

Simple unit mixes two mic inputs with line

Low-cost stereo mini mixer

Here's a low-cost stereo mixer that should be just right for many applications. It hooks into the tape loop of a conventional stereo amplifier and can be used to mix two microphones with line level signals from an amplifier, musical instruments, or a tape recorder.

by **BRANCO JUSTIC**

Most stereo mixers are rather large and elaborate affairs but not this one. It goes with your existing hifi amplifier and will let you mix two microphone inputs with program material derived from a hifi tuner, turntable, CD player or tape recorder. It's just the shot for

small public address applications or for adding commentary to a slide show.

Because the mixer is installed in the tape loop of the amplifier, all the existing functions of your system are retained. In addition, you can independently adjust the program and micro-

phone levels in any proportions you desire. The resultant stereo output is then fed to the amplifier tape input sockets and is also made available to the tape recorder input sockets.

Another possible application of the Mini Mixer is to use its line inputs as instrument inputs, eg, from a guitar or electronic keyboard. In this role, the optional mono output from the mixer can be fed to a mono amplifier, or to a stereo amplifier switched to mono mode. Result — a simple 4-input mixer with two instrument and two microphone inputs.

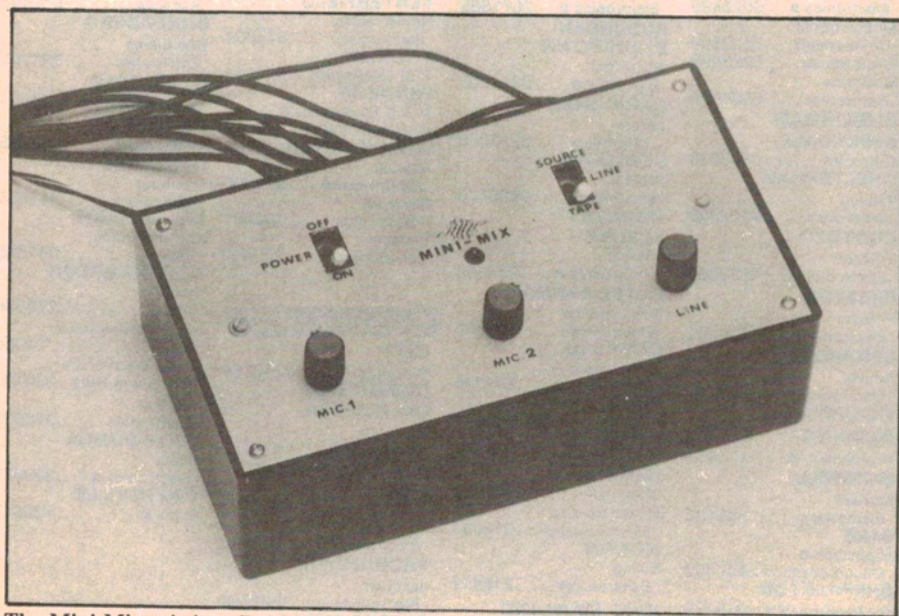
Let's now take a look at the controls on our new Mini Mixer. In the interests of simplicity and low cost, these have been kept to an absolute minimum. As can be seen in the photograph, there's a power on/off switch, a line/tape switch, and three potentiometer controls which set the signal levels from the microphones and the selected program.

The line/tape switch simply selects the program material to be mixed with the microphone inputs. In the line position, the signal is taken from the amplifier tape outputs; in the tape position, the signal comes from your tape recorder.

The only other item on the front panel is a power on/off indicator LED. The rear panel accommodates the two microphone jack sockets.

A problem that arises with most mixers is that, when the time comes to use them, you can never find the necessary interconnecting cables. This design solves that problem simply by using captive cables. The cables are soldered directly to the mixer's printed circuit board at one end and are fitted with RCA plugs at their free ends for connection to the amplifier and tape recorder.

So, wherever the mixer goes, the interconnecting cables go.



The Mini Mixer is installed in the tape loop of your stereo amplifier.

level signals

How it works

Refer now to Fig.1. The circuit is really very simple and is based on two TL071 op amps configured as summing amplifiers.

Double pole switch S1 selects either the amplifier tape outputs or the tape recorder outputs. The selected inputs, together with the microphone inputs (Mic 1 and Mic 2), are then fed to level potentiometers RV1-RV3. After that, the various signals are AC-coupled via C1-C4 to the two summing amplifier circuits.

Each summing amplifier circuit consists of a simple resistive mixer network followed by an inverting op amp stage. IC1 and its associated resistor network (R1-R3) sums the signal sources for the left channel while IC2 looks after the right channel. R7 and R8 set the gain of their respective op amp stages, while C5 and C6 ensure high frequency stability by rolling off the response above 70kHz.

Note that the left and right channel line input signals are fed only to their respective left and right channel summing amplifiers, while the microphone inputs are fed to both channels. A high degree of isolation between channels is maintained due to the virtual earth characteristic at the signal input of each op amp.

The outputs from the operational amplifiers are AC-coupled via C7 and C9 to the appropriate inputs on the amplifier and tape recorder. A simple resistive mixer consisting of R9, R10 and R15 provides an optional mono output whilst retaining a high degree of channel separation.

Power supply

The Mini Mixer can be powered by batteries or by a DC or AC plugpack supply. The acceptable range of voltage is 6-20V DC or 4-15V AC.

Diodes D1-D4 form a bridge rectifier which feeds into D5. The output of D5 is then filtered by C9 and fed via on/off switch S2 to a filter/voltage divider network (C10, C11 and R12-R14) which provides the bias for the non-inverting inputs of the op amps. Power indication is provided by LED D6 which is wired in series with current limiting resistor R11 across the supply rails.

Because a bridge rectifier is used, an external DC plugpack supply (if used) can be connected with either polarity.

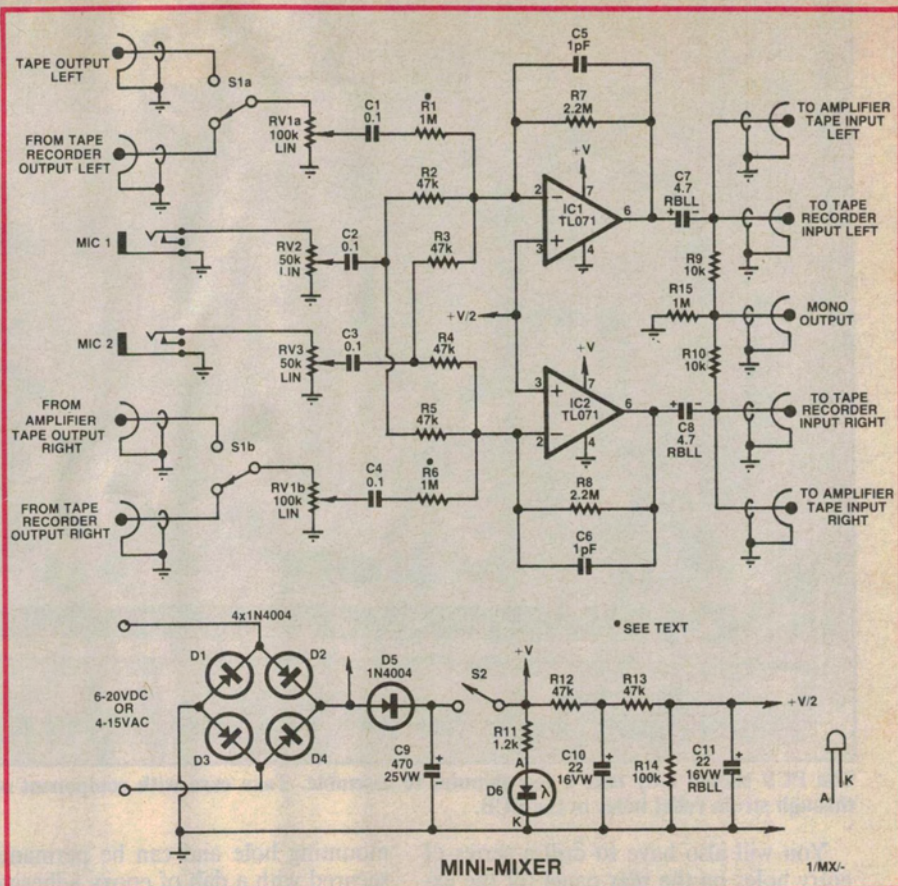


Fig.1 the circuit uses two op amp ICs configured as summing amplifiers.

D5 serves to isolate the filter circuitry so that an optional VU meter (to be described next month) can be powered from the output of the bridge.

Construction

A complete kit of parts for this project is available from Oatley Electronics (see price panel).

Virtually all the parts, including the potentiometers and switches, are mounted on a single printed circuit board (PCB) coded 87/mx/5. This is housed in a standard plastic case measuring 195 x 113 x 60mm.

Begin construction by filing rectangular openings in the PCB to clear the switch toggles (but not the plastic pivot assemblies). Once this has been done, the parts may be installed on the PCB as shown in Fig.2. No special procedure need be followed when installing the parts, but watch the orientation of the electrolytic capacitors, diodes and integrated circuits.

The switches, pots and electrolytic capacitors (C7-11) are all mounted on the copper side of the PCB. These parts are shown dotted on the layout diagram (Fig.2). Cut the pot shafts to a length of 15mm before installing the pots on the PCB.

Note that the switches are mounted on 5mm standoffs to provide clearance for the pivot assemblies. Short lengths of hookup wire are used to make the connections between the switch terminals and the PCB, and between the various pot terminals and the PCB.

The completed PCB can now be put aside and attention turned to the case. Two self-adhesive aluminium labels are supplied with the complete kit and these should be carefully affixed to the lid of the case and to the rear panel. This done, the case can be drilled and filed to accept the pot shafts and switch actuators, and to accept the two microphone sockets on the rear panel.

Specifications

Gain

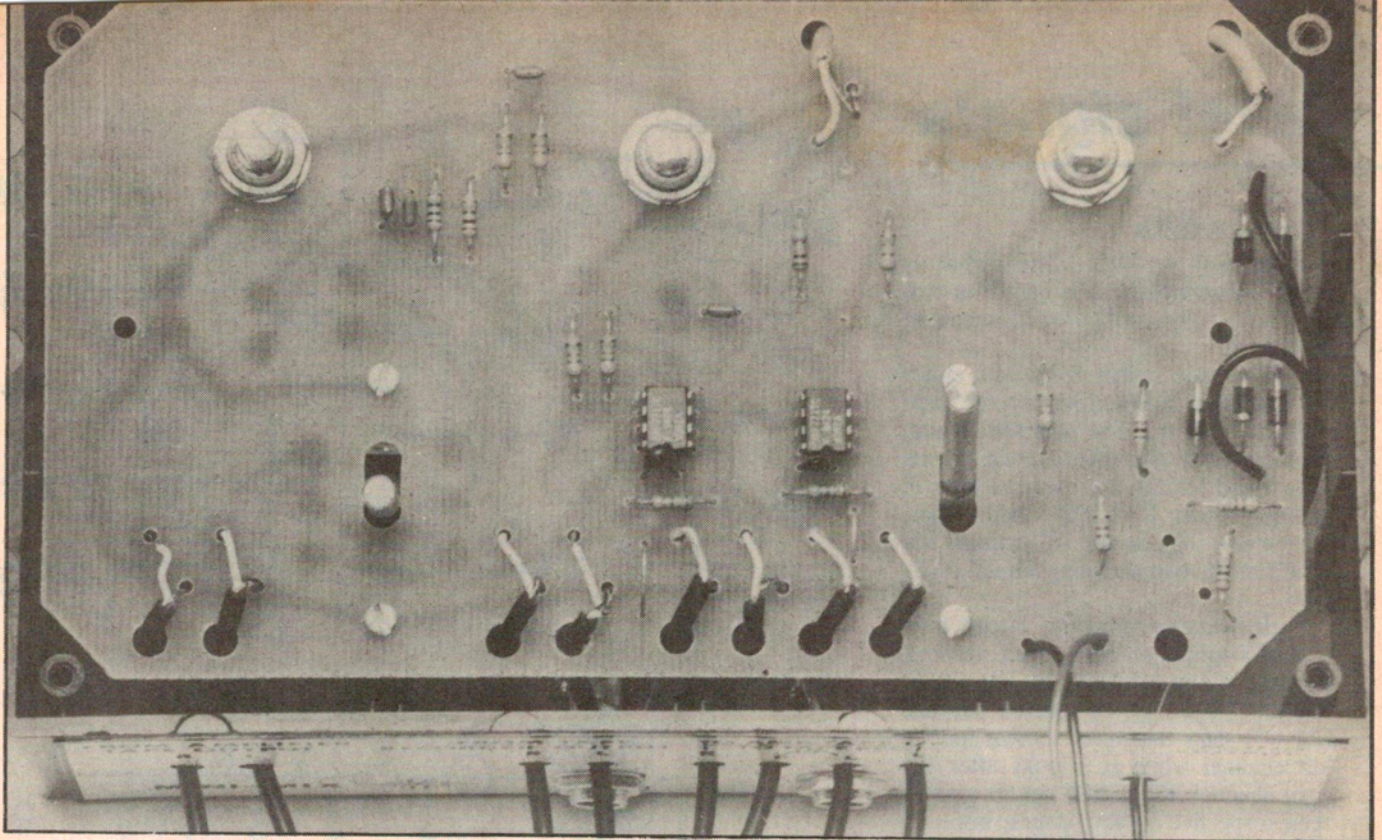
Line inputs 6.5dB (1kHz)
Mic. inputs 33.5dB (1kHz)

Signal-to-noise ratio

Line inputs 66dB (1V output)
Mic. inputs 62dB (1V output)

Frequency response

Line inputs 10Hz-20kHz (-3dB)
Mic. inputs 70Hz-20kHz (-3dB)



The PCB should only take a few minutes to assemble. Take care with component orientation and note that the external leads are run through strain relief holes in the PCB.

You will also have to drill a series of entry holes on the rear panel for the external connecting leads and for the power supply leads. These holes can all be 4mm in diameter.

Finally, two 3mm mounting holes should be drilled in the front panel (to match the PCB mounting holes), along with a hole for the indicator LED. The latter should be a push fit into its

mounting hole and can be permanently secured with a dab of epoxy adhesive.

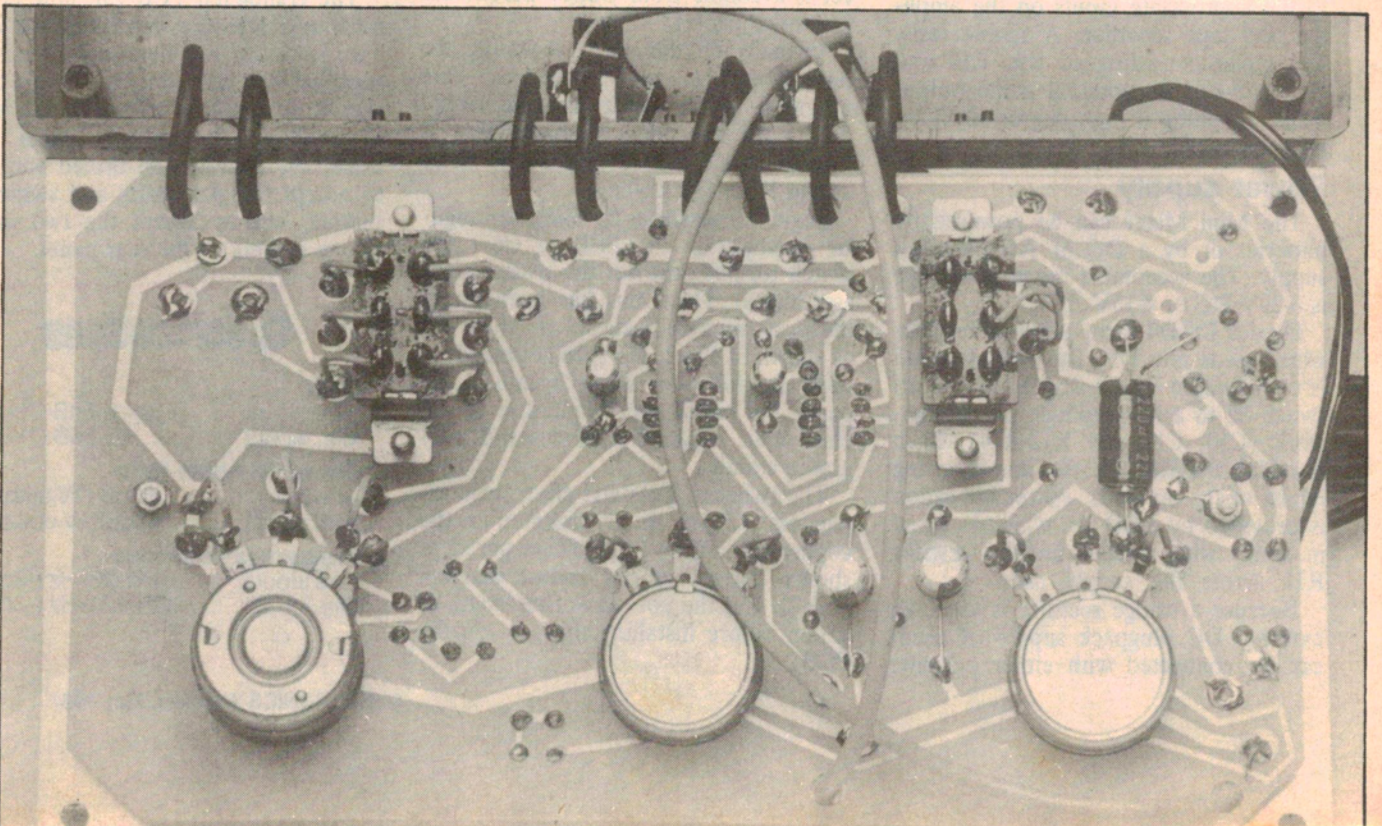
All that remains now is the wiring and final assembly. The input, output and power leads are run to the PCB via the holes provided in the rear panel and via the strain relief holes on the PCB itself (see photo). The RCA sockets are wired using short (approx. 200mm) lengths of shielded audio cable while

the LED is connected using ordinary hookup wire.

Be careful not to confuse the anode and cathode leads, otherwise the LED won't work.

Once the wiring has been completed, go over your work and carefully check for wiring errors. In particular, check that all polarised parts have been installed correctly. This done, the PCB

The pots, switches and electrolytic capacitors are all mounted on the copper side of the PCB.



can be mounted on the front panel on 5mm spacers and secured using machine screws and nuts.

Testing

It is a good idea to check the power supply voltages before connecting the unit to your amplifier. To do this, switch on and check that the supply voltage across C9 is between 6V and 20V DC. If this is correct, check that the voltage on pin 3 of each IC is at half supply.

It's now simply a matter of hooking the unit up to your amplifier, plugging in a microphone, and testing to see that everything works correctly. You should be able to vary the relative levels of the different signal sources using the front panel controls.

Finally, note that R1 and R6 may be reduced to increase the line input sensitivity. This may be necessary in order to use the line inputs as instrument inputs. $\text{\textcircled{2}}$

PARTS LIST

- 1 PCB, code 87mx5, 182 x 10mm
- 2 DPDT toggle switches
- 1 plastic case, 195 x 113 x 60mm
- 1 self-adhesive label for front panel
- 1 self adhesive label for rear panel
- 4 RCA/RCA shielded audio leads (cut in half)
- 2 6.5mm microphone sockets
- 1 plugpack power supply (see text)
- 6 5mm standoffs

Semiconductors

- 5 1N4004 silicon diodes
- 2 TL071 JFET input op-amps
- 1 5mm red LED

Capacitors

- 1 470 μ F 25VW electrolytic
- 2 22 μ F 16VW low leakage electrolytic
- 2 4.7 μ F 16VW low leakage electrolytic
- 4 0.1 μ F monolithic
- 2 1pF disc ceramic

Resistors (0.25W, 5%)

- 2 x 2.2M Ω , 3 x 1M Ω , 1 x 100k Ω , 6 x 47k Ω , 2 x 10k Ω , 1 x 1.2k Ω , 1 x 100k Ω linear dual gang potentiometer, 2 x 50k Ω linear single gang potentiometers

Miscellaneous

- Hookup wire, machine screws and nuts, shielded audio cable.

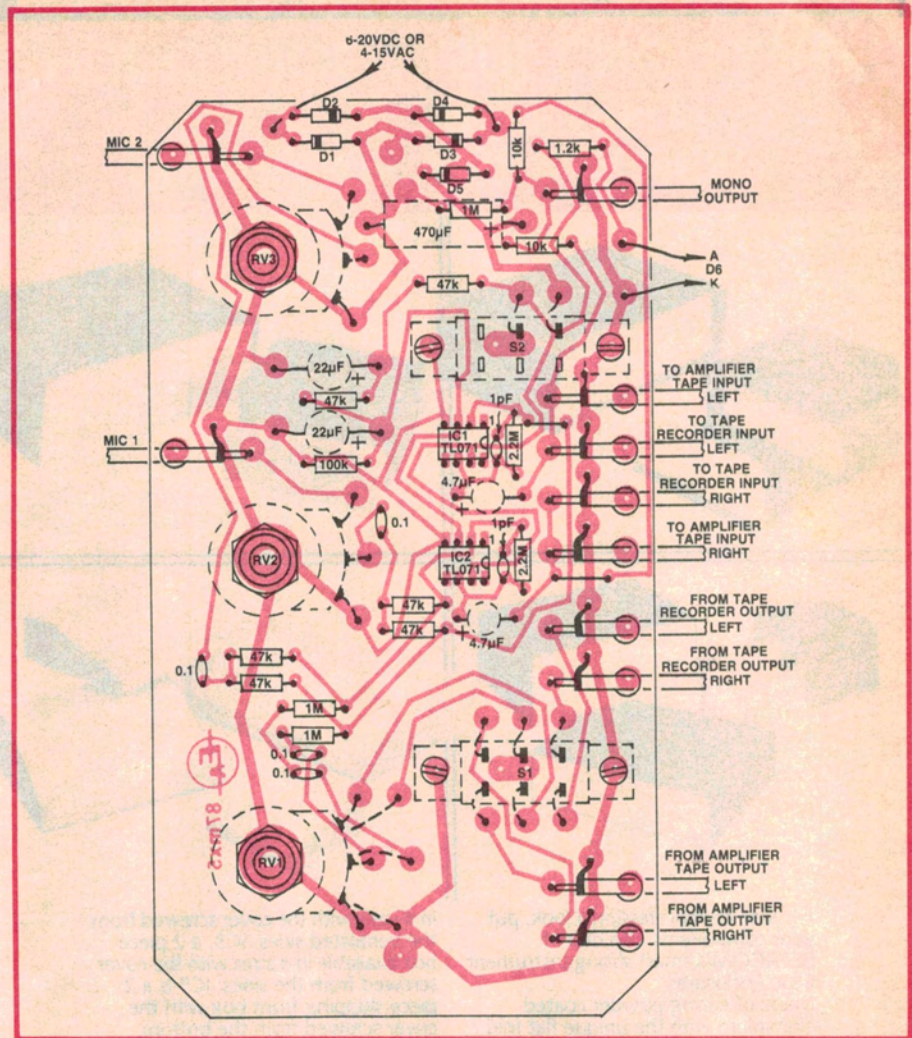
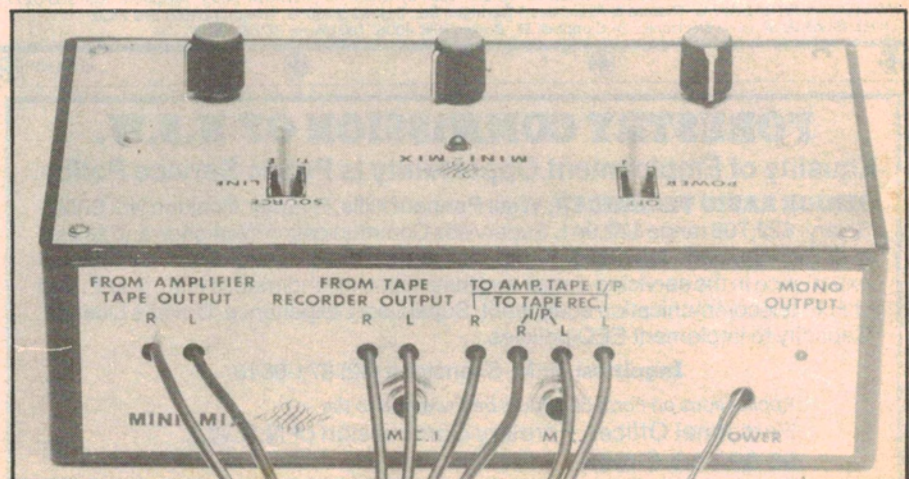


Fig.2: the parts shown dotted are all mounted on the copper side of the PCB.

Where to buy parts: parts for this project are available from Oatley Electronics, 5 Lansdowne Pde (PO Box 89), Oatley, NSW 2223. Phone (02) 579 4985. Note: copyright for the PC artwork for this project is owned by Oatley Electronics.

Prices are as follows:

- PCB plus on-board components \$27.95
- Complete kit of parts (excluding plugpack) \$48.95
- 12V AC plugpack \$11.50



The two microphone jack sockets are mounted on the rear panel.