	440	1303.75
– 90	321.60	90	673.50	270	1006.50	450	1320.70
– 80	341.70	100	692.50	280	1024.45	460	1337.60
– 70	361.70	110	711.45	290	1042.30	470	1354.45
– 60	381.65	120	730.30	300	1060.15	480	1371.25
– 50	401.55	130	749.10	310	1077.95	490	1388.00
– 40	421.35	140	769.70	320	1095.65	500	1404.65
– 30	441.10	150	786.60	330	1113.30	510	1421.30
– 20	460.80	160	805.25	340	1130.90	520	1437.85
– 10	480.45	170	823.80	350	1148.45	530	1454.35
0	500.00	180	842.35	360	1165.95	540	1470.80
10	519.50	190	860.80	370	1183.35	550	1487.20
20	538.95	200	879.20	380	1200.75	560	1503.50
30	558.35	210	897.55	390	1218.05	570	1519.80
40	577.70	220	915.85	400	1235.30	580	1536.00
50	596.95	230	934.10	410	1252.50	590	1552.15
60	616.20	240	952.30	420	1269.65	600	1568.25
70	635.35	250	970.40	430	1286.70		

DigiTrace JBS-100-ECW-A

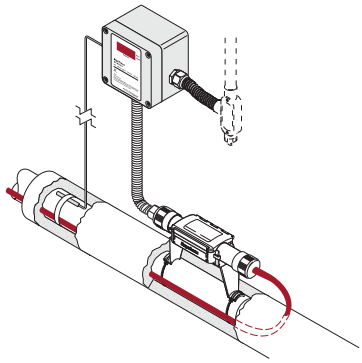
WALL-MOUNTED DIGITAL ELECTRONIC CONTROLLER

For nonhazardous locations

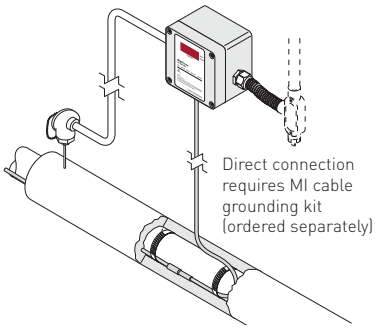
Heating cables using junction box



Heating cables using RayClic connection kit



MI heating cable using direct connection



PRODUCT OVERVIEW

The DigiTrace JBS-100-ECW-A is an electronic temperature controller that provides accurate control for all heating cables.

Housed in a NEMA 4X enclosure and designed to be wall mounted, the unit includes a window and a digital display that shows the monitored actual/set point temperatures and alarm conditions (RTD failure, high or low temperature) if detected. Alarm conditions can be remotely indicated via a form C dry contact. Status LEDs indicate whether the digital display is showing the set point or actual temperature.

Programming the set point temperature, deadband, and high and low alarm thresholds on the JBS-100-ECW-A is accomplished using the built-in digital display and push buttons.

The JBS-100-ECW-A is programmable to maintain temperatures of 425°F (218°C), can be used with voltages from 100 to 277 Vac, and is capable of switching current up to 30 Amps.

Temperature data is provided by a customer supplied 100-ohm platinum RTD, which can provide feedback for either temperature maintenance or ambient sensing for freeze protection.

The kit contains all the necessary materials for a complete installation. For a direct connection to a Pyrotenax MI cable, eliminating the need for a field power connection device, a grounding kit is required (ordered separately).

GENERAL

Approvals	**Nonhazardous locations**
Supply voltage	100–277 Vac ±10% 50–60Hz Common supply for controller and heat tracing circuit

ENCLOSURE

Protection	NEMA 4X
Material	Fiberglass reinforced polyester plastic
Entries	2 x 3/4 in (19 mm) conduit entries for power and heater 1 x 1/2 in (13 mm) conduit entry for RTD sensor
Relative humidity	0% to 90%, noncondensing
Ambient installation and usage temperature	–40°F to 140°F (–40°C to 60°C)

CONTROL

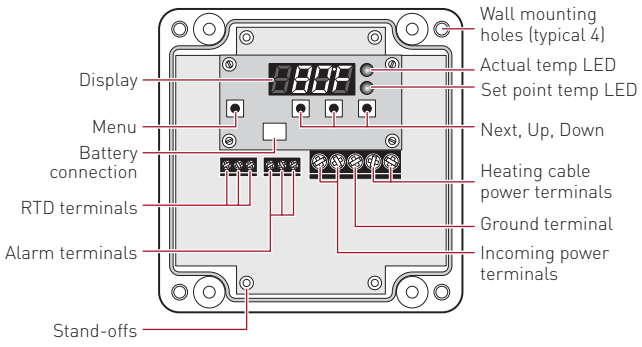
Relay type	Double-pole, mechanical
Control range	32°F to 425°F (0°C to 218°C)
Deadband	Adjustable 2°F to 10°F (2°C to 10°C)
Accuracy	±3°F (1.7°C) of set point

INPUT POWER

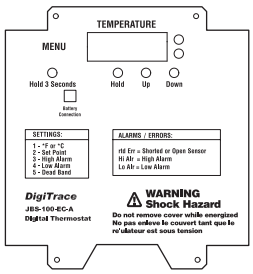
Voltage	277 Vac nominal, 50/60 Hz maximum
Current	30 A maximum
Circuit breaker rating	40 A maximum

ENCLOSURE

JBS-100-ECW-A without wire cover



Wire cover



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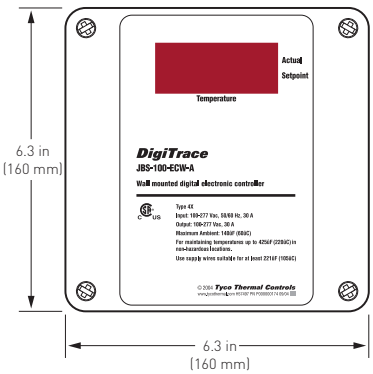


MONITORING AND ALARM OUTPUT

Temperature	Low alarm range: 20°F–420°F (–6°C–216°C) from set point, or OFF High alarm range: 38°F–482°F (3°C–250°C) from set point, or OFF
RTD failure	Shorted or open RTD sensor
Alarm relay	Form C: 2 A at 277 Vac, 2 A at 48 Vdc Normally energized; changes state upon an alarm
Voltage	Alarm relay changes state upon loss of voltage to the controller

TEMPERATURE SENSOR (NOT INCLUDED)

Input type	100 Ω platinum RTD, 3 wire α = 0.00385 Ω/Ω/°C

PROGRAMMING AND SETTING

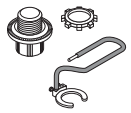
Method	Programmable at controller – Set/Up/Down push buttons on front panel
Units	°F or °C
Digital display	Four numeric display digits for parameter and error/alarm indication
LEDs	Indicate actual and set point from display
Memory	Nonvolatile, restored after power loss
Stored parameters	Parameters can be programmed without power supply (external battery) and parameters are stored in nonvolatile memory.
Alarm conditions	Low/high temperature and RTD failure (open or shorted)

CONNECTION TERMINALS

Power supply input	Screw rising cage clamp, 18–6 AWG
Heating cable output	Screw rising cage clamp, 18–6 AWG
Ground	Screw rising cage clamp, 18–6 AWG
RTD	Screw rising cage clamp, 22–14 AWG
Alarm	Screw rising cage clamp, 22–14 AWG

ORDERING DETAILS

JBS-100-ECW-A

Description	Catalog number	Part number	Weight/lbs
Wall mounted digital electronic controller	JBS-100-ECW-A	P000000181	4.0
Spare Parts and Accessories			
MI cable grounding kit (required if installing MI heating cable)	MI-GROUND-KIT	P000000279	0.2
			
Replacement controller unit	JBS-100-EC	P000000217	1.0

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