# T64H-Relay Installation Guide

The highly compact T64H-RELAY controller can be easily installed in many plastic or metal enclosures. Threre are 5 mounting holes on the controller board (see Figure 3 on next page), and you only need to use 5 PCB standoffs to support the controller and to fasten it to a console box.

1. **Wiring -** Detachable screw terminal blocks are provided for quick connection to all inputs, outputs and power supply wires. Since the terminal block is inserted vertically to the board surface, you need to remove the terminal block before you start wiring. Use a small flat-head screw-driver and insert underneath the terminal block, apply even pressure to raise the terminal block until it becomes loosened from the connecting-pin strip, as shown below:
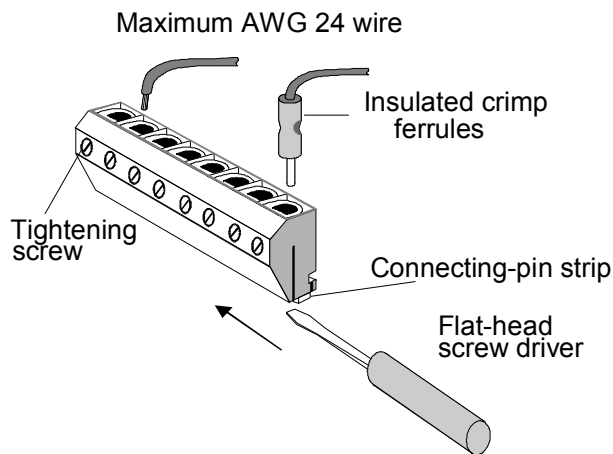


Figure 1: Removing Screw Terminal block

Although wires of up to 24 AWG  may be connected directly to the screw terminal, insulated crimp ferrules can also be used to provide a good end termination to multi-stranded wires. Use of Ferrules reduces the possibility of stray wire-strands short-circuiting adjacent terminals and its use is therefore highly recommended.

2. **Power Supply -** The T64H-RELAY PLC has its own built in power supply circuit which  provides regulated DC power to the whole system. You need to use a transformer with 12V-0-12V type of secondary winding. The transformer should be able to source at least 0.5A of current with less than 10% output voltage drop. Connect the three leads of the transformer to the first three terminals of the power supply screw terminal block  as shown in the following diagram:
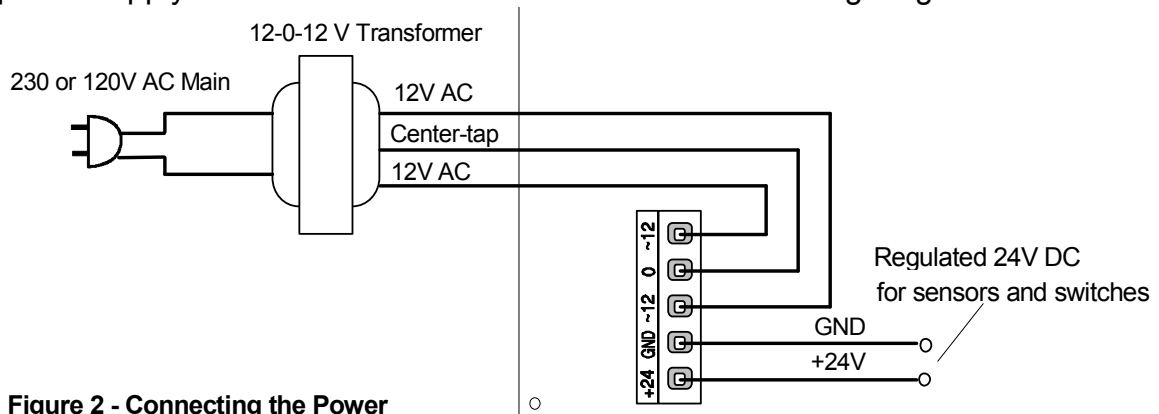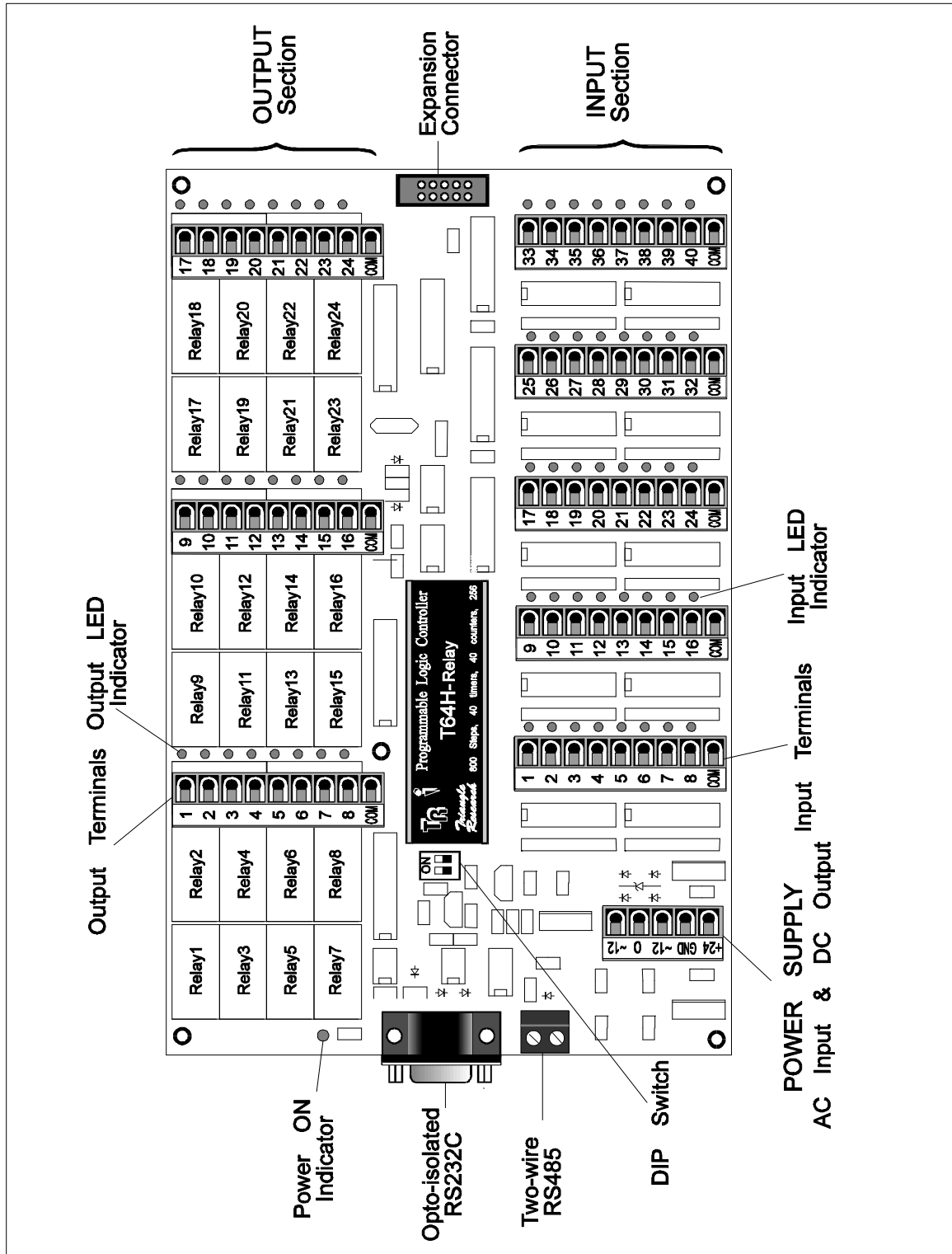


Figure 2 - Connecting the Power

Figure 3 - T64H-Relay Programmable Controller

## Table 1-1 - DIP Switch Settings

| DIP Switch | OFF | ON |
|------------|-----|-----|
| SW1 | All outputs, relays, timers and counter values are non retentive. | The first 32 relays, timers #1-8 and counters #1-8 retain their logic status and present values when power off. |
| SW2 | - Reserved - | - Reserved - |

T64H-Relay outputs a regulated, DC 24V power which may be used by sensors or limit switches for turning on input opto-isolators. The current rating for this supply is dependent on the transformer rating, as follow:

| Transformer current rating | Max. output current of 24V DC |
|---|---|
| 12-0-12 @0.5A | 0.2A |
| 12-0-12 @1.0A | 0.7A |

3. **Input Units -** There are a total of 40 physical inputs (divided into 5 blocks of 8 inputs each, see Figure 3)  in the basic T64H-RELAY. These inputs are numbered from 1 to 40. These numbers correspond directly to the first 40 entries in TRiLOGI's$^{TM}$ Input Table. All the inputs of the T64H-RELAY employ AC opto-isolators and they can be connected to either PNP or NPN type sensors. Every 8 inputs are connected to a separate COMMON point.  With expansion board, the T64H-Relay PLC may be expanded up to 72 inputs in the near future.
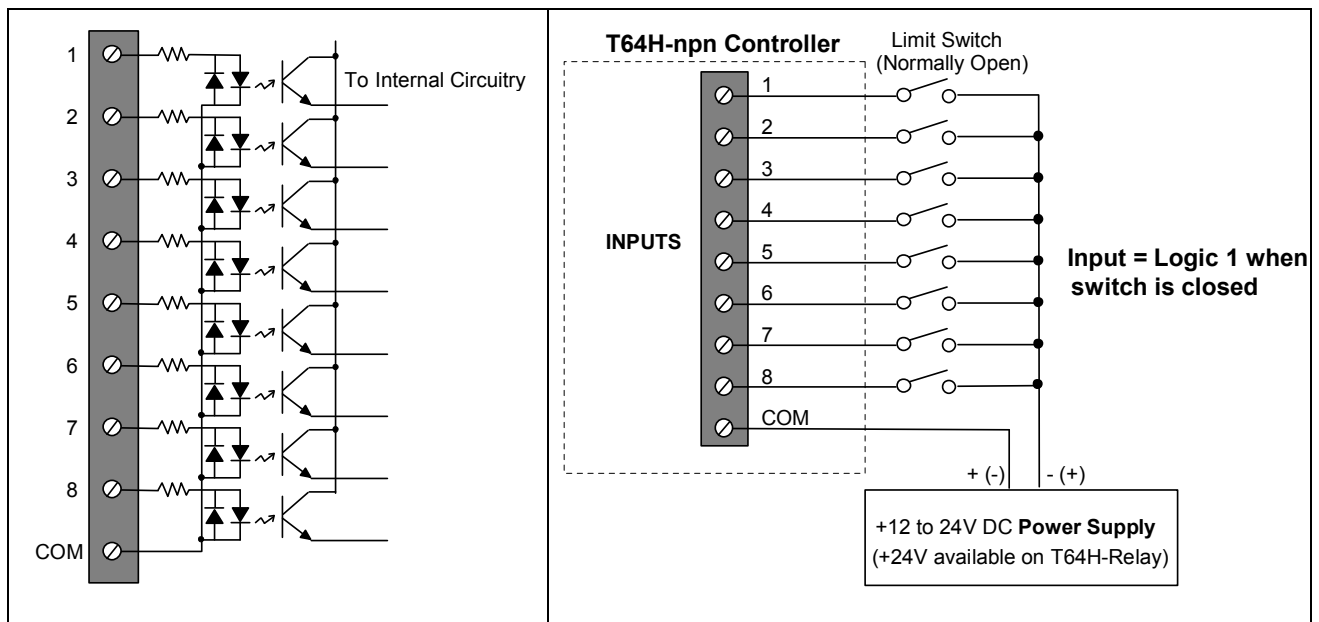


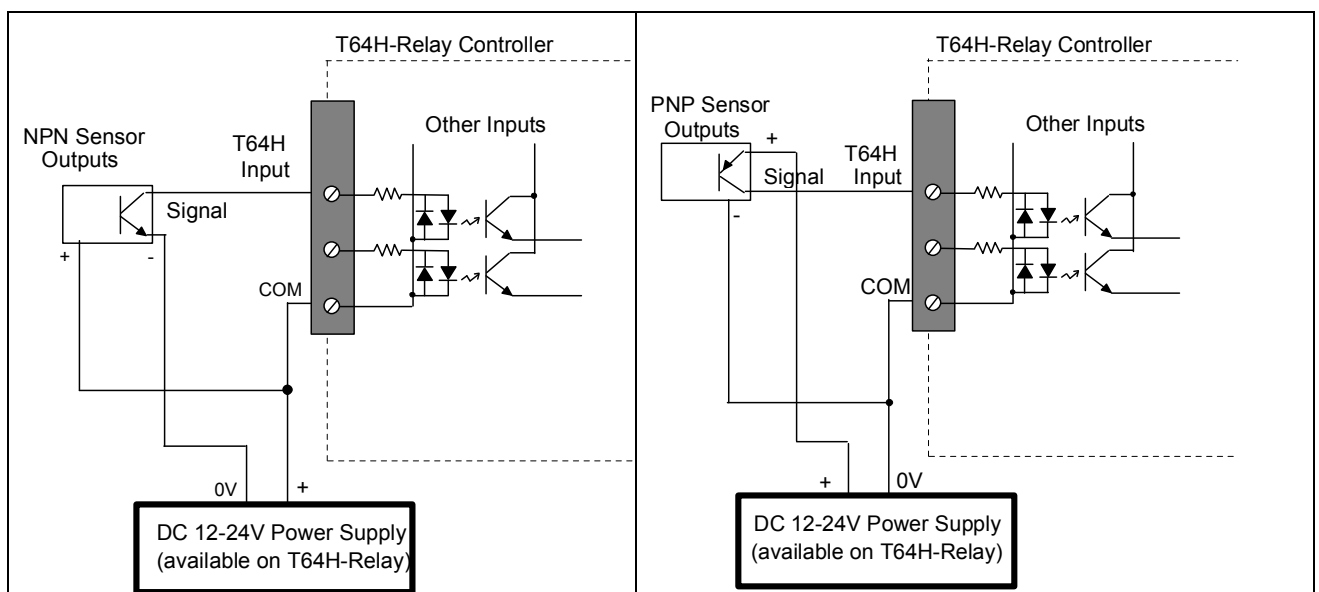Figure 4  Opto-isolated input interface & limit switch interfacing



Figure 5  Input Interfacing to PNP and NPN type sensors

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Input Voltage for Logic 1:   +12V to +30V, > 5mA
Input Voltage for Logic 0:   Open Circuit  or leakage current < 2mA.

**4. Output Units -** The T64H-RELAY controller provides 24 normally-open, voltage-free relay outputs. Every 8 outputs share a common terminal (COM). Each output has an LED indicator adjacent to its terminal which lights up when the output is turned ON. With expansion board, the T64H-Relay PLC may be expanded up to 56 outputs in the near future.

Electrical specifications:

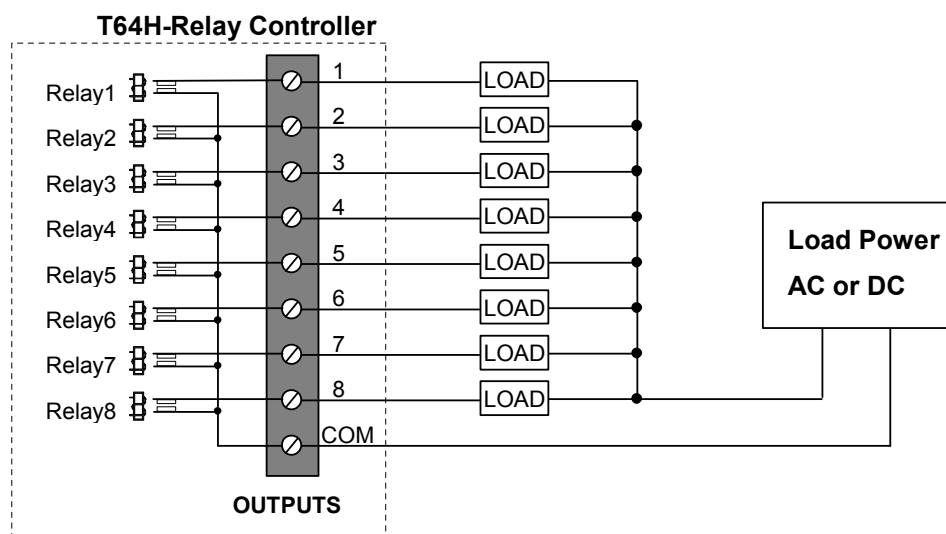| | | |
|---|---|---|
| Output type | : | Relay contacts, Normally open. |
| Current Rating  @24V DC | : | 2A (Electrical life = $2 \times 10^5$  cycles) |
| @250V AC | : | 2A (Electrical life = $2 \times 10^5$  cycles) |
| @125V AC | : | 3A (Electrical life = $2 \times 10^5$  cycles) |
| Maximum  total current | : | 5A |
| per block of 8 outputs | | |



Figure 6 - Output interfacing to load

**Note:**   When switching inductive load, always ensure that snubber circuit or bypass diode is connected to absorb inductive kick which occurs when the relay contact opens. If left unchecked, the inductive kick causes electric arc to form across the contact which will wear out the contact material and severely shorten the contact life of the relay.
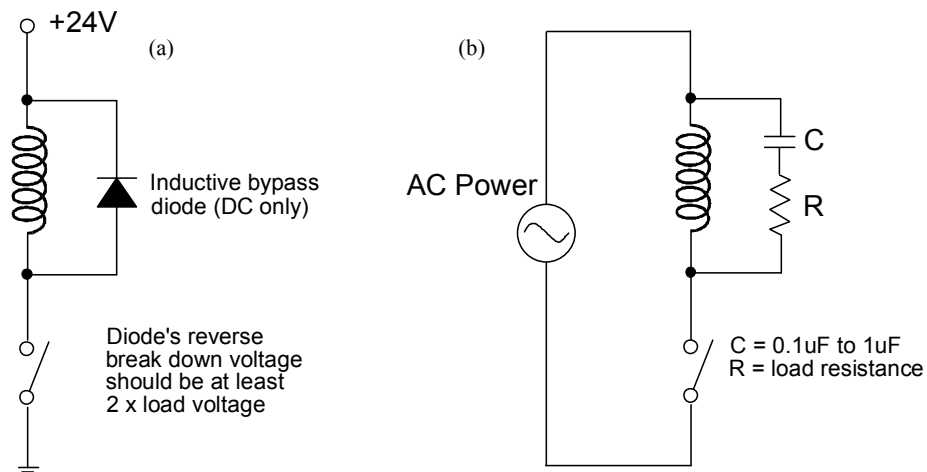


Figure 7   (a) Inductive snubber circuit - DC load only.
(b) Inductive snubber circuit - AC/DC load.

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5. **Internal Relays -** The T64H-RELAY supports up to 256 internal relays. Internal relays are useful for storing temporary logic states or serving as flags to a host computer which may examine them via the serial port. If DIP switch SW1 is ON, then the first 32 internal relays retain their logic states when the power is off.

6. **Timers -** The 40 software countdown timers in T64H-RELAY occupy the first 40 entries in TRiLOGI's Timers table. The range of the timer preset value is from 0.1 to 999.9 seconds. If DIP switch SW1 is ON, then the first 8 timers retain their present values and logic states when the power is off.

   Additional timers may be created by feeding a built-in clock source to unused counters. The T64H-RELAY supports 6 clock sources of various periods: 0.01s, 0.02s, 0.1s, 0.2s, 1 sec and 1 minute. The 0.01s clock source can be used to create high speed timers of 0.01s resolution.

7. **Counters -** There are 40 independent counters in T64H-RELAY. These counters occupy the first 40 entries in TRiLOGI's Counters table. All counters range from 1 to 9999. These counters either operate as down-counters from a preset value or as reversible Up/Down counters. Any one or all of the first 8 counters can also double as step counters for the 8 sequencers available in T64H-RELAY. If DIP switch SW1 is ON, then the first 8 counters retain their present values and logic states when the power is off.

8. **Sequencers -** Model T64H-RELAY controller supports 8 sequencers of 32 steps each. A sequencer is a highly convenient feature for programming machines or processes which operate in fixed sequences. Any one or all of the first 8 counters can be used as step counters for the sequencers which correspond to sequencers "Seq1" to "Seq8". A Sequencer operates in "steps". Each time the execution condition for the special function ------[AVseq] goes from OFF to ON, the sequencer will forward (increment) one step (starting from 0 to the preset values). See TRiLOGI Programmer's Reference for an example on the use of the Sequencers.

9. **Maximum Program Steps -** A program step is roughly equivalent to a NO or NC contact on the ladder diagram. (Please refer to TRiLOGI's manual for details). T64H-Relay allows program of up to 800 steps to be written.

10. **Host computer connection -** Programming of the T64H-RELAY controller is done entirely on an IBMPC compatible computer using the extremely user-friendly ladder-logic editor cum simulator software: TRiLOGI™ Version 3.1 or higher. (Please refer to TRiLOGI's Programmer's Reference for details) TRiLOGI allows ladder programs to be created on the PC's screen and simulated in real-time. Editing and debugging is greatly simplified with this interactive simulation capability of the software. After creating the program, it is necessary to connect the PC to the T64H-Relay controller for program-transfer and on-line monitoring.

    T64H-Relay PLC has two _independent_ serial ports: one opto-isolated RS232 port for direct connection to PCs and one RS485 port for networking. Both serial ports use communication format of 8 data bit, 1 stop bit and no parity. The RS485 may be configured for communication speeds of between 1200 and 38,400. (See H-series User's Manual on the "BW" hostlink command). The RS232C, however, is fixed at speed of 9600 baud.

T64H-Relay allows two computers to simultaneously communicate with the PLC. (See H-Series User's Manual for details on communication protocol). One using the RS232C and the other using the RS485 interface. The RS232C interface is provided via a DB9 female connector and the RS485 interface is provided via a two-pin screw terminal block; both are situated along the left edge of the controller board (See Figure 3).

RS232C connection to the PC serial port is simply made using a low cost, straight DB9 female-to-male computer serial cable. Either COM1: or COM2: of the PC may be used.  If your computer has a 25-pin serial connector, then you will need a 9-pin (male) to 25-pin (female) cable to complete the connection. The PC may also be connected to the RS485 interface using a RS232C-to-RS485 converter (See H-series User's Manual for more detailed description).