

Electromechanical Timer Replacement

PIC12C508 Based Timer

Author: Ravi Pailoor

Chip Technologies Bangalore, India

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 timebase. 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 = $(n \times 100)/256$ 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:

- 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.
- Transformer based power supply is not cost effective but used mainly for isolation.
- U2B for 50 Hz squaring is used because LM358 has dual opamp and only one is required for comparing.

Microchip Technology Incorporated, has been granted a non-exclusive, worldwide license to reproduce, publish and distribute all submitted materials, in either original or edited form. The author has affirmed that this work is an original, unpublished work and that he/she owns all rights to such work. All property rights, such as patents, copyrights and trademarks remain with author.

Electromechanical Timer Replacement

FIGURE 1: **SCHEMATIC** Vcc Vcc RLY U2A R4 ₩√ R2 C4 CIN GND **PWM** 2 SEL 50 Hz C5 S/S PIC12C508 Time Setting Comparing Vcc J3 1 R9≶ 2 U2B 1 2 3 R7 ≶ S1 R6≶ ≶R8 Q1 START/STOP Time-base Generator Relay Output <u>Vç</u>c D1 D3 78L05 J2 T1 G 0 1 2 3 C2 C1 = C3 : Power Supply

Electromechanical Timer Replacement

NOTES:			



WORLDWIDE SALES & SERVICE

AMERICAS

Corporate Office

Microchip Technology Inc. 2355 West Chandler Blvd. Chandler, AZ 85224-6199 Tel: 602-786-7200 Fax: 602-786-7277 Technical Support: 602 786-7627 Web: http://www.microchip.com

Atlanta

Microchip Technology Inc. 500 Sugar Mill Road, Suite 200B Atlanta, GA 30350 Tel: 770-640-0034 Fax: 770-640-0307

Boston

Microchip Technology Inc. 5 Mount Royal Avenue Marlborough, MA 01752 Tel: 508-480-9990 Fax: 508-480-8575

Chicago

Microchip Technology Inc. 333 Pierce Road, Suite 180 Itasca, IL 60143 Tel: 630-285-0071 Fax: 630-285-0075

Dallas

Microchip Technology Inc. 14651 Dallas Parkway. Suite 816 Dallas, TX 75240-8809 Tel: 972-991-7177 Fax: 972-991-8588

Dayton

Microchip Technology Inc. Two Prestige Place, Suite 150 Miamisburg, OH 45342 Tel: 937-291-1654 Fax: 937-291-9175

Los Angeles

Microchip Technology Inc. 18201 Von Karman, Suite 1090 Irvine, CA 92612 Tel: 714-263-1888 Fax: 714-263-1338

New York

Microchip Technology Inc. 150 Motor Parkway, Suite 416 Hauppauge, NY 11788 Tel: 516-273-5305 Fax: 516-273-5335

San Jose

Microchip Technology Inc. 2107 North First Street, Suite 590 San Jose, CA 95131 Tel: 408-436-7950 Fax: 408-436-7955

Toronto

Microchip Technology Inc. 5925 Airport Road, Suite 200 Mississauga, Ontario L4V 1W1. Canada Tel: 905-405-6279 Fax: 905-405-6253

ASIA/PACIFIC

Hong Kong

Microchip Asia Pacific RM 3801B, Tower Two Metroplaza 223 Hing Fong Road Kwai Fong, N.T., Hong Kong Tel: 852-2-401-1200 Fax: 852-2-401-3431

Microchip Technology Inc. India Liaison Office No. 6, Legacy, Convent Road Bangalore 560 025, India Tel: 91-80-229-4036 Fax: 91-80-559-9840

Korea

Microchip Technology Korea 168-1, Youngbo Bldg. 3 Floor Samsung-Dong, Kangnam-Ku Seoul, Korea Tel: 82-2-554-7200 Fax: 82-2-558-5934

Shanghai

Microchip Technology RM 406 Shanghai Golden Bridge Bldg. 2077 Yan'an Road West, Hong Qiao District Shanghai, PRC 200335 Tel: 86-21-6275-5700

Singapore

Fax: 86 21-6275-5060

Microchip Technology Taiwan Singapore Branch 200 Middle Road #10-03 Prime Centre Singapore 188980 Tel: 65-334-8870 Fax: 65-334-8850

Taiwan, R.O.C

Microchip Technology Taiwan 10F-1C 207 Tung Hua North Road Taipei, Taiwan, ROC Tel: 886 2-717-7175 Fax: 886-2-545-0139

EUROPE

United Kingdom

Arizona Microchip Technology Ltd. Unit 6, The Courtyard Meadow Bank, Furlong Road Bourne End, Buckinghamshire SL8 5AJ Tel: 44-1628-851077 Fax: 44-1628-850259

Arizona Microchip Technology SARL Zone Industrielle de la Bonde 2 Rue du Buisson aux Fraises 91300 Massy, France Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79

Germany

Arizona Microchip Technology GmbH Gustav-Heinemann-Ring 125 D-81739 Müchen, Germany Tel: 49-89-627-144 0 Fax: 49-89-627-144-44

Italy

Arizona Microchip Technology SRL Centro Direzionale Colleoni Palazzo Taurus 1 V. Le Colleoni 1 20041 Agrate Brianza Milan, Italy Tel: 39-39-6899939 Fax: 39-39-6899883

JAPAN

Microchip Technology Intl. Inc. Benex S-1 6F 3-18-20, Shinyokohama Kohoku-Ku, Yokohama-shi Kanagawa 222 Japan Tel: 81-45-471- 6166 Fax: 81-45-471-6122

7/29/97

All rights reserved. ©1997, Microchip Technology Incorporated, USA. 8/97



Printed on recycled paper.

Information contained in this publication regarding device applications and the like is intended for suggestion only and may be superseded by updates. No representation or warranty is given and no liability is assumed by Microchip Technology Incorporated with respect to the accuracy or use of such information, or infringement of patents or other intellectual property rights arising from such use or otherwise. Use of Microchip's products as critical components in life support systems is not authorized except with express written approval by Microchip. No licenses are conveyed, implicitly or otherwise, under any intellectual property rights. The Microchip logo and name are registered trademarks of Microchip Technology Inc. in the U.S.A. and other countries. All rights reserved. All other trademarks mentioned herein are the property of their respective companies.