

# Portable 60-Hz "CLOCK" OSCILLATOR

*Crystal-controlled time base for field use.*

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**M**OST digital clocks and sports timers are energized by the ac line—not so much for power as for the 60-Hz frequency that is used as the time base. This means that such digital devices cannot be used in vehicles or boats or

**How It Works.** The integrated circuit used in this time base is an MM5369, a recently introduced 17-stage, mask-programmable oscillator/divider. Although masking options are available for use with almost any crystal frequency, the IC used operates with a low-cost, readily available 3.58-MHz color-TV crystal and delivers 60 Hz at its output pin. Trimmer capacitor C2 allows for exact frequency adjusting, and a buffered 3.58-MHz output is available. Current drain is approximately 1.2 mA with a 10-volt supply.

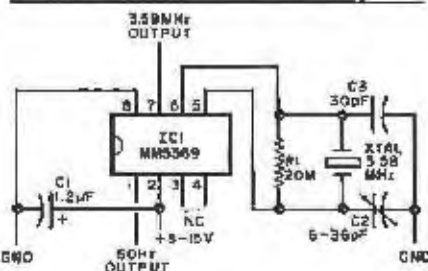


Fig. 1. Schematic of circuit.

## PARTS LIST

- C1—1.2- $\mu$ F, 35-V tantalum capacitor
  - C2—6-36-pF trimmer capacitor
  - C3—30-pF capacitor
  - IC1—MM5369 programmable oscillator/divider, for use with a 3.58-MHz crystal (National)
  - R1—20-megohm  $\frac{1}{4}$  watt resistor
  - XTAL—3.579545-MHz color-TV crystal
- Note: The following are available from Bill Godbout Electronics, Box 2355, Oakland Airport, CA 94614: etched and drilled pc board (068) at \$2.50; complete kit of parts, including board at \$5.95. California residents, please add 6% sales tax.

**Construction.** Because of the high frequencies involved, a small pc board (or perforated board) such as that shown in Fig. 2 should be used. Figure 2 also shows component installation. Since the IC is a MOS type, take the usual precautions when installing.

**Adjustment.** If you have a frequency counter, or a calibrated oscilloscope, check for the presence of 3.579545 MHz at pin 7 of the IC. You can adjust trimmer capacitor C2 for the correct value. If you do not have a frequency counter, use the Lissajous-figure approach with a scope, with the output of a conventional 6-volt transformer as the horizontal sweep and the output of IC1 pin 1 for the vertical signal. Adjust C2 until a very slow-moving square appears on the scope. If you have neither a counter nor a scope and are planning to use the clock with a portable timing device, use some form of accurate time signals such as those from WWV, CHU, etc., to start the timer at a one-minute "beep" and stop it at the next minute "beep." Adjust C2 to obtain the correct time interval.  $\diamond$

for timing outdoor events that are not near an ac power outlet.

The 60-Hz crystal-controlled time base described here (Fig. 1) can be powered by any dc supply between 3 and 15 volts. It has low power consumption, is stable within 2 parts per million and is small enough to fit inside the case of many digital clocks and timers.

Fig. 2. Actual-size etching and drilling guide (far right) and component layout. Components are mounted on nonfoil side.

