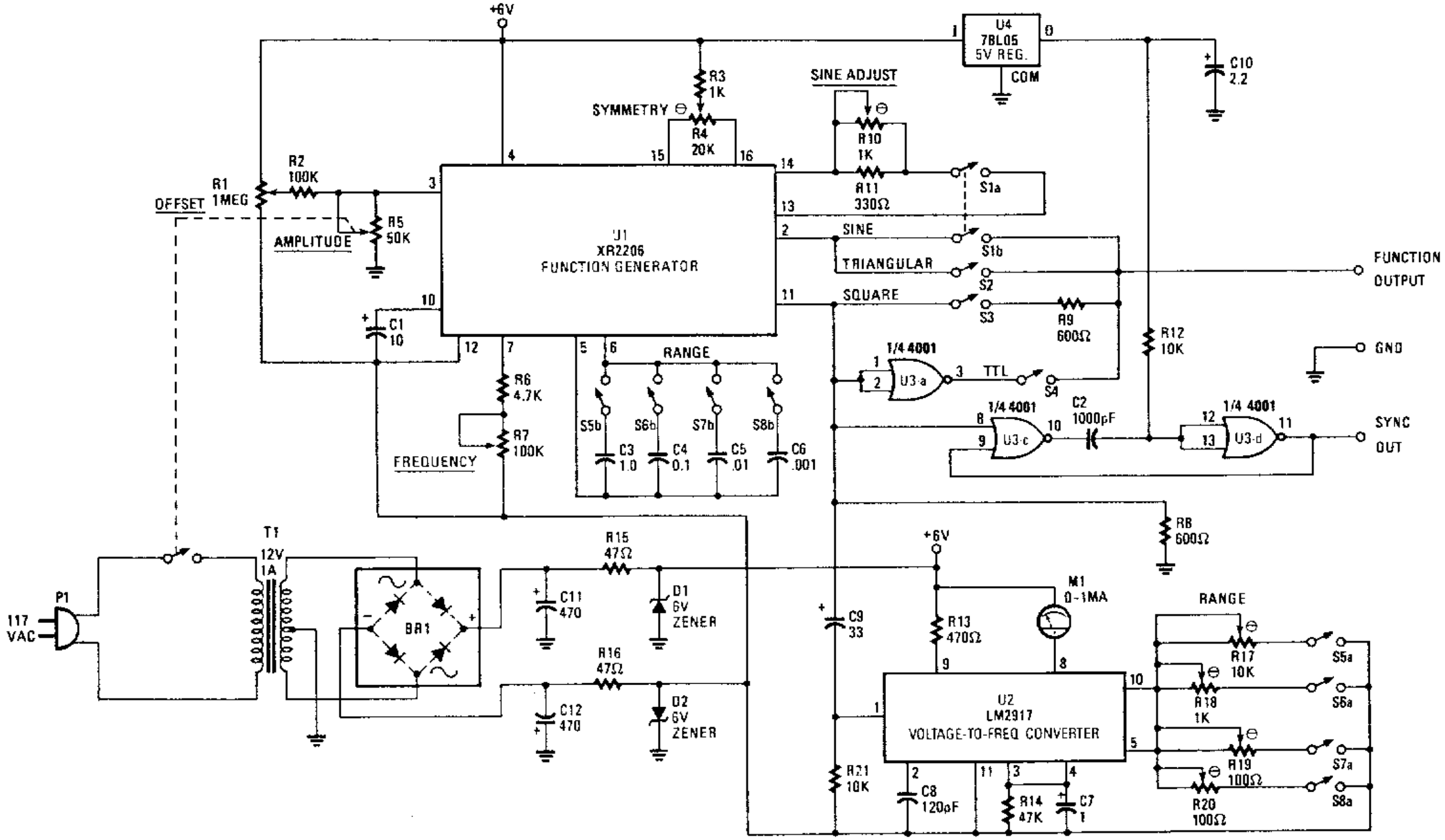
34

Function Generators

The sources of the following circuits are contained in the Sources section, which begins on page 667. The figure number in the box of each circuit correlates to the entry in the Sources section.

AUDIO FUNCTION GENERATOR

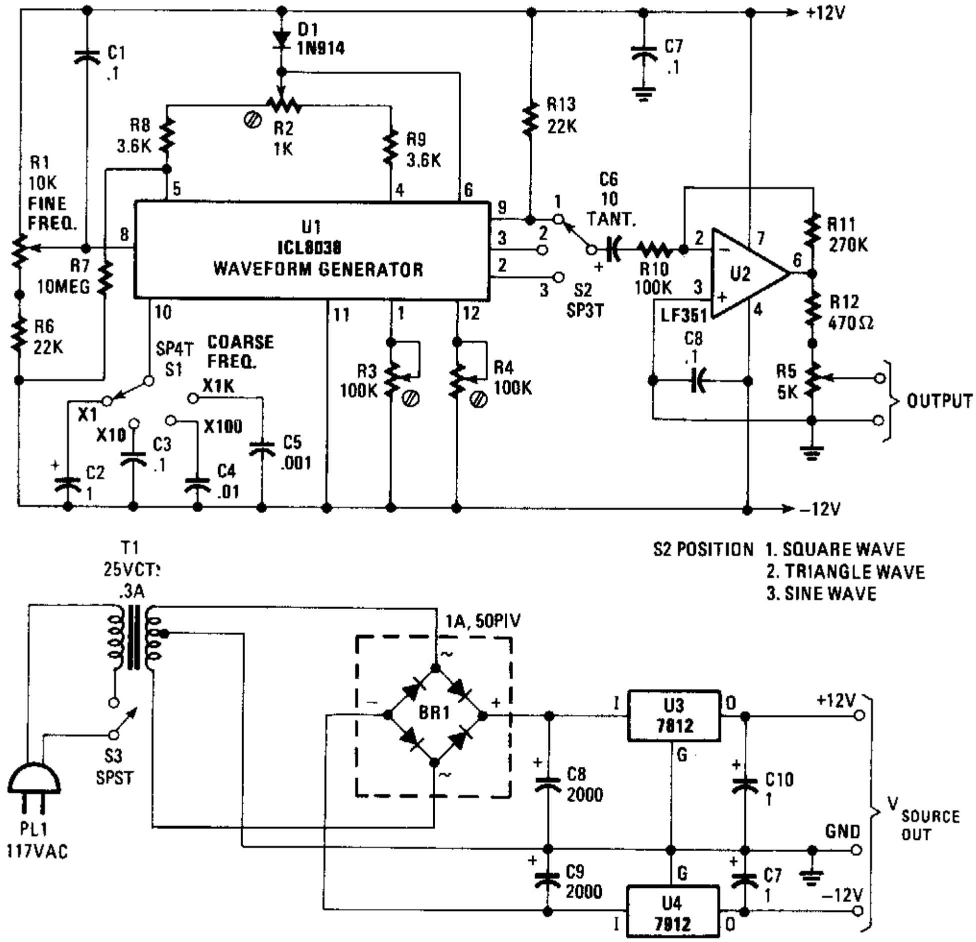


HANDS-ON ELECTRONICS

Fig. 34-1

Using an EXAR XR2206, this generator will produce sine, square, and triangular waves from 10 Hz to 100 kHz. U1 is the XR2206 chip, R7 controls frequency, and S5 through S8 select the frequency range. U3 produces a TTL-compatible square-wave output, while U3C and D produce a sync signal for scope use. U2 is a frequency/voltage converter that is used to drive analog meter M1, which reads the generator frequency.

FUNCTION GENERATOR

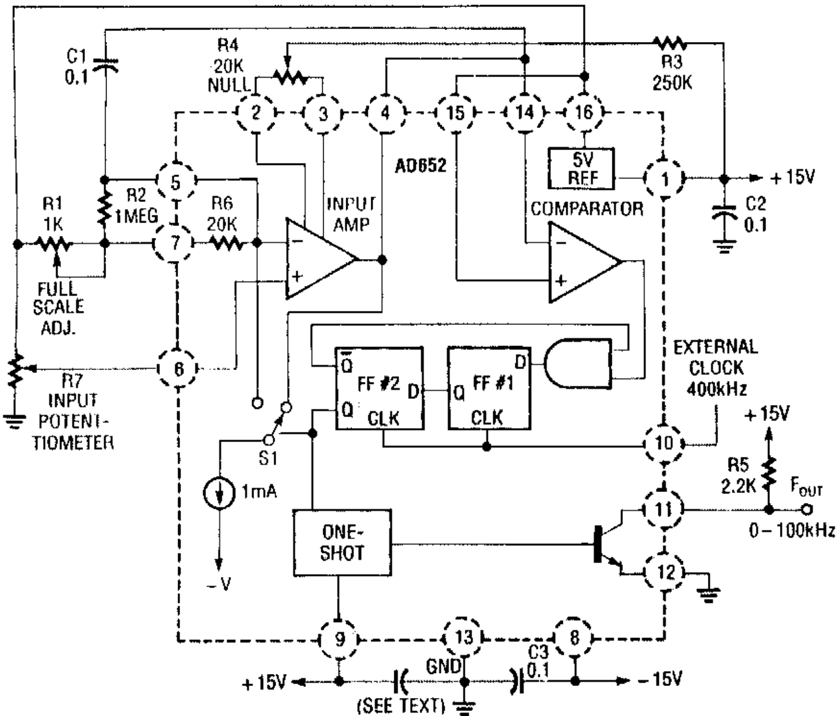


RADIO-ELECTRONICS

Fig. 34-3

Using an Intersil ICL8038, this function generator generates frequencies from 1 Hz to over 80 kHz. R1 is the fine frequency control and S1 is the coarse frequency control range switch. S2 selects square-, triangle-, or sine-wave output. U2 is a buffer amplifier and R5 sets output level. R2 is adjusted for a symmetrical triangle wave. R3 and R4 are adjusted for minimum sine-wave distortion. Power supply is ±12 V at less than 100 mA.

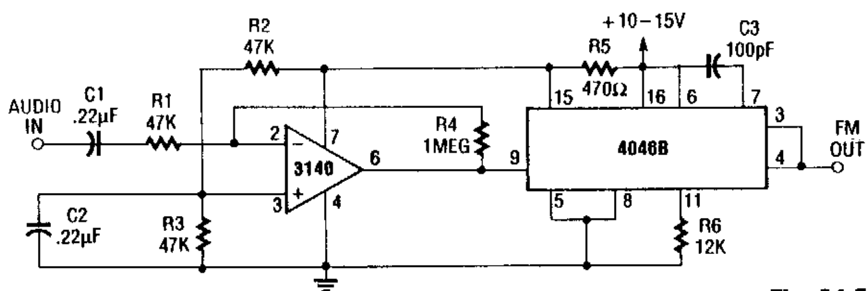
POTENTIOMETER-POSITION V/F CONVERTER



RADIO-ELECTRONICS *Fig. 34-4*

In this application, an AD652IC is used in a synchronized V/F converter that derives its input from the position of a potentiometer. This can represent a position of a mechanical component, weight, size, etc., to give a 0-to-100-kHz output versus the 0-to-5-V output from the potentiometer.

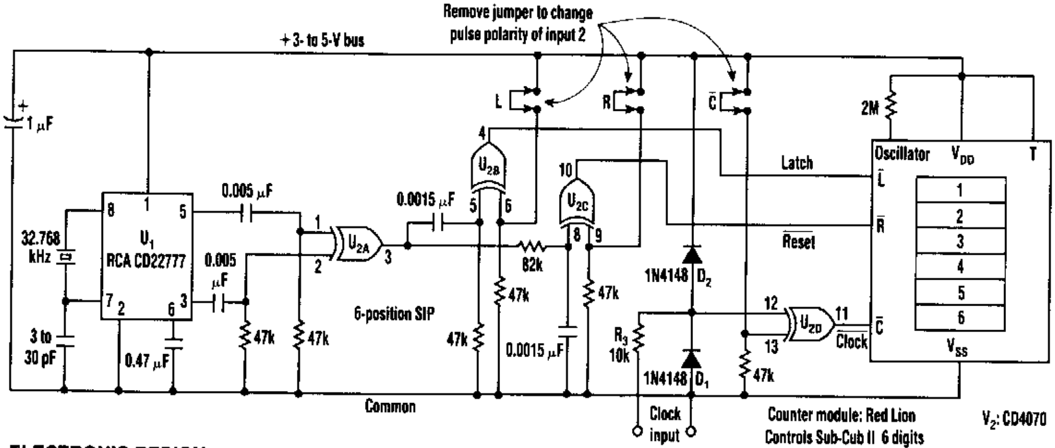
FM GENERATOR



RADIO-ELECTRONICS *Fig. 34-5*

The internal zener on pin 15 of the 4046B supplies a stable voltage to the 3140IC op amp. This amplifier modulates the 4046B VCO. The amplifier gain is about 20× (26 dB voltage). The VCO produces a 220-kHz carrier that is FM modulated. C3 can be changed to vary this frequency.

1-Hz TIMEBASE FOR READOUT AND COUNTER APPLICATIONS



ELECTRONIC DESIGN

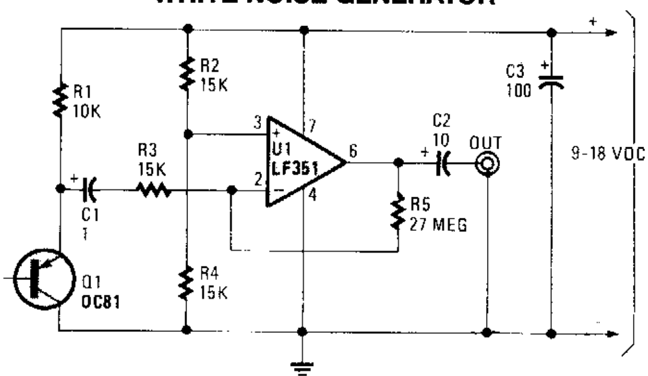
Fig. 34-6

This counter makes direct readout of frequency-generating equipment very easy when a 1-Hz timebase is added to latch, reset, and the count signal is conditioned. This design has the flexibility to select either polarity.

By differentiating, inverting, and ORing the clock pulses in XOR gate U2A, a stream of 1-Hz, positive, 200-μs pulses is generated. For latching, the 1-Hz stream is again differentiated in U2B, input 1 to supply a 50-μs pulse. Though U2B's output goes from high to low, it can be reversed, by making input 2 low.

Because the reset pulse must occur after the latch signal, the 1-Hz stream from U2A is delayed 100 μs at U2C input 1. The output-pulse polarity is determined by making U2C's input 2 either high or low.

WHITE NOISE GENERATOR

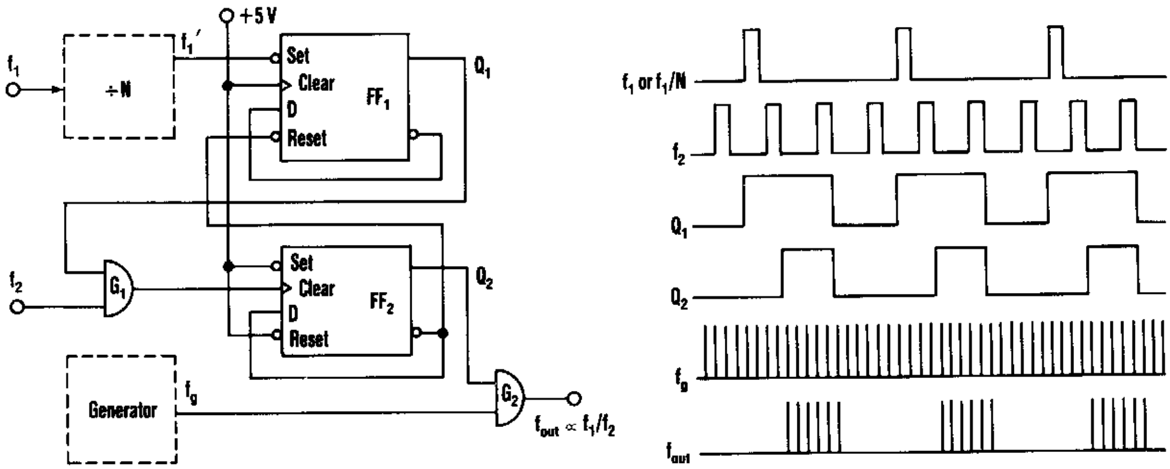


HANDS-ON ELECTRONICS

Fig. 34-7

Germanium transistor Q1 is used as a noise generator in the audio range. U1 acts as a high-gain amplifier. Q1 is not critical; most germanium transistors appear to be satisfactory. A germanium diode can also be substituted. This circuit is mainly used for sound effects and noise experiments. It is not flat over the audio range because of unpredictable effects in Q1, but it should be useful where high precision is not necessary.

FREQUENCY-RATIO MONITORING CIRCUIT

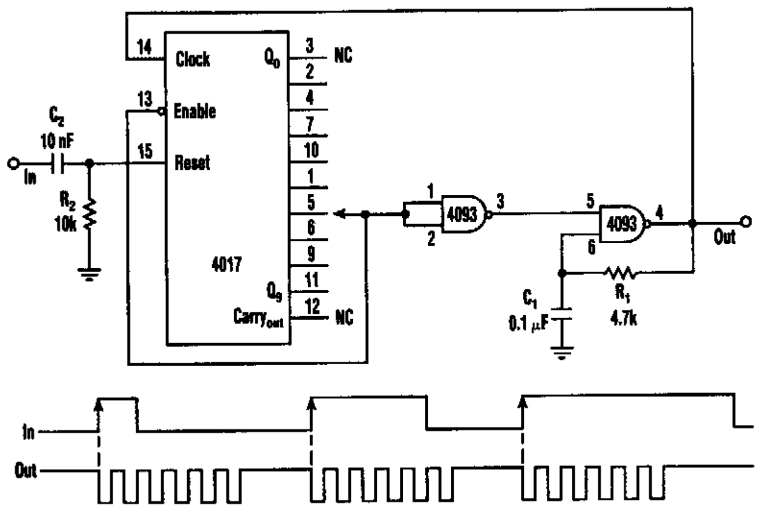


ELECTRONIC DESIGN

Fig. 34-8

This circuit produces an output frequency that is linearly proportional to the ratio of two input frequencies f_1/f_2. Each pulse of the bias f_1 (or f) will open G1 for a period $T = 1/f_2$ so that f_g/f_2 pulses pass to the output.

PULSE TRAIN



ELECTRONIC DESIGN

Fig. 34-9

This circuit has a rate multiplier using a 4093 Schmitt trigger as an oscillator, driving a 4017 decade counter. When a pulse present at the input (to C2) 4017 is reset, output zero goes high, and outputs 1 to 9 go low. The oscillator (4093) starts running and the 4017 counts the pulses until the 4017 output (1 to 9) connected to pin 1 and 2 of the 4093 goes high. The oscillator is inhibited and the output remains high until the next input pulse.