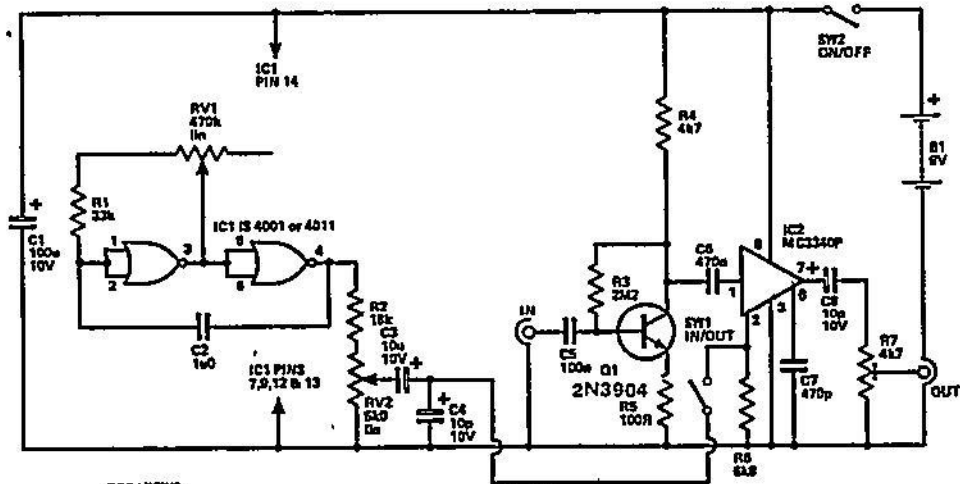


TREMOLO UNIT

This is one of the most popular types of special effect unit for use with guitars, the operation is to amplitude modulate the input signal with a low frequency signal. Thus a constant input as in (a) would emerge from the tremolo unit varying in amplitude at a low frequency as in (b).

In this circuit the input signal is taken to the input of an electronic attenuator (based on IC2) via a common emitter amplifier using Q1. R6 sets the gain of the attenuator (with zero modulating voltage) at about unity, but the amplification provided by Q1 gives an output level of a few hundred millivolts. This can either feed a high level input of the amplifier, or R7 can be adjusted to attenuate the output to a level which is suitable to drive the ordinary guitar input. It is necessary to have the stage of amplification ahead of the IC2 so that this part of the circuit is handling a fairly high signal level, and gives a good signal to noise ratio.

The gain of IC2 can be varied by applying a control voltage to pin 2. This control signal is generated by a conventional CMOS astable circuit which uses two of the gates

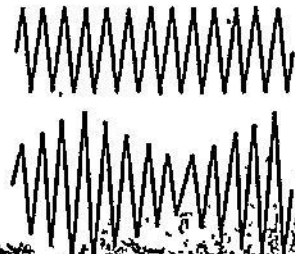


TOP VIEWS



contained in IC1. The operating frequency of the astable can be varied from about 1 to 10 Hz by means of frequency control RV1. A squarewave signal is produced by the astable, and this must be fil-

tered to remove the high frequency components in order to give a smooth and pleasant tremolo effect. This filtering is given by R2 and C4. RV2 controls the amplitude of the modulating signal and acts as the tremolo depth control. SW1 can be used to disconnect the modulation when the tremolo effect is not required.



TREMOLO ADAPTER

ADD TREMOLO TO YOUR ELECTRIC GUITAR
OR OTHER ELECTRONIC INSTRUMENT

BY DEANE A. GARDNER

TREMOLO devices are quite popular for adding interesting effects to different types of electronic musical instruments. In fact, they are often built into expensive systems. For systems that lack the tremolo feature, an inexpensive tremolo adapter is easily added.

The ideal tremolo would be a low-frequency (6 to 10 Hz) sine-wave oscillator driving a non-distorting, voltage-controlled amplifier (vca). Some circuits employ triangle-wave modulation or a nonlinear vca, which can cause undesirable clicks or distortion. The tremolo adapter described avoids these problems by using a sine-wave modulation signal to control the channel resistance of a field effect transistor. The FET vca has much less distortion than bipolar transistor or diode techniques.

As shown in the schematic diagram, *IC1* and its associated components form a phase-shift oscillator. The output of this oscillator is attenuated by *R4* and *R5* and is then

fed to *Q1* via *S1*. You can change the value of *R5*, which affects the modulation depth, to suit the gain of the FET used. A lower resistance increases the depth, but avoid going below 30,000 ohms or the FET will become reverse biased.

The oscillator output adds or subtracts from the bias level set by *R6* and *R7*. The voltage on the inverting input of *IC2* will always be very close to ground level. Therefore, the gate-source voltage of *Q1* is dependent only upon gate voltage relative to ground, resulting in a low-distortion modulation of the signal on the drain terminal. The output of *IC2* is attenuated by *R9*.

With a 1-volt peak-to-peak drive, the frequency range of the tremolo adapter is 40 to 50,000 Hz. Extended low-frequency response can be obtained by increasing the capacitance of *C4* and *C5*. Higher gain can be obtained by increasing the value of *R8*.

Use of a printed circuit board or perforated phenolic board and solder clips for assembling the adapter is strongly recommended. Also, use only a low-wattage soldering iron to solder in to place the components. (Switch *S1* can be a footswitch if desired, but it must be sturdily mounted. A commercial footswitch, selling for as little as \$3, is ideal for this application.)

When assembly is complete, plug the instrument to be used with the adapter into *J1* and a power amplifier into *J2*. If any clipping circuits, such as a fuzzbox, are to be used, they must be placed between the instrument and the tremolo adapter. Flip *S2* to power the adapter. (Note: It may take a few seconds before the tremolo oscillator reaches full output.) Place *S1* in the OUT position and adjust level control *R9* as desired. Set *S1* to IN and adjust *R4* for the desired depth of tremolo. That is all there is to it. ♦

