



# INSTRUCTION MANUAL

## 48mm, 1/16 DIN Solid State Temperature Controller - Relay Output - Solid State Output - For Heating - Model Series: ETR-901, ETR-902, ETR-905



ETR-901



ETR-902



ETR-905

All temperature controls in this series are made to fit into panel cut-outs which measure 1<sup>5</sup>/<sub>16</sub>" (45mm) square. A minimum of 4" (102mm) 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 ( $\alpha = .00392$ ) Two or 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 Mode Rejection (NMR):	NMRR 60 dB, Min. (60Hz)

### CONTROL OUTPUT

Relay-Heating:	SPDT relay, 3 amps maximum resistive load at 120V/240VAC, 24VDC.
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Optional: 3-32VDC:

### CONTROL MODES

On-Off:  
  
Proportional:

### INDICATION

Output:

### SET POINT

Resolution:

Accuracy:

For control of solid state relay.

Hysteresis: 5.0% of scale symmetrically above and below the set point.

Proportional Band fixed at 5% of scale. Standard relay cycle time, 20 seconds. 1 second for SSR controls. On ETR-905, manual reset is 4% of scale, externally adjustable.

"Red" LED, heater on.  
"Green" LED, heater off.

ETR-901, 902: 0.2% of SPAN.

ETR-905: least significant digit.

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## POWER

Rating: ETR-901 and 902 models  
110/220VAC **NOT** field  
selectable  $\pm 15\%$ , 50/60Hz.  
ETR-905 model 90-  
264VAC. 24V AC/DC  
models available on special  
order.

Consumption: Less than 3VA.

## ENVIRONMENTAL & PHYSICAL

Operating Temperature: 10° to 125°F (-12 to 52°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: 9 oz. (250 grams)

## DIMENSIONS

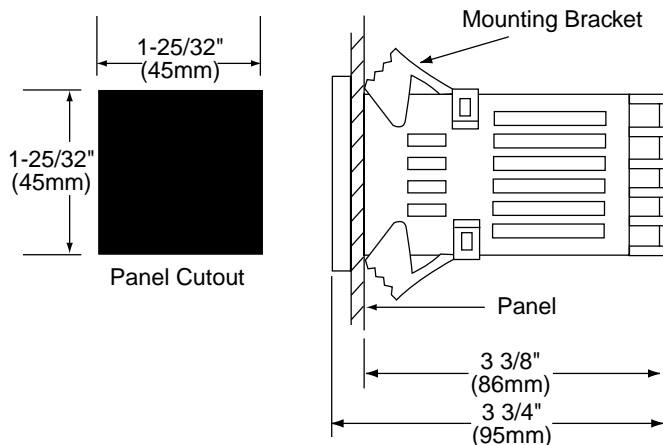
H 1 $\frac{7}{8}$ " (48mm)  
W 1 $\frac{7}{8}$ " (48mm)  
D 3 $\frac{3}{4}$ " (95mm)  
Depth behind panel 3 $\frac{3}{8}$ "  
(86mm)

Panel Cutout: 1 $\frac{25}{32}$ " sq. (45mm sq.)

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.



Mounting Dimensions

## MANUAL RESET ADJUSTMENT

(Applies to the ETR-905 only.)

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

## WIRING

All wiring should conform to local and national codes:

### Following Diagrams for ETR-901 and ETR-902 Models:

(Do not operate 120 volt controls on 240 volts.)

Diagram 1: For 120VAC operation and relay output. An external magnetic contactor must be used if the heater load exceeds 360 watts.

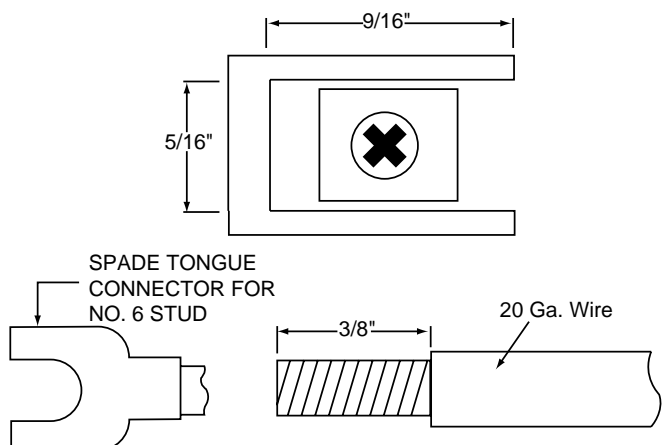
Diagram 2: For 120VAC operation and 3-32VDC output. For use with solid-state relay for heater control. Solid-state relays can be single or three-phase.

### Following Diagrams for ETR-905 Model:

Diagram 3: For 90-264VAC operation and relay output. An external magnetic contactor must be used if the heater load exceeds 3 amps.

Diagram 4: For 90-264VAC operation and 3-32VDC output. For use with a solid-state relay for heater control. Solid-state relays can be single or three-phase.

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.



Lead Termination

The ETR-901 and ETR-902 must be used with the line voltage specified. They are not interchangeable from one line voltage to another. The ETR-905 has universal line voltage capabilities from 90-264VAC.

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°F (0.5°C) error.

For wiring 3 wire RTD (Resistance Temperature Detectors), all leads connecting 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 4 and 5. If a two wire RTD is to be used, install a jumper between terminals 4 and 5.

**WARNING!**

Dangerous voltages are sometimes present in this instrument. Before installation or beginning any trouble shooting procedures, the power to all equipment must be switched off and locked out. Units suspected of being faulty must be disconnected and removed to a properly equipped workshop for testing and repair. Component replacement and internal adjustments must be made by qualified maintenance personnel only.

**WARNING!**

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

**CAUTION!**

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 control 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 and national 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.

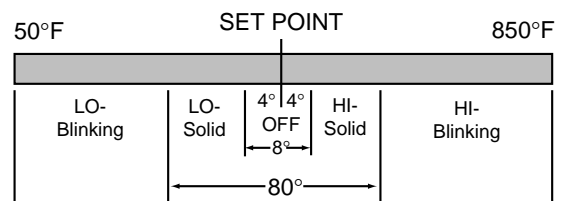
**GENERAL OPERATION**

**“OUT” Pilot Lamp Indication:**

Adjust the set point to the desired temperature. The “OUT” lamp will display a red color. This indicates the relay (or SSR) is closed and the control is calling for heat. When the process is within the control’s proportional band (20°), the lamp will cycle from red to green with the heater(s). The relay (or SSR) is in the “open” position when the lamp indicates a green color. The digital display on the ETR-905 indicates the actual process temperature as measured at the location of the thermocouple or RTD sensor. *Note: The control will not cycle if it is configured as “on-off”.*

**Operation of HI and LO indication lamps on Model ETR-902:**

These lamps compare the actual process temperature to the control set point. The lamps blink on and off if the process temperature is more than 10% of the scale from the set point. Since the standard temperature range is 50-850°F, 10% equals 40° below (LO lamp) or 40° above (HI lamp) the set point. If the lamps are solid, then the process temperature is within 10% (+ - 40°). Both lamps are off if the temperature is within 1% (+ - 4°) of the set point. Also note the diagram below:

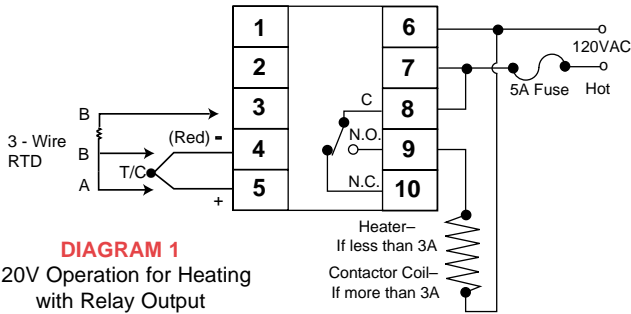


**CALIBRATION INSTRUCTIONS**

Calibration is accomplished by using the four potentiometers located on the bottom of the right-hand circuit board. The control is opened by unlatching the clamps located on the top and bottom 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:

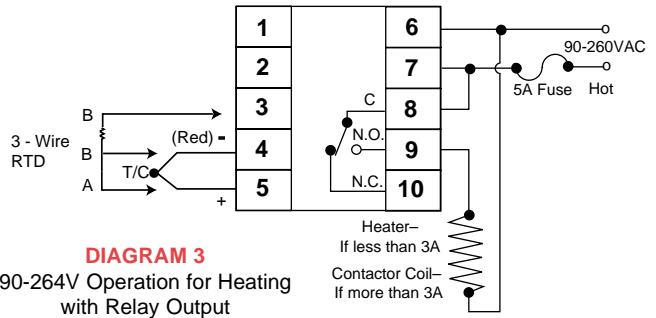
- VR1 . . . .Low scale calibration
- VR4 . . . .High scale calibration (ETR-905 only)
- VR2 . . . .Low scale switching point
- VR3 . . . .High scale switching point

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.

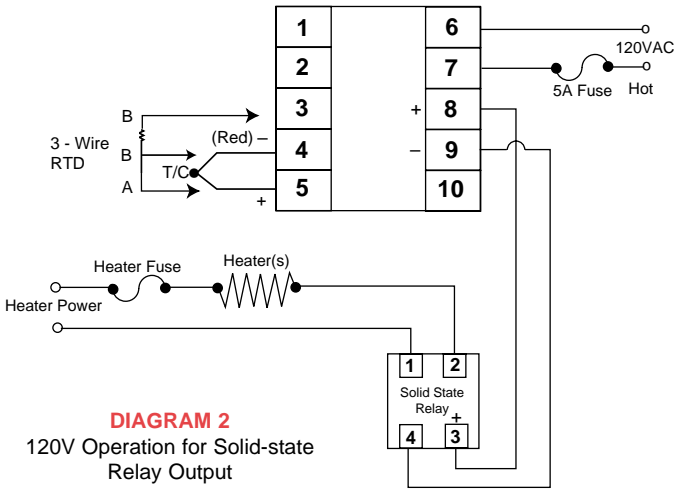


**DIAGRAM 1**  
120V Operation for Heating  
with Relay Output  
**ETR-901/902**

**NOTE:** Other voltages can be used if the control was specified and labeled thus.

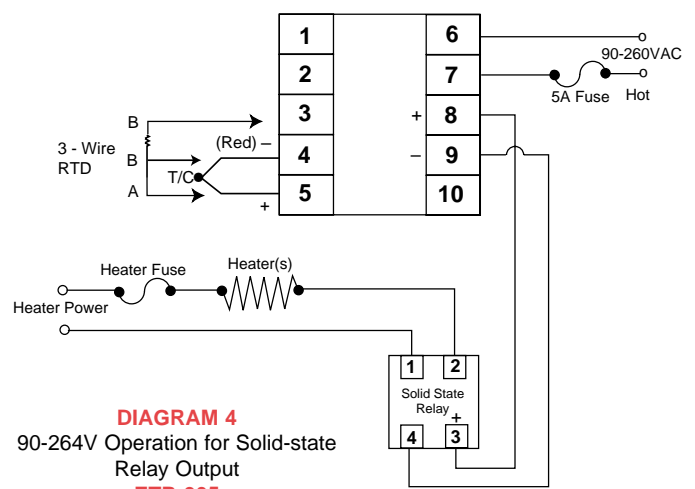


**DIAGRAM 3**  
90-264V Operation for Heating  
with Relay Output  
**ETR-905**



**DIAGRAM 2**  
120V Operation for Solid-state  
Relay Output  
**ETR-901/902**

**NOTE:** Other voltages can be used if the control was specified and labeled thus.



**DIAGRAM 4**  
90-264V Operation for Solid-state  
Relay Output  
**ETR-905**

**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.

## TROUBLESHOOTING

Experience has proven that many control problems are not caused by a defective instrument. See below for some of the 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 (or RTD) is open at tip.
- Thermocouple (or RTD) lead is broken.
- Shorted thermocouple (or RTD) leads.
- Short across terminals.
- Open or shorted heater circuit.
- Open coil in external contactor.

- Burned out line fuses.
- Defective line switches.
- Burned out contactor.
- Defective circuit breakers.

If these points have been checked and the controller still 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 CO.**  
ATTN: Repair Department  
64 West Seegers Road  
Arlington Heights, IL 60005



Telephone: (847) 593-8050 • FAX: (847) 593-8062