

DIY Kit 98. PREAMPLIFIER

Our Kit 17 - LM386 amplifier - has been a great success. However, unless you have a signal of sufficient amplitude it will not produce its maximum power output. What is needed is a preamplifier to go with it.

This preamplifier is the answer. It has a gain greater than 40 dB which is more than enough for most applications. You may vary the gain by just changing one resistor. It will also take its input from an electret microphone by adding one resistor. We have provided this resistor and an electret microphone in this kit.

How it Works

As you can see from the circuit there are two transistors. They make up a DC feedback pair, with the negative feedback coupled from the collector of Q2 to the emitter of Q1. The input signal is applied via a 0.1uF capacitor to the base of transistor Q1. The bias voltage for this transistor is set up by the 2K2, 100K & the 150K resistors. A low pass filter consisting of the 2K2 & a 10uF capacitor removes unwanted hum and noise from the DC bias voltage. This is called 'supply decoupling' and is usually necessary in preamp circuits to ensure that the output signal is free of hum & noise.

The output from the first stage is taken from the collector of Q1 and its 22K load resistor. Although this 22K resistor is not strictly necessary it helps to linearise the output and significantly reduces distortion. Q1's output is fed to the base of Q2 and the final output signal appears at its collector.

Negative feedback is applied by the 2K2 resistor, R5. The 1.5nF capacitor C4 across this resistor ensures that the circuits response to radio frequency noise is greatly reduced by rolling off frequencies above 48kHz.

The overall gain is set by the ratio of R5 and R6. The gain equation is

$$\text{Gain} = 1 + (2200/100) = 23$$

which is equivalent to 23dB.

The electrolytic C6 in series with R6 sets the lower frequency response to 72Hz. The output is taken from across the R7 load resistor of Q2 via a 10uF electrolytic capacitor.

Power is supplied from any 6V to 12V DC source. At 12V the current drain is 3mA. This drops to 2mA at 9V.

Optional Electret Microphone

Provision is made for an electret microphone to be used on the input. If you use this option then add resistor R9 connecting the input side of C3 to the decoupled supply rail. R9 provides bias current to the electret microphones internal FET. If you use other types of microphones then omit R9.

Construction

Check the components provided against the parts list below. It is generally best practice to add the lowest height components first: the resistors. Make sure to get Q1 & Q2 correct. They are not the same. One is an NPN transistor while the other is a PNP type. Also make sure to get the electrolytic capacitors around the correct way.

As mentioned above if you are using an electret microphone then also put in the resistor R9. We have supplied both with this kit.

Testing

Connect Kit 98 to a Kit 17 and try it out is the best test. Short circuit the input with your fingers. You should hear a 'blurt' from the speaker. If not then check all the components and their orientation. Check for bad solder joints. It is best to use shielded audio cable for the input signal and the connections between Kit 98 and Kit 17 input.

References

This kit is adapted from *Silicon Chip*, July 1994.

For more information visit our web site at

<http://kitsrus.com>

PARTS LIST

Resistors 5%, carbon:

100R	R6.....	1
2K2	R2 R5 R7	3
10K	R9.....	1
22K	R3.....	1
100K	R1 R8	2
150K	R4.....	1

Capacitors

100nF box poly	C3.....	1
1.5nF box poly	C4.....	1
10uF mini ecap	C1 C5	2
22uF mini ecap	C6.....	1
100uF/16V mini ecap	C2.....	1

Electret microphone.....		1
BC548B	Q1	1
BC558B	Q2	1
Kit 98 PCB		1

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