DESCRIPTION

1. CONFIGURATION OF THE PIC12C508.
   a) Pin 2 - input for configuration.
   b) Pin 3 - output for software PWM generation.
   c) Pin 4 - input for start/stop switch.
   d) Pin 5 - input for 50 Hz time-base.
   e) Pin 6 - output for relay driving.
   f) Pin 7 - input for comparator input.

2. POWER SUPPLY.
   Transformer T1, Diodes D1, D2, and D3 with C1, C2, C3, and U3 form the power supply giving 5 volts to the relay and the I.C.s. A transformerless power supply can be used if isolation is required.

3. TIME-BASE
   To generate a time-base for the timer, the second opamp, U2B, is used to generate a square wave of 50 Hz. Alternatively, a resistor and a zener diode can be used for generating a near square wave. Even the internal clocking can be used for the time-base.

4. CONFIGURATION
   Jumper J3 is used to select the range of the time-base. If J3 is open, 0 to 100 second range is selected and if closed 0 to 100 minutes range is selected.

5. START/STOP
   Switch S1 will start the timing and also stop the timer is required.

6. COMPARISON
   The PIC12C508 will generate PWM which is filtered to generate an analog signal. Double filtering can be used for a smoother waveform. This signal is fed to the inverting I/P of the opamp (LM358 used as the comparator). It is then compared to the signal at the non-inverting input. The signal (0 - 5V via potentiometer R5 and resistor R4) to the non-inverting input is proportional to the timing required.

7. OUTPUT
   The SPDT relay is driven by the PIC12C508 on time-out.

OPERATION

On power up the timer goes to standby mode. The time is selected by R5. The range depends on the selection of J3 as explained previously. Once the time is set, the START/STOP button is pressed to start the timing. The PIC12C508 will generate a PWM signal at a ratio of 1:258 (8-bits) and poll pin 7 for a change of state. On detecting the change, the timing is scaled as follows:

256 bits = 100 seconds or minutes
n bits = (n x 100)/256 seconds or minutes

After calculation the relay will be switched on and the timer will start timing out. The 50 Hz input is taken as the time-base and the timer will de-energize the relay on time-out and go to standby mode. At any given time, pressing switch S1 will stop the timer.

Notes:

1. Software generation of PWM and converting to analog will not give 5 volts due to attenuation. Hence the POT setting has to be limited to the generated voltage or the analog voltage will have to be amplified to 5 volts. This voltage will have to be proportional from 0 to 256 bits.
2. Internal or mains based timing is as accurate as crystal based timing.
3. Transformer based power supply is not cost effective but used mainly for isolation.
4. U2B for 50 Hz squaring is used because LM358 has dual opamp and only one is required for comparing.
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