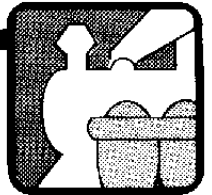


Steam Loco Whistle



Some additional sounds to frighten the tiny plastic people around your model railway.

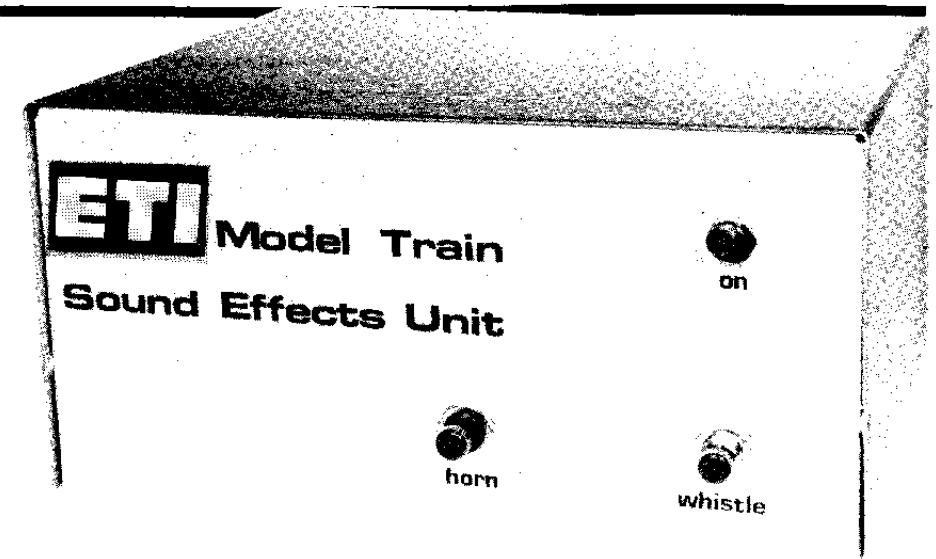
OUR LATEST MODEL train sound generator of this very popular series is a realistic steam locomotive whistle, created electronically.

Four transistors are used to generate the whistle sound and a single integrated circuit mixes this sound with that produced by our previous train sound effects circuits.

The whistle can be built and used individually or as an integral part of a complete sound effects unit, built in one case like ours.

Construction

The whistle is built on a printed circuit board (PCB) so construction is very easy. Follow the layout in Fig. 1 inserting and soldering each component in turn, starting with the resistors followed by capacitors and finally semiconductors. The IC is



cheap (a 741) so you may not feel it worth the cost of a holder. If so, solder it carefully, allowing each pin to cool before soldering the next.

Connection details for this project are given also in Fig. 1 and this shows where the other sound effects are connected if you put them all together in one case, as we did. Drill the case for all connections and switches and simply parallel connect the power supply, i.e., the 9 V battery, to each circuit at the board side of the on/off switch. The output lead from the whistle board to the output jack socket should be a screened lead,

with the shielding taken to 0V.

If you intend to connect your projects together, you will need to make a slight change to the Two-tone Train Horn board, and this modification is shown in Fig. 3. Simply unsolder and take out capacitor C5 and insert the two resistors Rx and Ry as shown. The output from this board was originally fed to a loudspeaker and the resistors simply act as a potential divider, dropping this output level to one which suits the input of the mixer formed by IC1.

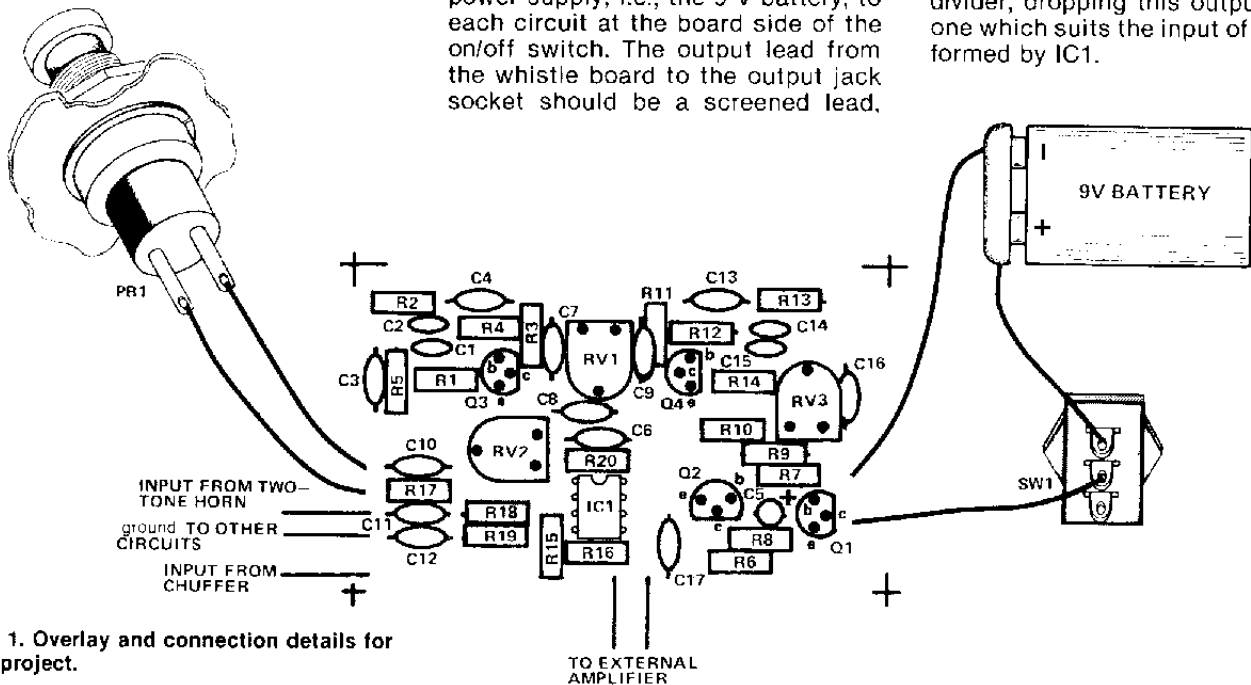


Fig. 1. Overlay and connection details for the project.

HOW IT WORKS

The waveform of a steam whistle is a complex combination of two main things: white noise and an audio frequency oscillation. Both are fairly easy to recreate electronically.

White noise is usually made by a 'noisy' zener diode, the output being amplified to the required level. The generator we used is of the same type as in the 'Chuffer' project; i.e., a transistor (Q1) biased into zener mode and a simple transistor amplifier (Q2).

The audio frequency oscillation is a straightforward mixture of two similar (but not identical) sinewaves, which after their addition produce a more complex

waveshape than either of the two individual waves. The sinewave generators are known as 'Twin-T' oscillators because the feedback components (e.g. R1,2 and C3, and C1,2 and R5) around the transistor (Q3) are in the shape of two letter Ts. The frequency is set by the values of the feedback components and in this circuit is fixed. The other oscillator frequency is variable because one of the resistors is replaced by a preset (RV3). At RV3's mid-position the frequency is about the same as that of the other oscillator.

Preset RV1 mixes the two sinewaves so that an appropriate waveform is obtained. Similarly, RV2 mixes this waveform with

the white noise produced elsewhere in the circuit. Adjustment of all three presets will result in the required sound.

Integrated circuit IC1 is an operational amplifier used as a simple mixer/amplifier which combines the steam whistle, chuffer, and two-tone horn sounds into one, suitable for amplification by an external amplifier (say your stereo system).

The gain of the mixer is determined by the ratio of R20 to the input resistances, R17, 18 or 19, of the channel concerned and so by varying the chosen resistor the levels of the individual sounds in the mix can be altered to suit.

PARTS LIST

RESISTORS (All 1/4W, 5%)

R1,2,8,18	100k
R3,11	47k
R4,12	1M0
R5	12k
R6	6k8
R7	470k
R9	15k
R10	1k
R13,14	82k
R15,16,17	22k
R19	27k

POTENTIOMETERS

RV1,2	1M0 miniature horizontal preset
RV3	22k miniature horizontal preset

CAPACITORS

C1,2,14,15	4n7 ceramic
C3,16	47n ceramic
C4,13	10n polyester
C5	470n, 35V tantalum
C6,7,8,9,10,11,12,17	100n polyester

SEMICONDUCTORS

IC1	741 operational amplifier
Q1-4	2N2925 NPN transistor

MISCELLANEOUS

SW1	single-pole, single-throw toggle switch
PB1	push-to-make switch
	Case to suit.
	Battery and clip

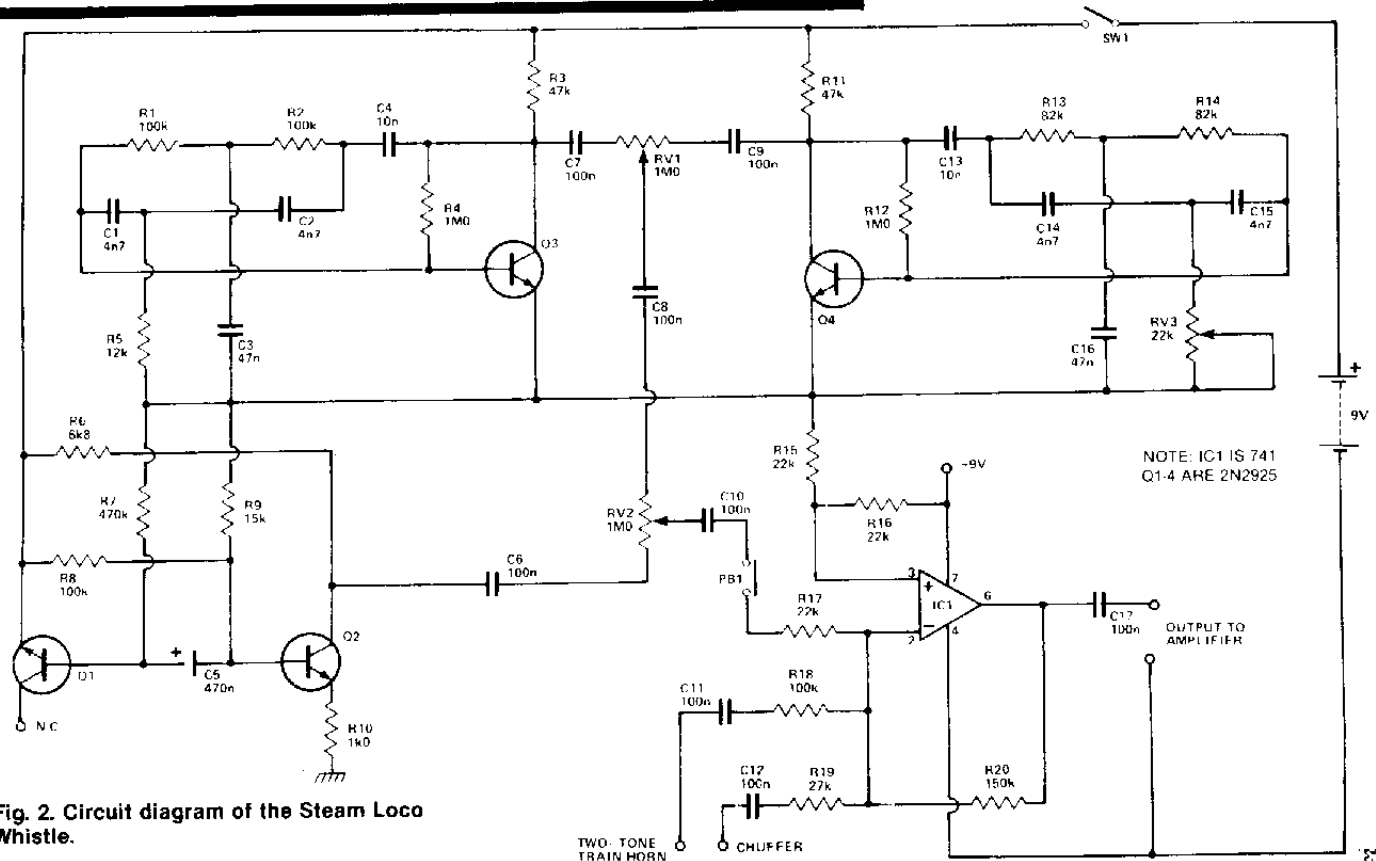


Fig. 2. Circuit diagram of the Steam Loco Whistle.

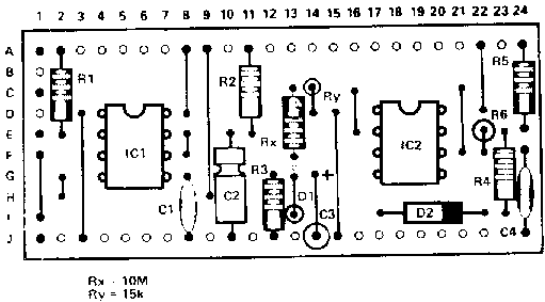


Fig. 3. The modification to the Two-Tone Train Horn board — take out C5 and insert Rx and Ry.