CROSSING SOUND

This kit is available from:

Talking Electronics

email Colin Mitchell:

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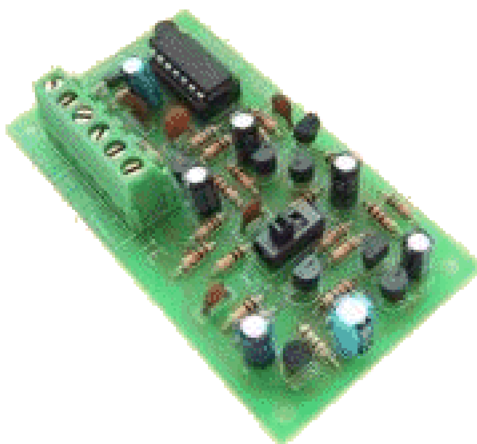
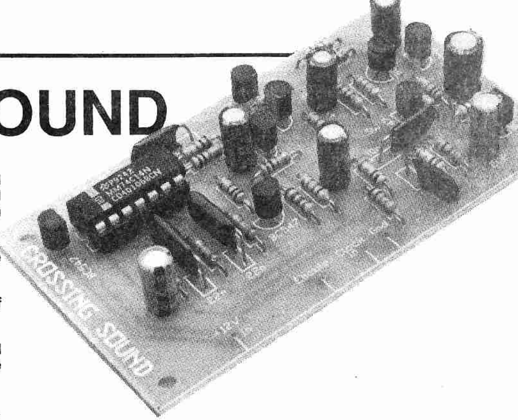
for pricing and postage.



CROSSING SOUND



The bell sound is the third module of the level crossing. Sound is a detail rarely included in model railway crossings because of the difficulty in producing realistic bell tones.

There are two methods that can be used to produce the bell sound: obviously the first is by using a bell.

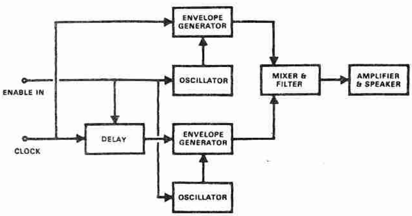
Unfortunately, the small bells used are incapable of producing a good tone.

The second method is to generate the sound electronically. The quality of an electronic bell tone depends entirely on the design of the circuit.

The circuit described here generates two bell tones, both at approximately the same frequency. One is slightly delayed to be as near to the sound of prototype crossings as possible.

How it works

Look at the block diagram of the Crossing Sound module. The unit can be divided into seven simple blocks.



Both oscillators are schmitt inverter oscillators based on the 74C14. Each uses components of the same value. The slight variations in individual components cause the oscillators to work at slightly different frequencies, making each bell tone distinguishable.

The delay is an R - C network followed by two schmitt inverters. This provides a short noninverted delay.

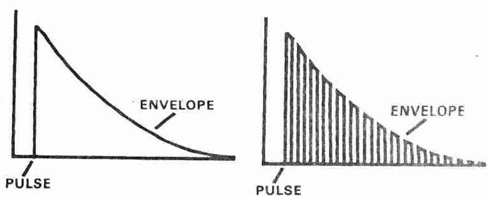
The clock output from the Level Crossing board is fed into one envelope generator directly and into the other via the delay.

If you have been wondering why the clock frequency was divided by four on the Level Crossing board, it is because the lamps on a railway crossing flash slower than the bells ring. As the clock determines the bell speed, the lamps had to be driven via a frequency divider.

Each envelope generator works like this: a pulse from the clock (or delay) is passed through a 10K resistor and a 10n capacitor. This take the base of the BC547 HIGH. It is normally held low by a 100K resistor. The BC547 is wired as an emitter follower. Every time a pulse is passed to its base, it switches on briefly, charging the 10 mfd capacitor. The capacitor discharges through the 15K resistor, producing a voltage envelope.

The voltage envelope is fed through a 2K7 resistor to a second transistor and an electrolytic. The output of the envelope generator is taken from the other side of this electrolytic.

The second transistor is wired as a 'chopper' transistor. It is driven by the oscillator. It imposes the waveshape of the oscillator onto the voltage envelope.

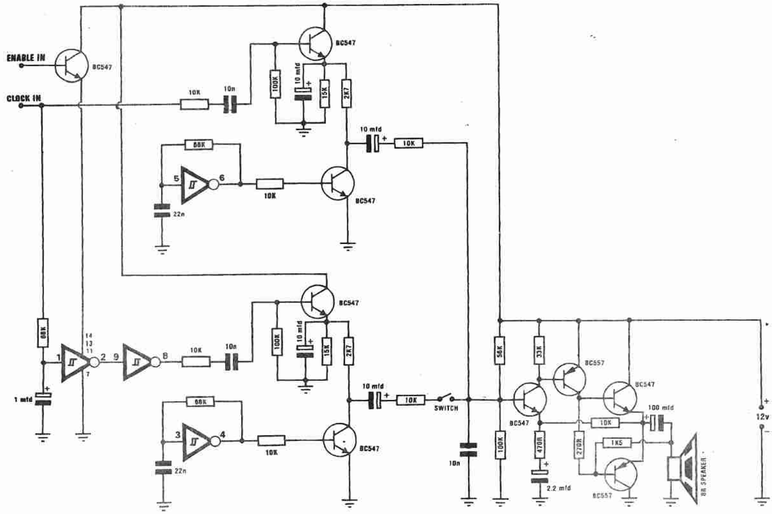


This envelope gives the bell its ringing sound.

This first bell sound is then mixed with the bell sound produced by the second oscillator and the signal is fed to the output amplifier, which is a simple four transistor push-pull amplifier.

At the point where the signal is fed into the amplifier, it is filtered by a 10n capacitor connected between the input and earth. This capacitor removes the high frequency component of the square wave, mellowing the tone being fed into the amplifier.

A switch can be placed in line with one bell tone to switch it on or off. This will be discussed in the boom control article.



The Crossing Sound module. Compare the circuit diagram with the block diagram. You should be able to see the various blocks on the circuit diagram.

The ENABLE line from the Level Crossing unit switches ON the sound via an emitter follower that feeds the 74C14 power. The amplifier remains on all the time.

Construction

The crossing sound unit is constructed on a PC board measuring 4.5cm x 8.5cm. The board is designed to line up with the top of the Level Crossing PC board, making the wiring between the two units as simple as four links.

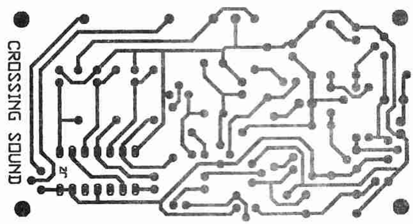
Solder in the twenty two resistors first, followed by the IC socket. The transistors are next. Two of them are BC557's and the rest are BC547's, so make sure you get them in the right place. Solder in the electrolytics and capacitors, taking care with the polarity of electrolytics. Insert the 74C14.

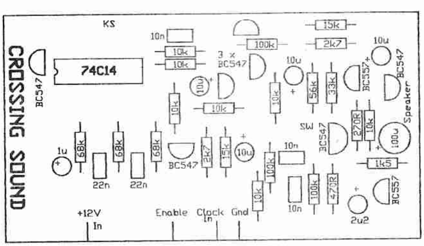
You may find it convenient to use PC pins for connection to the speaker, switch and Level Crossing board. Alternately the two PC boards can be placed side by side and joined as shown in the photograph.

Going further

The speaker can be mounted underneath the model of the level crossing, and the sound let out through some well disguised holes under hedges or something similar.

If it is too loud, a 15 ohm resistor can be placed in





line with the speaker. As mentioned previously, the amplifier remains on all the time. In the event that it picks up noise from your trains, it can be modified to switch off. A track on the PC board is cut, to separate the unit from the power supply. It is then wired to the other side of the emitter follower that switches the 74C14. The transistor is replaced with a BC338.

See page 44.

Crossing Sound Parts List

1 - 270R
1 - 470R
1 - 1K5
2 - 2K7
7 - 10K
2 - 15K
1 - 33K
1 - 56K
3 - 68K
3 - 100K

3 - 10n
2 - 22n
1 - 1 mfd electro
1 - 2.2 mfd electro
4 - 10 mfd electro
1 - 100 mfd electro

7 - BC547 transistors
2 - BC557 transistors
1 - 74C14 hex schmitt inverter

1 - 14 pin IC socket
1 - 8R speaker
1 - Crossing Sound PC Board