

AF-Ultrasonic Frequency Meter

DESCRIBED in *The Review of Scientific Instruments*, this electronic frequency meter measures frequencies between 20 cycles and 160 kc, independently of amplitude and waveform.

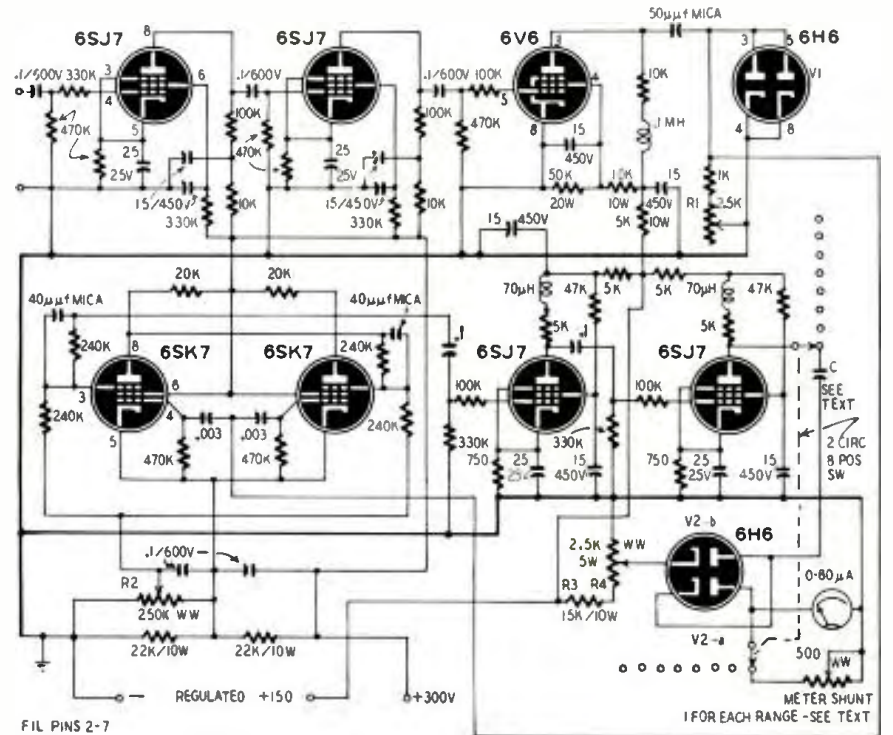
The signal is applied to the input terminals and amplified by two 6SJ7 high-gain amplifiers. A 6V6 is driven beyond cutoff and to saturation so it clips the positive and negative halves of the signal and produces square waves of the same frequency as the input signal. The square waves are differentiated and applied to a diode clipper V1 which removes the positive pulses. The negative pulses are applied to the control grids of a pair of 6SK7's in a modified Eccles-Jordan multivibrator circuit. This circuit is so connected that one tube is cut off and the other conducting at all times. The multivibrator "flips" when a negative pulse is applied to the grid of the nonconducting tube. A positive pulse has no effect on the circuit. The first negative pulse "flips" the multivibrator and the next makes it "flop;" thus, two negative triggers are required to make the multivibrator go through one complete cycle.

The output of the multivibrator is a square wave one-half the frequency of the input signal, thus simplifying high-frequency compensation and increasing the useful range of the meter. Because the multivibrator output is distorted at high frequencies, it is fed to cascade-connected 6SJ7's working as clippers. These produce square waves whose amplitude is constant, regardless of the input frequency and amplitude.

The square waves are applied to a 6H6 discriminator through capacitor C, which is charged through diode V2-a, resistors R3, R4, and the output impedance of the second 6SJ7 clipper during the positive half of the square wave. During the negative half of the cycle, C discharges through V2-b, the meter, and the clipper impedance. If the time constants of the charge and discharge circuits are equal, the meter current is determined by the size of C and the frequency of the square wave. Therefore, the meter can be calibrated to read directly in cycles per second.

Ranges are switched with a 2-circuit, eight-position rotary switch that changes the value of the charging capacitor C and the meter shunts. The high-frequency ends of the ranges are 160, 800, 1,600 cycles and 8, 16, 40, 80, and 160 kc when C equals .05, .01, .005, .0019, .0005, .00025, .00018, and .00009 μ f. All meter shunts are 500-ohm potentiometers.

To adjust the instrument, apply an audio signal to the input terminals. Use a scope to check the triggering pulses at the grids of the 6SK7 multivibrators. A sharp negative pulse should be observed. Adjust R2 for a square wave when the scope is connected between ground and either plate of the multivibrator. Adjust R1 for reliable triggering action. Adjust R4 until the meter reads off scale (about 100 μ a) at the full-scale frequency of one of the ranges. Bring the meter back to full scale with the appropriate shunt. Calibrate the scales with a wide-range a.f. signal generator.



This instrument indicates the frequency of signals of any waveform or amplitude.