



# INSTRUCTION MANUAL

## Ogden 1/4 DIN Solid State Temperature Controller - Relay Output - Solid State Output - For Heating - Model Series: ETR-401, ETR-402, ETR-404 and ETR-406



All temperature controls in this series are made to fit into panel cut-outs which measure 3<sup>5</sup>/<sub>8</sub>" x 3<sup>5</sup>/<sub>8</sub>" (92 x 92mm). A minimum of 3" in depth is required for electrical clearances of rear terminal connections. The following specifications are common to all models:

**INPUT**

Thermocouple (T/C)	Type K, J. Specified on Control Label.
RTD	PT 100 ohm DIN ( $\alpha = .00385$ ) or JIS ( $\alpha = .003916$ ) Three-Wire.
Cold Junction Compensation	Automatic
Input Break Protection	Built-in, upscale on open sensor and output off.
Input Impedance	10M ohm.
Common Mode Rejection (CMR)	CMRR 120 dB, Min.

Normal Model Rejection (NMR) NMRR 60 dB, Min. (60Hz)

**CONTROL OUTPUT**

Relay—Heating

Optional:  
3-32 VDC  
4-20mA  
Relay—Alarm

SPDT relay, 3 amps maximum resistive load at 120V, 240VAC, or 24VDC.

Output to solid state relay.  
Output to SCR.

SPST relay, 2 amps maximum resistive load at 120V or 240VAC.

**CONTROL MODES**

On-Off

Proportional

Differential 0.5% of full-scale range.

Proportional Band 2.5% of range, fixed. Proportional Cycle time 20 sec. on Relay Controls, 1 second on SSR Controls.

## INDICATION

Output "On" LED red lamp.  
"Off" LED green lamp.

## SETPOINT

Resolution Analog S.P.: 0.2% of full scale range.  
Digital S.P.: Least significant digit  
Accuracy 1% of full scale range.  
Repeatability  $\pm 0.1\%$  of full scale range.  
Manual Reset 4% of full scale range, adjustable.

## POWER

Rating ETR-401 and 402 models  
110/220VAC field selectable  
 $\pm 15\%$ , 50/60 Hz  
ETR-404 and 406 models 90-264VAC. 24V AC/VDC models available on special order.  
Consumption Less than 3VA

## ENVIRONMENTAL & PHYSICAL

Operating Temperature  $10^{\circ}$  to  $125^{\circ}\text{F}$  ( $-12$  to  $52^{\circ}\text{C}$ ).  
Humidity 10 to 90% RH. (non-condensing)  
Insulation 20M ohm Min. (5000VDC).  
Breakdown 2000VAC, 50/60Hz, 1 minute.  
Vibration 10 - 55Hz, Amplitude 1.0mm.  
Shock 660 ft./S<sup>2</sup> (20g).  
Weight ETR-401 & 402 14 ozs. (400 grams)  
ETR-404 & 406 10 ozs. (285 grams)

## DIMENSIONS

H  $3\frac{3}{4}"$  (96mm)  
W  $3\frac{3}{4}"$  (96mm)  
D  $2\frac{5}{8}"$  (67mm)  
Depth behind panel  $2\frac{1}{16}"$  (52mm)  
Panel cutout  $3\frac{5}{8} \times 3\frac{5}{8}"$  (92 x 92mm)  
DIN Case Plastic, full plug-in construction, with screw terminals on rear, adjustable brackets for panel mounting.

## MOUNTING

When mounting the instrument, it is important the control remains within the ambient temperature range of 10 to 125°F. Mounting it in any position is permissible. After inserting the control into the panel secure it with the two mounting brackets provided with each unit. Use light to moderate pressure.

## WIRING

All wiring should conform to local and national electrical codes:

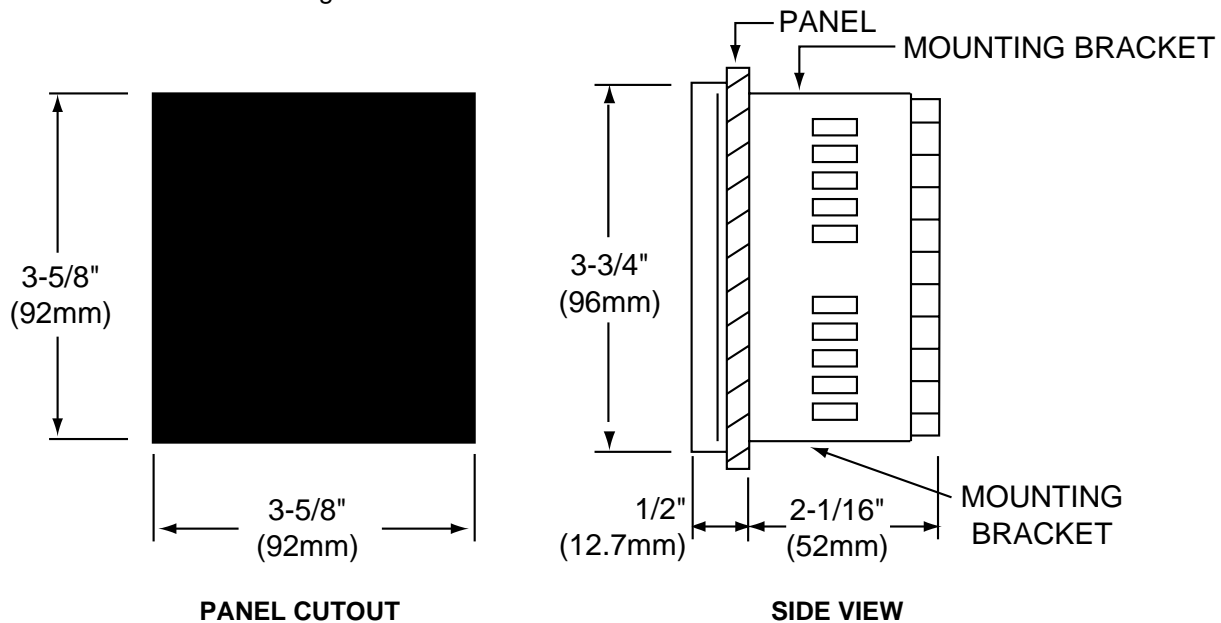
### Following for ETR-401 and ETR-402:

- Diagram 1: For 110 VAC operation. An external magnetic contactor must be used if the heater load exceeds 360 watts.
- Diagram 2: Controls with a 3-32 VDC output for use with a solid state relay for heater control. This diagram can also be used for controls with 4-20mA output.
- Diagram 3: For 110 VAC control power and the use of a three-phase magnetic contactor. Control can operate on 220 VAC by wiring to terminal 1 instead of terminal 3.

### Following for ETR-404 and ETR-406:

- Diagram 4: For 110/220 VAC operation. An external magnetic contactor must be used if the heater load exceeds 360 watts.
- Diagram 5: For 110/220 VAC control power and the use of a three-phase magnetic contactor.
- Diagram 6: For 110/220 VAC operation and the use of a high or low alarm.

NOTE: The use of motor starters in place of magnetic contactors should be avoided. They have very large inductive loads that can damage the controller's relay.



When wiring the thermocouple, check the thermocouple and extension wire (compensating cable) to make sure they conform to the appropriate thermocouple type specified by the instrument. Extension wires must be the same alloy and polarity as the thermocouple. The total lead resistance should not exceed 100 ohms for accurate measurements. One hundred ohms of lead resistance will introduce a 1 degree F (0.5 degree C) error.

For wiring 3 wire RTD (Resistance Temperature Detectors), all leads connecting the RTD to the controller must be the same gauge and composition to assure effective lead resistance compensation. If the RTD is a 3 wire device, install the two common wires of the RTD to terminals 17 and 18. If a 2 wire RTD is to be used, install a jumper between terminals 17 and 18.

**WARNING!**



**RISK OF ELECTRIC SHOCK** - Dangerous and potentially fatal voltages are present when working on this equipment. Before installation or beginning any troubleshooting procedures, the electric power to this equipment must be disconnected and locked out as described by OSHA Standards. Units suspected of being faulty must be removed and returned to Ogden for inspection and/or repair. They contain no user serviceable components.

**WARNING!**



To help minimize the possibility of fire or shock hazards, do not expose this instrument to rain or excessive moisture. This control is not to be used in hazardous locations as defined in Articles 500 and 505 of the National Electric Code.

**WARNING!**



Do not use this instrument in areas subject to hazardous conditions such as excessive shock, vibration, dirt, moisture, corrosive gases or oil. The ambient temperature of the areas should not exceed the maximum rating.

**Wiring Precautions:**

- Before wiring, verify the label for correct model number and options. Switch off the power when checking.

- Care must be taken to ensure that maximum voltage ratings are not exceeded.
- It is recommended that power to these instruments be protected by fuses or circuit breakers rated at the minimum value possible.
- All units should be installed inside a suitably grounded metal enclosure to prevent live parts being accessible to human hands and metal tools.
- All wiring must conform to appropriate standards of good practice and local codes and regulations. Wiring must be suitable for voltage, current, and temperature ratings of the system.
- Both solderless terminals or “stripped” leads as specified below can be used for power leads. Only “stripped” leads should be used for thermocouple connections to prevent compensation and resistance errors.
- Take care not to over-tighten the terminal screws.
- Unused control terminals should not be used as jumper points as they may be internally connected, causing damage to the unit.

**GENERAL OPERATION**

Turn the analog knob (ETR-401, 402, 404) or adjust the digital setpoint (ETR-406) to the desired temperature. Upon energizing, the output pilot LED marked “OUT” will turn red. This indicates the control relay is closed and the system is calling for heat. As the process temperature approaches the setpoint, the control will cycle the heaters on and off. The LED will turn green when the heater load is turned off.

**Exception** – If the controller has a 4-20ma output then the output LED will always remain in the “on” position.

**TEMPERATURE INDICATION**

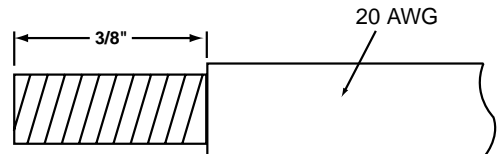
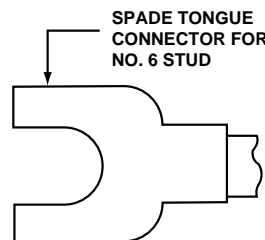
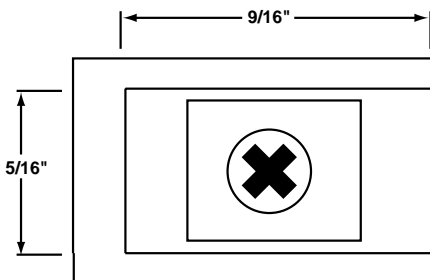
The method of actual process temperature indication depends on what model you have:

ETR-401 – Indication by red/green LED only. The setpoint temperature is reached when the lamp changes from red to green.

ETR-402 – Indication by deviation meter which is labelled in percent. This meter indicates process deviation from the setpoint. The meter is calibrated in percent of full-scale temperature, -10% to +10%.

ETR-404 and 406 – Digital indication of the actual process temperature using the digital display.

Common to all controls: “SV” = Set Value  
“PV” = Process Value



**WARNING**

Failure of devices, such as the thermocouple-RTD sensor, heater output relay or temperature control can result in severe damage to a product while in process, melting of the heater or a damaging fire. An over-temperature protection device must be installed in your process that will remove all power from the heating circuit if the above failure occurs. We recommend that this device be classified as a safety control and carry U.L., CSA or FM listing or certification. Failure to install high-limit temperature control protection where a potential hazard exists could result in damage to equipment and property, and fatal injury to personnel.

## MANUAL RESET ADJUSTMENT

This adjustment is located on the front of the control (except ETR-401).

When the process stabilizes, approximately one half hour after adjusting setpoint, an adjustment in "reset" may also be necessary. Start with the reset adjustment pointing to zero. If the temperature indication stabilizes *above* the setpoint temperature, then adjust the reset to the "minus" side. If the temperature indication stabilizes *below* the setpoint temperature, then adjust the reset to the "plus" side. By turning this adjustment once or more, the indicated temperature should eventually match the setpoint temperature. It is very important to wait approximately 15 minutes after each adjustment to allow the system time to stabilize.

## ALARM OPERATION (Optional)

The control comes equipped with a form-A relay that can be used for a deviation alarm. This is called a deviation alarm because if the control set point is changed then the alarm set point keeps the same deviation from the control set point. This relay is rated for a maximum load of 2 amps, 240 volts. The alarm set point adjustment is located on the front of the control. The alarm is adjustable from 0-10

percent of the range of the control from the set point, in either a positive or negative direction. If the alarm adjustment is set to 0 then the alarm relay would energize exactly at the control set point. Use the positive side of the adjustment for a high temperature alarm and the negative side of the adjustment for a low temperature alarm. Refer to wiring diagram No. 6 for detailed wiring instructions.

## CALIBRATION INSTRUCTIONS

Calibration is accomplished by using the four potentiometers located on the bottom of the left-hand circuit board. The control is opened by unlatching the clamps located on the top and bottom of the front of the control. The control should be allowed to warm up for at least 1/2 hour before checking the calibration. The purpose of the potentiometers is as follows:

- VR1.....Low scale calibration.
- VR4.....High scale calibration.
- VR2.....Low scale switching point.
- VR3.....High scale switching point.

The "reset" adjustment must be set to 0 before calibration. VR1 and VR4 have a slight effect on each other so you should calibrate low scale and high scale at least three times each.



ETR-401



ETR-404

RESET  
ADJUSTMENT

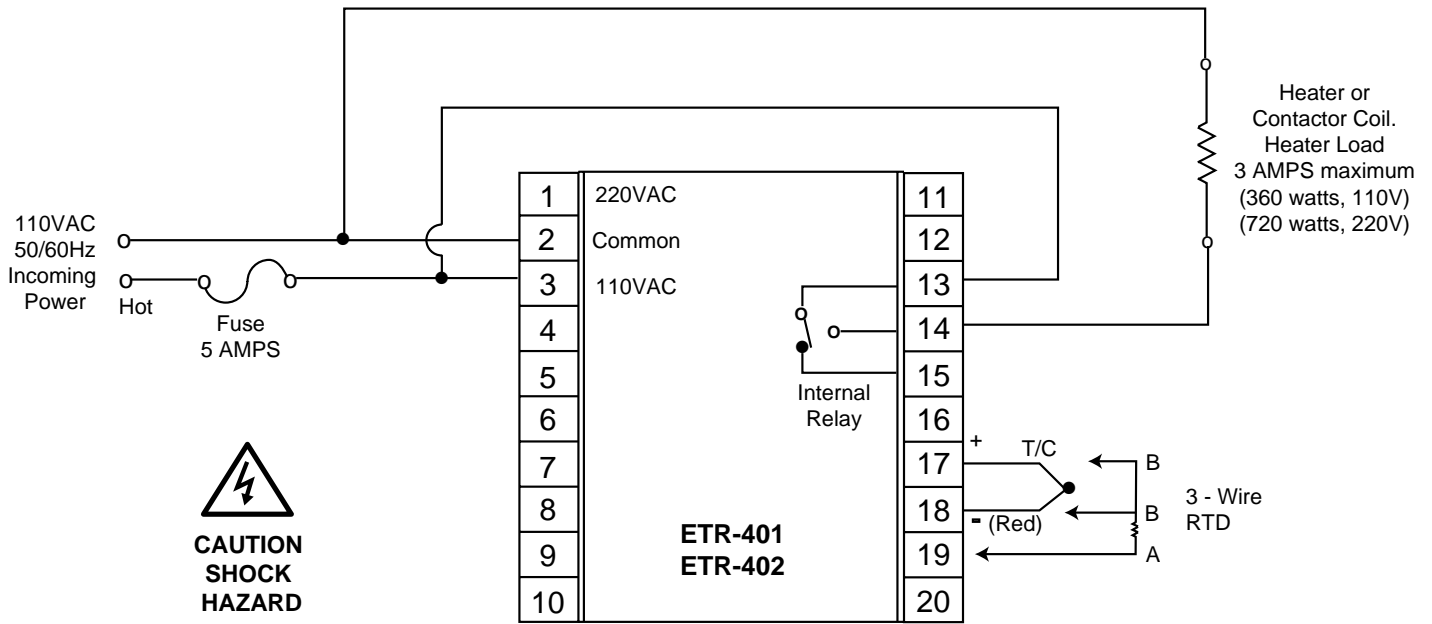


ETR-402

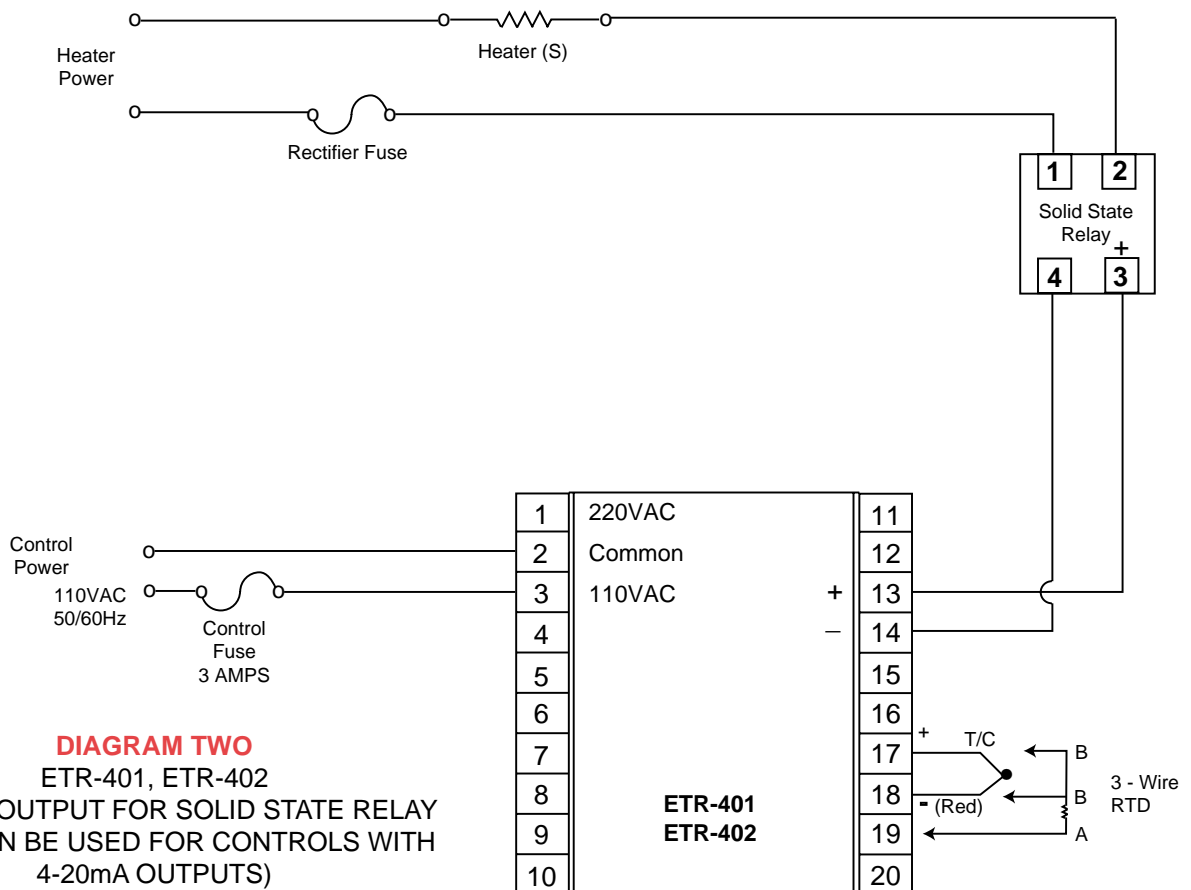


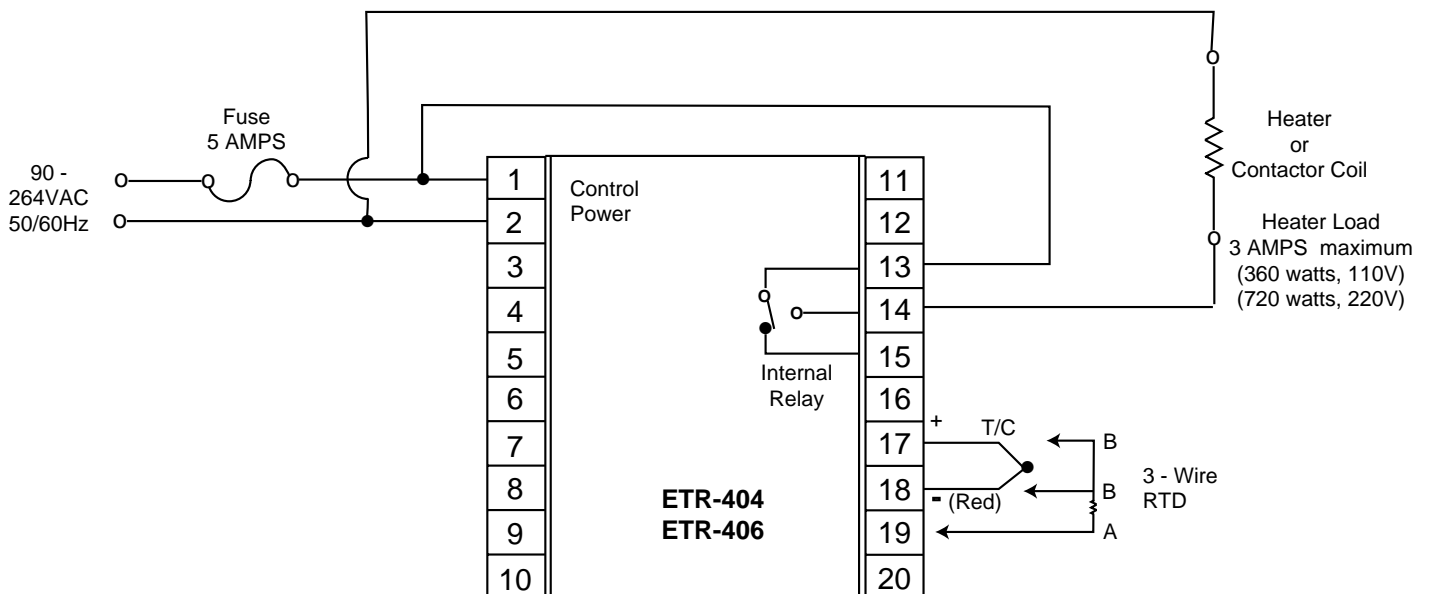
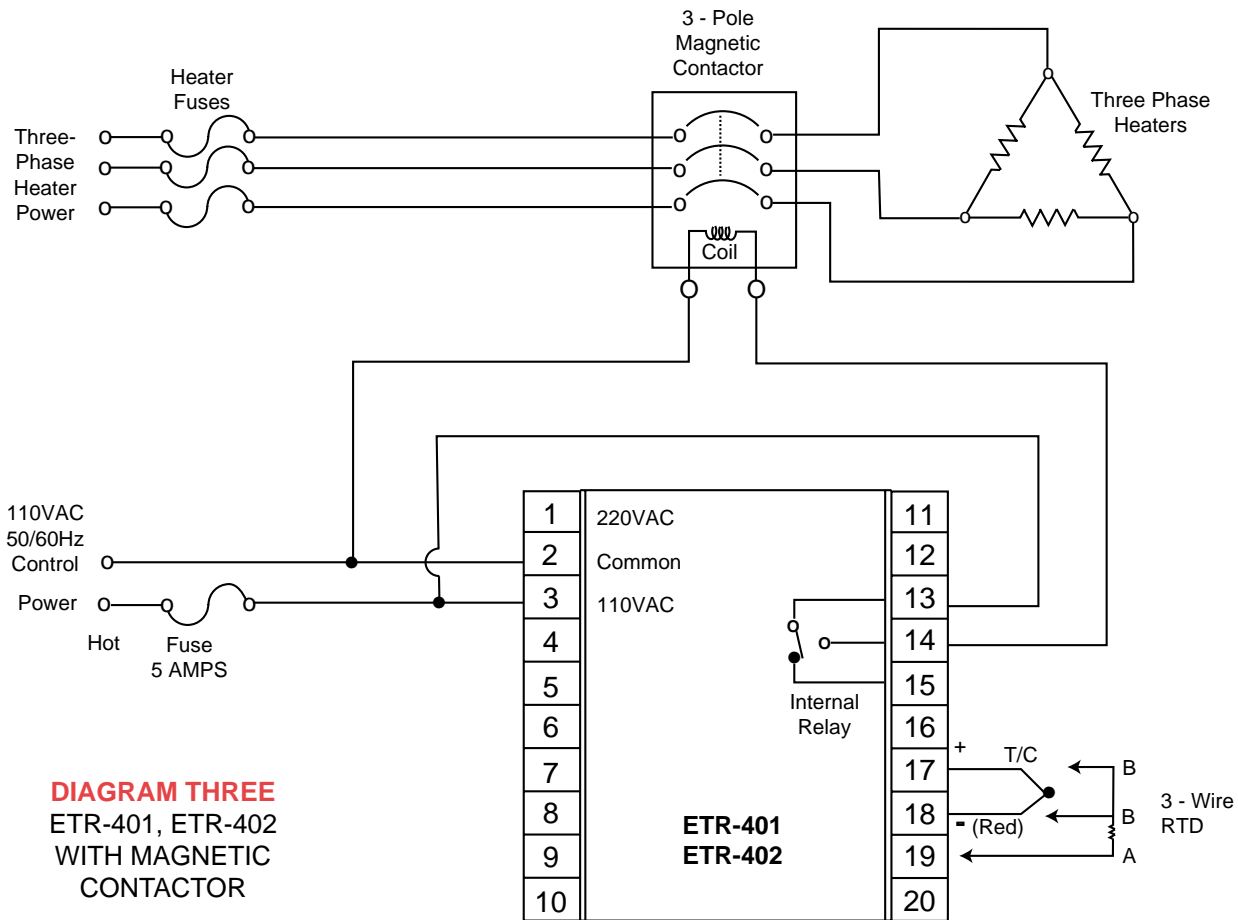
ETR-406

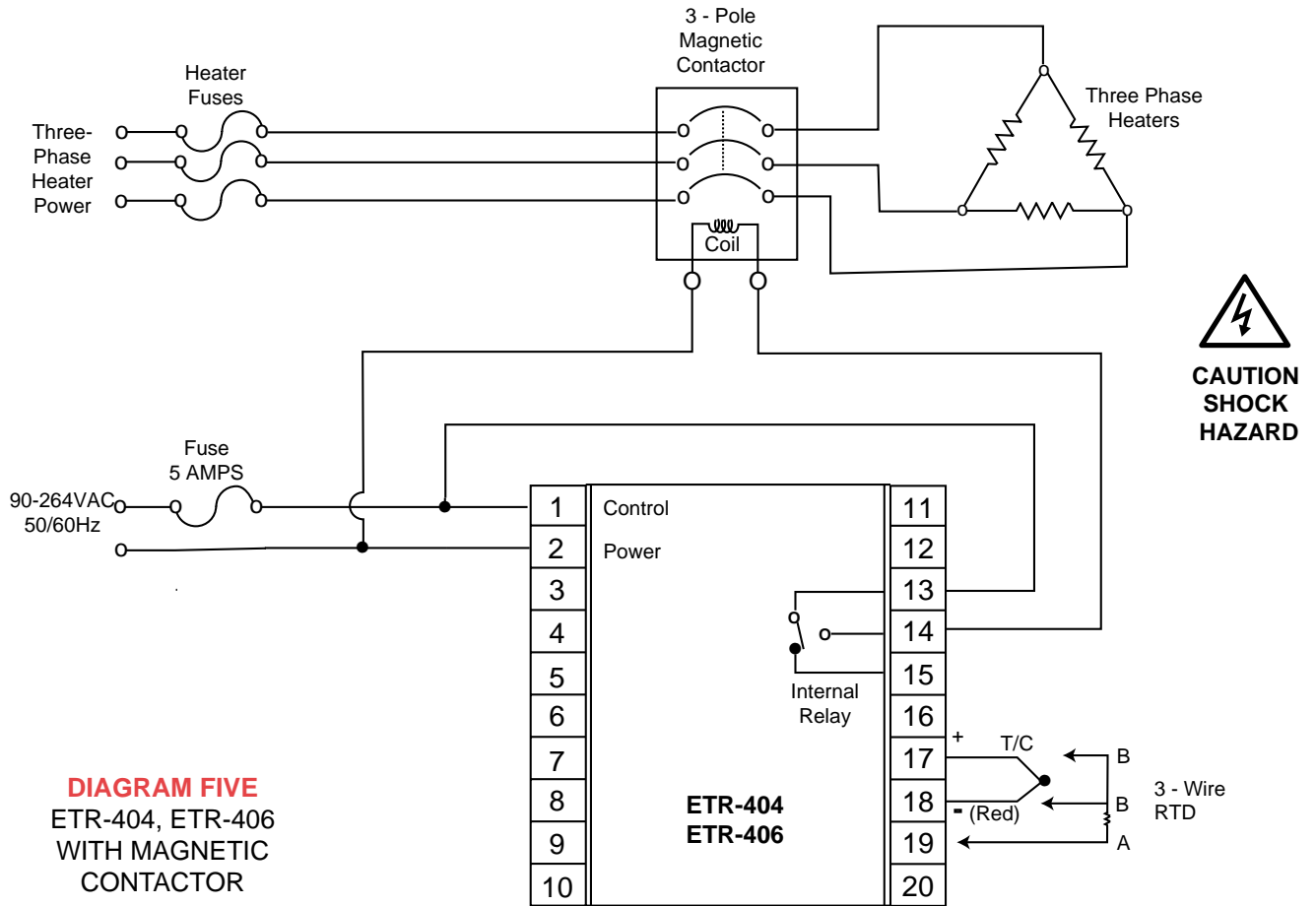
ALARM  
ADJUSTMENT



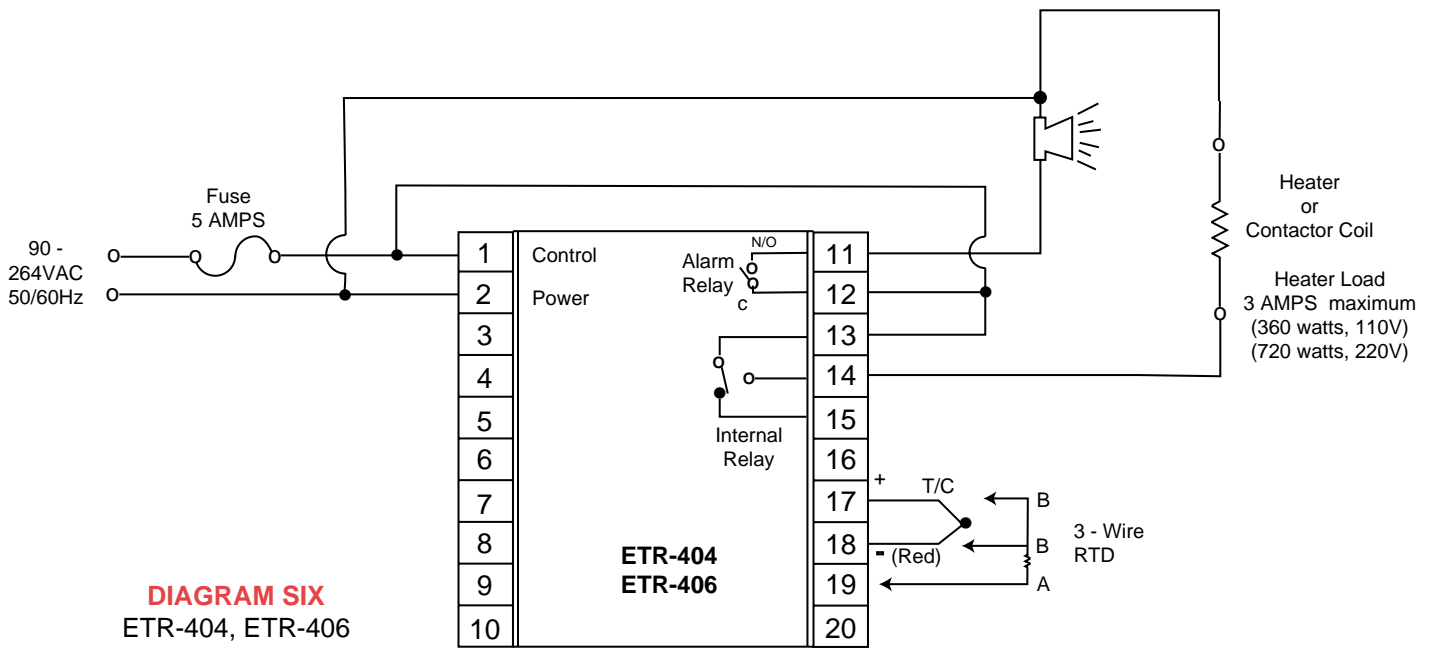
**DIAGRAM ONE**  
ETR-401, ETR-402  
RELAY OUTPUT







**DIAGRAM FIVE**  
ETR-404, ETR-406  
WITH MAGNETIC  
CONTACTOR



**DIAGRAM SIX**  
ETR-404, ETR-406  
WITH RELAY  
OUTPUT AND  
OPTIONAL ALARM



## TROUBLESHOOTING

**WARNING** THIS PROCEDURE REQUIRES ACCESS TO THE CIRCUITRY OF A LIVE POWER UNIT. DANGEROUS ACCIDENTAL CONTACT WITH LINE VOLTAGE IS POSSIBLE. ONLY QUALIFIED PERSONNEL ARE TO PERFORM THESE PROCEDURES. POTENTIALLY LETHAL VOLTAGES ARE PRESENT.

Experience has proven that many control problems are not caused by a defective instrument. See chart below for some of the other common causes of failures:

Line wires are improperly connected.

No voltage between line terminals.

Incorrect voltage between line terminals.

Connections to terminals are open, missing or loose.

Thermocouple is open at tip.

Thermocouple lead is broken.

Shorted thermocouple leads.

Short across terminals.

Open or shorted heater circuit.

Open coil in external contactor.

Burned out line fuses.

Burned out relay inside control.

Defective solid-state relays.

Defective line switches.

Burned out contactor.

Defective circuit breakers.

If the points listed on the chart have been checked and the controller does not function, it is suggested that the instrument be returned for inspection.

Do not attempt to make repairs. Also, it is advisable to use adequate packing materials to prevent damage in shipment.

Return control to:  
**OGDEN MANUFACTURING COMPANY**  
ATTN: Repair Department  
64 W. SEEGERS ROAD  
ARLINGTON HEIGHTS, IL 60005

### NOTE;

Control can be removed from housing by pushing up plastic holding clips located on top and bottom of bezel and pulling control from housing. Power must be turned off.



64 West Seegers Road  
Arlington Heights, IL 60005  
(847) 593-8050 • Fax: (847) 593-8062  
www.ogdenmfg.com • sales@ogdenmfg.com

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