

Dirty Electronics: Sudophone (4th ed.)

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THE SUDOPHONE

The Sudophone exemplifies a Dirty Electronics approach. It consists of a simple oscillator circuit using a 555 timer integrated circuit (IC), miniature loudspeaker, junk tin can and grip-bolts. The Sudophone is played by holding the tin can and gripping its bolt. A hand can also cup the opening of the tin to produce a mute effect. Squeezing the bolt and tin alters the pitch of the instrument through using the conductivity of the human body to change the resistance of the circuit. Without touch there is no sound. With touch there is pitch, filtering and dynamic (muting) control. The instrument requires no amplification, the output from the IC drives the loudspeaker directly, and is in the true sense 'electroacoustic'.

Since circa 2005, the Sudophone has gone through many iterations, and has provided a basis for much wonderful music.

The following notes on the Sudophone are intended as a reference only and do not provide a full detailed step-by-step guide on how to make the instrument.

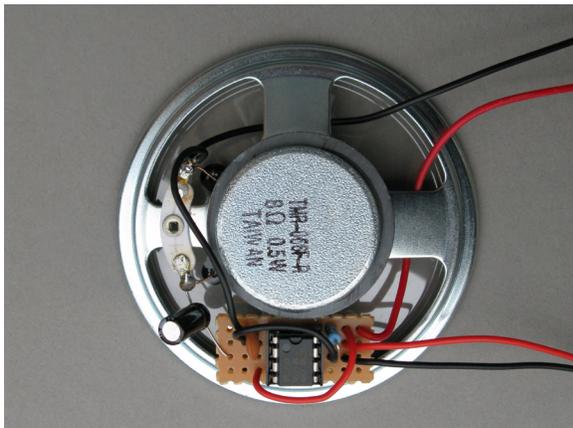


Fig. 1. Sudophone. Completed circuit mounted to loudspeaker chassis.

The instrument is constructed using stripboard (Veroboard). Appendix 1 shows the stripboard layout of the circuit. The grid intersections represent the holes in the board. The copper strips run horizontally. The red crosses show breaks in the strips. Capacitor C2 (Fig. 5) is mounted off-board: its leg connecting directly to the positive loudspeaker terminal (see Fig. 1).

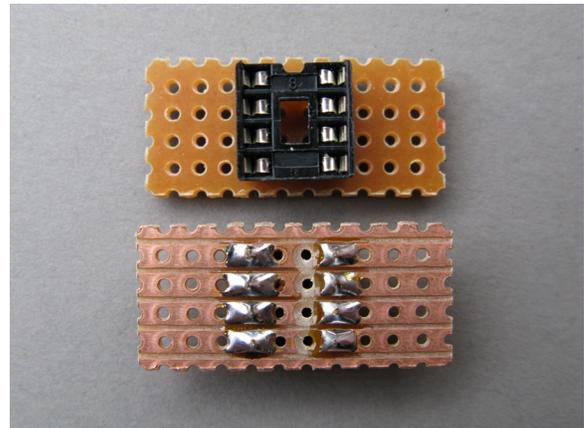


Fig. 2. Stripboard (10 x 4 holes) and Direct-In-Line (DIL) socket and board flipped over showing breaks in strips.

TIN CAN

Any tin can be used for the Sudophone, although there are a number of key considerations. Tins with a ring-pull lid are stronger: a thick metal rim around the opening of the tin is left after opening. Also, the ring-pull variety leave a less sharp edge after opening. The standard 420 g size tin is big enough for all of the parts to be housed inside. For this size tin, a miniature loudspeaker with a diameter of 66 mm is recommended. The loudspeaker is held in place on the bottom of the tin by its magnet. The tin needs to be free of its label or any coating: the outside surface must be conductive. Tins that are corrugated are ideal in that the corrugation, as well as

strengthening the tin, provides an excellent handgrip.



Fig. 3. Tin can (420 g) and bolt. Additional parts from left to right: M6 nut, M6 washer, 6.3 mm grommet (inside diameter), shower hose washer, M6 solder tag, M6 nut.

BOLT

Different types of bolts or metal fixings can be used as the hand-grip as long as they are conductive. The bolt shown in Fig. 3 is a M6 hex bolt, 75 mm length, part threaded. This bolt is long enough to fit the bulk of the hand, yet not too heavy. The part thread bolt, when fastened to the tin, leaves a smooth area to grip.

GROMMET

The grommet is a critical part of the Sudophone. The bolt must be insulated from the tin. The circuit should only be completed, and sound made, when the tin and the bolt are effectively joined through the human body.

SHOWER HOSE WASHER

The function of the shower hose washer is to make firm the grommet, and consequently the bolt. This 'firmness' is significant in how the hand-grip feels and how the instrument is played. An alternative type of washer may be used.

SOLDER TAG

The solder tag is optional and may be replaced by a M6 washer. In this case, wire B1 (Fig. 5) may be wrapped around the bolt and secured between the washer and the nut.



Fig. 4. Nut, solder tag, grommet, shower hose washer from inside the Sudophone.

CONSTRUCTION NOTES

Stripboard comes in larger sheets that need to be cut to size. The Sudophone circuit can fit on a piece of stripboard 10 x 4 holes (Fig. 2). Score with a knife 'through' the holes on both sides of the stripboard. It should then snap cleanly. Use a 3 mm drill bit to break the copper strips (twist bit between fingers). The IC should be placed into the DIL socket only when all of the other components and wires have been soldered.

Thread the battery clip wires under the loudspeaker chassis before fastening to the board. This takes the strain of the connections (Fig. 1). The negative battery cable (G) can alternatively be connected to the negative speaker terminal instead of

directly to the board. This provides more slack for the battery clip (Fig. 1).

Once the board is complete, use either double-sided sticky tape, glue or Blu Tack to secure the stripboard to the loudspeaker chassis. To avoid short circuits, the back of the stripboard must not directly touch the metal chassis.

Drill a 9 mm hole just above centre in the tin - the hole is likely to be jagged – and then use a round file to size the hole to 9.5 mm. Put the shower hose washer ‘on’ the grommet and press them together through the drilled hole from the inside of the tin. CAUTION THE RIM OF THE TIN IS SHARP (Fig. 4).

To connect wire B2 (Fig. 5) to the tin, file or sand a small patch inside the rim of the tin and apply solder to this area (Fig. 6). Once the solder has taken to the rim, solder wire B2.

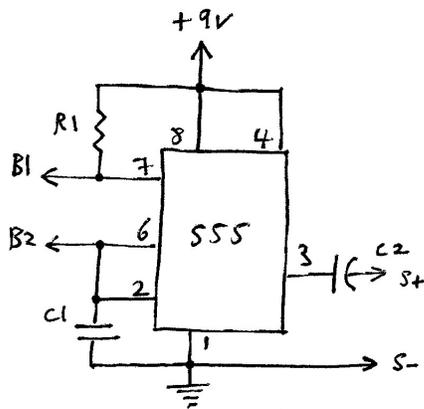


Fig. 5. Sudophone schematic

- C1 = 0.1 uF
- C2 = 22 uF
- R1 = 10k
- B1 = bolt (solder tag)
- B2 = tin
- S- = speaker negative
- S+ = speaker positive



Fig. 6. Sudophone

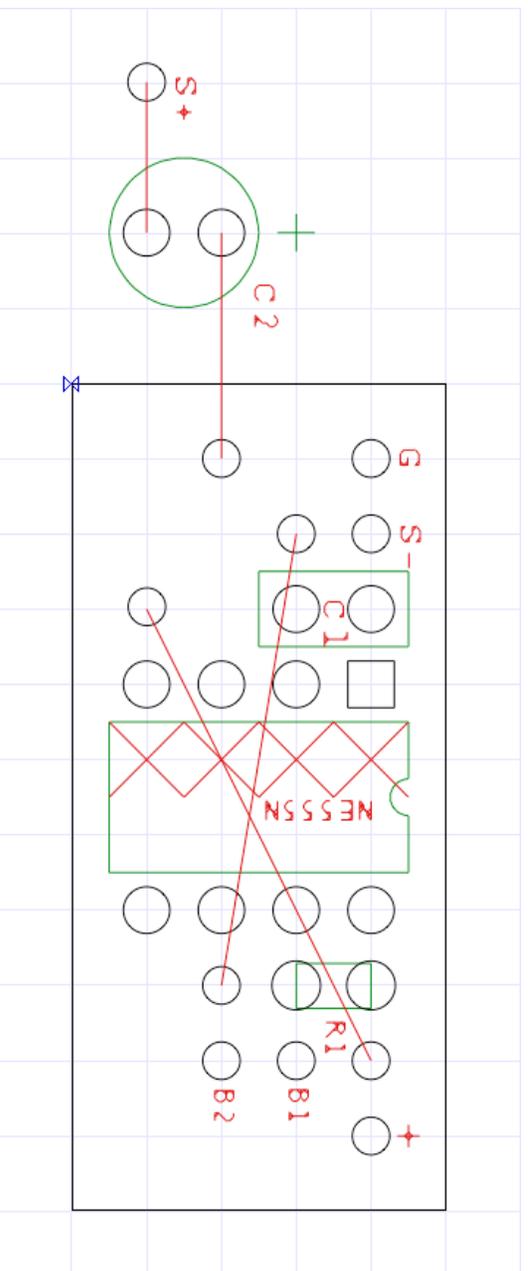
CARE

- Stick the battery to the inside of the can – tape, double-sided sticky tape or Blu Tack works well
- Disconnect the battery after use
- Make sure the battery does not short circuit inside the tin when disconnected or not in use
- Take care with the battery clip – fastening and unfastening the clip can cause loose connections
- Use a fully charged battery
- The bolt may be removed for transportation

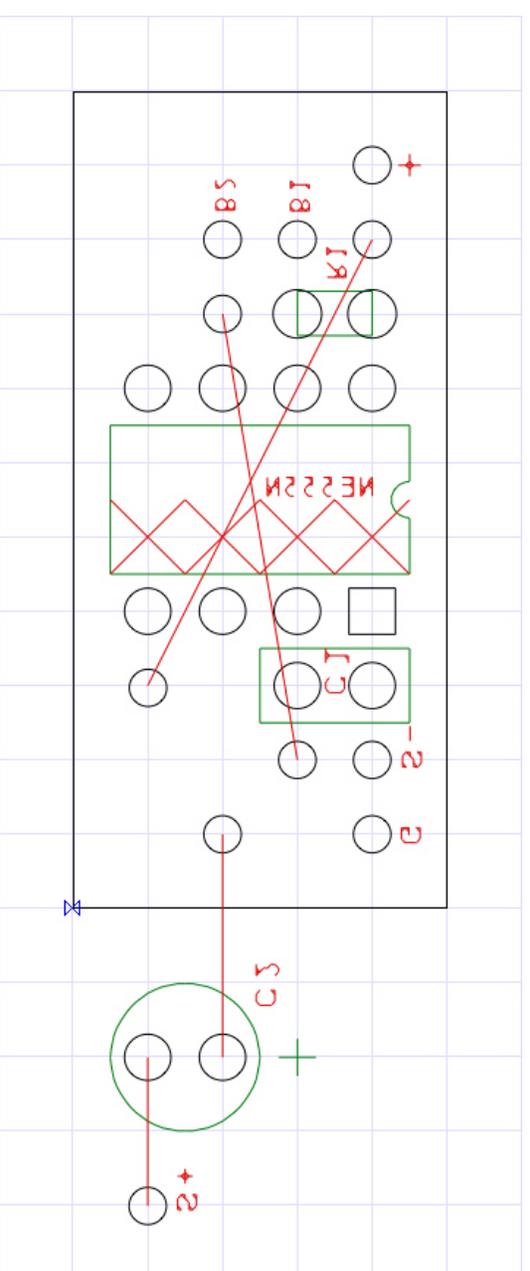
Selected Reading

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- Marston, R. M. *Timer/Generator Circuits Manual*. Newnes circuits manual series. Oxford, OX: Heinemann Newnes, 1990.
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- Richards, John. Ed. *Nine Easy Pieces for the Sudophone*. 2009.

Appendix 1 : stripboard layout



Sudophone layout (component side)



Sudophone layout – flipped over (strip side)