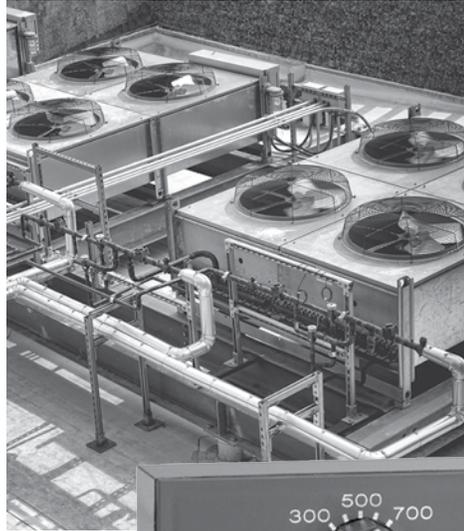
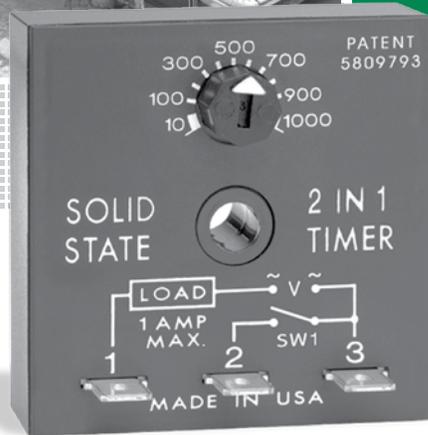




Expertise Applied | Answers Delivered



HVAC
Timers



APPLICATION GUIDE

APPLICATION GUIDE

Bypass timing

Allows Low Temperature Starting of an Air Conditioner

In some applications, a process variable may be out of range when the equipment is asked to cycle. With a safety limit switch open, automatic equipment cannot be started until the open limit switch is closed or manually bypassed. This application shows how to automatically bypass a process limit switch without damaging the equipment. A bypass time delay momentarily shorts across an open limit switch; allowing the equipment to start and close the open limit switch. If the limit switch opens after the bypass timer times out, the equipment shuts down.

A common example of this situation occurs with air conditioning equipment operating in moderately cold temperature zones. The connection diagram shown represents a typical control circuit from a rooftop air conditioner. It is a chilly fall morning. A southern facing wall of glass has captured enough heat to send the room temperature above normal. The thermostat calls for cooling. Because of the low ambient temperature, the refrigerant pressure is too low and the LPC (low pressure control) is open. Under normal conditions, the LPC protects the compressor from overheating caused by low refrigerant pressure. The addition of a bypass timer allows the system to start and attempts to establish an acceptable refrigerant pressure. The normally closed solid state output of the TAC4 Series is connected across the LPC contacts. The TAC4's output remains closed for one to three minutes each time the thermostat switch closes. It then times out and its output opens for the rest of the cycle. If the LPC opens during a cycle, the compressor shuts down. The bypass delay allows starting when the ambient temperature is low and then returns compressor protection to the low pressure switch. The lockout relay is a fast acting latching circuit. If the LPC or HPC (high pressure control) opens, the lockout relay latches preventing further operation until the lockout relay is reset.

Low Pressure Switch in Compressor Relay Circuit

The TAC4 is a normally closed all solid state delay on make timer. When power is applied to the compressor relay circuit, the TAC4 will provide a closed circuit across the low pressure switch for a preselected delay to allow pressure to build up and the switch to close.

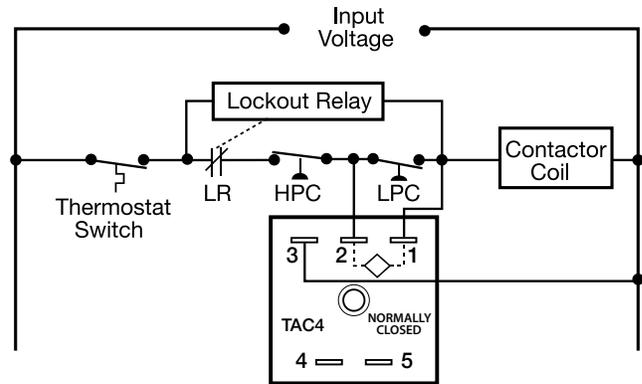


Figure 1

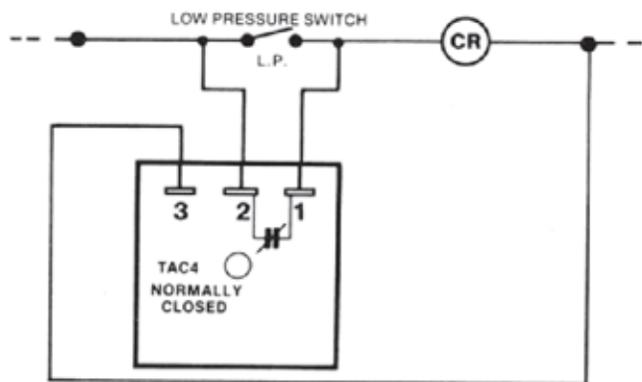


Figure 2

APPLICATION GUIDE

Debouncing - Demand Reduction Timers

Random Start Sequencing

Random Start Sequencing is a common practice used to prevent overloading of power lines due to peak demand current levels. Peak demand usually occurs after power failures or when night shutdown systems are used.

A low cost random start system includes a delay on make time delay in the control circuitry of the system as shown. Random start timers are placed in each piece of equipment, each timer set for a different time delay period.

The random start delay is connected so that its time delay occurs after loss of power. When power is restored, the normally open solid-state output of the TDU#1 timer keeps the transformer de-energized for a selected time delay. Upon completion of this delay, the solid-state output changes state and the transformer is energized.

Debouncing - Preventing Contact Chatter

Switch bounce can cause unacceptable contact chatter. In this application, the TDU#2 timer is used to debounce control switch SW1. Upon closure of SW1, the normally open solid-state output of the TDU#2 timer keep the contactor coil de-energized during the debounce time delay. Upon completion of the time delay, the contactor is energized. The debounce time delay will be reset to zero if SW1 opens at any time prior to the completion of the TDU#2 time delay.

Exhaust Fan Delay

In many existing installations a neutral connection (white wire) is not available in the switch box. The two terminal delay-on-break THD7 is perfect for these installations. SW1, when closed, operates the fan directly and holds THD7 reset. When SW1 opens, THD7 begins timing and holds the fan on until the end of the time delay. The system is reset each time SW1 is closed.

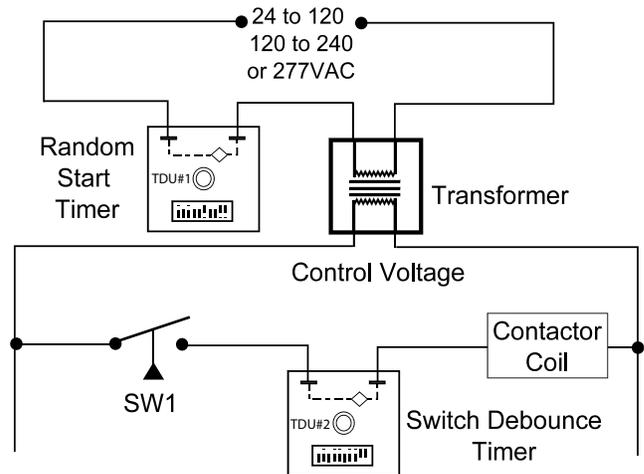
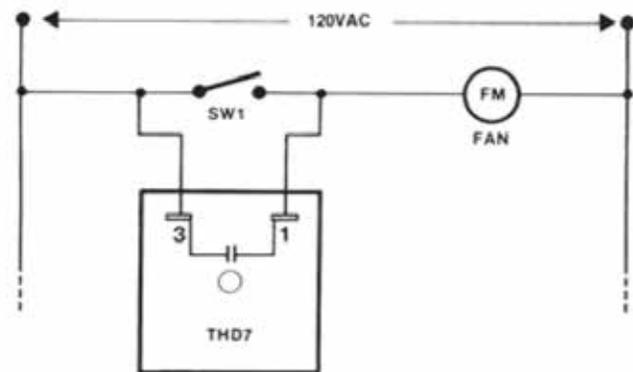


Figure 3



Timing Diagram

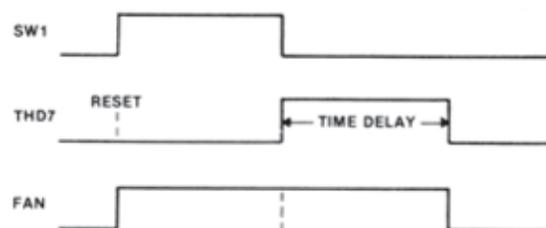


Figure 4

APPLICATION GUIDE

Prepurge Gas Vapors

When the thermostat closes, the fan turns on. While purging the combustion chamber, the fan forces the flag switch to close, applying power to the solid-state timer. The time delay starts, keeping ignition controls off until gas vapors are removed. The solid-state timer then sends power to the flame sensor control section which fires the electrode. If the pilot is lit, the main burner is also lit. If the flame sensor does not see a flame, the electrode is fired one more time. After a second failure, the system goes into lockout and must be manually reset (Lockout circuitry not shown).

A Dual Anti-Short Cycle Timer - Lockout Plus Random Start Delay

Far too many motors are short cycled after a momentary power outage. The utilities reclosing process attempts to re-establish power automatically after a fault has tripped OFF a supply line. The reclosing breaker makes three attempts to re-establish power. Each attempt is a few seconds after the circuit re-trips. Compressors, pumps, machine tools and milling machines that operate with variable loads may not be able to start under peak loading. These motors may be subjected to excessive locked rotor stress after a momentary power outage. A new compact time delay, the T2D Series, doubles the protection provided by traditional anti-short cycle timers. When power is applied, a random start delay begins. The T2D's solid state output is OFF during the random start delay. After timeout, the output energizes and latches ON regardless of the condition of the initiate switch. With traditional random start timers, the time delay doesn't begin until the initiate switch is closed. When the initiate switch opens ending the machine cycle, another anti-short cycle delay called a lockout delay begins. The machine cannot be restarted until this delay is completed. This time delay limits the number of motor starts per hour. This second lockout delay provides further short cycling protection previously not available within a single compact timing module.

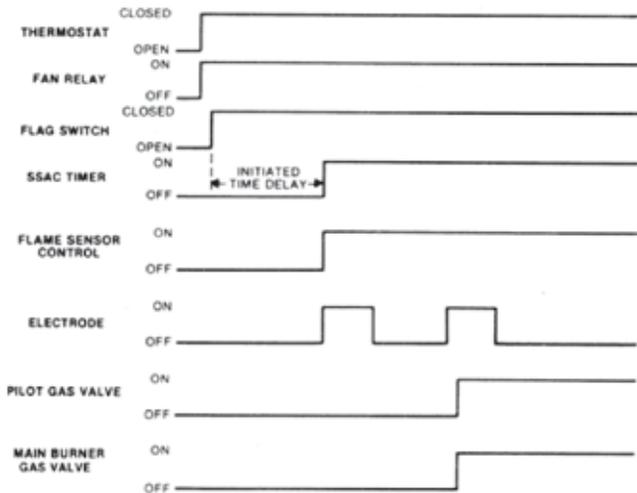


Figure 5

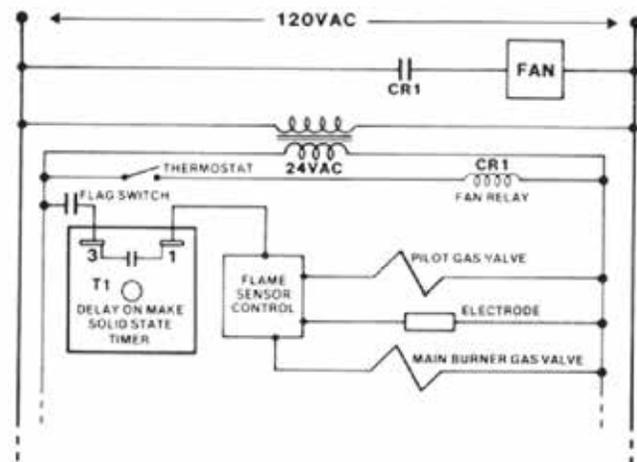


Figure 6

T2D Connection - Lockout Plus Random Start Delay

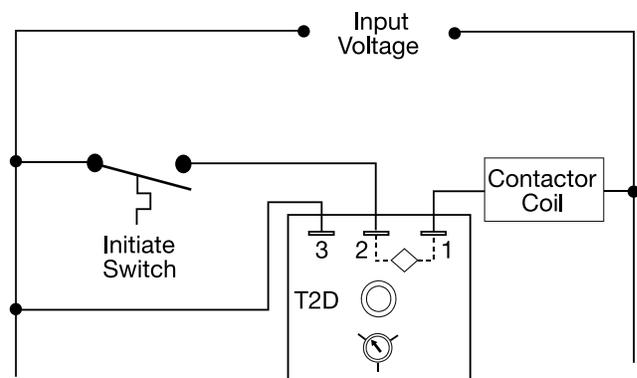
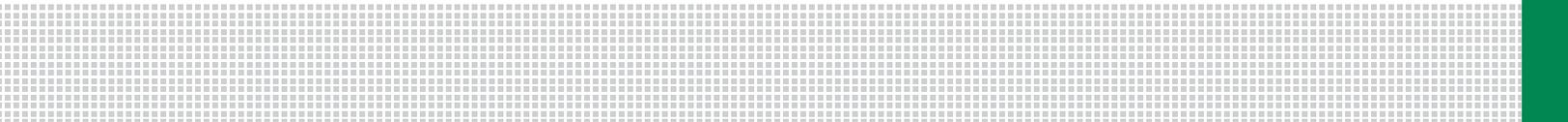


Figure 7

**For more information, visit
Littelfuse.com/Time-Delay-Relays**



Additional technical information and application data for Littelfuse protection relays, generator and engine controls, fuses and other circuit protection and safety products can be found on **Littelfuse.com**. For questions, contact our Technical Support Group (**800-832-3873**). Specifications, descriptions and illustrative material in this literature are as accurate as known at the time of publication, but are subject to changes without notice. All data was compiled from public information available from manufacturers' manuals and datasheets.