

# telephone amplifier

**makes distant callers loud and clear**

'Keeping in touch' is easier said than done, despite the modern telephone networks that stretch to the four corners of the globe. For one thing, a pound for a minute seems a lot of money to hear Granny's faint voice ten thousand miles away and then not understand a word she's saying. Elektor has come up with a solution in the form of an amplifier which, when connected to the telephone, enables the whole family to listen in to the conversation.

Some callers, of course, don't need amplifying, as anyone blessed with an old aunt who bellows hearty greetings down one's ear at eight o'clock on Sunday morning will agree. Here an attenuator would be more appropriate. But then that is an exception. Distant and sometimes even local lines can be very poor indeed, so that an amplifier is really practical. For instance, when relatives ring up from South Africa, say, or Australia, it would be much more economical if the whole family could listen instead of having to 'queue up' to say a few costly words. What's more, the amplifier drowns any interference caused by crossed lines and thousands of 'clicking' relays, so that the once distant voice sounds as loud and clear as if the person were sitting in the same room.

Now that we know what the amplifier is for, we can study the circuit diagram in figure 1. Looking at the drawing from left to right, the circuit starts with a pick-up coil, the centre contains an amplifier and at the other end there is the loudspeaker. The pick-up coil operates according to magnetic principles: an alteration in the magnetic field that is radiated by wires in the telephone set in the receiver will be fed to the amplifier. This slightly roundabout system is necessary, since a direct electrical connection to the interior of a telephone is forbidden.

The rest of the circuit diagram in figure 1 comprises very few components. L represents the telephone pick-up coil





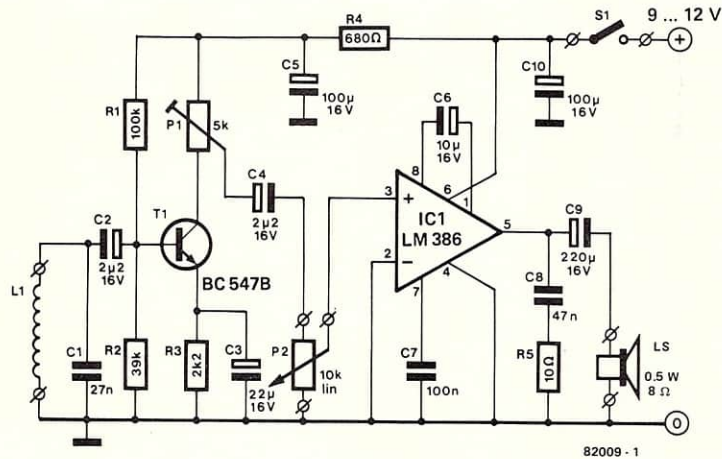


Figure 1. The circuit diagram of the telephone amplifier.

#### Parts list

#### Resistors:

- 1 = 100 k
- 2 = 39 k
- 3 = 2k2
- 4 = 680 Ω
- 5 = 10 Ω
- 6 = 4k7 (5 k) preset
- 7 = 10 k linear

#### Capacitors:

- 1 = 27 n
- 2, C4 = 2μ2/16 V
- 3 = 22 μ/16 V

- C5, C10 = 100 μ/16 V
- C6 = 10 μ/16 V
- C7 = 100 n
- C8 = 47 n
- C9 = 220 μ/16 V

#### Semiconductors:

- T1 = BC 547B
- IC1 = LM 386

#### Miscellaneous:

- L1 = telephone pick-up coil
- LS = 8 Ω/½ W miniature loudspeaker
- S1 = on/off switch

which is specifically designed for this type of application. A very low AC voltage is induced across the coil and this is amplified by transistor T1 and the amplifier IC1 and then fed to the loudspeaker.

There are two ways in which the volume can be adjusted: either by using P1 to set the threshold value or by means of the volume control P2.

A printed circuit board has been designed for the telephone amplifier, the details of which are shown in figure 2. Using a miniature Japanese loudspeaker and a 9 V PP11 battery, the whole circuit will easily fit into a plastic case of roughly 120 x 65 x 40 mm. A mains power supply may also be used, provided the supply voltage is very well stabilised, as otherwise there could be some mains hum.

The construction is very straightforward indeed and so we can proceed with the setting-up, which primarily involves L1 and P1. First of all, the best position for the pick-up coil has to be found. Ideally speaking, this is underneath the telephone, but this would mean having to raise the 'phone a little, since the coil is about 3 centimetres high. Another solution is to fit L1 onto the side of the telephone so that it is close to the amplifier. Readers should decide for themselves what the best practical solution is.

Now for the preset P1. This adjusts the maximum volume. Above a certain level, the sound reaching the amplifier input will be so loud that acoustic feedback ('howl round') will occur. This is a kind of echo that has got out of hand and produces a high-pitched tone. After setting P2 to maximum, P1 is adjusted so that this just does not occur. It would of course be feasible to omit all the components to the right of P2 and use HiFi equipment to reproduce the caller's voice, but then, that is up to the reader.

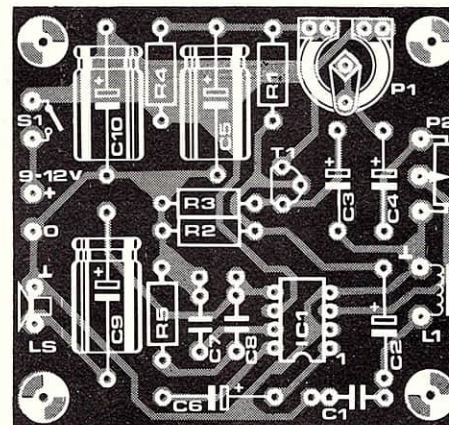
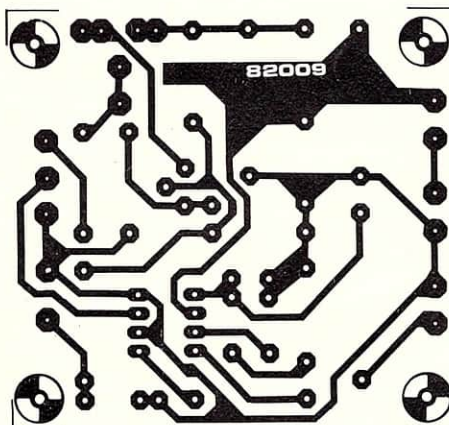


Figure 2. The printed circuit board track pattern and component layout for the telephone amplifier.