



**TC or MC RAC**

**General Purpose Load Controller  
Installation**

**For**

**Water Heater and Pool Pump Loads**

## TCRAC Installation Instructions

The TCRAC is a general purpose Load Control device with a switching power supply capable of operating from 85 to 276 VAC 50 or 60 Hz. The two BLACK wires are the power input leads and can be connected to any voltage within the specified range.

The two YELLOW wires connect to a 30 amp normally closed relay usually used for Water Heating and Pool Pump loads.

Some models of the TCRAC also have connections for HVAC control where the device is wired to control the thermostat circuit of the HVAC unit.

The TCRAC label shown below has a schematic showing the relays and relay ratings of the device. Detailed they are :

BLACK and BLACK are the Power input – usually connected to 120 or 240 VAC

YELLOW and YELLOW are the R3 relay and connect in series with the load to be controlled

R1 and R2 are used for HVAC control and are connected to the THERMOSTAT control circuit only. They are limited to 24VAC 1 Amp ratings as this is more than sufficient for the application. These relays and wires are custom to the customer configuration and are not always installed

**EnTek**

Power In 4 W Max  
Load Control Unit  
Series TC240RAC

Raintight Enclosure

Black 120 / 240 VAC  
Black  
Yellow #12  
Yellow #12

White  
Green  
Orange  
Red  
Blue  
Yellow

R2  
R3  
R1

Not all relays or wires are installed in all units

R3 30 Amps 240V Res.  
R1 , R2 1 Amp 24 V Res

0 0 0 0 0  
Diag R1 R2 R3 Com  
Green = Internal Diagnostic  
Yellow = R1  
Green = R2  
Red = R3

**Caution**  
Risk of electrical shock. This controller is not a disconnect. Power may be restored at any time. One or more disconnects must be opened before servicing this controller or appliance

**Danger**  
To reduce the risk of electrical shock - do not connect to a circuit operating at greater than 150 volts above ground

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.  
This product contains a type-accepted transmitter approved by the FCC and / or Industry Canada

YA1 SN 14663258

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For connection of the Load Control device to a Water Heater or pool pump the circuit must be deactivated at one or more disconnects. It is recommended that the circuit breaker be located and turned off before any control or other panels are opened. Once the breaker is disconnected, open the electrical disconnect panel desired and using a voltmeter verify that the power is disconnected.

### **Water Heater Instructions**

Locate the Water Heater circuit breaker and disconnect power to the circuit



If a local Disconnect is available, open it and remove the disconnect bar



Securely mount the TCRAC using the three mounting tabs.



Open the remote disconnect box and remove the disconnect bar. Be sure that the main Circuit Breaker is disconnected as power will remain on the input side of the disconnect even with the bar removed and a shock hazard will exist while installing the device



Mount the TCRAC near the load to be controlled. Usually Flex Conduit is used on the installation. When this is not used, a jacketed Romex cable should be used to connect the load wires into a Junction Box for connection to the TCRAC.

In many cases the TCRAC will mount close enough to the load to connect without a Junction box. In all cases, follow National and Local Electrical Codes to assure a safe installation. Where stranded wires cannot be joined with solid wires in a Terminal Strip, add a short solid wire into the strip and connect other wires together with an approved wire nut.

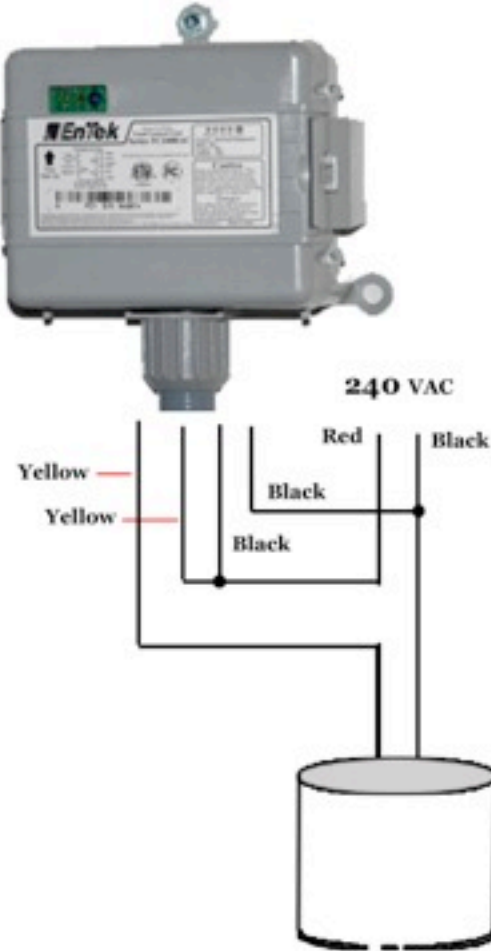


Replace the covers on the Disconnect box, replace the bar and close the box. Don't forget to reconnect power at the Water Heater Circuit Breaker.



The Load Control RAC is designed for 240 vac power input and control of loads of up to 240 vac and up to 30 amps. Normally the RAC is used for Water Heating control or for Pool Pump applications. To install the RAC, be sure that power is turned off at the appropriate circuit breaker and wire the RAC as shown in the diagram.

The RAC is weather tight and may be used in outdoor applications but care must be taken to be sure that the RAC is mounted in the plane shown in the diagram.



Where a disconnect box is not available, use an electrical box to connect a cable to the water heater connections and connect the wires inside the electrical box. For outdoor installations use flex electrical

conduit for the wiring. EnTek makes a Junction box for this purpose as well as custom conduit fittings for use in device installation.



When the EnTek Junction Box is unavailable, use of a standard 4X4 Electrical Junction Box and Standard Flex Conduit fittings is recommended

### **Pool Pump**

Pool pump applications are electrically identical to Water Heating applications but vary significantly in physical connections. Electrically the power is still applied to the two BLACK wires (can be 120 or 240 VAC 50 / 60 Hz) and the Load is still interrupted by the two Yellow wires. These wires are a dry relay contact and are inserted in series with one leg of the pump motor to be controlled. Pool Pumps are typically mounted in wet areas and extra care must be taken to prevent shock hazards. As with all such equipment all exposed metal must be grounded and all normal grounding procedures followed as prescribed by the National Electric Code and local regulations.

The RAC is designed to be internally isolated and is fully enclosed with non-metallic materials to reduce the possibility of shock hazards. When properly installed in accordance with National and Local requirements the RAC is safe for use in wet areas.

Typical installations are accomplished via connections to an outdoor disconnect, switch box or pump timer. In all cases it is important to insure that the RAC is mounted in the proper plane (see the arrow on the front label) and that the RAC is mounted higher than the box that it is being connected to. When possible a bottom conduit entry is recommended.

The MC RAC has a spin on conduit fitting for ½ inch flex (non reinforced) and the TC requires a Junction Box or Flex Conduit Fitting for the application. Wiring is accomplished inside an internal wiring bay in the MC product by use of approved wire nuts as referred to in App Note appended to this document.

Graphically, use the Water Heater Installation graphic. For 120 VAC operation simply substitute “White” for “Red”/

## **Application Note #101 6-22-10**

### **Connection recommendations for the FC, TC and MC products.**

This application note outlines the best connection practices for connecting the high current connections of the load controllers.

It should be noted that the connections to Water Heating loads represent both high voltage and high current. Improper termination can result in excessive contact resistance at the junction of the wires which can result in an excessive temperature rise at the wire junction. This is not a defect of the product or the associated wiring but is an installation issue that must be addressed by the installer and the materials chosen for the installation. As in all electrical appliances and controls, the wiring connections must be proper and low contact resistance.

This document is a compilation of comments from independent installers with experience in installation and is intended as a guide as to their experiences. EnTek does, however, suggest strongly that as with any electrical connection, good mechanical connection be made as well as a sound electrical connection.

Wire nuts are commonly used for connections to Water Heaters and can be used both safely and successfully when the wires are properly stripped and mechanically twisted together before application of the wire nut.

Paraphrased comments from Professional Installers :

- 1) In regard to making the 30A connection from the switches #12 stranded to usually a #10 solid or wire stranded to/from the appliance to be controlled.

The first thing I'd like to mention is that “ installation technique” is far more important than the particular brand or type of wire nut or other connecting component. I cannot emphasize this too much.

Wire nuts are not a rated pressure connector for current, they are listed by how many, and what sizes of wires (combinations of wires) that they can contain.

For shop applications, where we are sub-assembling pigtails to the switches, I prefer using Buchanan crimp-on connectors (ferrule and cap style)

For field applications I prefer the Ideal 76B (red) wire nut. This older style has the flat top, fluted sides, no side wings. Again, installation technique is vital, and this style allows for a more consistent installation.

- 2) Scientific Atlanta commissioned a study at Georgia Tech for recommendations for wire nut connections. This study resulted in the recommendation of the 3M Scotch-Lok (red) wire nut based on contact resistance (thus temperature rise) and mechanical security. Once installed properly they absolutely will not come off, and sometimes have to be removed by cutting the wires at the junction point. Proper installation is, however, much more difficult than the Ideal brand. The 3M is hard to get started, resulting in many of them being scrapped, and/or the chance of a poor connection if not properly threaded making technique again a critical component of the installation.
- 3) The ferrule type connection is the very best and in my view the preferred connection. These connections use high pressure to both secure the wire from moving and lowering the contact resistance through multiple pressure points. The down side to this type of connection is that a tool is required (almost all electricians have one of these) and the connection is permanent. To replace the Load Controller, a small amount of wire must be trimmed off each wire and then re-stripped / terminated. The upside is that the connection resistance is minimal and secure. New types of connections are on the market using high pressure connections (still requiring a crimping tool) and having an integrated insulator over the connection point.

Regardless of the connection means used, good practice must be incorporated where there is sufficient physical wire contact and mechanical integrity to assure that a tight connection will be assured over time. At all times local and National codes must be followed.

While this document appears to represent that these connections are troublesome, there are millions of EnTek and similar controllers successfully installed in the field with good connections. This document is solely to draw attention to these connections so that good practice is used in all connections and that overheated connections are minimized.

It must be stressed that there is nothing in the load controllers that can cause connection temperatures to rise. If there is burning or discoloration of insulation at or near the wire connections the problem is contact resistance from an inadequate connection.



# *Use of the Flex Fitting*



*Steps 1 - 4 show use with Main Enclosure*



*Add double O Rings for use with J Box*



*Use Single O Ring with thin materials*



*Double O Ring Configuration*