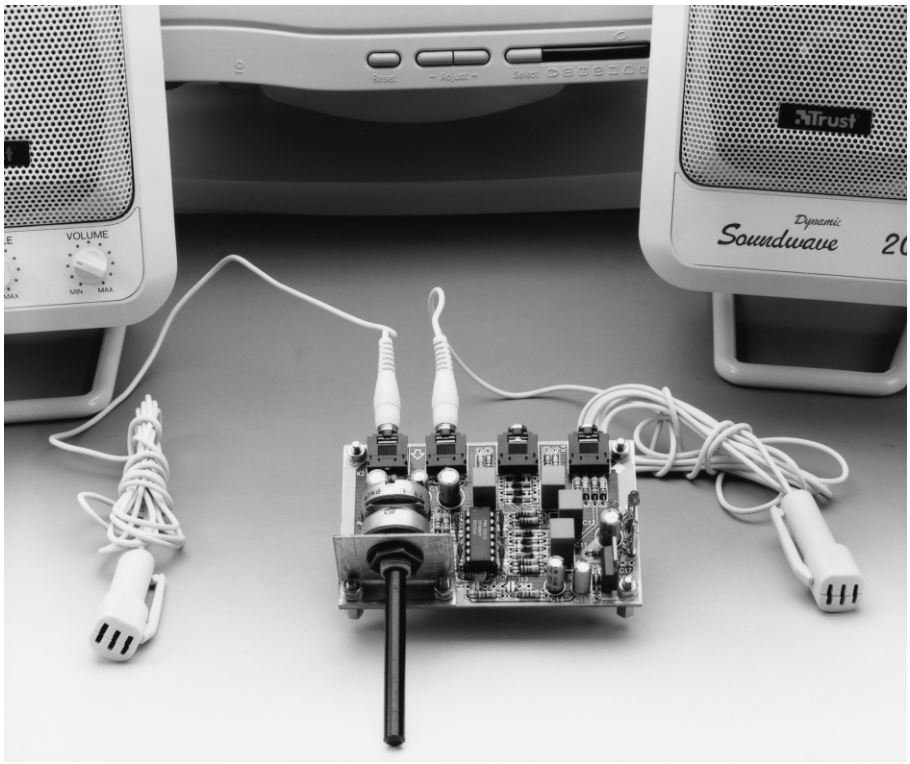
stereo microphone input adaptor for PC

useful extension of sound card



There are occasions when it is desirable or even essential for a stereo microphone to be connected to a personal computer. Unfortunately, the microphone input of most sound cards used in PCs is monophonic. This article describes a simple adaptor to convert the mono(phonic) input into a stereo(phonic) input. It may also be used to provide a cassette deck with a stereo(phonic) microphone input.

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Nowadays, there is not the sharp dividing line of yesteryear between consumer audio, TV, video, and computer, equipment. In fact, today it is sometimes difficult to decide where one ends and the other begins. The audio installation may be used to reproduce the sound of a film on the video recorder; the CD-ROM drive of a PC may be used to play an audio CD; and the PC may be used for processing audio and video signals.

The PC can serve not only for the reproduction of the simple sounds that support certain software, but also for processing complex music signals. In that case, the audio signals are first quantized via the sound card and subsequently processed as desired. In fact, hard-disk recording is no longer a novelty.

Unfortunately, the microphone

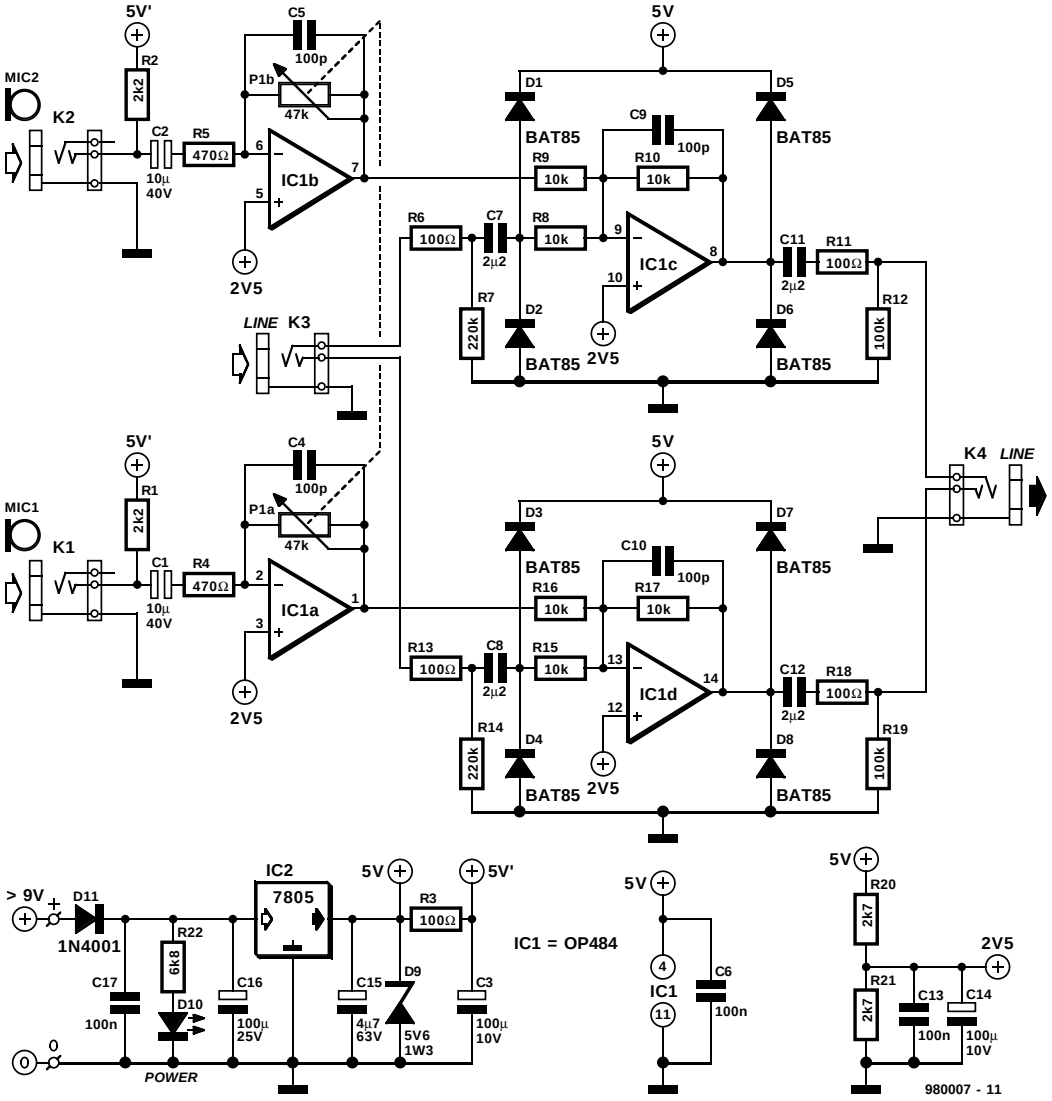


Figure 1. Circuit diagram of the stereo microphone adaptor for PCs.

input of most sound cards used in consumer PCs is monophonic. Luckily, however, many sound cards have a stereophonic line input. which can be converted to a stereo microphone input.

CIRCUIT DESCRIPTION

The conversion of a line input to a microphone input normally entails first of all raising the microphone output signal (a few millivolts to a few hundred millivolts) to line level (standard: 775 mV across 600 Ω designated 0 dBm, but in consumer equipment the r.m.s. level may range from 100 mV to 5 V). It is, however, convenient to retain the original line input function, and this is so in the present circuit.

In the circuit diagram in **Figure 1,** jack socket K_4 serves to connect the adaptor to the PC, socket K_3 is the 'new' line input, and sockets K_1 and K_2 form the stereophonic microphone input. The microphone output signals are amplified by operational amplifiers IC_{1a} and IC_{1b}, while IC_{1c} and IC_{1d} serve as adders and output stages.

Op amps IC_{1a} and IC_{1b} are straightforward inverting amplifiers whose amplification is determined by the ratio P_{1a}:R_1 (P_{1b}:R_2). In the prototype, this is ×23, which is sufficient for the electret microphones used.

Resistors R_1 and R_2 also provide the supply voltage for the FET impedance adaptor in these microphones. (FET = field-effect transistor).

Potentiometer P_1 serves to set the sensitivity of the microphone input or the level of the amplified microphone signal.

The configuration of the adders/output stages is similar to that of the preamplifiers, but their amplification is unity and the output impedance is rather higher.

Resistors R_6-R_7 and R_{13}-R_{14} ensure stable operation with unusual line signals.

Since the supply voltage is only 5 V, the line inputs and outputs are protected against overvoltage by diodes D_1–D_8. Zener diode D_9 makes certain that the supply voltage cannot exceed 5.6 V in any circumstances.

The supply voltage is obtained from a standard 9 V mains adaptor, which need not be regulated nor rated for high currents (the circuit draws only about 10 mA). Regulator IC_2 holds the output voltage steady at 5 V. This low voltage ensures that the sound card cannot be overdriven or damaged by overvoltage.

The amplifier stages are powered by half the supply voltage via potential divider R_{20}-R_{21}, which is decoupled by capacitors C_{13} and C_{14}.

The supply lines to the microphones are decoupled by network R_3-C_3.

Diode D_{11} protects the lines against polarity reversal, while D_{10} is the on/off indicator.

CONSTRUCTION

The adaptor is best built on the printed-circuit board shown in **Fig-**

Parts list
Resistors:
R_1, R_2 = 2.2 kΩ
R_3, R_6, R_{11}, R_{13}, R_{18} = 100 Ω
R_4, R_5 = 470 Ω
R_7, R_{14} = 220 kΩ
R_8, R_9, R_{10}, R_{15}, R_{16}, R_{17} = 10 kΩ
R_{12}, R_{19} = 100 kΩ
R_{20}, R_{21} = 2.7 kΩ
R_{22} = 6.8 kΩ
P_1 = 47 kΩ stereo, logarithmic potentiometer for board mounting

Capacitors:
C_1, C_2 = 10 µF, 40 V, bipolar, radial
C_3, C_{14} = 100 µF. 10 V, radial
C_4, C_5, C_9, C_{10} = 100 pF
C_6, C_{13}, C_{17} = 0.1 µF
C_7, C_8, C_{11}, C_{12} = 2.2 µF, metallized polyester (MKT)
C_{15} = 4.7 µF, 63 V, radial
C_{16} = 100 µF, 25 V, radial

Semiconductors:
D_1–D_8 = BAT85
D_9 = zener diode, 5.6 V, 1.3 W
D_{10} = LED, high-efficiency
D_{11} = 1N4001

Integrated circuits:
IC_1 = OP484FP (Analog Devices) (see text)
IC_2 = 7805

Miscellaneous:
K_1–K_4 = stereo jack socket, 3.5 mm, for board mounting
PCB Order no. 980007-1 (see Readers Services section towards the end of this issue)

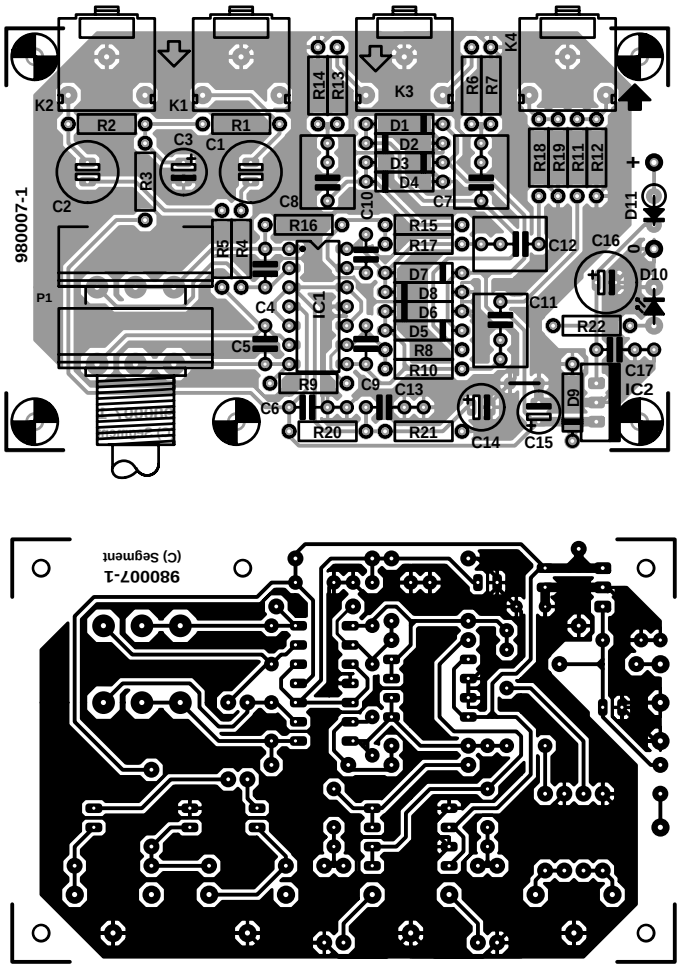
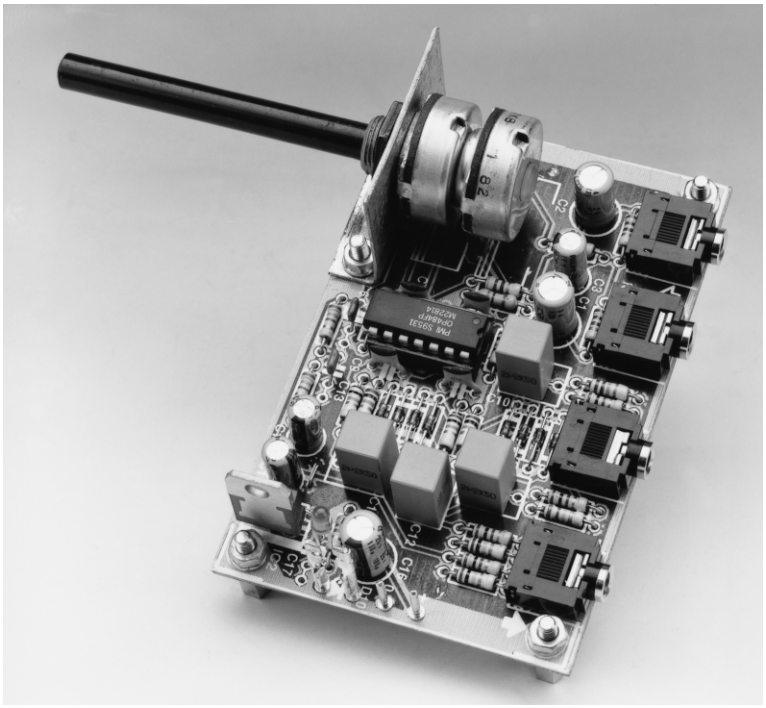


Figure 2. The various jack sockets and potentiometer can be fitted directly to the printed-circuit board.

Figure 3. Photograph of the completed prototype stereo microphone adaptor board.



ure 2. All jack sockets are at one side of the board and the volume/sensitivity control at the opposite side.

When the (straightforward) construction has been completed and the correct operation of the adaptor has been verified, the adaptor should be fitted in a suitable enclosure. This is preferably a small metal case to which the earth of the circuit is strapped via one central point (near one of the jack sockets).

OPTIONAL MODIFICATIONS

The amplification of the circuit specified earlier is sufficient for the (electret) microphones used with the prototype. If desired (or required), it may be raised by lowering the value of R_9 and R_{16}, but not below 2 kΩ.

The operational amplifier used in the IC_1 position is a Type OP484 from Analog Devices. This device combines a rail-to-rail input and output with a very low noise factor and a range of supply voltages that extends to well below that of most other types. Nevertheless, other types of op amp, such as the TLC272, may also be used.

[980007]