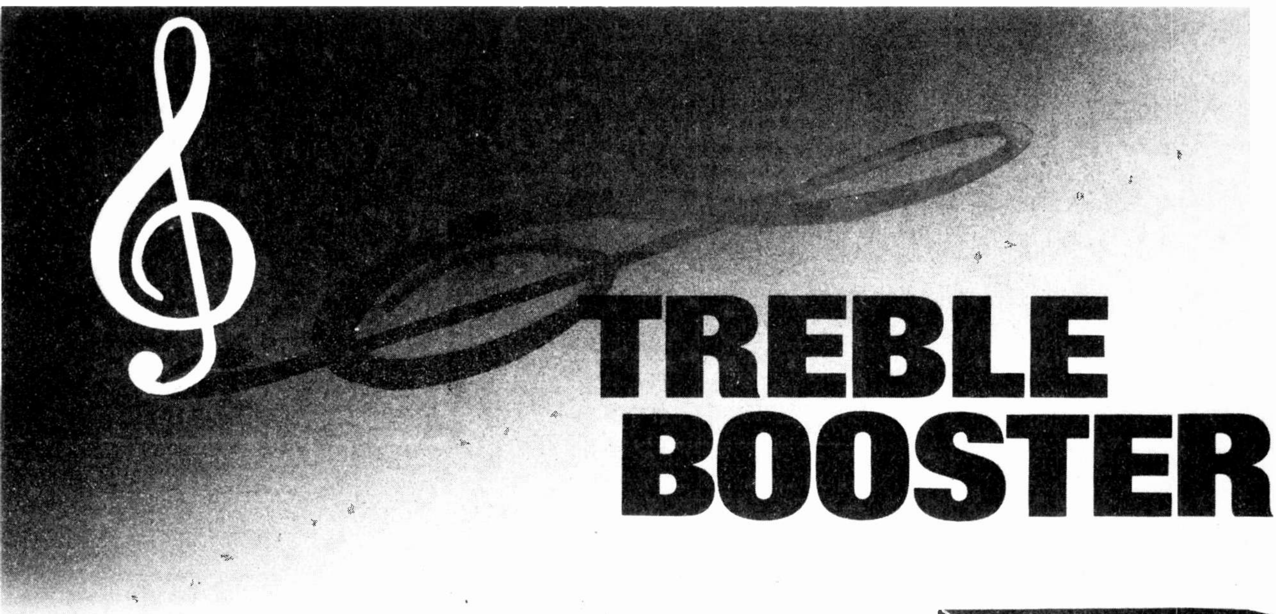
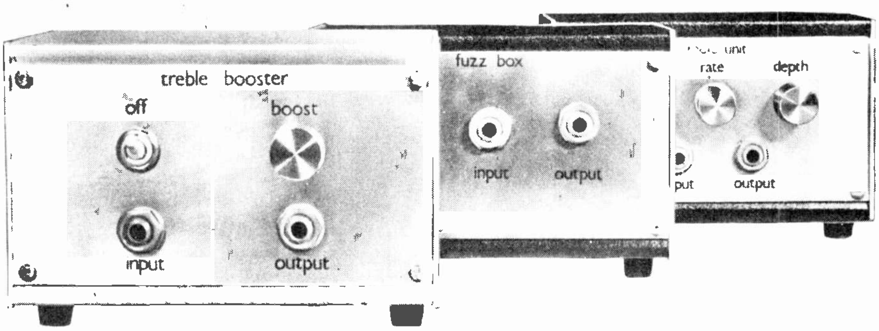


TREBLE BOOSTER

Second of three guitar effects units



By A. Russell

A SIMPLE but effective unit for heightening the higher frequency harmonics of electric guitar sounds is a Treble Booster.

The actual sounds produced are akin to those made by the early "Rock 'n Roll" guitarists, particularly when played near to the instrument bridge.

In addition to use as an effects unit the Booster will act as a straightforward pre-amplifier if required.

HOW IT WORKS

Basically the circuit consists of a simple pre-amplifier, using a low noise, high gain transistor.

In shunt with the input (Fig. 1) is an inductor L1. The impedance of this is less to low frequency signals and so the bass notes tend to be shunted to earth leaving the higher frequencies to be amplified and passed to the output socket JK2.

The "Boost" control VR1 is a 5 kilohm potentiometer in series with L1 and it controls the amount of bass cut applied to the incoming signal. When the wiper is rotated for maximum resistance there is almost no bass loss and all frequencies are amplified equally.

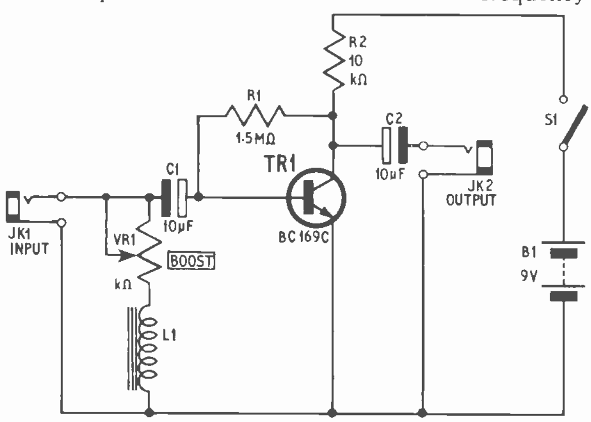


Fig. 1. Circuit diagram of Treble Booster

CONSTRUCTION

The prototype was built on a piece of 0·15in matrix Veroboard 1½in × 2½in as in Fig. 2. No breaks are required in the copper strips.

The primary of a small transistor output transformer is used for L1. The secondary winding and centre tap is not used and the leads from these should be cut short.

Control panel and Veroboard interwiring is straightforward (Fig. 2) and should present no difficulties. To prevent hum pick-up the input and output leads should be screened.

TESTING

With the unit completed, the wiring should be given a final check. With the battery connected you should find that the circuit will work first time since it is so simple.

A point to watch is the siting of the Booster. If it is placed near to the mains transformer of the amplifier, hum will be picked up by L1 so this should be avoided. ★

COMPONENTS . . .

Resistors
R1 1·5MΩ
R2 10kΩ
$\frac{1}{4}$W 10% carbon

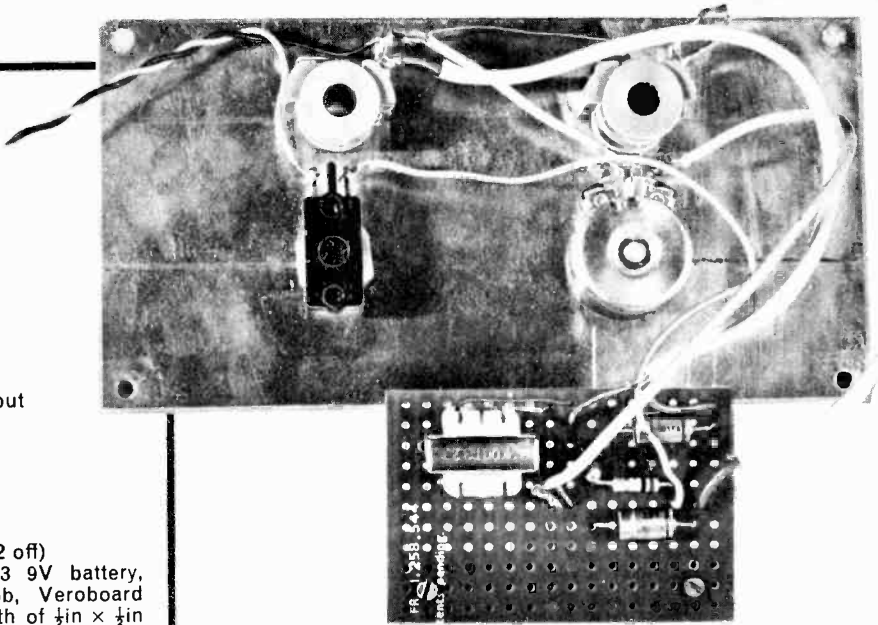
Capacitors
C1, C2 10μF elect. 25V (2 off)

Potentiometer
VR1 5kΩ lin. carbon

Inductor
L1 Eagle LT700 miniature output transformer

Transistor
TR1 BC169C

Miscellaneous
JK1, JK2 Standard jack sockets (2 off)
S1 On/off toggle switch, B1-PP3 9V battery, Battery connectors, Control knob, Veroboard $1\frac{1}{2}$in × $2\frac{1}{2}$in 0·15in matrix $2\frac{1}{2}$in length of $\frac{1}{2}$in × $\frac{1}{2}$in plastics angle.



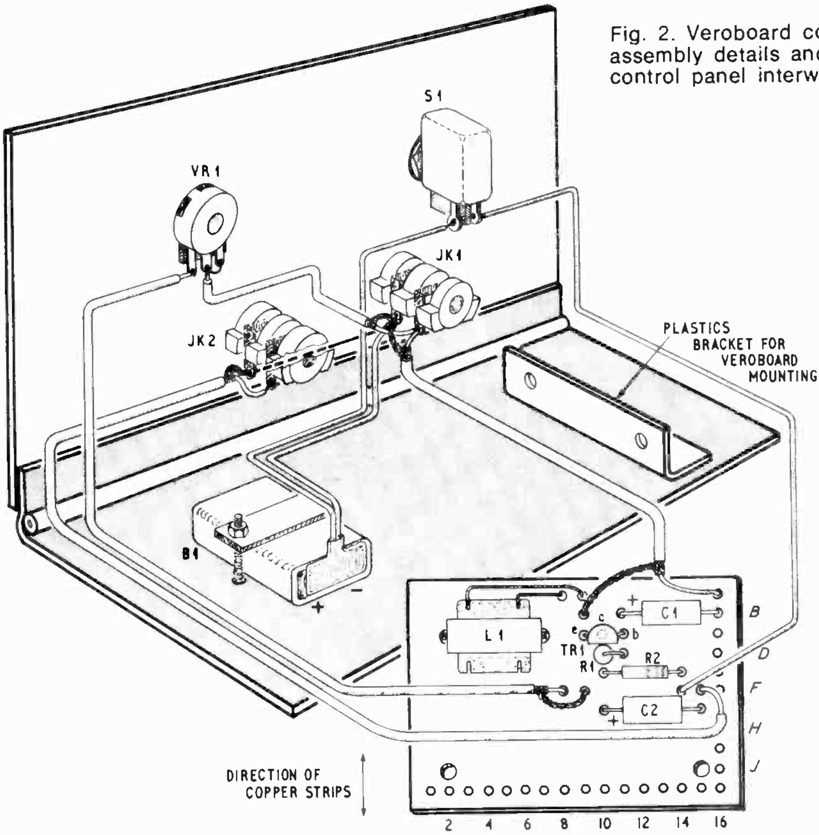


Fig. 2. Veroboard component assembly details and control panel interwiring

Silicon Controlled Switch

SCS COUNTING CIRCUITS

By D. Burn, Ph.D.

THE purpose of this article is to introduce a relatively little known semiconductor device, the silicon controlled switch (SCS), and to show how quite simple and inexpensive counting circuits may be constructed with it.

THE SILICON CONTROLLED SWITCH

The SCS is a four layer device, very similar to the thyristor, in which all four layers are accessible as electrodes (Fig. 1a). Unlike most thyristors, it is designed to handle only fairly small currents (up to 500mA), and may be regarded as a low power transistor combined with a "holding" circuit.

The usual symbol for the SCS is shown in Fig. 1b, which corresponds closely to the structure of Fig. 1a, and emphasises its similarity with the thyristor. On the other hand, it is much easier to understand the operation of the SCS if it is thought of as a pair of *pnp-npn* transistors connected as shown in Fig. 1c, the electrodes being named accordingly.

Suppose that a voltage is applied to the device as indicated in Fig. 1c and that the base is reverse biased by means of a resistor connected between the base and emitter. Provided that the applied voltage is less than the transistor breakdown voltage, neither transistor will conduct, since neither can obtain any base current. The device will therefore be in a stable "OFF" state.

If a positive pulse is now applied to the base, the *npn* transistor will begin to conduct and thus supply base current to the *pnp* transistor. This in turn will begin to conduct and supply more base current to the *npn* transistor, augmenting that derived from the input pulse.

The process is now self-sustaining and the current through the device rapidly increases until both the transistors are saturated. Since each transistor is providing the base current required by the other, there is no further need for the input pulse, and current will continue to flow after the input has ceased. The device is now in a stable "ON" state, with the value of the anode current being determined by the external circuitry.

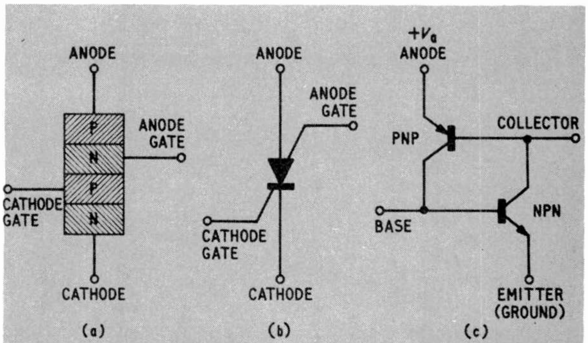


Fig. 1. The silicon controlled switch (a) internal construction; (b) circuit symbol; (c) equivalent circuit

TURNING OFF

To turn the device off again, it may be thought that it is merely necessary to reverse the turn-on procedure and apply a negative pulse to the base. Unfortunately it is not quite as simple as that.

Due to the very high gain of the device, the magnitude of such a negative pulse would almost certainly exceed the maximum permitted reverse base-emitter junction potential and thus destroy the SCS. Instead, a technique is employed analogous to that used with thyristors: reduction of the anode current to a low value.

There is a certain minimum current, known as the holding current i_H, necessary to maintain the device in the "ON" state. If the anode current is reduced below i_H, neither transistor can obtain sufficient base current to keep it conducting and so the combination rapidly turns off. This may be achieved either by applying a negative pulse to the anode, or a positive pulse to the emitter; both methods will be illustrated in the circuit to follow. Once the device has turned off, the anode potential may be restored for, as we have already seen, it can only be turned on by a pulse at its base.