

# **TMF1 CLOCK/TIMER**

## **USER'S MANUAL**

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# TMF CLOCK/TIMER

## 1.0 Introduction

The TMF 1.0 is a combination clock and timer display. The operating mode is selected by the Mode Switch (SW1). If dual operation is not desired, it can be permanently configured as either a clock or a timer.

## 2.0 Hardware Specifications

Dimensions:

Circuit board: 2.05" high by 4.4" wide

Display: 0.75" high by 2" wide by 0.315" deep

Mounting: four 0.1" diameter holes

Timebase:

Crystal, +/-50ppm

Display:

Four digit red LED with colon

Digit height = 0.56"

Single T-1 red LED as AM indicator

## 3.0 Operation

The Mode Switch (SW1 on schematic page 1) places the TMF 1.0 in either Clock or Timer mode. Grounding the MODE input selects Timer Mode, allowing the MODE input to float selects Clock Mode.

In Clock Mode the display shows time in a 12-hour format. A separate LED (D1) indicates AM. The colon between the hours and minutes digits blinks every other second. In this mode the Set Switch increases the time by 25 minutes per second in the Fast position and 2 minutes per second in the Slow position.

In Timer Mode the TMF functions as a minute downcounter. The AM LED, colon, and hour digits are all blanked. The Set Switch increases the minutes by 10 per second in the Fast position and decreases the minutes by 2 per second in the Slow position. After setting the desired number of minutes, the display will countdown to 00, at which point the 00 display will flash.

Time of day is maintained while in Timer Mode and minutes downcount continues while in Clock Mode. This allows switching from one mode to the other without disrupting the functioning of either mode.

When power is first applied, the display will flash on and off, in both modes, until one of the Set Switches is activated.

## 4.0 Installation

Schematic page 3 shows the wiring connections to the TMF circuit board. The Mode Switch is only needed if both modes will be used. To permanently place the TMF in Clock Mode, omit SW1 and make no connection to the MODE input. To permanently place the TMF in Timer Mode, omit SW1 and solder a jumper from GND to the MODE input.

The set inputs, FAST and SLOW, are active when pulled low. The Set Switch is shown

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as a momentary-off-momentary toggle, but two normally-open pushbuttons could be used to ground the FAST and SLOW inputs.

Because the TMF circuit board has provisions for full wave bridge (FWB) or full wave center tapped (FWCT) rectification, a wide variety of power transformers may be used. See Appendix A for the appropriate voltage ranges. TMF boards assembled by Lucid Technologies are configured for FWB rectification.

**WARNING - If you purchased an assembled TMF1 and are using the center-tap transformer configuration, you must remove diodes D4 and D5 from the board!**

For FWB rectification the transformer secondary connects to the inputs labeled AC1 and AC2 (make no connection to CT). For FWCT the secondary center-tap connects to the CT input with the other two secondary wires going to AC1 and AC2.

### 5.0 Troubleshooting

- Measure DC voltage on the positive side of C1. This is the input to the voltage regulator and should be 8 to 12 volts. There may be several volts of ripple at this point.
- Measure DC voltage at U2(pin-9) and U3(pin-3). Both pins should be +5V.
- Using an oscilloscope, look at U2(pin-2). This is the clock oscillator of the microcontroller. It should have a 4.19MHz sine-wave about 300 mV peak-to-peak.
- Look at U2(pin-6) or U3(pin-10). This is the data enable line from the microcontroller to the display controller. It pulses low (about 360 microseconds) whenever data is sent to the display controller. Normally, it will pulse low once a second. When setting the time it should pulse at the same rate the display is updated. If it never pulses low, the microcontroller is not talking to the display controller.

APPENDIX A

TMF PARTS LIST

Quan.	Ref#	Part
1	C1	100ufd, 25V
2	C2,C3	20pfd
2	C4,C5	0.1ufd
1	D1	T-1 LED, red
4	D2-D5	1N4001
1	R1	3.3K, 0.25W, 1% (orange-orange-brown-black)
1	R2	2.4K, 0.25W, 5% (red-yellow-red)
1	RN1	8-pin, 10K, pin-1 common
1	U1	MC78M05CT
1	U2	MC68HC705J1ACP
1	U3	MC14489P
1	Y1	4.1943MHz
1	DISP	CC56-21EWA, red 4-digit LED

Additional parts you may need to install the TMF1:

Power transformer:

- 14-18V at 90mA for full-wave center tapped, or
- 8-10V at 135mA for full-wave bridge

Set Switch:

- Momentary-Off-Momentary toggle, or
- Two Normally-Open pushbuttons

Mode Switch:

- On-Off toggle

APPENDIX B

PARTS PLACEMENT

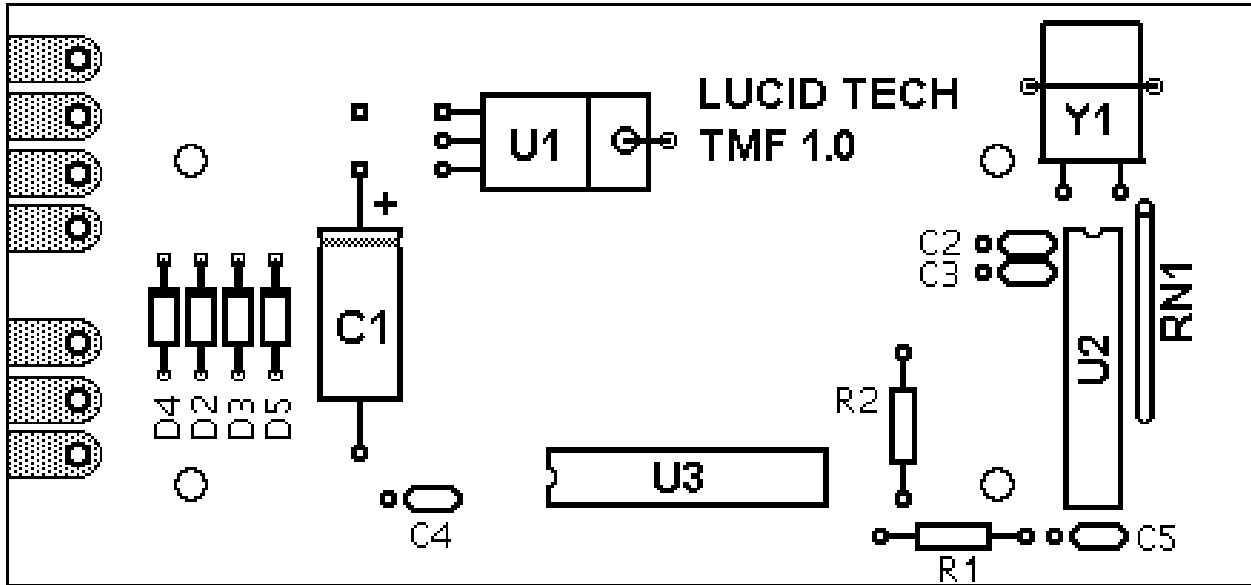


Figure B1 Rear view diagram

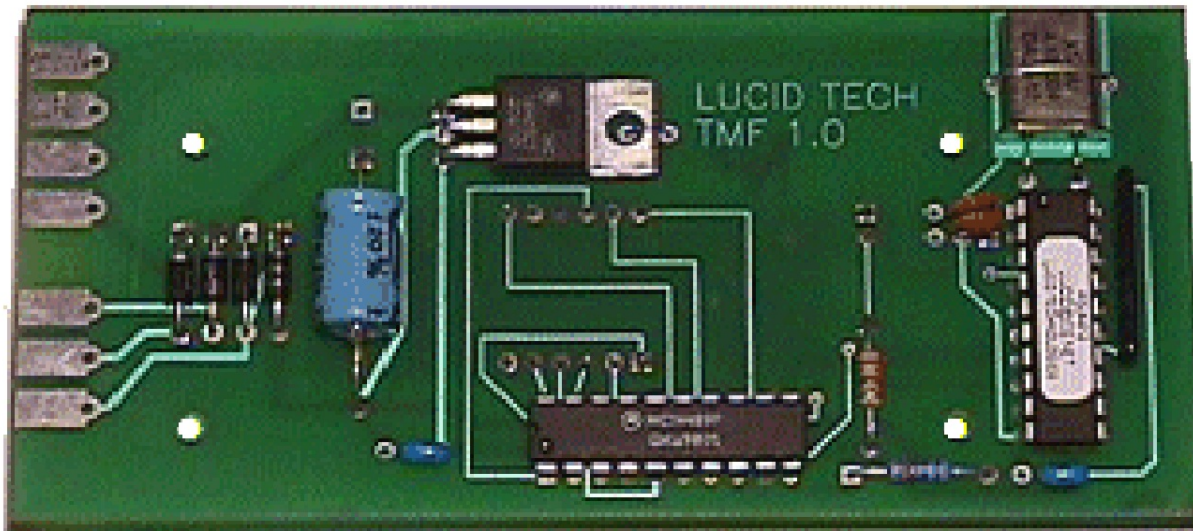


Figure B2 Rear view picture

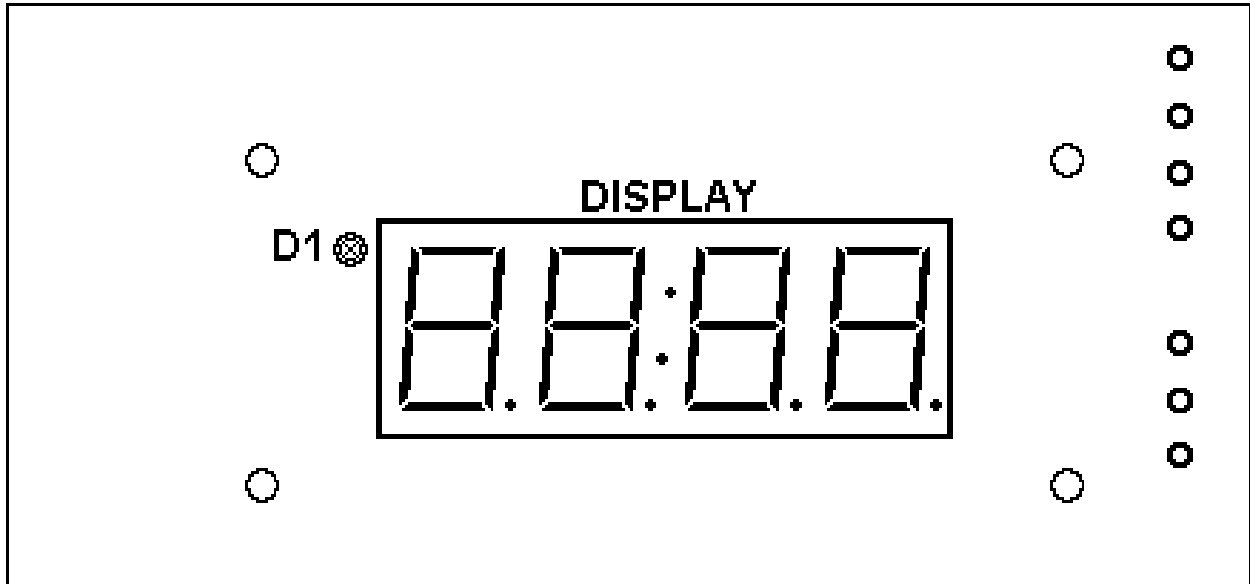


Figure B3 Front view diagram

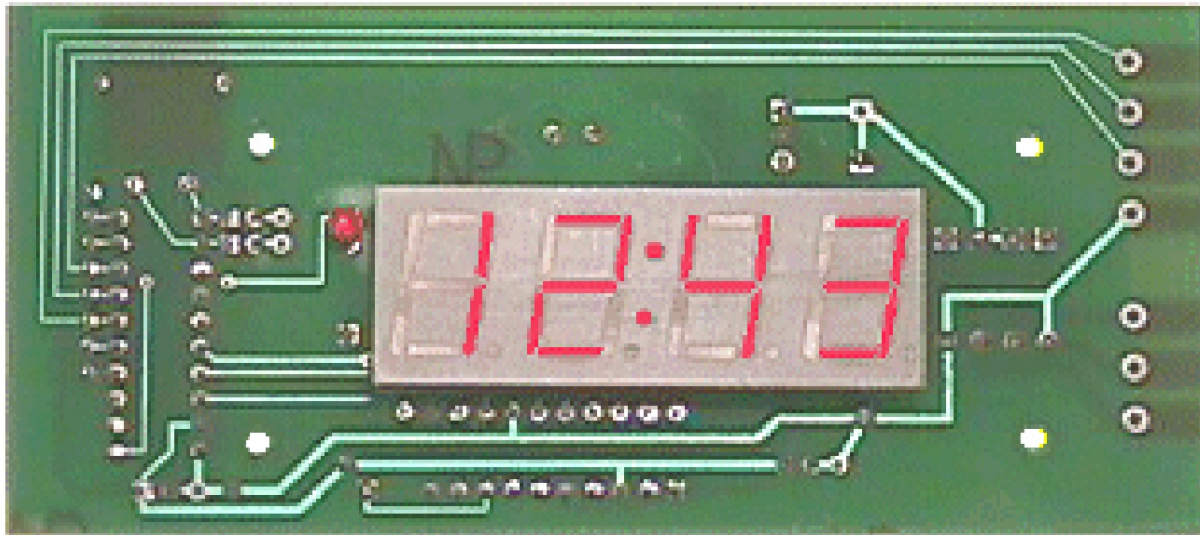


Figure B4 Front view picture

APPENDIX C

DIMENSIONS

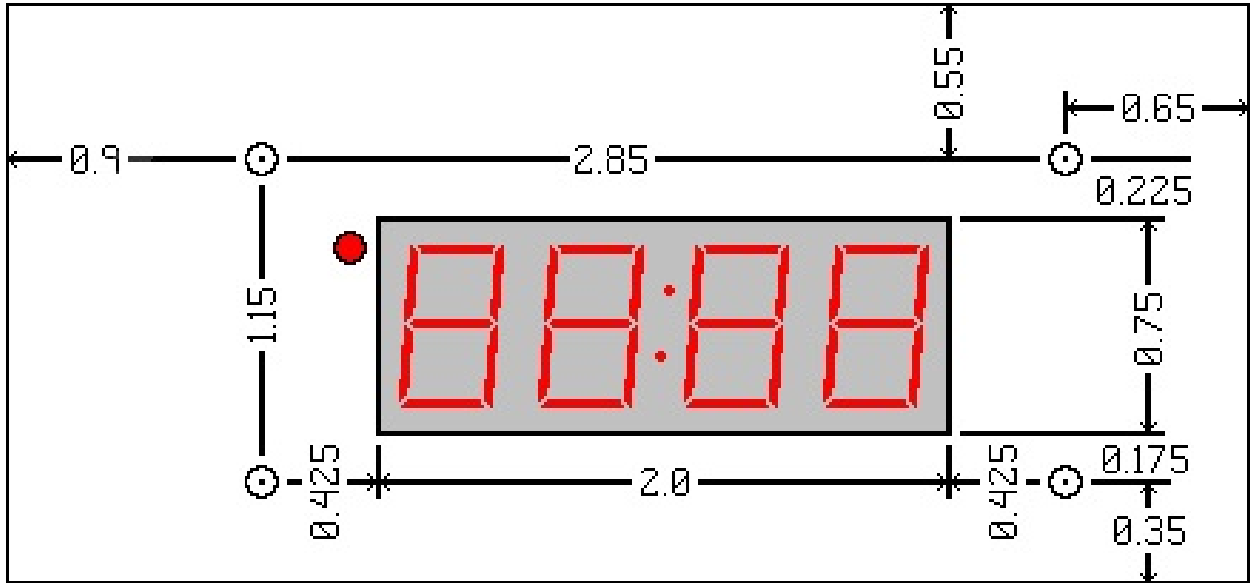
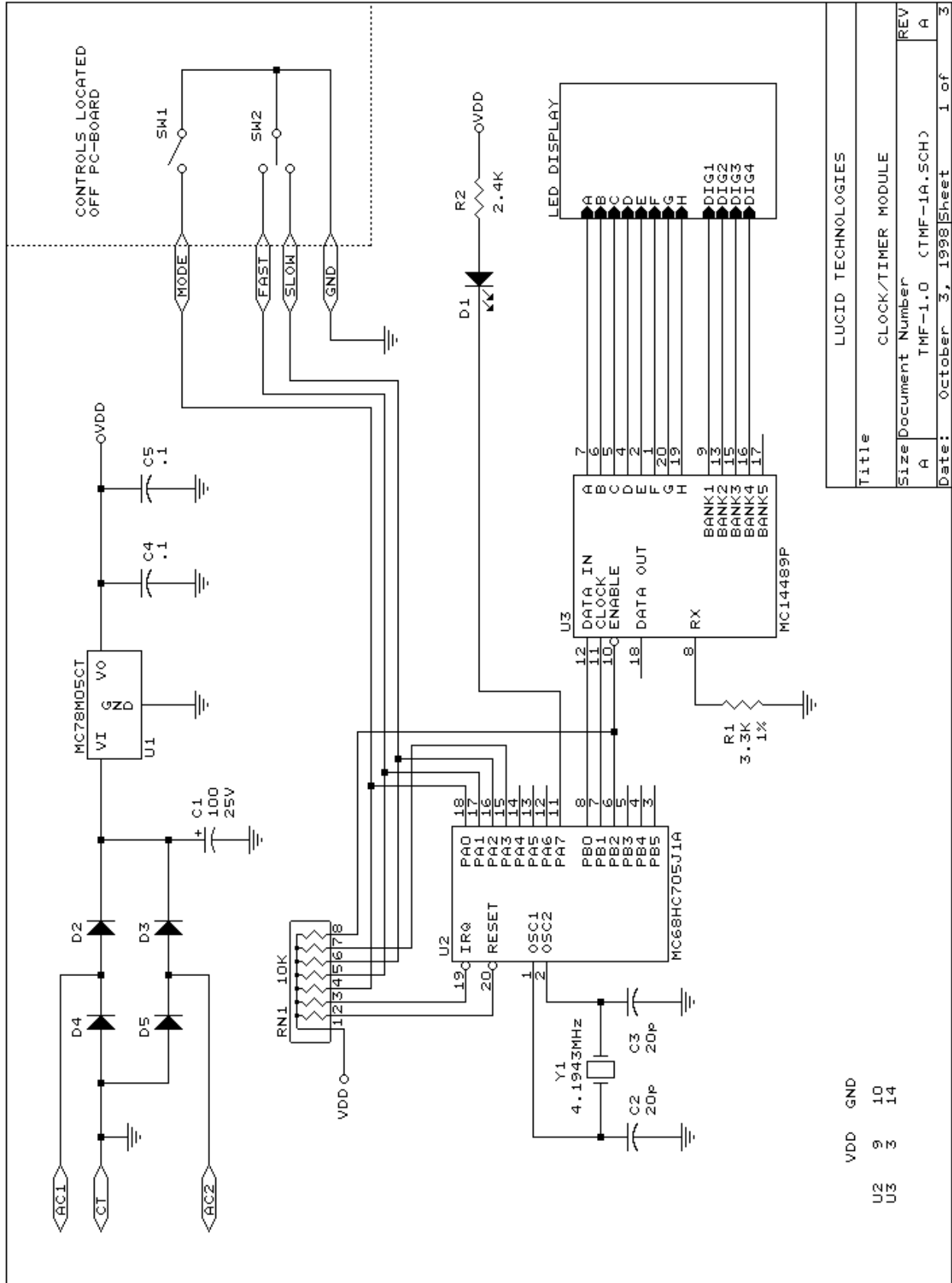


Figure C1 TMF dimensions in inches

TMF circuit board is 4.4 inches wide and 2.05 inches high.



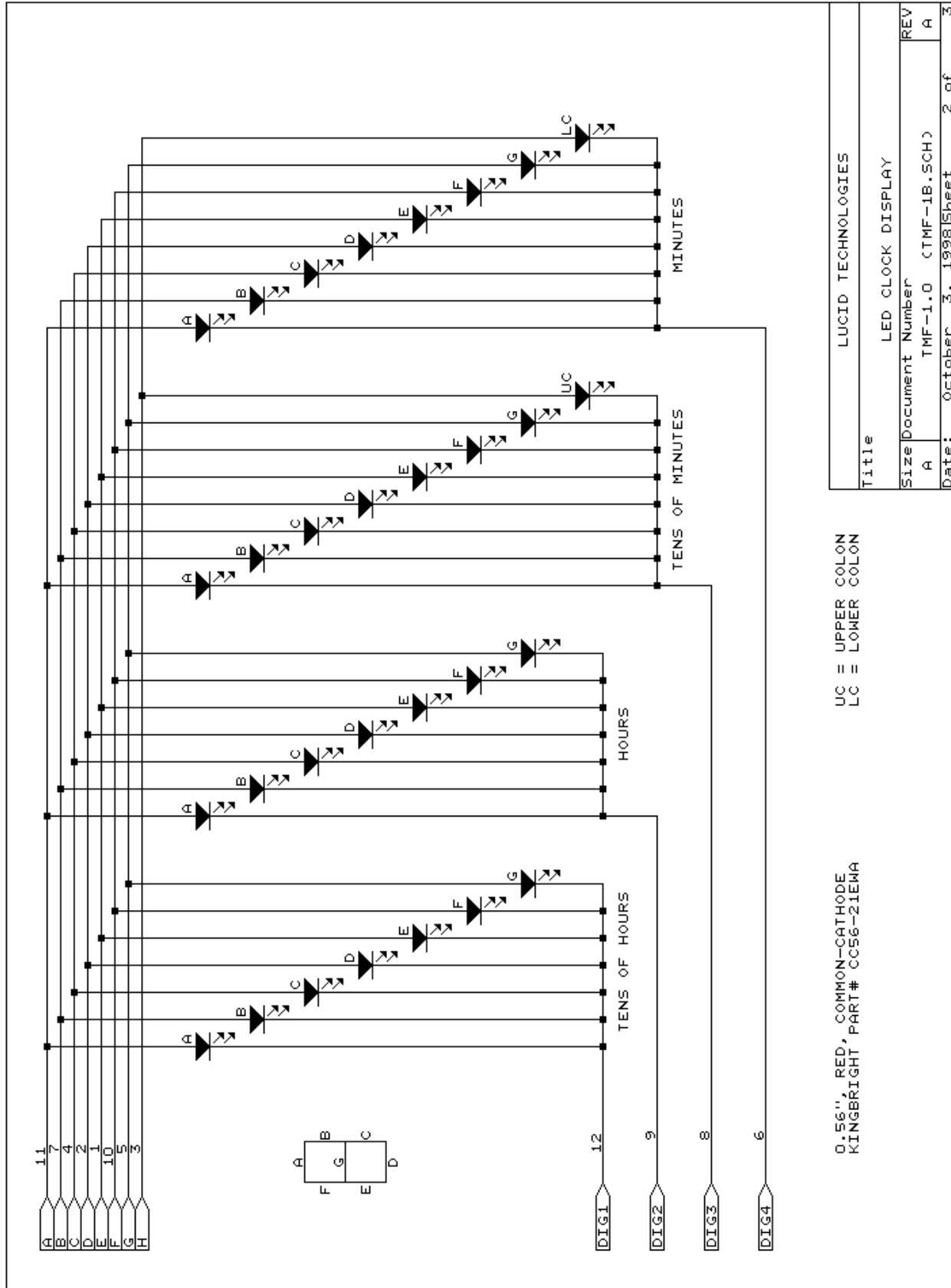
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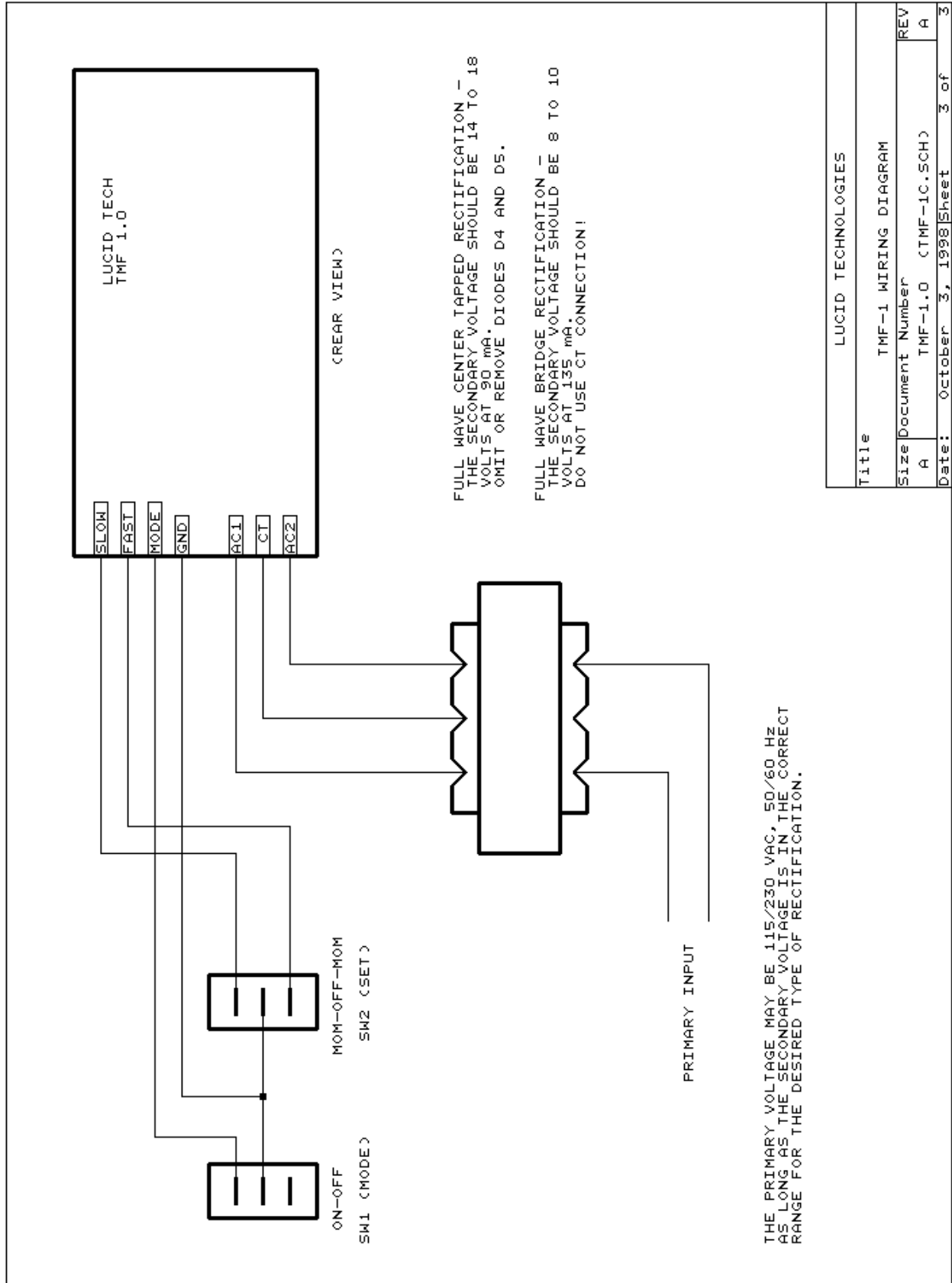
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Size		CLOCK/TIMER MODULE	
Document Number	A	TMF-1.0 (TMF-1A.SCH)	REV A
Date:	October 3, 1998	Sheet	1 of 3

VDD GND  
 U2 9 10  
 U3 3 14

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