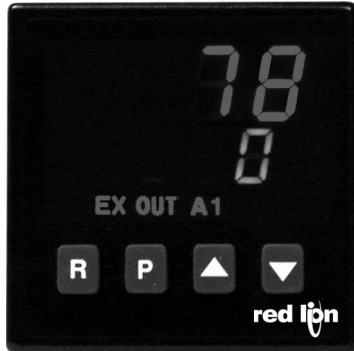


## MODEL TLA - TEMPERATURE LIMIT ALARM



- FM APPROVED, UL RECOGNIZED
- 2-LINE BY 4-DIGIT DISPLAY
- EXCEED, OUTPUT, AND ALARM ANNUNCIATORS
- FOUR BUTTON SILICONE RUBBER KEYPAD
- THERMOCOUPLE OR RTD SENSOR INPUT
- REMOTE RESET INPUT
- MAIN LIMIT OUTPUT: 5A RELAY. SELECTABLE FOR HIGH OR LOW TRIP ACTIVATION
- OPTIONAL ALARMS: 5A RELAY(S)
- OPTIONAL NEMA 4X/IP65 SEALED FRONT BEZEL
- PARAMETER SECURITY VIA PROGRAMMABLE LOCKOUTS



UL Recognized Component,  
 File # E179259

### GENERAL DESCRIPTION

The TLA is a Factory Mutual approved temperature limit alarm, intended to provide an independent shutdown for thermal processes. The TLA accepts signals from a variety of temperature sensors (thermocouple or RTD elements), and its comprehensive programming allows it to meet a wide variety of application requirements.

Dual 4-digit displays allow viewing of the process temperature and limit setpoint simultaneously. Front panel indicators inform the operator of the process and output status. The main limit output and alarm outputs are field replaceable.

The limit output is selectable for high or low trip activation. If the process temperature goes above the limit setpoint for a high trip, or below the limit setpoint for a low trip, the limit relay will de-energize to initiate a process shutdown. The limit output cannot be reset until the process temperature returns to the proper operating range; manual reset is required (local or remote). Sensor failure will initiate a process shutdown.

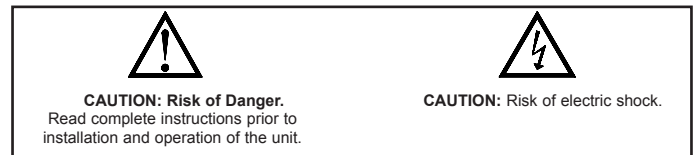
Relay alarm(s) can be configured to activate according to a variety of actions (Absolute HI or LO, Deviation HI or LO, and Band IN or OUT) with adjustable hysteresis. A standby feature suppresses the alarm during power-up until the process stabilizes outside the alarm region.

The unit is constructed of a lightweight, high impact plastic case with a tinted front panel. The front panel meets NEMA 4X/IP65 specifications when properly installed. Multiple units can be stacked horizontally or vertically. Modern surface-mount technology, extensive testing, plus high immunity to noise interference makes the TLA extremely reliable in industrial environments.

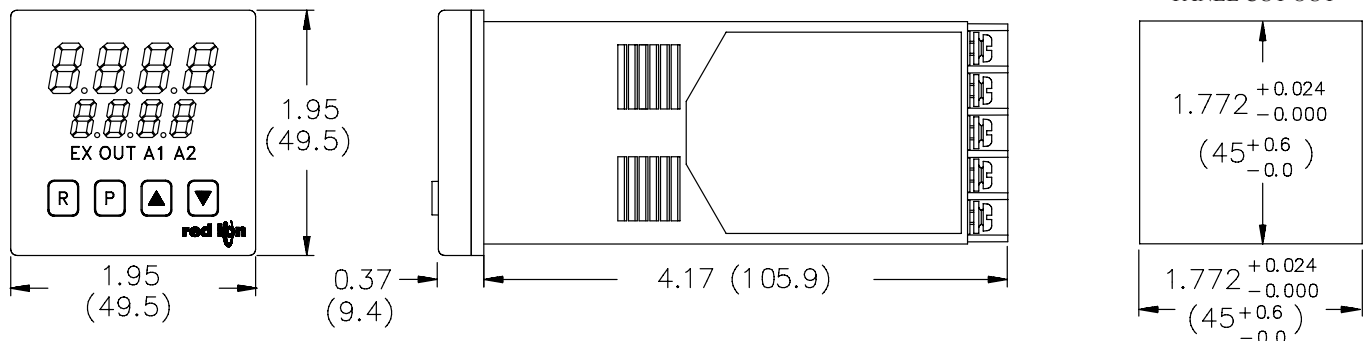
### SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the TLA to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the unit.



### DIMENSIONS In inches (mm)



## GENERAL SPECIFICATIONS

### 1. DISPLAY: 2 line by 4-digit LED

**Upper (Main) Display:** 0.4" (10.2 mm) high red LED

**Lower (Secondary) Display:** 0.3" (7.6 mm) high green LED

#### Display Messages:

“LOLO” - Appears when measurement exceeds + sensor range.

“ULUL” - Appears when measurement exceeds - sensor range.

“OPEN” - Appears when open sensor is detected.

“SHrt” - Appears when shorted sensor is detected (RTD only)

“...” - Appears when display values exceed + display range.

“-...” - Appears when display values exceed - display range.

#### LED Status Annunciators:

EX - Temperature exceeds limit setpoint

OUT - Limit output is de-energized

A1 - Alarm #1 is active

A2 - Alarm #2 is active

### 2. POWER:

**Line Voltage Models:** 85 to 250 VAC, 50/60 Hz, 8 VA.

#### Low Voltage Models:

**DC Power:** 18 to 36 VDC, 7 W.

**AC Power:** 24 VAC +/-10%, 50/60 Hz, 9 VA

### 3. CONTROLS: Four rubber push buttons: R, P, Up, Down

### 4. MEMORY: Nonvolatile EPROM retains all programmable parameters and values.

### 5. ENVIRONMENTAL CONDITIONS:

**Operating Range:** FM rated @ 0 to 65°C, UL rated @ 0 to 55°C

**Storage Range:** -40 to 80°C

**Operating and Storage Humidity:** 85% max. relative humidity (non-condensing) from 0°C to 65°C.

**Altitude:** Up to 2000 meters

### 6. ISOLATION BREAKDOWN RATINGS:

**AC line with respect to all inputs and outputs:** 2300 V for 1 minute (250 V working)

**Relay contacts to all other inputs and outputs:** 2300 VAC

**DC Power with respect to sensor input:** 50 V working (500 V for 1 minute)

### 7. CERTIFICATIONS AND COMPLIANCES:

#### SAFETY

Factory Mutual Approved, Report #3014646, FM 3545, FM 3810

UL Recognized Component, File #E156876, UL 873, CSA C22.2 No. 24

Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.

Type 4X Enclosure rating (Face only), UL 50

IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.

IP65 Enclosure rating (Face only), IEC 529

## ELECTROMAGNETIC COMPATIBILITY

### Emissions and Immunity to EN 61326

#### Immunity:

Electrostatic discharge	EN 61000-4-2	Criterion A	4 kV contact discharge 8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Criterion A	10 V/m
Fast transients (burst)	EN 61000-4-4	Criterion A	2 kV power 1 kV signal
Surge	EN 61000-4-5	Criterion A	1 kV L-L, 2 kV L&N-E power 1 kV signal
RF conducted interference	EN 61000-4-6	Criterion A	3 V/rms
Voltage dip/interruptions	EN 61000-4-11	Criterion A	0.5 cycle

#### Emissions:

Emissions	EN 55011	Class A
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#### Notes:

1. *Criterion A: Normal operation within specified limits.*

### 8. CONNECTION: Wire clamping screw terminals

**Wire Gage Capacity:** Two 14 AWG (2.55 mm), four 18 AWG (1.02 mm), or four 20 AWG (0.61 mm).

**Terminal Torque:** 1.0Nm (8.9 in-lbs.).

1.4Nm (12.4 in-lbs.) max.

### 9. CONSTRUCTION: Black plastic alloy case and collar style panel latch. Panel latch can be installed for vertical or horizontal instrument stacking. One piece tinted plastic bezel. Bezel assembly with circuit boards can be removed from the case to change the output board without removing the case from the panel or disconnecting wiring. Unit meets NEMA 4X/IP65 requirements for indoor use, when properly installed. Flame resistant. Installation Category II, Pollution Degree 2.

### 10. WEIGHT: 0.38 lbs (0.17 kgs)

## INPUT SPECIFICATIONS

### 1. SENSOR INPUT:

**Sample Period:** 100 msec

**Step Response Time:** Less than 300 msec typ., 400 msec max. (to within 99% of final value)

**Normal Mode Rejection:** Greater than 40 dB @ 50/60 Hz

**Common Mode Rejection:** Greater than 120 dB, DC to 60 Hz

**Overvoltage Protection:** Input overload 120 VAC for 15 seconds max.

### 2. Failed Sensor Response:

**Main Output:** Sensor failure will initiate a process shutdown

**Display:** “OPEN”

**Alarms:** Upscale

### 3. INDICATION ACCURACY: ±(0.3% of Span +1°C) at 23°C ambient after 20 minute warm-up. (Includes NIST conformity, cold junction effect, A/D conversion errors and linearization conformity.)

**Span Drift (maximum):** 130 PPM/°C

### 4. RTD INPUT: 2 or 3 wire, 100 Ω platinum, alpha = 0.00385 (DIN 43760), alpha = 0.0039162

**Excitation:** 150 μA typical

**Resolution:** 1 or 0.1 degree

**Lead Resistance:** 15 Ω max. per input lead

RTD TYPE	RANGE
385	-200 to +600°C -328 to +1100°F
392	-200 to +600°C -328 to +1100°F
OHMS	2.0 to 320.0

### 5. THERMOCOUPLE INPUT:

**Types:** T, E, J, K, R, S, B, N, Linear mV, software selectable

**Input Impedance:** 20 MΩ all types

**Lead resistance effect:** 0.25 μV/Ω

**Cold junction compensation:** Less than ±1°C typ., (±1.5°C max), error over 0 to 65°C max. ambient temperature range. Defeated for Linear mV indication mode.

**Resolution:** 1° for all types, or 0.1° for T, E, J, K, and N only.

TC TYPE	RANGE	WIRE COLOR	
		ANSI	BS 1843
T	-200 to +400°C -328 to +752°F	blue (+) red (-)	white (+) blue (-)
E	-200 to +750°C -328 to +1382°F	violet (+) red (-)	brown (+) blue (-)
J	-200 to +760°C -328 to 1400°F	white (+) red (-)	yellow (+) blue (-)
K	-200 to +1250°C -328 to +2282°F	yellow (+) red (-)	brown (+) blue (-)
R	0 to 1768°C +32 to +3214°F	black (+) red (-)	white (+) blue (-)
S	0 to 1768°C +32 to 3214°F	black (+) red (-)	white (+) blue (-)
B	+149 to +1820°C +300 to +3308°F	grey (+) red (-)	no standard
N	-200 to +1300°C -328 to +2372°F	orange (+) red (-)	orange (+) blue (-)
mV	-5.00 to +56.00	no standard	no standard

### 6. REMOTE RESET INPUT: Internally pulled up to +5 VDC (1MΩ).

V<sub>IL</sub>: 0.85 V max., V<sub>IH</sub>: 3.65 V min., V<sub>IN</sub> MAX: 5.25 VDC, I<sub>OFF</sub>: 1μA max.

## OUTPUT SPECIFICATIONS

### 1. LIMIT AND ALARM OUTPUT RELAYS:

**Contact Rating:** 5 A @ 250 VAC or 30 VDC (resistive load) 1/10 HP @ 120 VAC (inductive load)

**Life Expectancy:** 100,000 cycles at max. load rating. (Decreasing load increases life expectancy.)

2. **LIMIT OUTPUT:** TLA21000: Form-C relay; TLA11100: Form-A relay. Selectable for high or low trip activation. If the process temperature goes above the limit setpoint for a high trip, or below the limit setpoint for a low trip, the limit relay will de-energize to initiate a process shutdown. The limit output cannot be reset until the process temperature returns to the proper operating range; manual reset is required (local or remote).

**Annunciators:**

“EX” - Lit when the process temperature exceeds the limit setpoint.

“OUT” - Lit when the limit output is de-energized.

3. **ALARM OUTPUTS (Optional):** One or two Form-A relays.

**Modes:**

Absolute High Acting	Absolute Low Acting
Deviation High Acting	Deviation Low Acting
Inside Band Acting	Outside Band Acting

**Reset Action:** Programmable; automatic or latched. Latched alarms can be reset regardless of limit exceed condition.

**Standby Mode:** Programmable; enable or disable.

**Hysteresis:** Programmable.

**Annunciator:** “A1” and “A2” programmable for normal or reverse acting.

## ORDERING INFORMATION

### 85 to 250 VAC

LIMIT OUTPUT	ALARM 1 OUTPUT	ALARM 2 OUTPUT	REPLACEMENT OUTPUT BOARD	PART NUMBERS
Form-C Relay	Form-A Relay		RBDLA210	TLA21000
Form-A Relay	Form-A Relay	Form-A Relay	RBD48111	TLA11100

### 18 to 36 VDC / 24 VAC

LIMIT OUTPUT	ALARM 1 OUTPUT	ALARM 2 OUTPUT	REPLACEMENT OUTPUT BOARD	PART NUMBERS
Form-C Relay	Form-A Relay		RBDLA210	TLA21010
Form-A Relay	Form-A Relay	Form-A Relay	RBD48111	TLA11110

## EMC INSTALLATION GUIDELINES

Although this unit is designed with a high degree of immunity to Electro Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the unit may be different for various installations. Listed below are some EMC guidelines for successful installation in an industrial environment.

- The unit should be mounted in a metal enclosure, which is properly connected to protective earth.
- Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
  - Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
  - Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
  - Connect the shield to common of the unit and leave the other end of the shield unconnected and insulated from earth ground.
- Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
- Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.

- In very electrically noisy environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure.

The following EMI suppression devices (or equivalent) are recommended:

Ferrite Suppression Cores for signal and control cables:

Fair-Rite # 0443167251 (RLC #FCOR0000)

TDK # ZCAT3035-1330A

Steward #28B2029-0A0

Line Filters for input power cables:

Schaffner # FN610-1/07 (RLC #LFIL0000)

Schaffner # FN670-1.8/07

Corcom #1VR3

Note: Reference manufacturer’s instructions when installing a line filter.

- Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
- Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
 

Snubbers:  
RLC #SNUB0000

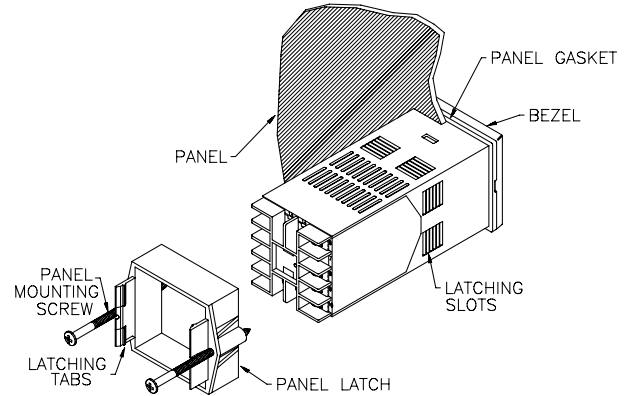
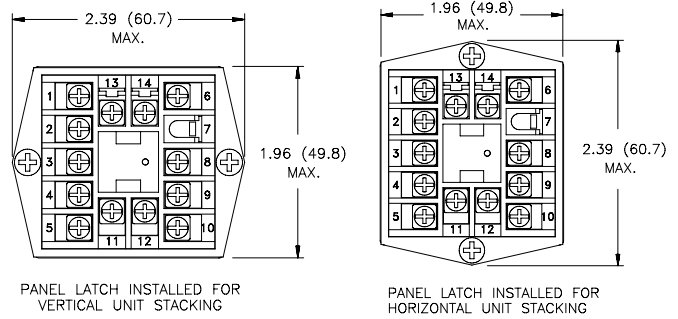
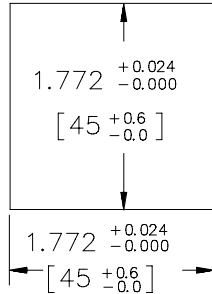
# 1.0 INSTALLING THE TLA

The TLA meets NEMA 4X/IP65 requirements for indoor use to provide a watertight seal in steel panels with a minimum thickness of 0.09 inch, or aluminum panels with a minimum thickness of 0.12 inch. The units are intended to be mounted into an enclosed panel. It is designed so that the units can be stacked horizontally or vertically. The bezel assembly **MUST** be in place during installation of the unit.

## Instructions:

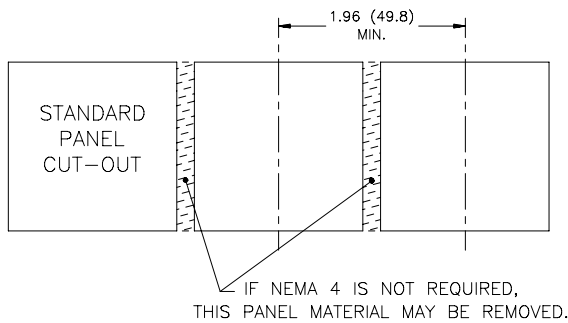
1. Prepare the panel cutout to the dimensions.
2. Remove the panel latch from the unit. Discard the cardboard sleeve.
3. Carefully remove the center section of the panel gasket and discard. Slide the panel gasket over the unit from the rear, seating it against the lip at the front of the case.
4. Insert the unit into the panel cutout. While holding the unit in place, push the panel latch over the rear of the unit, engaging the tabs of the panel latch in the farthest forward slot possible.
5. To achieve a proper seal, tighten the panel latch screws evenly until the unit is snug in the panel, torquing the screws to approximately 7 in-lbs (79 N-cm). Over tightening can result in distortion of the panel, and reduce the effectiveness of the seal.

*Note: The installation location of the TLA is important. Be sure to keep it away from heat sources (ovens, furnaces, etc.), and away from direct contact with caustic vapors, oils, steam, or any other process byproducts in which exposure may affect proper operation.*




## Multiple Unit Stacking

The TLA is designed for close spacing of multiple units. Units can be stacked either horizontally or vertically. For vertical stacking, install the panel latch with the screws to the sides of the unit. For horizontal stacking, the panel latch screws should be at the top and bottom of the unit. The minimum spacing from center line to center line of units is 1.96" (49.8 mm). This spacing is the same for vertical or horizontal stacking.



*Note: When stacking units, provide adequate panel ventilation to ensure that the maximum operating temperature range is not exceeded.*

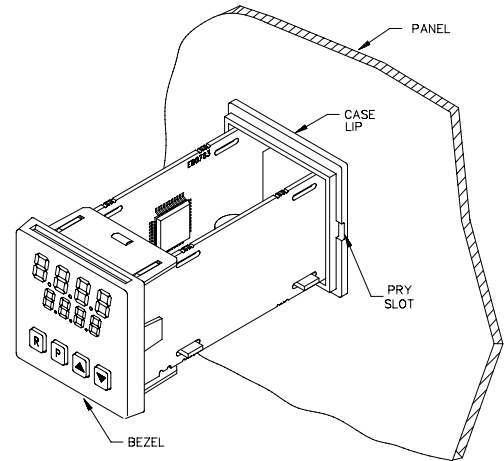
 **Caution:** Disconnect power to the unit and to the output control circuits to eliminate the potential shock hazard when removing the bezel assembly.

## Unit Removal Procedure

To remove a unit from the panel, first loosen the panel latch screws. Insert flat blade screwdrivers between the latch and the case on either side of the unit, so that the latches disengage from the grooves in the case. Push the unit through the panel from the rear.

## Removing Bezel Assembly

The bezel assembly must be removed from the case to replace the output board. To remove the bezel assembly, insert a flat blade screwdriver into the pry slot on either side of the unit. Twist the screwdriver handle until the unit is ejected enough to allow removal.



**Caution:** The bezel assembly contains electronic circuits that can be damaged by static electricity. Before removing the assembly, discharge static charge on your body by touching an earth ground point. It is also important that the bezel assembly be handled only by the bezel itself. Additionally, if it is necessary to handle a circuit board, be certain that hands are free from dirt, oil, etc., to avoid circuit contamination that may lead to malfunction. If it becomes necessary to ship the unit for repairs, place the unit in its case before shipping.

## Installing Bezel Assembly

To install the bezel assembly, insert the assembly into the case until the bezel is fully seated against the lip of the case. Properly installing the bezel assembly is necessary for watertight sealing.

## 2.0 WIRING THE TLA

After the unit has been mechanically mounted, it is ready to be wired. All wiring connections are made to the rear screw terminals. When wiring the unit, use the numbers on the label and those embossed on the back of the case, to identify the position number with the proper function.

All conductors should meet voltage and current ratings for each terminal. Also cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the unit (AC or DC) be protected by a fuse or circuit breaker. Strip the wire, leaving approximately 1/4" (6 mm) bare wire exposed (stranded wires should be tinned with solder). Insert the wire under the clamping washer and tighten the screw until the wire is clamped tightly.

*Caution: Unused terminals are NOT to be used as tie points. Damage to the TLA may result if these terminals are used.*

### POWER WIRING

#### AC Power

Primary AC power is connected to terminals #11 and #12, labeled AC. To reduce the chance of noise spikes entering the AC line and affecting the TLA, an AC feed separate from that of the load should be used to power the TLA. Be certain that the AC power to the TLA is relatively "clean" and within the variation limit. Connecting power from heavily loaded circuits or circuits that also power loads that cycle on and off (contacts, relays, motors, etc.), should be avoided.

#### DC Power

DC Power (18 to 36 VDC) is connected to terminals #11 and #12 labeled DC+ and DC- respectively.

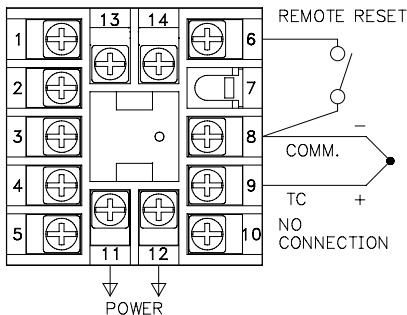


**CAUTION:** Observe proper polarity when connecting DC voltages. Damage to the unit may occur if polarity is reversed.

### SIGNAL WIRING

#### Thermocouple

When connecting the thermocouple, be certain that the connections are clean and tight. If the thermocouple probe cannot be connected directly to the TLA, thermocouple wire or thermocouple extension-grade wire must be used to extend the connection points (copper wire does not work). Always refer to the thermocouple manufacturer's recommendations for mounting, temperature range, shielding, etc. For multi-probe temperature averaging applications, two or more thermocouple probes may be connected to the TLA (always use the same type). Paralleling a single thermocouple to more than one TLA is not recommended. Generally, the red wire from the thermocouple is negative and connected to the TLA's common.



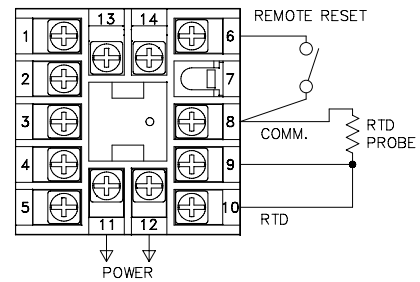
Thermocouple Connection

#### RTD

When connecting the RTD, be certain that the connections are clean and tight. RTD sensors have a higher degree of accuracy and stability than thermocouple sensors. Most RTD sensors available are the three wire type. The third wire is a sense lead for canceling the effects of lead resistance of the probe. Four wire RTD elements may be used by leaving one of the sense leads disconnected. Two wire RTD sensors may be used in either of two ways:

- Attach the RTD to terminals #8 and #10. Install a copper sense wire of the same wire gauge as the RTD leads. Attach one end of the wire at the probe and the other end to terminal #9. Complete lead wire compensation is obtained. This is the preferred method.
- Attach the RTD to terminals #8 and #10. Install a shorting wire between terminals #9 and #10. A temperature offset error of 2.5°C/ohm of lead resistance exists. The error may be compensated by programming a temperature offset.

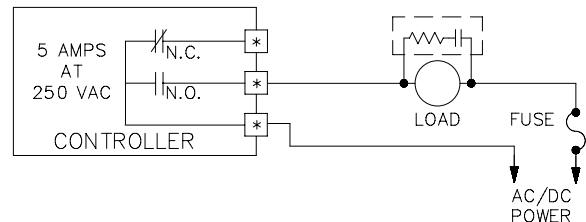
*Note: With extended cable runs, be sure the lead resistance is less than 15 ohms/lead.*



RTD Connection

#### RELAY CONNECTIONS

To prolong contact life and suppress electrical noise interference due to the switching of inductive loads, it is good installation practice to install a snubber across the contactor. Follow the manufacturer's instructions for installation.



*Note: Snubber leakage current can cause some electromechanical devices to be held ON.*

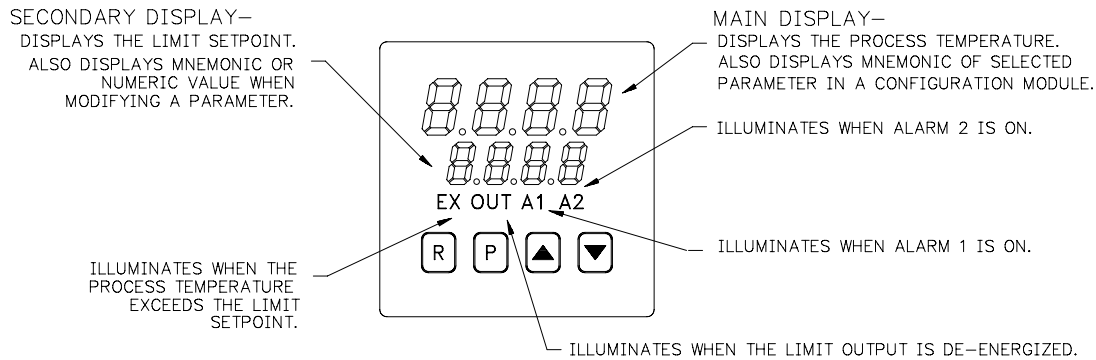
\*Terminal numbers are model dependent. See Terminal Configurations for description.

#### REMOTE RESET WIRING

The use of shielded cable is recommended. Follow the EMC installation guidelines for shield connection.

Terminal #6 is the Remote Reset. Any form of mechanical switch may be connected to terminal #6 (REMOTE RESET) and terminal #8 (COMM.). Sinking open collector logic with less than 0.7 V saturation and off-state leakage current of less than 1 µA may also be used.

# 3.0 FRONT PANEL DESCRIPTION



The front panel bezel material is flame and scratch resistant, tinted plastic that meets NEMA 4X/IP65 requirements, when properly installed. Continuous exposure to direct sunlight may accelerate the aging process of the bezel. The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents. There are two 4-digit LED displays, a red upper Main Display and a lower green Secondary Display.

There are up to four panel annunciators, with red backlighting, that illuminate to inform the operator of the TLA and output status. See the front panel diagram for a description of the annunciators. Four front panel buttons are used to access different modes and parameters. The following is a description of each button.

Do NOT use tools of any kind (screwdrivers, pens, pencils, etc) to operate the keypad of this unit.

## Button Functions

**R** - The Reset (R) button is used to reset the limit and alarm relays. The limit output cannot be reset until the process temperature returns to the proper operating range. Latched alarms can be reset regardless of limit exceed condition.

**P** - The Parameter (P) button is used to access programming, enter the change, and scroll through the available parameters in any mode.

**UP, DN** - The Up/Down buttons are used to modify parameters.

## TLA POWER-UP

Upon applying power, the TLA delays input indication and control action for five seconds to perform several self-diagnostic tests and to display basic TLA information. Initially, the TLA illuminates both displays and all annunciators to verify that all display elements are functioning. The TLA then displays the programmed input sensor type in the main (top) display and the revision number of the TLA's operating system in the secondary (bottom) display. The TLA

checks for correct internal operation and displays an error message (E-xx) if an internal fault is detected. (See the Troubleshooting section for further information.)

Upon completion of this sequence, the TLA begins displaying the input value and setpoint, and updates the outputs based upon this condition.

## TLA CONFIGURATION OVERVIEW

The TLA is programmed with certain parameter settings from the factory. Factory settings are listed in parentheses in the various Configuration of Parameters tables. In many cases, these settings must be changed to the particulars of the application before proper operation can be started.

The TLA is typically in the Normal Display Mode. In this mode, the process temperature is displayed in the main (top) display, and the limit setpoint is displayed in the secondary (bottom) display. When changes to the parameter configurations are needed, the P button is pressed, and the TLA will enter into the Parameter Mode.

## PARAMETER CONFIGURATION BASIC STARTUP

For basic start-up, it is important to verify or change Input Parameter Module (1-IN) parameters tYPE and SCAL, and Output Parameter Module (2-OP) parameter LiAC (Limit Trip Action). For alarm set-up, it is important to verify or change Alarms Parameter Module (4-AL) parameters ACt1, AL-1, ACt2, and AL-2.

If the above Input parameters or the input wiring connections are not correct, then the main (top) display may display an error message or incorrect value. Verify the input programming and wiring. (If incorrect display continues, refer to the Troubleshooting section.) All other parameter configurations are important but will not prevent the TLA from showing a correct display.

# 4.0 PARAMETER MODE

The Parameter Mode is accessed by pressing the P Button from the Normal Display Mode. While in the Parameter Mode, the temperature is displayed in the main (top) display, and the parameter is displayed in the secondary (bottom) display. The correct password must be entered before any parameters can be accessed. To modify values, use the UP or DOWN button while the parameter is displayed. Use the P button to accept the new value, and to scroll through the parameters. The TLA will automatically return to the normal display mode if no action is taken. The TLA responds to the new values immediately, but the change

is not committed to non-volatile memory until the TLA is returned to the Normal Display Mode. If power loss occurs before returning to the normal display mode, the new values must be re-entered.

To gain access to the Configuration Parameter Modules continue to CNFP and press the UP button. These modules allow access to the fundamental set-up parameters of the TLA. If the setpoint or alarm values are modified, the CNFP step will be skipped.

## Parameter Mode Reference Table

DISPLAY	PARAMETER	RANGE	DESCRIPTION
PASS	Password to access parameters	0 to 250	If an incorrect value is entered, the TLA will display "End" momentarily, and then return to the normal display mode. The default password is 10. The wildcard password is 222 (in case the password is forgotten).
SP	Limit setpoint	-999 to 9999	Range limited by SPLO & SPHI.
AL-1 *	Alarm #1	-999 to 9999	The Alarm parameters can be independently locked out from appearing. See Configuration Module 3, Parameter Lock-outs.
AL-2 *	Alarm #2	-999 to 9999	
CNFP	Configuration parameter modules	"Up" button: enter configuration modules.	These modules allow access to the fundamental set-up parameters of the TLA. The modules are grouped into related programming steps, such as inputs, outputs, alarms, etc. Upon completion of each module, the program returns to "CNFP".
End	End of Parameter Mode		When the parameter list has been scrolled through, the TLA will display "End" momentarily, and then return to the normal display mode.

\* Model Number Dependent.

## CONFIGURATION PARAMETER MODULES

The Configuration Parameter modules are accessed by pressing the UP button from CNFP in the Parameter Mode. The UP or DOWN buttons can be pressed to move to the desired Parameter Module. The P button is then pressed to enter into that module. The main (top) display will be the parameter, and the secondary (bottom) display will be the parameter value. The UP or DOWN buttons are used to modify the desired parameter value, and the P button enters the new value, and moves to the next parameter. The TLA responds to the new values after the P

button is pressed, however, the change is not committed to permanent memory until the TLA is returned to the Normal Display Mode. If power loss occurs before returning to the Normal Display Mode, the new values must be entered again. At the end of each module, the TLA will go back to CNFP. Other Parameter Modules can be accessed by pressing the UP or DOWN buttons, or pressing P will return to the Normal Display Mode.

Parameters that are model number, or program dependent will only be displayed when the appropriate options are installed or programmed.

## CONFIGURE MODULE 1 - INPUT PARAMETERS (1-IN)

DISPLAY	PARAMETER	RANGE (FACTORY SETTING)	DESCRIPTION/ COMMENTS
tYPE	Input Type	tc-t - Type T TC tc-E - Type E TC tc-J - Type J TC tc-K - Type K TC tc-r - Type R TC tc-S - Type S TC tc-b - Type B TC tc-N - Type N TC LIN - Linear mV r385 - 385 curve RTD r392 - 392 curve RTD rLIN - Linear ohms (tc-J)	Select from the list of various thermocouple and RTD sensors.
SCAL	Temperature Scale	°F or °C (°F)	Select either degrees Fahrenheit (F) or degrees Celsius (C). <b>If changed, be sure to check all parameters.</b>
dCPt	Temperature Resolution	0 or 0.0 (0)	Select either 1 or 0.1 degree resolution. <b>If changed, be sure to check all parameters.</b>
FLtr	Digital Input Filtering and Display Update	0 to 4 0 - least input filtering 3 - most input filtering 4 - most input filtering and slower 500 msec display update rate (outputs still update at 100 msec rate) (1)	Select the relative degree of input signal filtering and display update rate. The filter is an adaptive digital filter that discriminates between measurement noise and actual process changes. Therefore, the influence on step response time is minimal. If the signal is varying too greatly due to measurement noise, increase the filter value. Conversely, if the fastest TLA response is desired, decrease the filter value.
SHFt	Input Signal Shift (correction offset)	-999 to 9999 1 or 0.1 degree (0)	If the TLA temperature disagrees with a reference temperature instrument or if the temperature sensor has a known calibration, the TLA temperature can be compensated by a correction offset. The following equation expresses the relationship: Desired Display Temp = (TLA Temp) + SHFt. Normally set to 0.
SPLO	Limit Setpoint Lower Limit	-999 to 9999 1 or 0.1 degree (0)	The TLA has programmable high and low setpoint limit values to restrict the setting range of the limit setpoint. Set the limit values so that the temperature setpoint value cannot be set outside the safe operating area of the process. SPHI must be above SPLO.
SPHI	Limit Setpoint Upper Limit	-999 to 9999 1 or 0.1 degree (9999)	

## CONFIGURE MODULE 2 - OUTPUT PARAMETERS (2-OP)

DISPLAY	PARAMETER	RANGE (FACTORY SETTING)	DESCRIPTION/ COMMENTS
LiAc	Limit Output Trip Action	LO - Low Acting HI - High Acting (HI)	The limit output is selectable for high or low trip activation. If the process temperature goes above the limit setpoint for a high trip, or below the limit setpoint for a low trip, the limit relay will de-energize to initiate a process shutdown. See the Limit Output Action section for details.

## CONFIGURE MODULE 3 - LOCKOUT PARAMETERS (3-LC)

DISPLAY	PARAMETER	RANGE (FACTORY SETTING)	DESCRIPTION/ COMMENTS
PASS	Password	0 to 250 (10)	The password is required to access all parameters. The password can be set to any value between 0 and 250. A wildcard password, 222, can be used as an alternative to the programmed password.
AL *	Alarms #1 and #2 access level	LOC - lockout, prevents the alarms from appearing rEd - read only, alarms appear, but cannot be modified Ent - enter, alarms appear, and can be modified (Ent)	The alarm(s) parameter in the Parameter Mode can be configured to be completely locked out, read only, or fully accessible.
FPrS	Front panel reset	NO - disabled YES - active (YES)	The front panel R button can be enabled or disabled. The Remote Reset input is not affected by this setting.

\* Model Number Dependent.

## CONFIGURE MODULE 4 - ALARMS PARAMETERS (4-AL)

DISPLAY	PARAMETER	RANGE (FACTORY SETTING)	DESCRIPTION/ COMMENTS
Act1	Alarm 1 action mode	A-HI - absolute high A-LO - absolute low d-HI - deviation high d-LO - deviation low b-IN - band inside b-Ot - band outside (A-HI)	When deviation low-acting with positive alarm value (d-LO), deviation high-acting with negative value (d-HI), or band inside-acting (b-IN) is selected for the alarm action, the indicator is OFF when the alarm output is ON. See the Alarms section for complete details of each action. <b>If changed, check alarm values.</b>
rSt1	Alarm 1 reset mode	Auto - automatic LATC - manual reset (Auto)	Automatic reset alarms are reset by the TLA when the alarm condition clears. Latched alarms require operator action to reset the alarm condition. The front panel R button, if enabled, can be used to reset a latched alarm (see FPrS in Configure Module 3). A latched alarm condition may also be reset via the Remote Reset input. See the Reset Action diagram in the Alarms section.
Stb1	Alarm 1 standby function (delay)	NO or YES (NO)	The alarm(s) may be independently configured to exhibit a power-on, standby delay which suppresses the alarm output from turning ON until the temperature first stabilizes outside the alarm region. After this condition is satisfied, the alarm standby delay is canceled and the alarm triggers normally, until the next TLA power-on. This feature also works for deviation and band alarms when the setpoint is changed via keypad. This action suppresses "nuisance" alarms. See the Alarm Standby diagram in the Alarms section.
AL-1	Alarm 1 value	-999 to 9999 (0)	The alarm values are either absolute values, or relative to the limit setpoint value (deviation and band alarms). An absolute alarm value is the value that is entered for the alarm. A relative alarm value is the mathematical sum of the temperature limit setpoint value and the alarm value (positive or negative), thus a relative alarm tracks the limit setpoint value as it is changed. If the alarm action is set as a Band Alarm, then only a positive alarm value can be entered.
Act2 *	Alarm 2 action mode	A-HI - absolute high A-LO - absolute low d-HI - deviation high d-LO - deviation low b-IN - band inside b-Ot - band outside (A-HI)	The Alarm 2 parameters are programmed independently of alarm 1. See the corresponding Alarm 1 parameter for description.
rSt2 *	Alarm 2 reset mode	Auto - automatic LATC - manual reset (Auto)	
Stb2 *	Alarm 2 standby function (delay)	NO or YES (NO)	
AL-2 *	Alarm 2 value	-999 to 9999 (0)	
AHYS	Alarm hysteresis value	1 to 250 (1)	The alarm value(s) have a programmable hysteresis band to prevent alarm output chatter near the alarm trigger point. The hysteresis value should be set to eliminate this effect. A value of 2 to 5 is usually sufficient for most applications. A single alarm hysteresis value applies to both alarms. See the Alarm Action Figures, in the Alarms section, for the effect of hysteresis on the various alarm types.

\* Model Number Dependent.

# CONFIGURE MODULE 9 - FACTORY SERVICE OPERATIONS (9-FS)

DISPLAY	PARAMETER	RANGE	DESCRIPTION/ COMMENTS
CodE	Factory service function code	48 - Calibrate instrument	TLA calibration. Refer to the Calibration section for details.
		66 - Reset parameters to factory settings	Entering code 66 restores all parameters to factory settings. The unit indicates the operation after the P button is pressed, by displaying "rSEt" in the lower display momentarily.
		77 (twice in succession) - Reset TLA calibration to nominal values	Caution: this operation erases the TLA calibration values and defaults the values to nominal settings. Reading errors of $\pm 10\%$ may result. Do not perform this operation unless the TLA has lost calibration. Loss of calibration is signaled by an "E-CL" error flag at power-up. To clear this flag, perform calibration procedure as noted in the Calibration section. Alternatively, "stepping" through one of the calibration procedures clears the error flag, but does NOT invalidate the calibration accuracy in any manner.

## USER PARAMETER VALUE CHART

TLA Number \_\_\_\_\_

MNEMONIC	PARAMETER	USER SETTING
<b>PR55</b>	Password	_____
<b>SP</b>	Limit Setpoint	_____
<b>RL - 1</b>	Alarm 1 Value	_____
<b>RL - 2</b>	Alarm 2 Value	_____

### 3-LL Lockout Parameters

MNEMONIC	PARAMETER	USER SETTING
<b>PR55</b>	Password	_____
<b>RL</b>	Alarm(s) Access Level	_____
<b>FPr5</b>	Front Panel Reset	_____

### 1-IN Input Parameters

MNEMONIC	PARAMETER	USER SETTING
<b>TYPE</b>	Input Sensor Type	_____
<b>SCALE</b>	Temperature Scale Units	_____
<b>RESOL</b>	Temperature Resolution	_____
<b>FILTER</b>	Digital Filtering	_____
<b>SHFT</b>	Input Offset	_____
<b>SPLB</b>	Limit Setpoint Lower Limit	_____
<b>SPHI</b>	Limit Setpoint Upper Limit	_____

### 4-RL Configure Alarm Parameters

MNEMONIC	PARAMETER	USER SETTING
<b>Act 1</b>	Alarm 1 Action Mode	_____
<b>rSt 1</b>	Alarm 1 Reset Mode	_____
<b>Stb 1</b>	Alarm 1 Standby Enabled	_____
<b>RL - 1</b>	Alarm 1 Value	_____
<b>Act 2</b>	Alarm 2 Action Mode	_____
<b>rSt 2</b>	Alarm 2 Reset Mode	_____
<b>Stb 2</b>	Alarm 2 Standby Enabled	_____
<b>RL - 2</b>	Alarm 2 Value	_____
<b>HHYS</b>	Alarm Hysteresis Value	_____

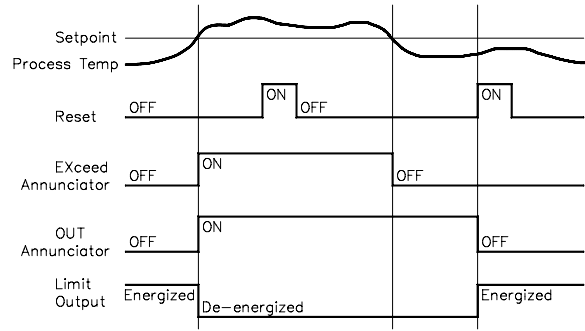
### 2-OP Output Parameters

MNEMONIC	PARAMETER	USER SETTING
<b>LACT</b>	Limit Output Trip Action	_____

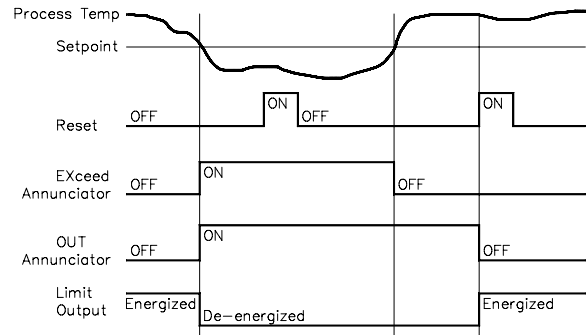
## LIMIT OUTPUT ACTION

The limit output is selectable for high or low trip activation. If the process temperature goes above the limit setpoint for a high trip, or below the limit setpoint for a low trip, the limit relay will de-energize to initiate a process shutdown. The limit output cannot be reset until the process temperature returns to the proper operating range; manual reset is required. The following action figures describe the status of the limit output and the front panel indicators for various over/under setpoint, and reset conditions. Reset is either by the front panel R button, if enabled, or by the Remote Reset input, terminal #6. Refer to Configure Module 2 - Output Parameters for details of configuring the limit output. Refer to Configure Module 3 - Lockout Parameters for details of configuring the front panel Reset button.

### High Trip Action



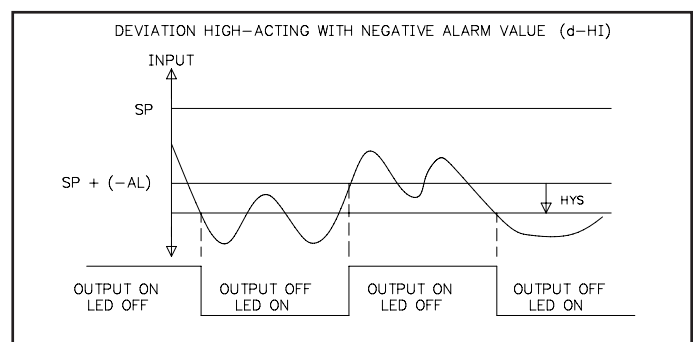
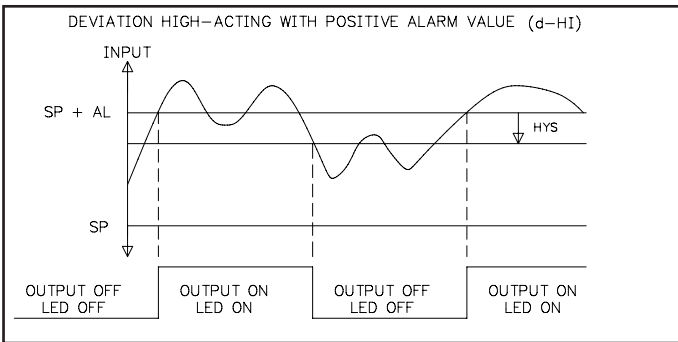
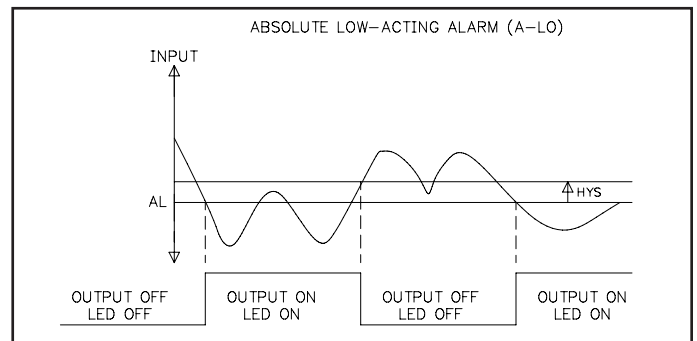
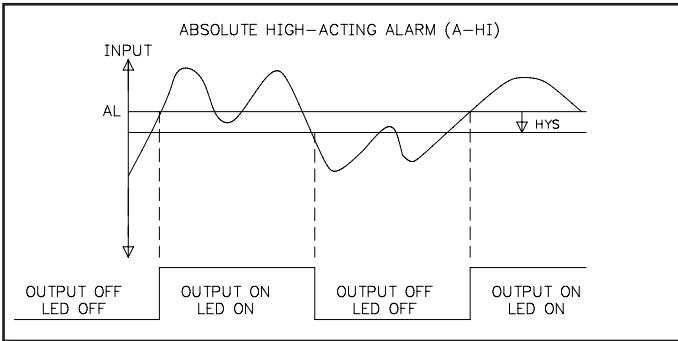
### Low Trip Action

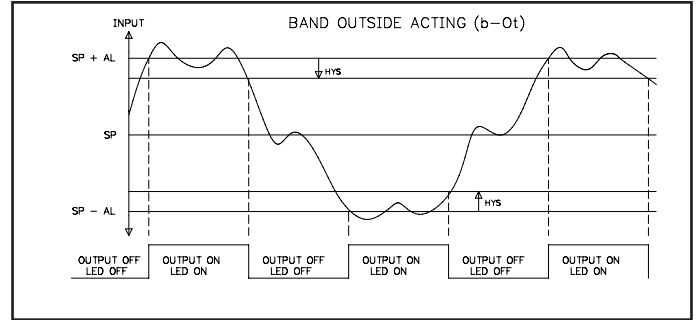
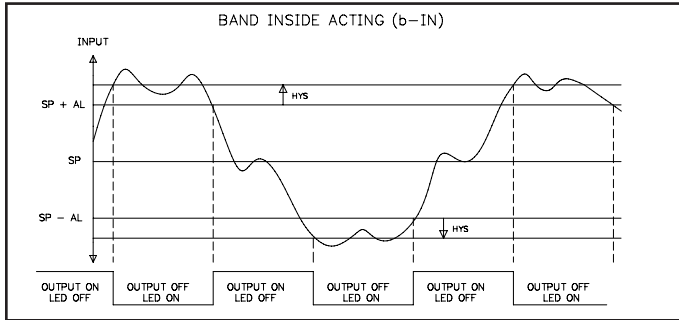
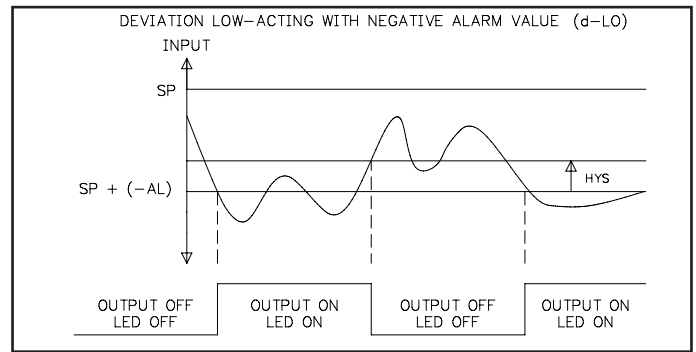
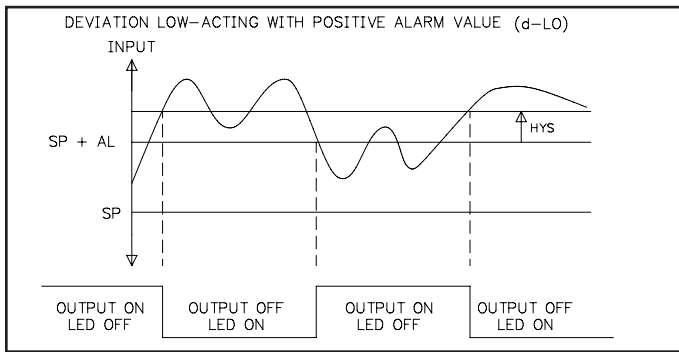


## 5.0 ALARMS (OPTIONAL)

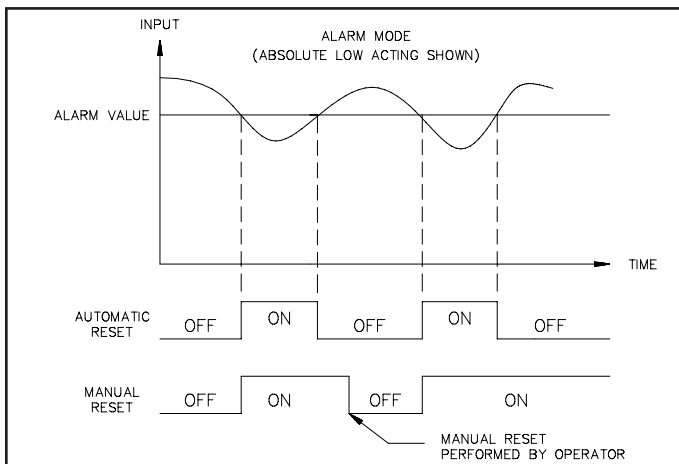
The alarm action figures describe the status of the alarm output and the front panel indicator for various over/under temperature conditions. The alarm output wave form is shown with the output in the automatic reset mode. Select the

alarm action with care -- in some configurations, the front panel indicator (LED) might be OFF while the output is ON. Refer to Configure Module 4 - Alarm Parameters for details of configuring the alarms.

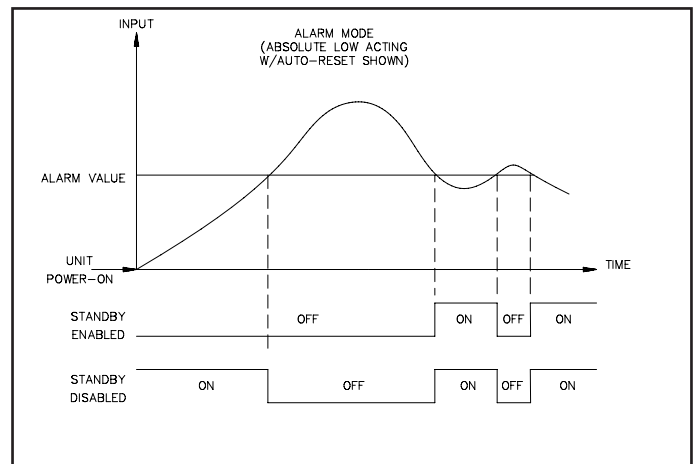




### Alarm Reset Sequence



### Alarm Standby Delay Sequence



### CALIBRATION CHECKS

The instrument has been fully calibrated at the factory for all input types. If the unit appears to be indicating or controlling incorrectly, see the Troubleshooting section before attempting this procedure.

If the TLA is suspected of reading incorrectly, the instrument may be checked for indication accuracy without disturbing the factory calibration. The following procedures may be used for this purpose.

*Note: Allow ½ hour warm-up before checking these parameters.*

#### mV Reading Check

1. Connect a DC mV source with an accuracy of 0.03% or better to terminal #8 (-) & #9 (+).
2. Configure Input Parameters Module 1 for linear mV (Lin) input, under tYPE.
3. Compare the TLA read-out to the standard at various points over the range (-5.00 mV to 56.00 mV). The tolerance is  $\pm(0.15\% \text{ of reading} + 1 \text{ LSD})$ .
4. Calibrate the TLA if the readings are out of tolerance.

#### Thermocouple Cold Junction Temperature Check

1. Connect a thermocouple probe of known accuracy (Types T, E, J, K, N only) to TLA. Select the probe used in Configure Module 1.
2. Connect a reference temperature probe to measuring end of thermocouple to monitor temperature. Allow sufficient time for temperatures to equalize.
3. Compare TLA display with reference temperature probe. The TLA display should equal the calibrated probe temperature. (Tolerance is  $\pm 1^\circ\text{C}$ .)
4. Calibrate the cold junction temperature if out of tolerance.

#### RTD Ohms Reading Check

1. Connect RTD simulator (with an accuracy of 0.1 ohm or better) capable of operating with less than 150  $\mu\text{A}$  to terminals #8, #9, & #10.
2. Configure Input Parameters Module 1 for linear ohms (rLin) input, under tYPE.
3. Compare the TLA read-out with the RTD simulator at various points over the range 2.0 to 300.0 ohms. The tolerance is  $\pm(0.3\% \text{ of span} + 1 \text{ LSD})$ .
4. Calibrate the TLA RTD ohms if out of tolerance.

#### Error Flag E-CL

If error flag "E-CL" appears at power-up, a loss of calibration parameters due to noise spikes has occurred. Entering code 77 twice in Factory Service Operations Module (9-FS) erases the TLA calibration values and defaults the values to nominal settings. Reading errors of  $\pm 10\%$  may result. It is recommended that the TLA be fully recalibrated. If using thermocouple only, the RTD calibration need not be performed.

*Note: the "E-CL" flag may be cleared by "stepping" through cold junction calibration procedure without the need to change any calibration values. A  $\pm 10\%$  reading error will still exist.*

# 6.0 CALIBRATION

When re-calibration is required (generally every two years), this procedure should be performed by qualified technicians using appropriate equipment. Equipment source accuracy of 0.03% or better is required.

The procedure consists of: applying accurate mV signals, setting the thermocouple cold junction temperature, and applying precision resistance, among others. Allow a 30 minute warm-up period before starting this procedure. Do not use thermocouple wire for the millivolt or RTD ohms calibration.

This procedure may be aborted by disconnecting power to the TLA before exiting the configuration mode. The existing calibration settings remain in affect.

*Note: After completing any of the calibration sequences, the TLA defaults the input sensor type to thermocouple type "J" (tc-J). Be sure to set input sensor for proper type.*

*Note: The TLA must be restored to normal display mode before any data is stored.*

## Factory Service Operations - Calibration (9-FS)

DISPLAY	PARAMETER	RANGE	DESCRIPTION/ COMMENTS
CodE	Enter function code	48	Calibrate instrument.
CAL	Millivolt calibration	yes/no	Calibration required for both RTD and TC input. If this procedure is performed, the cold junction temp or RTD ohms calibration procedures in turn must be completed.
CJC	Thermocouple cold junction temperature calibration	yes/no	Not required if only using RTD input. This procedure can only be performed AFTER an accurate mV calibration.
rtd	RTD resistance calibration	yes/no	Not required if only using TC input. This procedure can only be performed AFTER an accurate mV calibration.

### Millivolt Calibration (CAL)

Connect precision millivolt source with an accuracy of 0.03% to terminals #8 (-) & #9 (+). Cold Junction or RTD ohms calibration MUST be performed after millivolt calibration.

DISPLAY	ACTION	DESCRIPTION/ COMMENTS
StP1	Apply 0.0 mV	Wait 10 seconds, press P.
StP2	Apply 14.0 mV	Wait 10 seconds, press P.
StP3	Apply 28.0 mV	Wait 10 seconds, press P.
StP4	Apply 42.0 mV	Wait 10 seconds, press P.
StP5	Apply 56.0 mV	Wait 10 seconds, press P.

### RTD Ohms Calibration (RTD)

This procedure must be performed AFTER an accurate mV calibration. Connect one leg of precision resistance (accuracy of 0.1 ohm) to terminals #9 and #10 together, and the other leg to #8.

DISPLAY	ACTION	DESCRIPTION/ COMMENTS
Rtd1	Connect 0.0 ohm (jumper wire)	Wait 10 seconds, press P.
Rtd2	Connect 277.0 ohm	Wait 10 seconds, press P.

### Thermocouple Cold Junction Calibration (CJC)

This procedure must be performed AFTER an accurate mV calibration.

- Exit Factory Service Operations (continually press P until "End"), and return to Normal Display Mode.
- Connect a thermocouple probe of known accuracy to the TLA (Types T, E, J, K, and N only). Select the probe type used in Configure Module 1.
- Connect a reference temperature probe to the measuring end of the TLA thermocouple probe. The two probes should be shielded from air movement and allowed sufficient time to equalize in temperature. (As an alternative, the TLA thermocouple probe may be placed in a calibration bath of known temperature.)
- Compare TLA display with reference temperature probe (or calibration bath). If the displayed TLA temperature does not equal the reference probe temperature, calculate the CJ error as follows:  
CJ Error = reference probe temperature - displayed TLA temperature
- Enter Factory Service Operations Module (9-FS).

DISPLAY	PARAMETER	DESCRIPTION/ COMMENTS
CJC	Cold Junction Temperature	Observe the indicated cold junction temperature. Add the calculated CJ Error to the displayed value. Enter the sum as the new value for CJC. Exit 9-FS and repeat step 4.  Note: If the initial value for CJC is not within the range of 15°C to 40°C, enter 25.0° for CJC and repeat the Cold Junction Calibration procedure.

## 7.0 TROUBLESHOOTING

The majority of problems can be traced to improper connections or incorrect set-up parameters. Be sure all connections are clean and tight, that the correct output board is fitted, and that the set-up parameters are correct.

For further technical assistance, contact technical support at the appropriate company numbers listed.

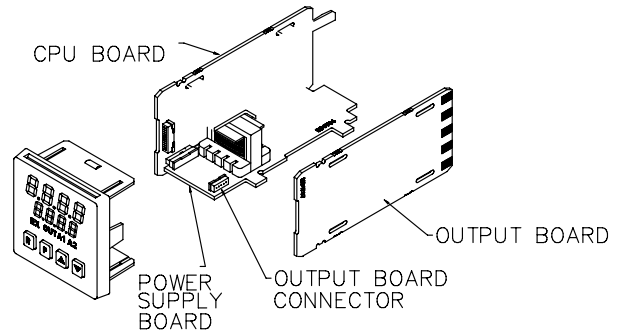
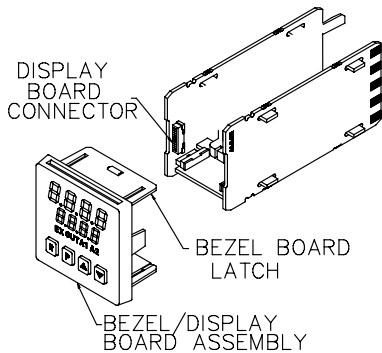
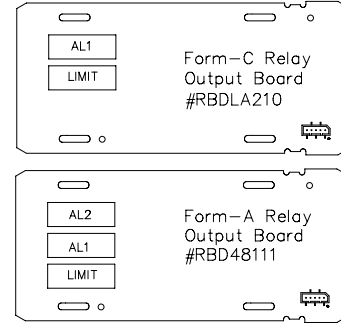
PROBLEMS	POSSIBLE CAUSE	REMEDIES
NO DISPLAY	<ol style="list-style-type: none"> <li>1. Power off.</li> <li>2. Brown-out condition.</li> <li>3. Loose connection or improperly wired.</li> <li>4. Bezel assembly not fully seated into rear of TLA.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check power.</li> <li>2. Verify power reading.</li> <li>3. Check connections.</li> <li>4. Check installation.</li> </ol>
TLA NOT WORKING	<ol style="list-style-type: none"> <li>1. Incorrect parameter set-up.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check set-up parameters.</li> </ol>
"E-FP" IN DISPLAY	<ol style="list-style-type: none"> <li>1. Defective front panel button.</li> </ol>	<ol style="list-style-type: none"> <li>1. Press R to escape, then check all buttons for proper operation.</li> <li>2. Replace unit.</li> </ol>
"E-UP" IN DISPLAY	<ol style="list-style-type: none"> <li>1. Internal problem with TLA.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace unit.</li> </ol>
"E-E2" IN DISPLAY	<ol style="list-style-type: none"> <li>1. Loss of setup parameters due to noise spike or other EMI event.</li> </ol>	<ol style="list-style-type: none"> <li>1. Press R to escape, then check all set-up parameters. <ol style="list-style-type: none"> <li>a. Check sensor input and AC line for excessive noise.</li> <li>b. If fault persists, replace TLA.</li> </ol> </li> </ol>
"E-CL" IN DISPLAY	<ol style="list-style-type: none"> <li>1. Loss of calibration parameters due to noise spike or other EMI event.</li> </ol>	<ol style="list-style-type: none"> <li>1. Press R to escape, then check TLA accuracy. <ol style="list-style-type: none"> <li>a. Recalibrate TLA. (See Factory Service Module code 77.)</li> <li>b. Reset parameters to factory default settings.</li> </ol> </li> </ol>
"..." or "-.." IN DISPLAY	<ol style="list-style-type: none"> <li>1. Display value exceeds display range.</li> <li>2. Defective or mis-calibrated cold junction circuit.</li> <li>3. Loss of set-up parameters.</li> <li>4. Internal malfunction.</li> </ol>	<ol style="list-style-type: none"> <li>1. Change resolution to display whole number and verify reading.</li> <li>2. Perform cold junction calibration.</li> <li>3. Check set-up parameters.</li> <li>4. Perform input calibration.</li> </ol>
"OPEN" IN DISPLAY	<ol style="list-style-type: none"> <li>1. Probe disconnected.</li> <li>2. Broken or burned-out probe.</li> <li>3. Corroded or broken terminations.</li> <li>4. Excessive process temperature.</li> </ol>	<ol style="list-style-type: none"> <li>1. Connect probe.</li> <li>2. Replace probe.</li> <li>3. Check connections.</li> <li>4. Check process parameters.</li> </ol>
"OLOL" IN UPPER DISPLAY	<ol style="list-style-type: none"> <li>1. Check input parameters.</li> <li>2. Change to input sensor with a higher temperature range.</li> <li>3. Replace transmitter or probe.</li> <li>4. Reduce temperature.</li> <li>5. Perform input calibration.</li> </ol>	<ol style="list-style-type: none"> <li>1. Input exceeds range of TLA.</li> <li>2. Temperature exceeds range of input probe.</li> <li>3. Defective or incorrect transmitter or probe.</li> <li>4. Excessive high temperature for probe.</li> <li>5. Loss of setup parameters.</li> </ol>
"ULUL" IN UPPER DISPLAY	<ol style="list-style-type: none"> <li>1. Input is below range of TLA.</li> <li>2. Temperature below range of input probe.</li> <li>3. Defective or incorrect transmitter or probe.</li> <li>4. Excessive low temperature for probe.</li> <li>5. Loss of setup parameters.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check input parameters.</li> <li>2. Change to input sensor with a lower temperature range.</li> <li>3. Replace transmitter or probe.</li> <li>4. Raise temperature.</li> <li>5. Perform input calibration.</li> </ol>
"OLOL" OR "ULUL" IN LOWER DISPLAY	<ol style="list-style-type: none"> <li>1. Signal input exceeds allowable range by 5%.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check remote signal source.</li> </ol>

# 8.0 INSTALLING AN OUTPUT BOARD

The TLA is supplied with an output board installed.

## Replacing Output Board

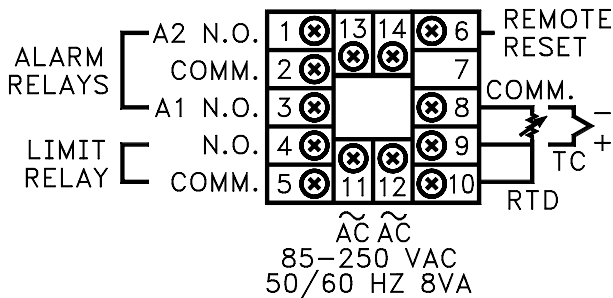
1. Remove the bezel assembly.
2. Lift up on the top bezel board latch while gently pulling out on the bezel/display board assembly. Do NOT remove the display board from the bezel.
3. Remove the output board by pulling it away from the other boards. Replace the output board by aligning the board to board connector. Be certain the connector is fully mated.
4. Connect the bezel/display board assembly by guiding the board ends into the bezel latches. Slide the assembly on evenly until the display board connector is completely engaged and bezel latches are fully seated onto the boards.



# 9.0 TERMINAL CONFIGURATIONS

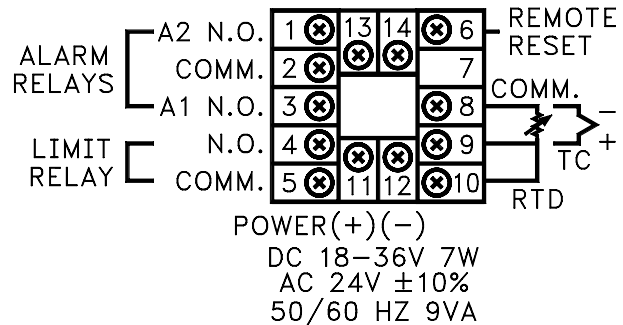
## AC Models

### Form-A Limit Relay with 2 Alarms

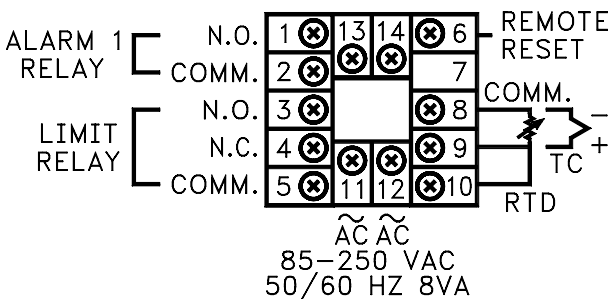


## DC Models

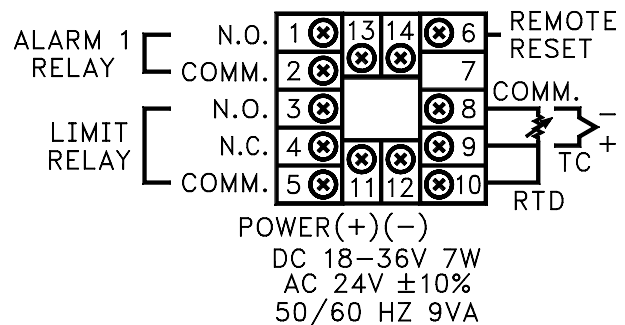
### Form-A Limit Relay with 2 Alarms



### Form-C Limit Relay with 1 Alarm



### Form-C Limit Relay with 1 Alarm



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#### **LIMITED WARRANTY**

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

No warranties expressed or implied are created with respect to The Company's products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained herein and relies on no other warranties or affirmations.

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