

The timer can operate in different modes. It can be used to power a device up or to power it down when the timing period elapses. In the power down mode, pressing the start button on the digital timer applies power to the device and power is automatically removed when the timing period is over. When used in the power up mode,

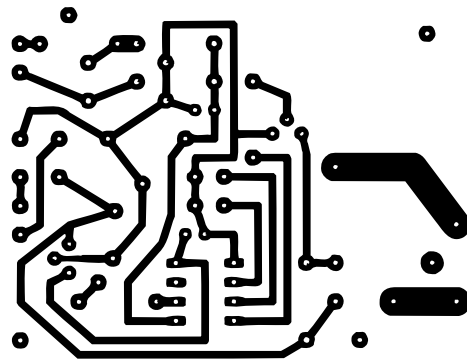


Fig. 2

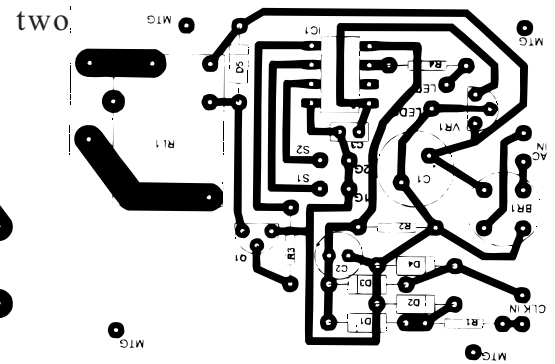


Fig. 3

power is applied when the timing period expires and you have to manually power the device down by pressing the reset button. The digital timer from Walmart has a maximum timing period of 99 minutes and 59 seconds.

Figure 2 shows the PCB layout looking through the board from the component side. Figure 3 shows the component layout. The circuit is simple enough to build using perfboard construction if you don't want to make the PCB. The board layout matches the Radio Shack relay specified in the parts list.

Begin construction by modifying the digital timer. Remove the back cover from the timer. Solder two 6-inch pieces of 30 gauge insulated wire to the piezo speaker terminals. Route them through the speaker opening on the back of the timer and reassemble the timer. Cut the wires so that about 2 inches remain and connect them to a 2 position .100" Molex type KK series female connector. Glue the connector to the back of the timer so that it is even with the edge of the timer. You can use any type of miniature connector that you happen to have on hand. The Molex type is convenient because its rectangular plastic body is easy to glue to the timer case.

Transformer T1 should be a 9 or 10 volt transformer. Do not use a 12 volt transformer as the DC voltage will be excessive for the relay. Any transformer with a 100 ma. rating or greater will be sufficient. If you can't find a suitable chassis mount transformer, purchase a 12-vdc wall transformer. Break the case open and use the transformer that is inside. You will have to find a way to mount the transformer to your case. Silicone glue can be used since the transformer does not weigh very much.

Assemble the circuit as shown in the schematic. You should use an IC socket for the PIC chip in case it has to be replaced in the future. Switch S1 is a miniature push button switch and S2 is a miniature toggle switch. Jack J2 can be any type that you prefer to use. Mount T1, the switches, jacks, and LED in a case of your choice and connect them to the circuit board. Be especially careful when wiring the connections for the 117 volts AC power. Do not let this wiring come in contact with any other part of the circuit.

Mount the circuit board in the case and carefully inspect all of your wiring. Do not plug the PIC chip in at this time. Plug the power cord into a 117 volt AC wall outlet and check the voltage between pins 1 and 8 of the IC socket. It should be between 4.85 and 5.25 volts. If it is, unplug the power cord and wait 30 seconds for the voltage across C1 to drop. You can then plug the PIC chip in and close the case.

You should make a 2-wire cable about two feet long with connectors on each end to match the digital timer connector and the connector on the interface box. Polarity is not important. You can also hardwire the timer to the interface box if you wish. I chose to use connectors so that I could unplug the timer in case I wanted to use it to time other events using the alarm.

To test the timer unit you will need a table lamp. Turn the lamp on and plug it into J1. Plug the line cord from the timer unit into the AC wall outlet. Connect the digital timer to the timer unit using the cable you previously made. Set the digital timer for 15 seconds but do not press the start button yet. Set the mode switch to the power down position and press the reset switch. The LED should light indicating that the unit is armed. Press the start button on the digital timer and the table lamp should turn on. The LED should also flash while the timer is counting down. After the 15 second time period elapses and the timer begins to beep, the table lamp and the LED should turn off.

Now change the mode switch to the power up position. The timer will still be set for 15 seconds from the previous test. Press the reset switch and again the LED should light to indicate the unit is armed. Press the start switch on the timer. This time the lamp should not come on, but the LED should start flashing to indicate a timing

sequence is in process. After the 15 seconds elapses and the timer starts beeping the table lamp should light and the LED should go out. You can then press the reset switch to turn the lamp off. This completes testing and the unit is ready to be put in service.

I'm sure you will find the timer to be a handy device to use. I have one final note concerning the relay. The Radio Shack literature says the contacts are rated for 10 amps. However, I am somewhat skeptical of this rating and would recommend not connecting more than a 500 watt load to the timer if you use this relay. If you need to switch a heavier load, replace the relay with one that has larger contacts and mount it off the circuit board. Do not use a relay with a coil resistance of less than 120 ohms or you may exceed the power rating of Q1.

PARTS LIST

R1, R3 - 2.2k, ¼ watt resistor
R2 - 22k, ¼ watt resistor
R4 - 470W, ¼ watt resistor
C1 - 470uF, 25 volt electrolytic capacitor
C2 - 10uF, 16 volt electrolytic capacitor
C3 - .1uF, 25 volt ceramic disc capacitor
D1 - D4 - 1N4148 switching diode
D5 - 1N4003 silicon diode
BR1 - 50, 1 amp volt bridge rectifier
VR1 - 78L05 voltage regulator
Q1 - 2N3904 or 2N4400 NPN transistor
IC1 - Microchip 12C508/P04 microcontroller
T1 - 9VAC or 10VAC transformer (see text)
S1 - Miniature N.O. miniature pushbutton switch
S2 - Miniature SPST toggle switch
RL1 - 12 volt SPDT relay (Radio Shack 275-248)

Digital Timer - West Bend model #40035 (Wal-Mart)

Misc. - LED, AC power cord, chassis mount AC receptacle, timer input jack, 8-pin IC socket, plastic case, misc. hardware

The following parts are available from:

ATC Electronics
P.O. Box 43033
Phoenix, AZ 85080
623-516-2926

Preprogrammed 12C508 microcontroller	\$ 3.50
12 volt relay with 3 amp contacts that matches PC board layout	\$ 1.50
Kit of all parts except for case and PC board. Includes relay with 3 amp contacts. Also includes J1, P1, J2 and matching plug. Does not include digital timer.	\$ 18.00

Include \$4.00 shipping and handling on all orders.
AZ residents include 7.2% sales tax.

This graphic is the correct size for making a PCB

