Silent timer warns of tape run-out

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At concerts and lectures especially, a cassette tape often runs out unnoticed. One solution is to install timing circuitry in the cassette-recorder case that will cause a light to flash when it's time to reverse or replace a cassette or to switch to another recorder. This silent warning system is also useful in duplicating cassette masters, where a preset recording time is important.

The alarm circuit operates from any voltage in the 5- to-15-volt range and can either be connected to the recorder bus or use its own battery. When the circuit is turned on, a light-emitting diode begins to blink once or twice per second, indicating that the circuit is functional and ready to start timing. When the start-timing button is pushed, the LED stops flashing and stays off for the duration of the timing period. At the end of the timing period, the LED begins to flash again, giving the signal to flip the tape.

The two main components of the circuit are a 14536 programable-timer integrated circuit and a 74C00 quad NAND gate IC. The timer contains an oscillator and a 24-stage counter. It counts pulses from the oscillator and, when some specified counter stage goes high, delivers a positive output pulse from the decode-out terminal (pin 13). Which of the counter stages triggers the output is specified by the voltages on pins 9, 10, 11, and 12. If these pins are high, high, low, and low, respectively (logic 1100), an output appears every time that stage 12 of the counter goes high. With all four pins high (logic 1111), output appears when stage 24 goes high.

Since this system was designed for a standard C90 cassette, which runs for 45 minutes a side, the timer is adjusted to provide a timing period of 44 minutes, or 2,640 seconds.Therefore the oscillator frequency is set at

$$f_{osc} = 2^{23}/2{,}640 = 3.2 \text{ kilohertz}$$

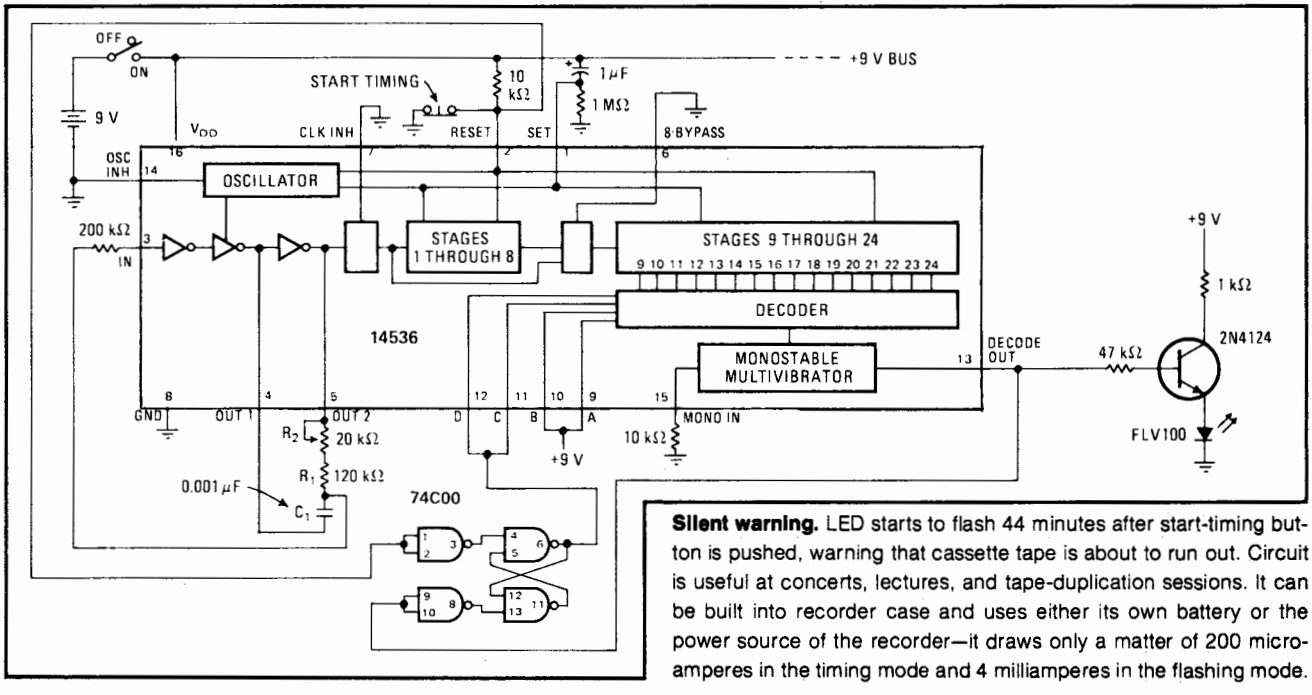
so that counting stage 24 will go high 44 minutes after the counter starts counting pulses from the oscillator (provided the decoder logic is 1111).

With this oscillator frequency, if the decoder terminals are set at logic 1100, stage 12 goes high after 2^{11} pulses, or

$$2^{11}/3.2 \text{ kHz} = 0.65 \text{ second}$$

The oscillation frequency is set by the time constant of C_1 and $(R_1 + R_2)$. A frequency meter is connected to pin 5, and R_2 is adjusted till the meter shows 3.2 kHz.

The circuit operates as follows: while the on-off switch is off, all pins are low. When the switch is turned on, pins 9 and 10 of the timer go high because they are wired to the positive-voltage bus. Therefore the decoder is programed with logic 1100, and the LED begins to flash every 0.65 second. When the start-timing button is pushed, the quad NAND circuit sets the decoder to logic 1111, so the LED stops flashing and the 44-minute count begins. After 44 minutes, the decode-out terminal (pin 13) goes high, resetting the decoder to 1100 so that the alarm signal flashes again. □



Silent warning. LED starts to flash 44 minutes after start-timing button is pushed, warning that cassette tape is about to run out. Circuit is useful at concerts, lectures, and tape-duplication sessions. It can be built into recorder case and uses either its own battery or the power source of the recorder—it draws only a matter of 200 microamperes in the timing mode and 4 milliamperes in the flashing mode.