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## **I. PREFACE**

This manual is designed to provide all the information necessary to install, start-up and troubleshoot the Touch-Plate Relay Control Panels RCP-0006 through RCP-0042.

## **II. OVERVIEW**

The Touch-Plate Relay Control Panels (RCP) have the following features:

- ? Up to 42 loads can be individually controlled from multiple locations by the use of momentary action switches.
- ? Pilot lights at remote switches indicate the status of the load being controlled.
- ? Stuck switch protection is built into the system. If a switch becomes stuck only that relay will be out of operation without disturbing the entire system. A stuck switch does not cause any heating of the relay which might cause premature failure.
- ? Economical 22 AWG wire can be used for switch wiring for distances up to 2000 ft.
- ? The system can be powered by 120 or 277 VAC supplies.
- ? The system is easily installed.

### III. DESCRIPTION

Each panel contains a transformer, power supply board, a Relay Control Board for every 6 relays, and the corresponding relays. All these components are mounted in an ETL approved enclosure using various cover and door options.

All the Relay Control Panels have a transformer and power board connected to one or more of the control boards. The power board and control boards have a modular design and are joined to each other by their push-in connectors.

The relays are connected to the control boards using push-in connectors to facilitate assembly and service.

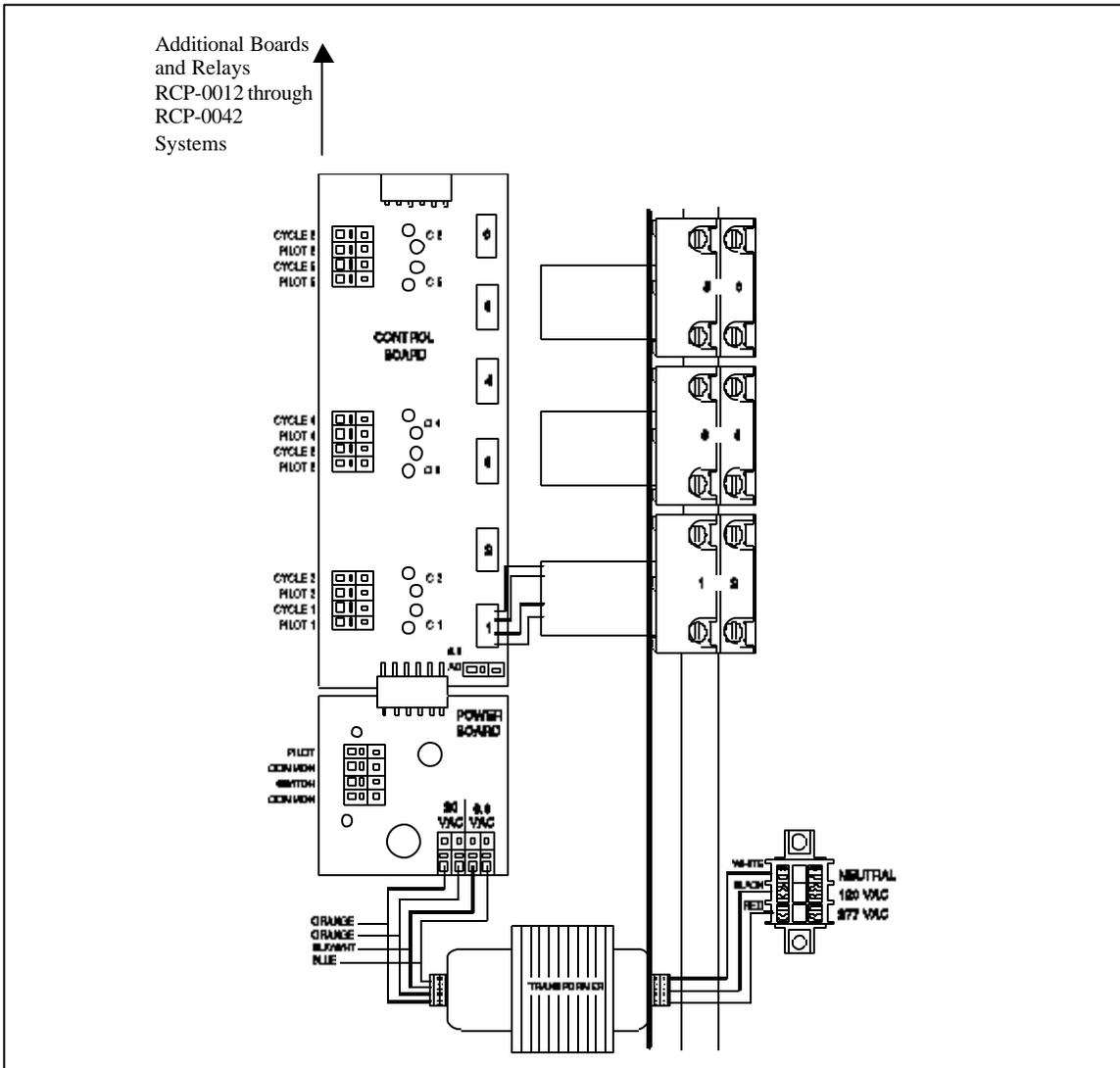


Fig. III-1 RCP Series Layout

## A. Relays

The relay is the Touch-Plate 3000-PL relay controlled by a 30 VDC coil. It is capable of switching loads up to 20 amps at 120 or 277 VAC (also CSA rated to 347 VAC). It has a secondary contact rated at 1 amp at 6.3 VAC which is intended for use with pilot lamps.

Every time the relay is operated, it changes status from OFF to ON or ON to OFF and stays in that status without any need of power. This minimizes heat dissipation in the enclosure.

The secondary contact is used to illuminate lighted switches, light indicators in graphic panels, or other devices.

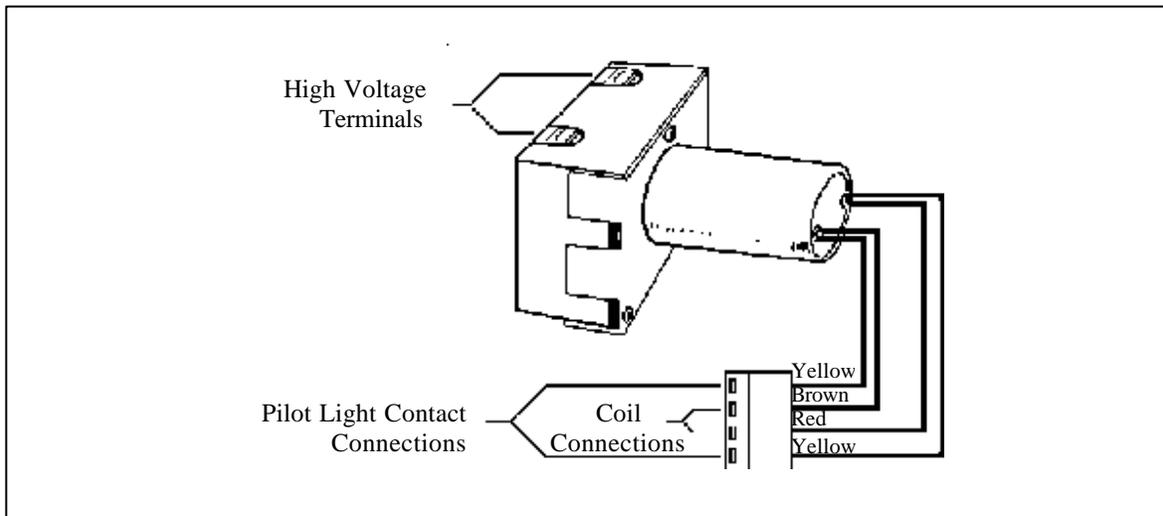


Fig. III-2 Relay

## B. Power Supply

The power supply consists of a transformer and a power board designed to handle the needs of the system. There are two sizes of transformers used depending on the number of relays and the amount of current that the pilot lights require. A small transformer is used with the RCP 0006 system and a large one is used for all other systems.

The power board has connections for the two "Common" outputs. These are Switch and Pilot Common. These two outputs are fully explained later in the manual.

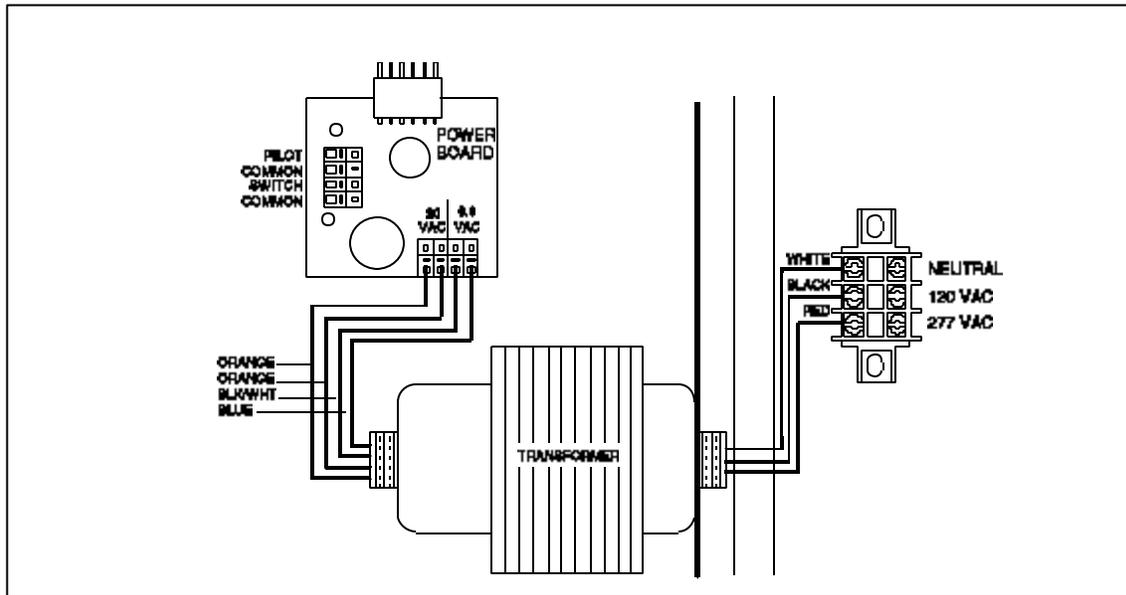


Fig. III-3 The Power Supply

### 1. The Transformer

There are two sizes of transformer. Both are ETL approved. Both have connections for 120 and 277 VAC.

The small transformer provides 22 VAC for the relays and 6.3 VAC at 500 mas for the pilot lamps. It will provide 1 amp at 5.8 volts AC.

## 2. The Power Board

The transformer secondaries are fed into the Power Board where the 22 VAC is rectified to provide 30 VDC. This is the voltage that is used to operate the relays via Switch Common.

The board contains one red and one green LED. The red LED indicates that there is power for the relays. The green LED indicates that 6.3 VAC is present for the pilot lamps.

### a. Common Connections

The power board has two black terminals labeled PILOT COMMON. These are the return terminals for all the pilot lamps. It is also the negative side of the 30 Volt power supply. All voltages in the system are referred to this point. When voltage measurements are given, it is assumed that one side of the volt meter would be connected to Pilot Common.

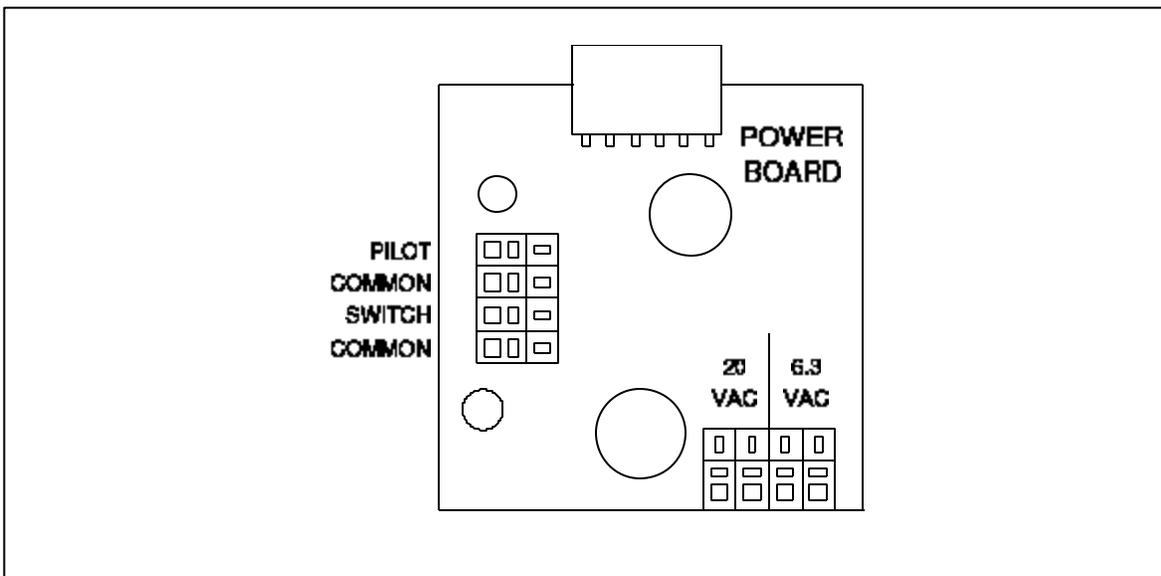


Fig. III-4 Common Connections On The Power Board

The two white terminals labeled SWITCH COMMON are used to supply the 30 volts DC required to switch the relays.

Switch Common is protected against accidental shorts to pilot common by a current limiting resistor.

## C. The Control Board

The Control Boards are designed to be easily connected to each other using plug in connectors.

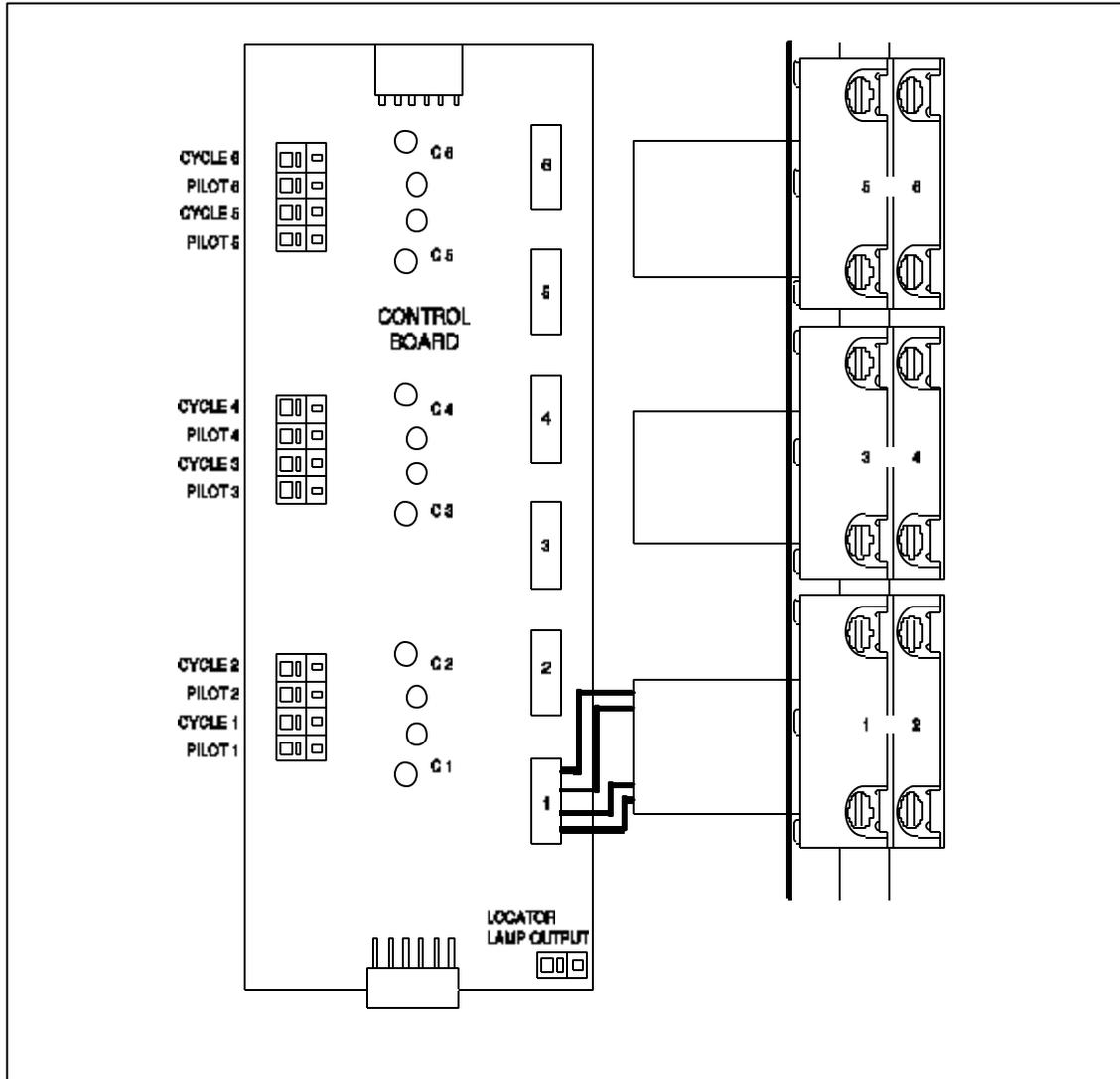


Fig. III-5 The Control Board

Up to a total of seven control boards can be connected together as in the RCP-0042. The first control board is connected to the power board.

The inputs and electronics for each relay are mounted on the control board. Orange terminals are inputs for each relay and the blue terminals are the pilot lamp outputs.

A separate blue terminal at the power connector end of the board provides a constant source of 6.3 VAC for use with locator lamps.

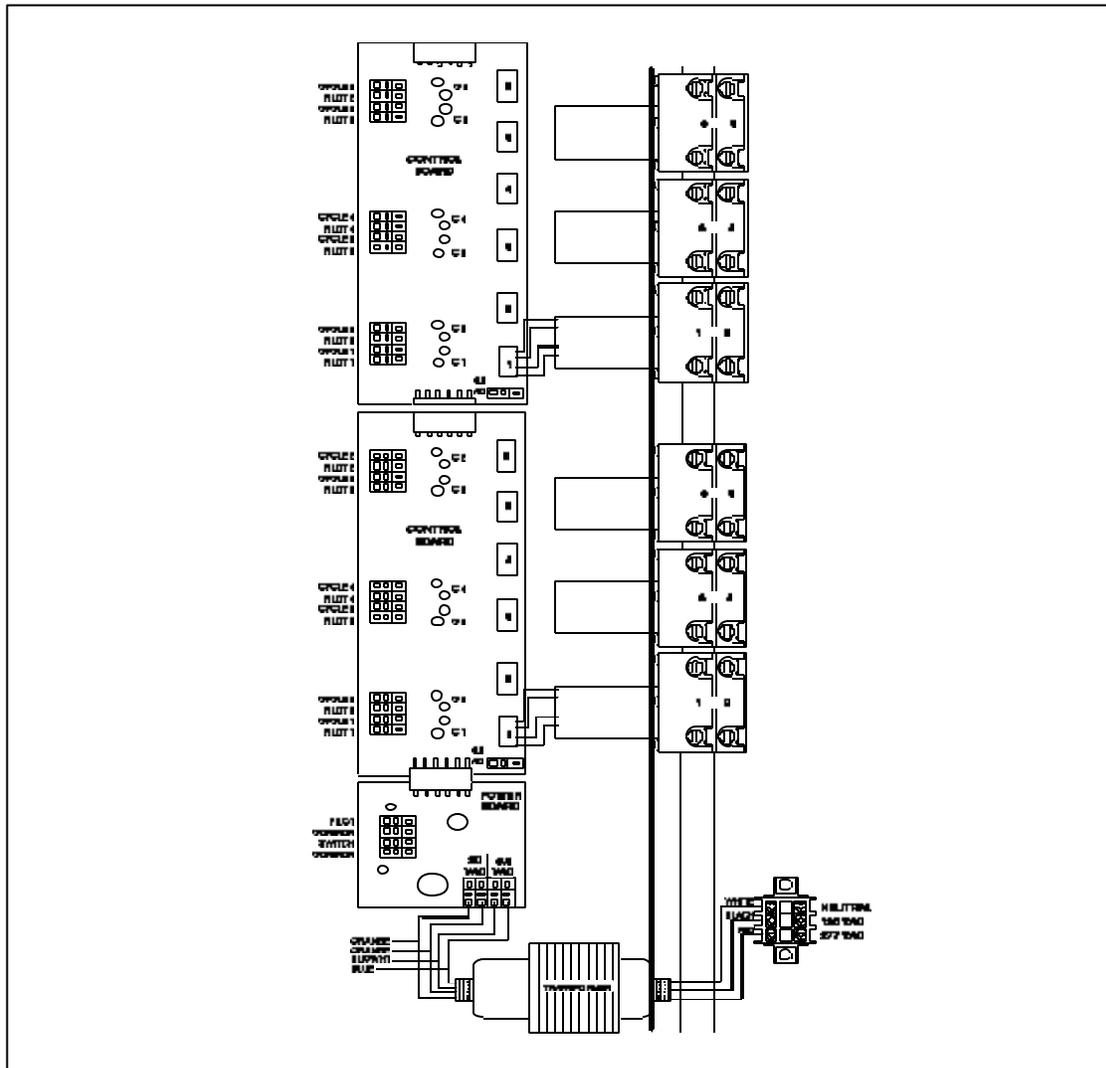
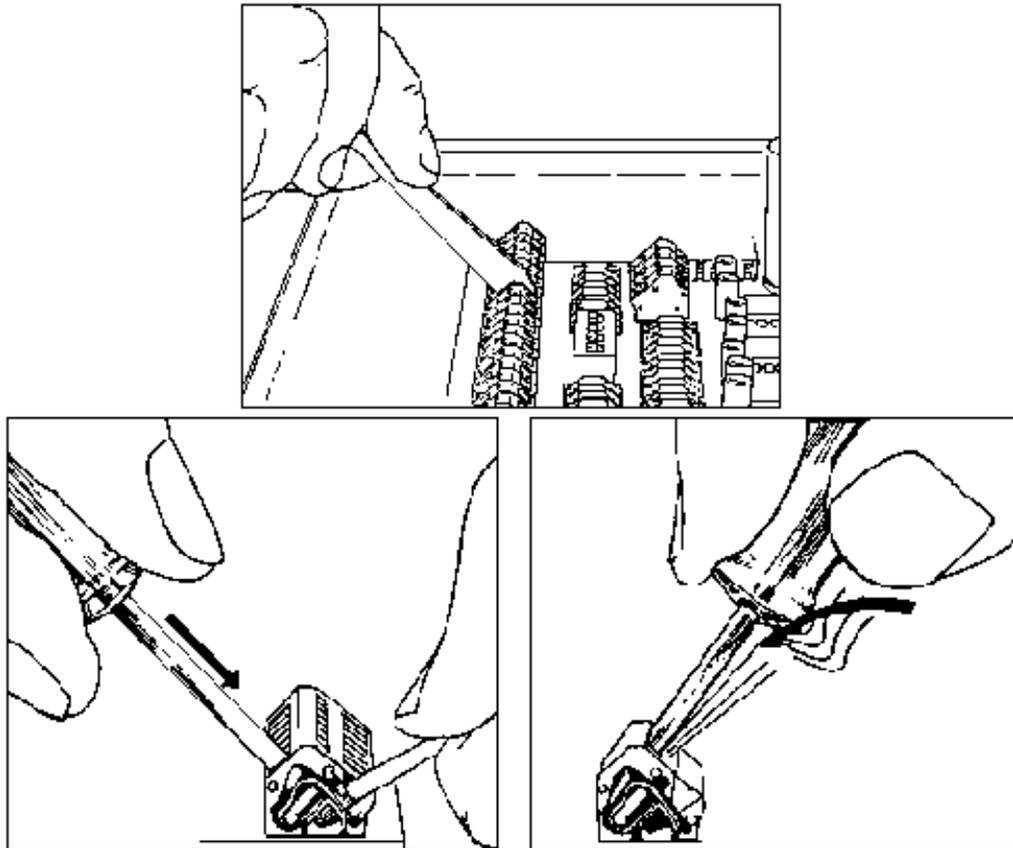


Fig. III-6 Two Control Boards And A Power Board Make A RCP-0012

## 1. Quick Connect Terminals

Touch-Plate uses color coded quick connect terminals. They can be easily opened using a small



screw driver or the special tool provided.

Fig. III-7 Quick Connect Terminals

The terminals are clearly identified by function and by relay number. All the terminals grouped under label 1 will affect Relay 1 of that board and so on.

## **D. Power Connections**

The RCP Cabinet should be mounted in a convenient location, convenient to the source of power and the loads. Since switches are wired with economical low voltage wire the distance from the switches is less of a factor in determining where to place the relay cabinet.

Each relay can switch up to 20 amps. The power connected to the relay has to come from a circuit breaker panel. Make sure that the circuit breakers are not rated over 20 amps. More than one relay can be powered from a single circuit breaker as long as the total connected load is less than the rating of the circuit breaker. Consult the local electrical code for load derating requirements which may reduce the number of amps load that can be connected to the relay.

It is best to put the power for the RCP on a separate circuit breaker. This prevents the lighting system from being incapacitated due to an overload on another circuit. It would be a false economy to save a circuit breaker and then not be able to turn on the lights in an emergency.

## **E. Switch Connections**

Momentary action switches are used to operate the relays. The advantage of using momentary action switches is that there can be many push buttons wired in parallel controlling the same relay. Because the control wires to the switches are "low voltage" they do not have to be run in conduit or have the expensive insulation used for high voltage wires.

Do not run the switch control wires in the same conduit as high voltage AC wires. Though this is permitted under some electrical codes when the control wires have high voltage insulation, do not do it with and Touch-Plate systems. To do so can cause induction of voltage in the control wires which in turn can cause false triggering and relay failure.

Twisted pair wiring should not be used for control wires over distances of more than 300 ft. These too can cause induction and false triggering of the relays.

The wiring is very simple. A wire is run from switch common (either of the two white terminals on the power board) to each of the switches. The other side of the switch is connected to the input (orange connector) of the relay that goes with that switch (or switches if more than one switch is being used for this relay).

## **F. Pilot Lamp Connections**

Pilot lamps are connected between the pilot output of the relay (blue terminal) and pilot common on the power board (black terminal).

There are two types of pilot lamps -- LED's (Light Emitting Diodes) and incandescent lamps. LED's take about 20 mas while incandescent lamps take from 120 to 200 mas. LED's can be wired using the same thin #22 gauge wire as

is used for the switches. Incandescent lamps require thicker wire. #18 gauge is fine for distances up to 300 ft. For longer distances, use thicker wire.

## G. Typical Connection Diagram

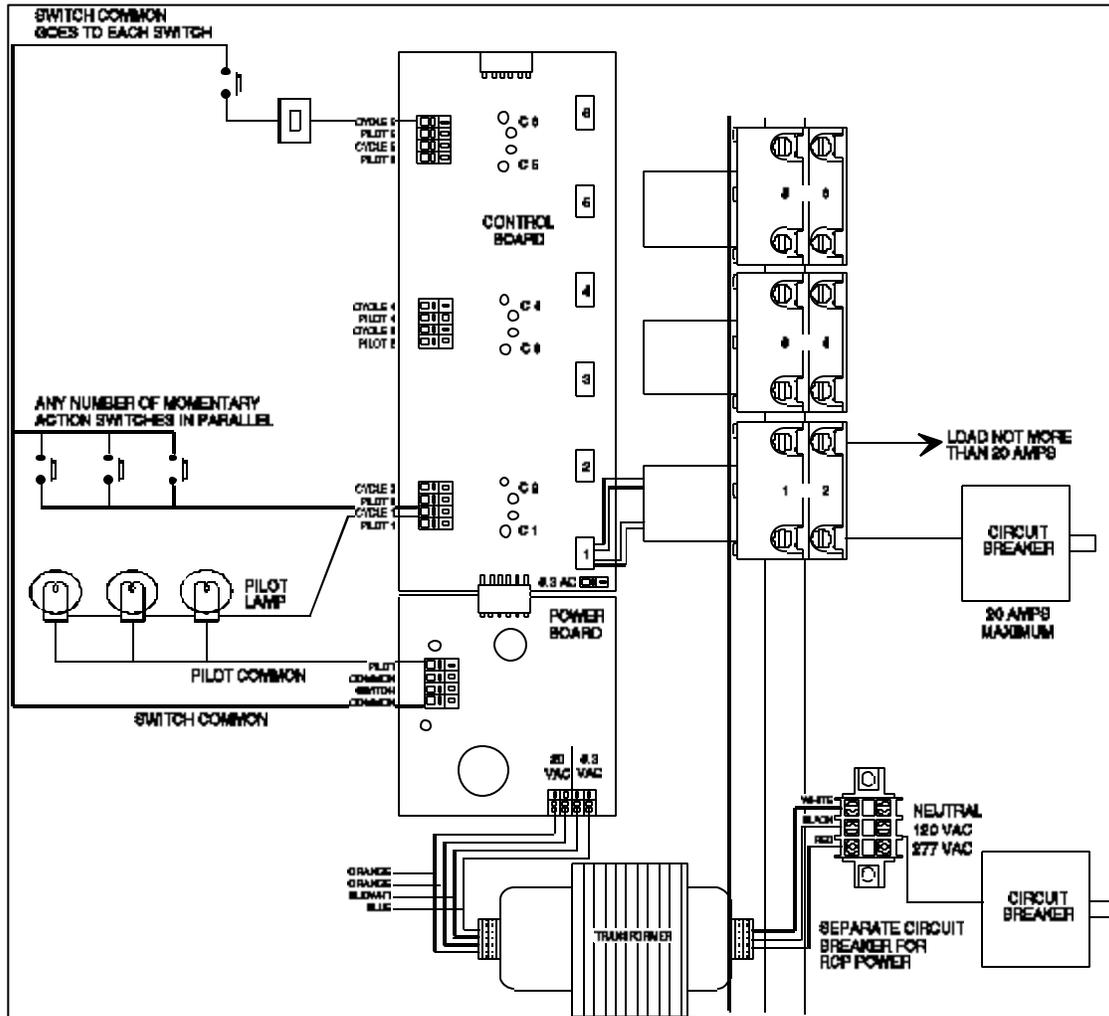


Fig. III-8 Typical Connection Diagram

## H. Points To Note When Connecting The System

### 1. Wire Size

For most applications, very thin wire can be used. Remember that the American Wire Gauge (AWG) sizes get larger in number as the wire gets thinner. Touch-Plate recommends that the thinnest wire used should be 22 AWG so that it is strong enough to be pulled through walls and attics without being broken. #22

AWG is sufficient for distances up to 1000 ft. for both switches and LED pilot lamps. Incandescent pilot lamps require thicker wire of at least 18 gauge.

## 2. Pilot Common Wire Size

Pilot Common is the wire used by the current that passes through all the pilot lamps and returns to the power supply. If there are 5 pilot lamps, then the current in the pilot common wire will be 5 times that in each of the pilot wires. If the pilot lamps are a long way from the power supply, it may be necessary to use more than one wire for pilot common. This is especially true when wiring the RCP-0024 or larger systems. With LED pilot lamps, this is rarely a problem, since 220 LED's may be powered by the RCP transformer.

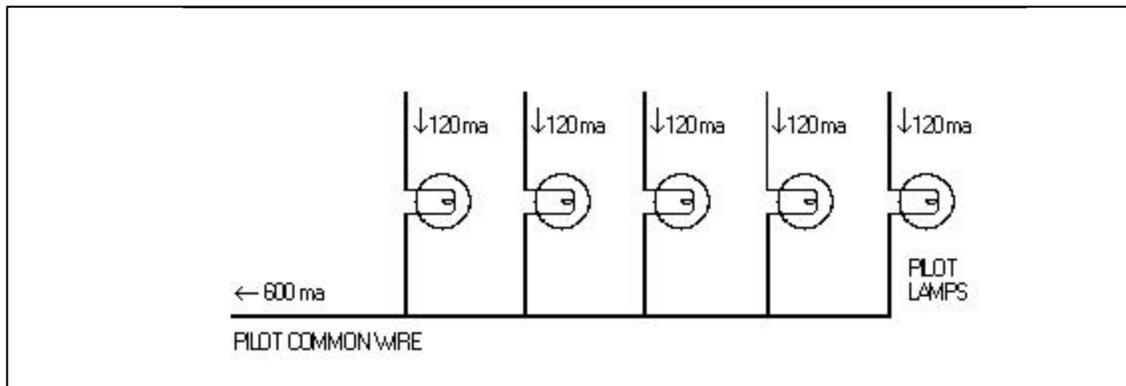


Fig. III-9 Pilot Common Carries More Current

## 3. Wire Types

When running control wires for long distances, say over 300 ft., any cable with twisted pairs should not be used. A twisted pair cable has a bundle of pairs of wires which have been twisted together. Wires twisted together can induce a signal from one wire to the other when a switch button is pushed. This could cause false triggering of a relay.

If running twisted pairs, put the pilot lamp wire and the control wire for a relay in the same pair.

## 4. Getting Two Or More Relays To Operate Together

Though it is possible to get two relays to operate together using a single button, it is not reliable. Eventually, the relays will get out of step with one another with one of the relays turning OFF while the other turns ON. If this function is required, the Touch-Plate Control Plus System is available.

## 5. Stuck Switch Protection

Stuck switch protection is built into the RCP series. If a switch should get stuck in the ON position, then it will not be possible to operate that relay from any of the switches that control that relay. However, all the other relays in the system will still operate. The stuck switch protection also prevents any relay or its electronics from being damaged.

## 6. Time Clock And Photo Cell Operation

The RCP series is not suitable for time clock or photo cell operation. For either of these two applications use the Touch-Plate Control Plus Series.

# IV. TROUBLESHOOTING

When troubleshooting, the first thought should always be "WHAT CHANGED?" If the system was working fine and then a new switch was installed and now it is not working at all, the likelihood is that the problem will have something to do with the new installation. Always check for a change first. If nothing obvious has changed recently, then review this list of possible problems to find the fault.

## A. System Dead - Both Green And Red LED's On Power Board Unlit

With both green and red LED's unlit, this indicates a complete loss of power to the system. First check the circuit breaker. If this has popped, find out why and then reset it. If it is not the circuit breaker at the wall, check the points in the sequence laid out below.

2. Check AC voltage at power board inputs. If no voltage here, then transformer is bad. Small transformer is in need of replacement. Large transformer may reset when it cools down.

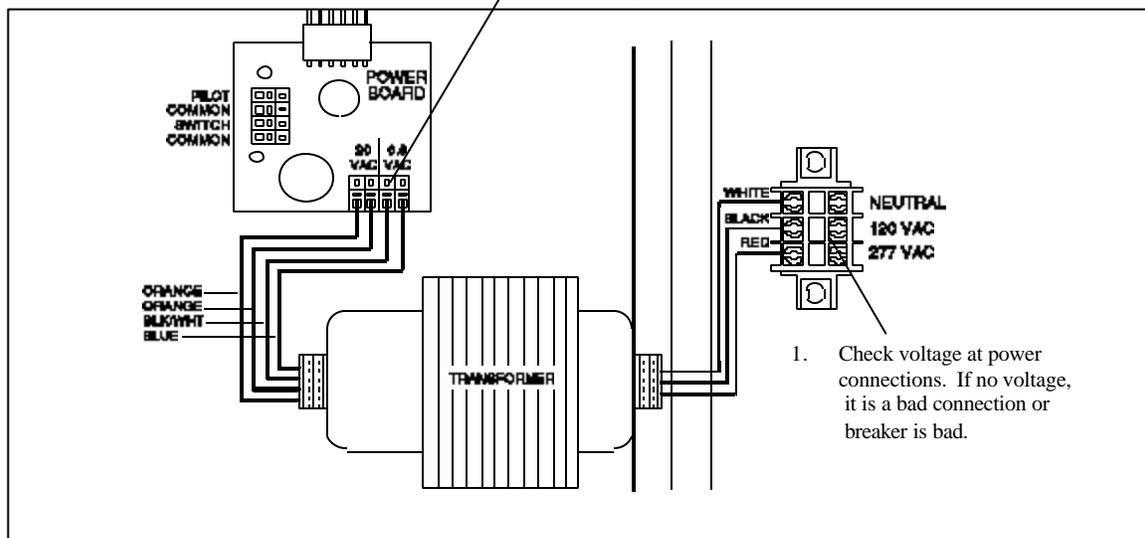


Fig. IV-1 System Dead - Both Red And Green LED's On Power Board Unlit

## B. System Dead - Both LED's On The Power Board Are Lit

If the LED's are lit, it means that there is power to the system. The red LED indicates that there is power for the relays but it does not indicate that there is power to Switch Common. Check the voltage between switch common and pilot common with a volt meter. If it is under 27 volts, there is a connection that is shorted some place to ground. Check the voltage on the AC scale of the volt meter too. If it measures 6 to 8 volts AC, switch common has been shorted to a pilot wire.

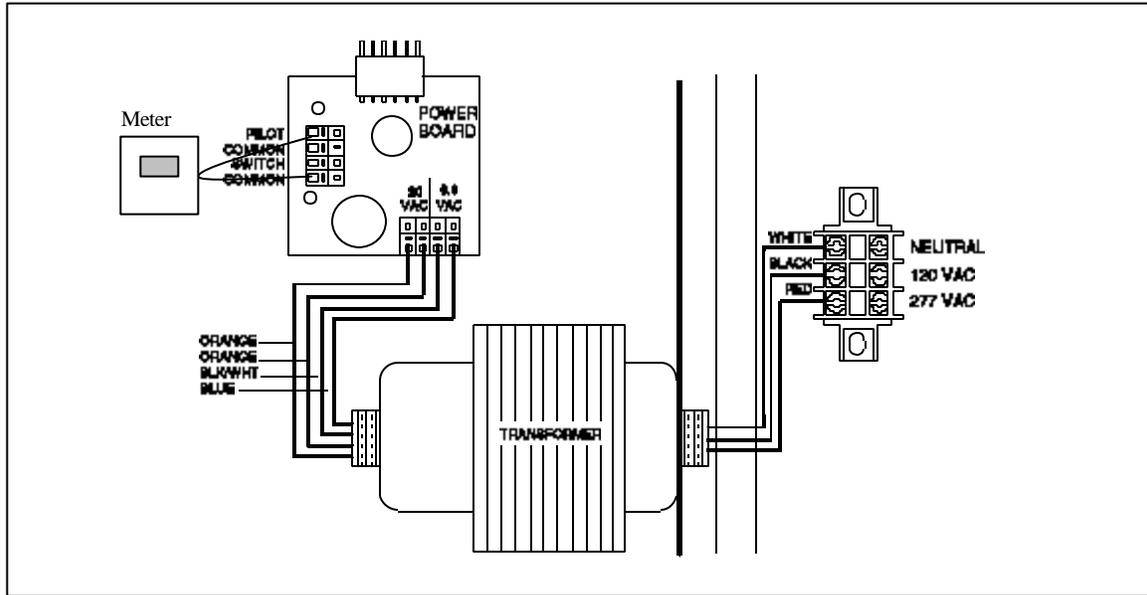


Fig. IV-2 Checking If Switch Common Has Been Shorted

## C. Green LED Not Lit While Red Is Lit

This indicates that there is no 6.3 VAC available. Normally this is caused by a popped circuit breaker on the large transformer.

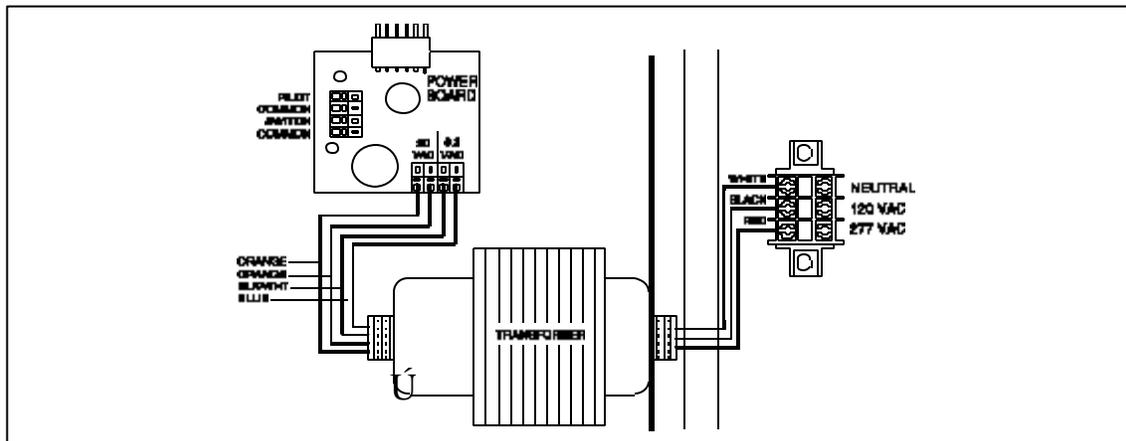


Fig. IV-3 Popped Circuit Breaker On Large Transformer

## D. Red LED Not Lit While The Green LED Is Lit

This would be caused by the 30 volts DC not being available. The most likely problem is a shorted transistor pulling the power supply down. Carefully check to see if any of the relays are hot. If so, unplug that relay. The rest should now work. There may be more than one transistor burnt out, so check all the relays. A burnt out transistor means that the board will have to be replaced.

## E. Intermittent Operation Of A Single Relay

This could be:

- ? *Sticky relay* - To test this, take a wire from Switch Common and use it as a makeshift switch by touching it to the orange terminal for that relay. If the relay still operates in a sticky fashion, unplug it and plug in a wire from one of the other relays. If it now works fine, the problem is definitely the relay and it needs to be replaced.

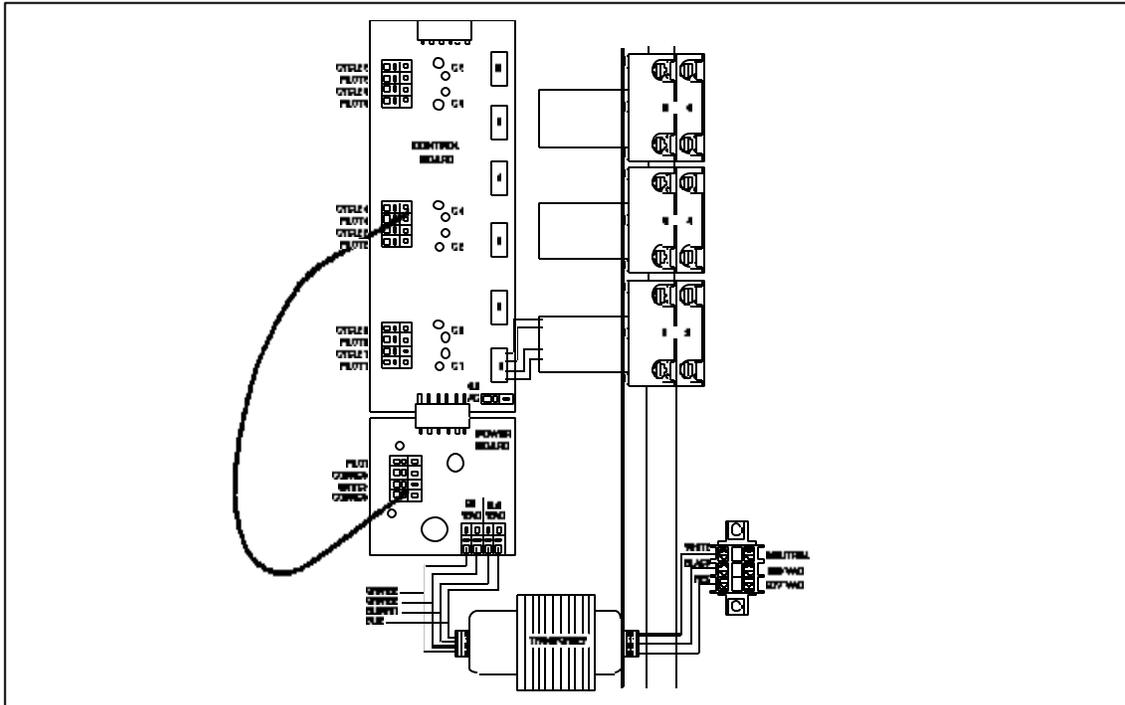


Fig. IV-4 Using A Wire From Switch Common As A Switch

- ? *Weak transistor* - If in the above test of switching relays on the same input the second relay was also sticky yet worked fine on its own socket, then the problem is a weak transistor which has to be replaced. This should be done by replacing the entire board.
- ? *Bad switch wiring* - If the relay works fine when it is operated at the panel with a piece of wire from switch common but does not work well when operated from the remote switch, then the problem is in the wiring. The most

likely place to look is for corroded connections at one of the switches, particularly if that switch is in a damp location.

## F. Single Relay Does Not Work

Pressing a switch does not operate the relay. Check if the switch is bad by using a piece of wire from switch common to the input for that relay. If the relay switches, then there is a problem in the wiring.

If it still does not work, try swapping the relay for another one. If the second relay works, the first relay was bad and must be replaced. If the second relay still does not work, it is probably the transistor. In this case, the control board will have to be replaced.

## G. All Pilot Lamps Are On All Of The Time Though Dim

This is caused by the pilot common wire being disconnected or not connected to pilot common. Check the wiring to see where this is occurring.

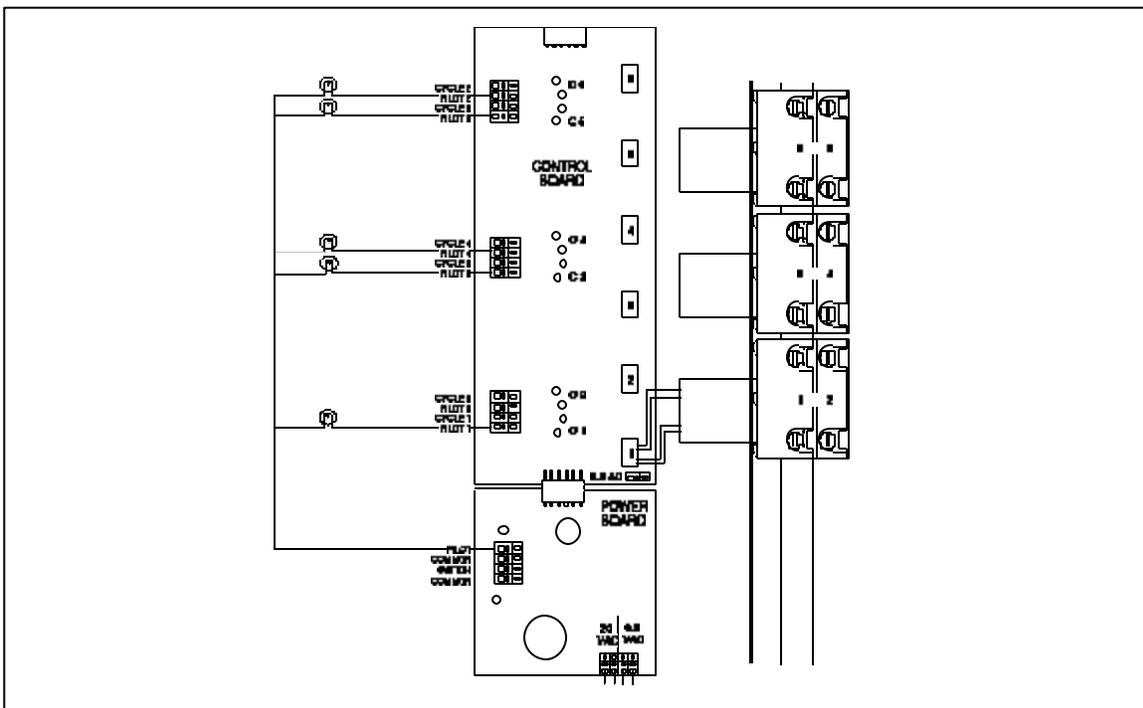


Fig. IV-5 Constantly On Dim Pilot Lamps Caused By Lifted Pilot Common

## H. Pilot Lamps Do Not Work But Relays Do Work

If the system has a large transformer, the most likely problem is that the circuit breaker on the transformer has popped. Find out why before resetting it.

In small transformer systems, the connections to the power board may be broken or the transformer coil has failed and the transformer needs to be replaced.

If there are still problems that are not resolved reread the manual to see if anything was missed. If you still cannot handle it, call the factory.

## V. SPECIFICATIONS

### A. Relay Specifications

High Voltage Contact:

1.0 HP 125 VAC	20 amps 125 VAC tungsten
1.5 HP 250 VAC	20 amps 277 VAC ballast

Copper conductors only  
Torque to 25 pounds/inch  
Maximum wire size 10 AWG

Low voltage contact: 1.0 amp at 6.3 VAC

### B. Transformer

Mini Transformer used in RCP-0006:

Inputs	277 or 120 VAC plus or minus 10%
Outputs	22 VAC open circuit; 20 VAC at 300 mas 6.3 VAC at 500mas; 5.8 VAC at 1 amp

Large Transformer used in RCP-0012 through RCP-0042

Inputs	277 or 120 VAC plus or minus 10%
Outputs	22 VAC open circuit; 20 VAC at 2.5 amps 7.8 VAC open circuit; 6.3 VAC at 5.5 amps

### C. Low Voltage Circuitry

Current into any input 1.5 mas  
Maximum allowed in line resistance 100 ohms

Recommended control wire  
up to 2000 ft. of wire 22 AWG  
(For longer distances, use thicker wire.)

Do not use twisted pair wire for lengths over 300 ft. Use shielded cable for long distances in areas with heavy radio frequencies.

Recommended lamp wiring:

LED's to 1000 ft.	22 AWG
Incandescent lamps to 300 ft.	18 AWG

(For longer distances, use thicker wire.)