

K55. SUCTION CUP PHONE PICKUP

It is often very convenient for other people in the room to listen to both sides of a phone conversation. The amplifier in this it has been designed for this use. A specially designed magnetic pickup with a suction cup attaches onto the earpiece of your phone at one end and into the amplifier at the other. The design is low cost and there is no direct electrical connection to the phone system.

The kit is constructed on single-sided printed circuit boards. Protel Autotrax & Schematic were used.

ASSEMBLY INSTRUCTIONS

Check off the components against the component listing. Make sure you identify every component. It is generally easiest if you solder the lowest height components first, the resistors then the capacitors & IC sockets. Make sure to get the electrolytic capacitors around the correct way. Note there is one link to make on the board next to the power supply pads. Use an offcut from a resistor to make the link.

CIRCUIT DESCRIPTION

The telephone pickup is really a magnetic field fluctuation detector. It picks up the oscillating magnetic field from the receiver of your telephone when someone is speaking to you. But it will also collect any other oscillating magnetic fields which happen to be floating around in the air. For example, low & high frequency noise from your TV set or computer monitor or the characteristic mains humm from power lines. High frequency filters have been built into the circuit to reduce some of this unwanted noise.

The telephone pickup circuit consists of two high gain preamplifier stages in the LM358 followed by a power amplifier to drive the speaker. The IC's are low cost and easily available.

Both preamps in the LM358 are biased to half the supply voltage by R4 & R5. This allows maximum voltage swing at the outputs before hitting either supply rail. C6 bypasses any AC signal to ground, stabilizing the DC bias voltage. R3 is necessary to couple the DC bias voltage to IC1:B while also providing a high impedance to the input signal.

The RC feedback circuit on both preamps will, like any RC circuit, have a cutoff frequency. Or to think of it another way, the capacitance starts to act as a short circuit as the frequency increases and the gain decreases. The cutoff frequency is given by the formula:

$$f = 1 / (6.28 \times RC)$$

This gives a cutoff frequency of 2.7KHz which has the effect of limiting the amount of high frequency noise, or 'hiss'. This high frequency roll-off does not greatly affect voice frequency signals since voice frequency is nominally in the range 300Hz to 3.0KHz.

The output of the second preamp is fed to the power amplifier stage via C7 & P1. C7 removes any DC component from the amplified signal while P1 acts as a volume control. The LM386 is very easy to use and requires a minimum of external components. C8 provides filternig & bypassing for the internal bias network. C9 removes any DC component from the output signal. The gain of the LM386 may be set according to the combination of resistors & capacitors across pins 1 & 8. With no components the gain is 20. Finally use some wire to connect the speaker to the terminal block output.

Place the suction cup near the receiver on the handset. Keep the speaker away from the handset to stop any feedback. The pickup will be affected by strong magnetic fields - mains wiring, a computer monitor and TV set. Low roll-off filters (to reduce the 50Hz hum) could have been included in the circuit just as the high roll-off filters have been. However, since the pickup responds to low frequency this allows the unit to be used to trace mains wiring behind your walls or under the floor.

WHAT TO DO IF IT DOES NOT WORK

Poor soldering is the most likely reason. Check all solder joints carefully under a good light. Next check that all components are in their correct position on the PCB. Did you add the single link. Are the IC's in their correct places. Are the electrolytic capacitors around the correct way.

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COMPONENTS

Resistors 1/4w, 5%:	
10K R2 R4 R5 R6 brown black orange	4
270K R1 R7 red violet yellow	2
100K R3 brown black yellow	1
Koa Trimpot 10K 103	1
Monoblock capacitors:	
100nF 104 C4 C5 C7	3
Electrolytic capacitors:	
10uF mini C6 C8	2
100uF mini C1 C9	2
220pF ceramic capacitors C3 C10	2
4n7 MPE box capacitor C2	1
LM358 IC1	1
LM386 IC2	1
8 pin IC socket	2
K55 PCB	1
Audio jack	1
6V battery snap	1
8 ohm speaker	1
Magnetic pickup with suction cap	1
2 pole terminal block	1

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