high boost

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All electric guitars and bass guitars have some sort of tone control, although this is generally very unsophisticated. This high boost circuit can provide a great improvement, for, as its name suggests, the treble can either be boosted or cut by about 35 dB. In addition, the turnover point of the tone control can be set to three different frequencies by means of a single switch.

It is a well-known fact that for some inexplicable reason, electronics has never succeeded in catching up with the quality of electric guitars. The average tone control circuit on an electric guitar usually consists of little more than a capacitor and a potentiometer and can hardly be expected to produce very good results. An active tone control is much more effective and the high boost circuit, for instance, can either amplify or attenuate the treble over a ± 35 dB range. The circuit is compact in size, allowing it to be fitted inside the guitar body, if desired. Its current consumption is low enough for a battery to be used as a power source.

In addition, the tone control is equipped with a turnover point switch. Understandably, not every guitar owner is going to be prepared to cut holes into his/her precious instrument. Taking this into account, the circuit enables both the treble and the turnover point to be selected with a switch that is possibly already fitted to the instrument (as in Stratocaster and Les Paul copies, for instance). This means that the guitar can be provided with a number of practical facilities without having to be disfigured.

Operation

Figure 1 contains the tone control circuit diagram. At the heart of the circuit, IC2 constitutes an active tone control together with R5 . . . R9, P1, C3 and C4. The tone control is preceded by an emitter follower that is built up around T1. This serves as a buffer for the high-impedance guitar pick-up at the circuit's input.

The DC offset of IC2 is determined by the resistors R10 and R11. As a result, half the supply voltage is fed to the IC's non-inverting input. The output of the opamp also determines the bias of T1 via resistors R3 and R4 in the feedback loop. The opamp used is not a common type, but has been selected for this purpose because of its low current consumption.

As mentioned previously, the tone control uses a three-position switch to select one of the three turnover points: 250 Hz, 800 Hz and 2500 Hz. The setting is altered by means of electronic switches which connect R8 and R9 in parallel to P1. The electronic switches, ES1 and ES2, are controlled by the D-type flipflops FF1 and FF2. These are wired so that the count cycle is as follows: 00-01-10-00-01-etc. When the count is 00, no resistor will be connected in parallel to the potentiometer and the turnover point will be at its lowest level (250 Hz). When the count is 01, however, ES1 will switch on, so that R8 will be connected in parallel with P1 and the turnover point will be at 2500 Hz. Then there is the 10 count, where R9 is in parallel to P1 and the turnover point frequency becomes 800 Hz.

Switch S1 controls the FF1 and FF2 counter. This switch is operated with the aid of P1. A type of monoflo made using the two other electr switches in IC3 for the purpose switch debouncing. Operation is as lows. P1 is usually turned to adjust treble. If a different turnover point quency is required, the potentiomet turned fully anti-clockwise, ther opening the switch in the pot. potentiometer is then turned in opposite direction. Now the tr control can be adjusted as requi After the switch has been opera three times, its initial turnover quency will be restored.

S1 can also be operated independe from P1. For this S1 must be repla by a pushbutton type. Depressing pushbutton will then step through turnover frequencies.

The current consumption of the cir is exceedingly low, slightly over 0.5 r which means that the circuit r comfortably be powered with a s 9 V battery.

Construction and setting-up

Figure 2 shows the printed circuit bc on which all the components mounted. The board is small enough be fitted inside a guitar, but it can be housed in a separate case, which be preferable for aesthetic reasons.

Most electric guitars have at least potentiometers: one acts as a volu control and the other as a tone cont All that has to be done therefore i replace them by two different ty P1 is a potentiometer with a bui switch. The switch is indicated as S the circuit diagram. The volume cont P2, is a 'normal', logarithmic type.

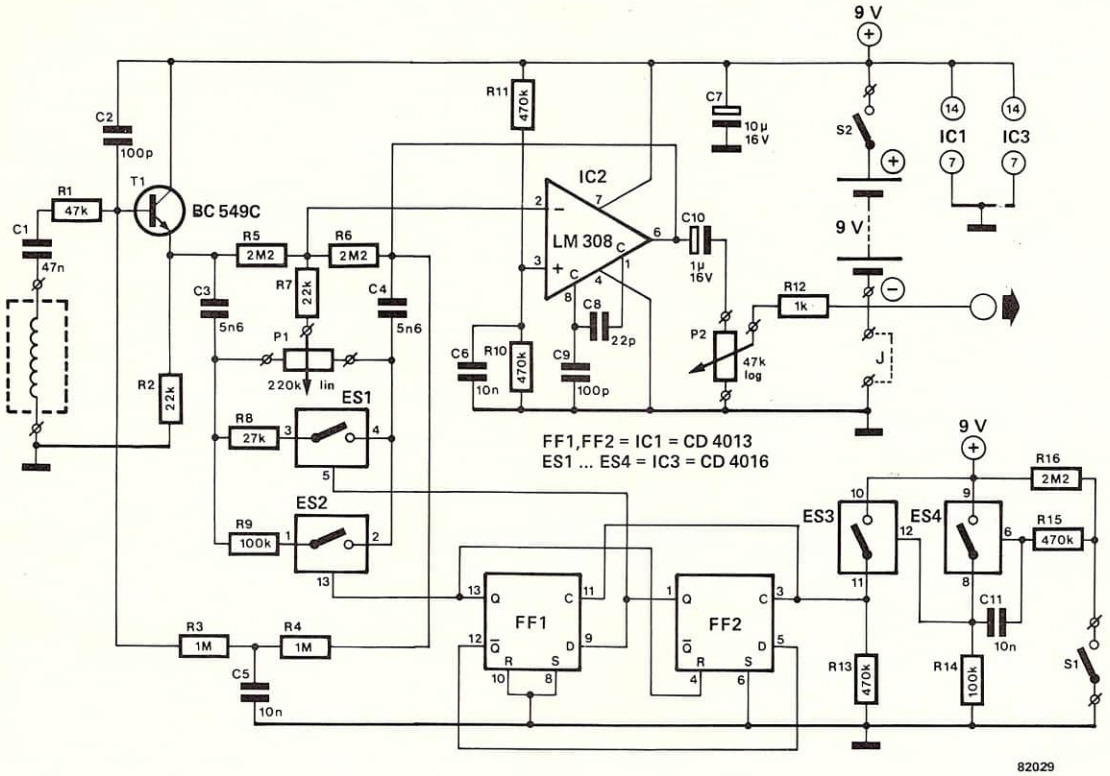
The potentiometers and switch S1 now connected up to the printed cir board and so are the guitar pick-up the battery. There are two possibil for switching the power on and off. first involves using the supply switch which means linking the dotted J nection on the board.

The second alternative is a slightly n elegant solution. The jack socket on guitar is replaced by a stereo vers When the plug is inserted, a 'shor caused between the connection for spare amplifier channel and grou since the plug is a mono type. By necting the negative terminal of battery to the second channel con tion of the socket and the circuit e to that of the socket, the power su will be switched on automatically w the lead is plugged into the guitar.

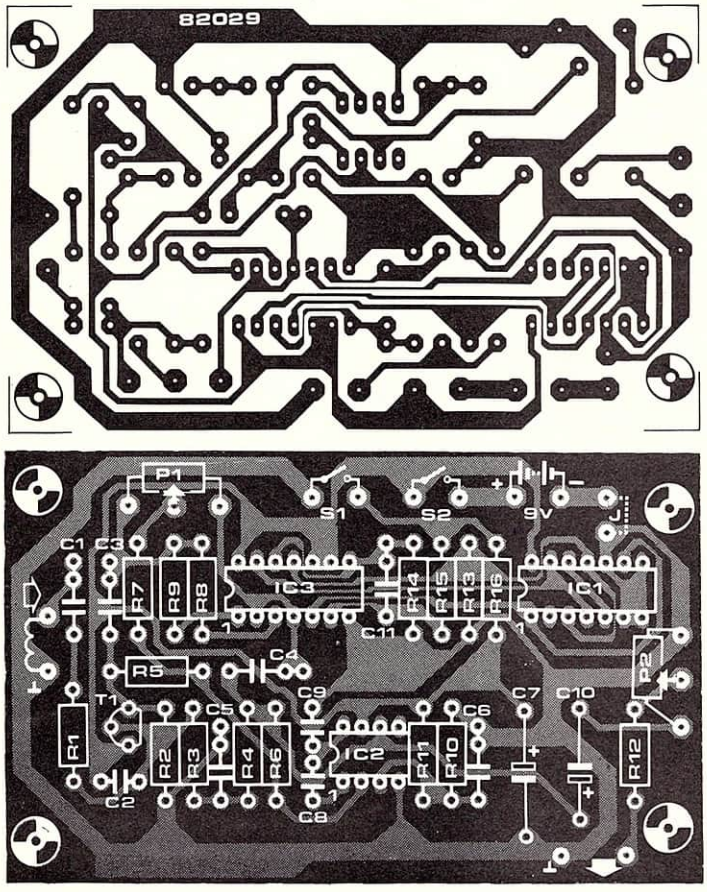
If housed in a separate case, the cir may be provided with a small m power supply. After all, the cir barely consumes 1 mA.

How to use the circuit

Readers should know by now how use the circuit, but just to make th clear: P2 serves to regulate the volu and P1 controls the treble. The turn point is altered by turning P1 fully clockwise until it 'clicks' and again. For each 'click' a lower turn



ure 1. The high boost control circuit for electric guitars. A single switch enables three different turnover points to be selected.



ure 2. The component overlay and the copper tracking pattern for the high boost printed uit board.

Parts list

Resistors:
R1 = 47 k
R2,R7 = 22 k
R3,R4 = 1 M
R5,R6,R16 = 2M2
R8 = 27 k
R9,R14 = 100 k
R10,R11,R13,R15 = 470 k
R12 = 1 k
P1 = 220 k linear plus switch
P2 = 47 k log

Capacitors:
C1 = 47 n
C2 = 100 p
C3,C4 = 5n6
C5,C6,C11 = 10 n
C7 = 10 µ/16 V
C8 = 22 p
C10 = 1 µ/16 V

Semiconductors:
T1 = BC 549C
IC1 = 4013
IC2 = LM 308
IC3 = 4016

Miscellaneous:
S1 = sp switch (on P1)
S2 = sp switch

point is selected. Three operations are required to return to the original turnover point. The order of selection is high-middle-low. The first change will only be a very subtle alteration to the sound, whereas the lowest turnover frequency will give the greatest change.