By JOHN CLARKE

Microphone preamp for PCs and MP3 players

Want to connect a professional microphone with balanced outputs to the line input of your PC's soundcard or an MP3 player for high-quality voice recordings? This microphone preamp circuit lets you do just that. It features a balanced input, has a clipping indicator LED and can be powered from a USB port or from an external DC source.

ALTHOUGH most PCs have a microphone input for recording, these inputs are for basic electret microphone types only. Electret microphones are typically used in headsets and are generally of low quality.

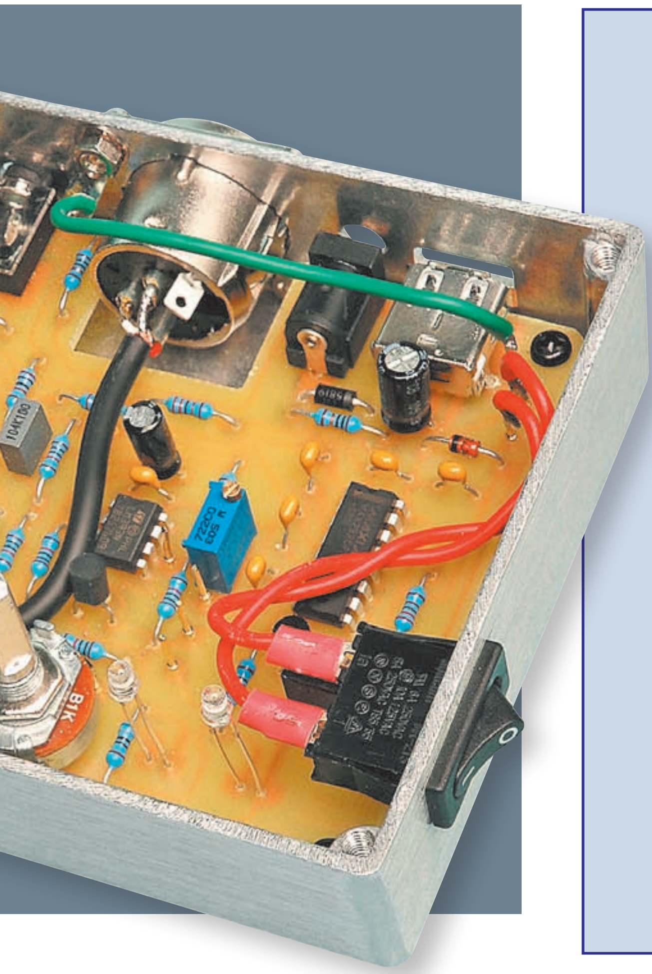
Similarly, some MP3 players include an internal electret microphone for recording, but again, the quality is limited. These players often also include a line input, to accept external audio signals.

Using an electret microphone will generally be satisfactory for recording brief announcements and reminders. However, if you want really good sound quality, a professional microphone will be required. This type of microphone will also be necessary when the microphone needs to be more than just a metre or two away from the computer or MP3 player.

Why are they better

So why do the professional microphones give better sound than low-cost electret microphones? There are several reasons.

First, professional microphones use a high-quality microphone element



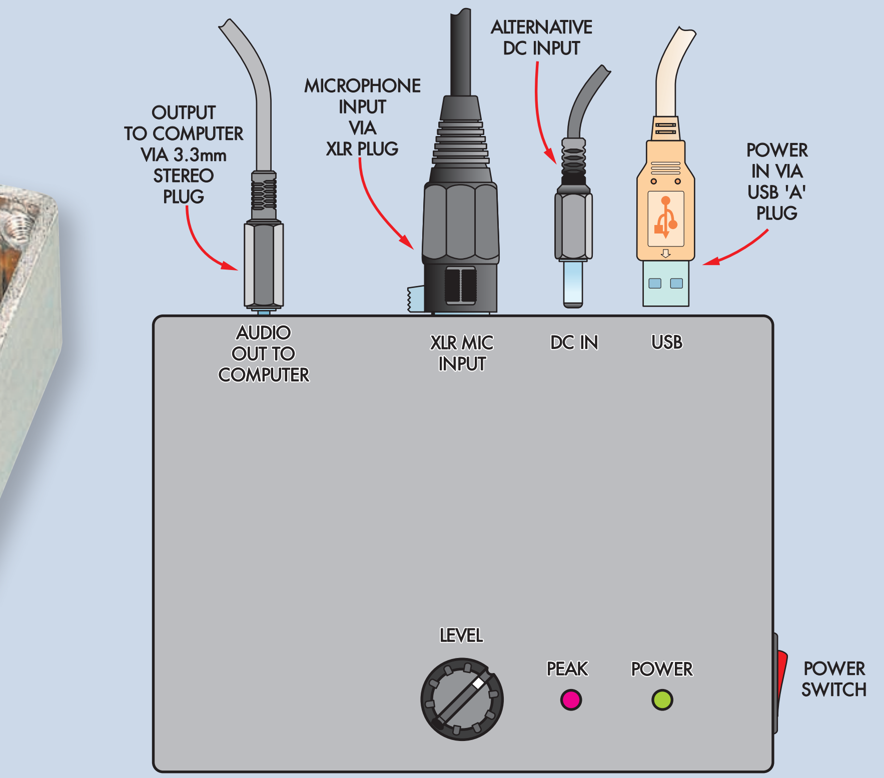


Fig.1: this diagram shows how the Balanced Microphone Preamplifier is connected to a computer. Power can come either from a USB port or from an external DC plugpack supply (see text).

Main Features

- Balanced input
- Stereo output
- USB or plugpack powered
- Level control
- Peak indicator
- Line level output

that has a smooth frequency response, plus low noise and low distortion. Typical low-cost electrets do not have a smooth frequency response, but a response that peaks around the mid audio frequencies. And while low-cost electret microphones readily detect handling and breathing noises, professional microphones are designed to minimise this problem.

Professional microphones also have a tailored pickup response that is more sensitive towards the front of the microphone than to the rear. This lack of sensitivity towards the rear helps prevent unwanted noise pickup.

Another advantage of professional microphones, particularly for voice recordings, is that they give more depth to the sound. That's because the bass response is more pronounced when the microphone is brought close to the mouth. A headset electret microphone, on the other hand, usually has a poor bass response.

Taken together, these refinements mean that a professional microphone will produce a recording that sounds far crisper and cleaner than one from an electret microphone – all without extraneous noises masking the wanted sound.

Of course, electret microphones are ideal for many applications. In fact, high-quality electret microphone inserts are often used in professional microphones and can produce excellent sound quality when placed inside a professional microphone housing. It's just that if you want high-quality recordings, a professional-quality microphone is the way to go.

Balanced outputs

While professional microphones can come in many forms (eg, dynamic and electret types), they all have one thing in common, and that

Specifications

Signal-to-noise ratio: 80dB with respect to 1V output and 50mV input and with 600Ω input loading impedance (this measurement includes a 20Hz to 22kHz bandpass filter).

Frequency response: within 0.25dB from 20Hz to 20kHz.

Total harmonic distortion: less than 0.01% at 1V output and 50mV input for all frequencies from 20Hz to 20kHz.

Signal handling: 2.8V RMS output

Sensitivity for 1V out: 9mV

Parts List – Balanced Microphone Pre-amp

1 PC board, code 780, available from the *EPE PCB Service*, size 102mm × 83mm
1 diecast aluminium box, size 119mm × 94mm × 34mm
1 3-pin small size female XLR panel socket
1 Type-A PC-mount USB socket
1 2.5mm PC-mount DC socket
1 3.5mm PC-mount stereo jack socket
1 Ultra-mini SPST rocker switch (S1)
1 knob to suit potentiometer
4 M3 tapped × 6.3mm standoffs
8 M3 × 5mm screws
2 M3 × 10mm screws
2 M3 nuts
4 M3 flat washers
1 solder lug
17 PC stakes
1 150mm length of red medium-duty hookup wire
1 75mm length of green medium-duty hookup wire
1 75mm length of 2-core shielded cable
1 25mm length of 6mm diameter heatshrink tubing
4 rubber feet

Semiconductors
2 TL072CP dual op amps (IC1,IC2)
1 LM393N dual comparator (IC3)
1 MAX232CPE RS232 line driver (IC4)
1 LM336-2.5 2.490V reference (REF1)
1 BC327 PNP transistor (Q1)
1 5.6V 1W Zener diode (ZD1)
1 1N5819 1A Schottky diode (D1)
1 3mm green LED (LED1)
1 3mm red LED (LED2)

Capacitors
1 100µF 25V PC electrolytic
2 22µF NP electrolytic
1 10µF 16V PC electrolytic
6 1µF monolithic ceramic
2 100nF MKT polyester
4 220pF ceramic
2 100pF ceramic

Resistors (0.25W 1%)

1 220kΩ	1 180Ω
3 100kΩ	2 150Ω
2 22kΩ	1 68Ω 1W (R1)
1 20kΩ	1 39Ω 1W (R1)
12 10kΩ	2 33Ω
1 2.2kΩ	1 10Ω
2 680Ω	1 10Ω (R1)

1 1kΩ 16mm linear pot (VR1)
1 50kΩ multi-turn top-adjust trimpot (VR2)

is a balanced output. A balanced output provides two signals that are 180° out of phase with each other. These signals are fed out via a 3-pin XLR plug that connects to a matching 3-pin XLR socket on the microphone lead.

As a result, the two balanced microphone signals are fed down the microphone cable via separate leads. These leads are 'shielded' to help prevent them picking up noise and mains hum. In addition, this arrangement effectively removes any noise that is picked up when connected to a balanced input on an amplifier.

In operation

In operation, the balanced leads each pick up the same noise signals along the length of the microphone lead. That's because these leads are run very close to each other, often as a twisted pair. When fed into a balanced amplifier, the signal from each lead is subtracted and this removes the common noise signal in each lead (ie, the noise signals are cancelled out by the amplifier because they are in phase).

The wanted audio signals from each microphone lead are also subtracted, but because these are in anti-phase, the signal level is actually doubled as a result of the subtraction. This means that balanced microphone leads can be many metres long without any noticeable increase in noise pickup.

In addition, the output impedance of professional microphones is usually very low, and this also minimises noise pickup. Impedances are often well below the standard 600Ω, with some high-quality microphones having an output impedance as low as 150Ω.

Of course, a balanced amplifier is also required in order to use a balanced microphone, and this is always found on professional audio gear. We also published a *Balanced/Unbalanced Converter for Audio work* in the September 2010 issue of *EPE* (it can convert signals both ways).

In operation, the balanced amplifier correctly subtracts the balanced signals and provides the gain required to bring the signal level up to line levels. This means that the recording can be made using the line input rather than the microphone input at the computer. Alternatively, for an MP3 player, you can again use the line input and forget about the internal microphone.

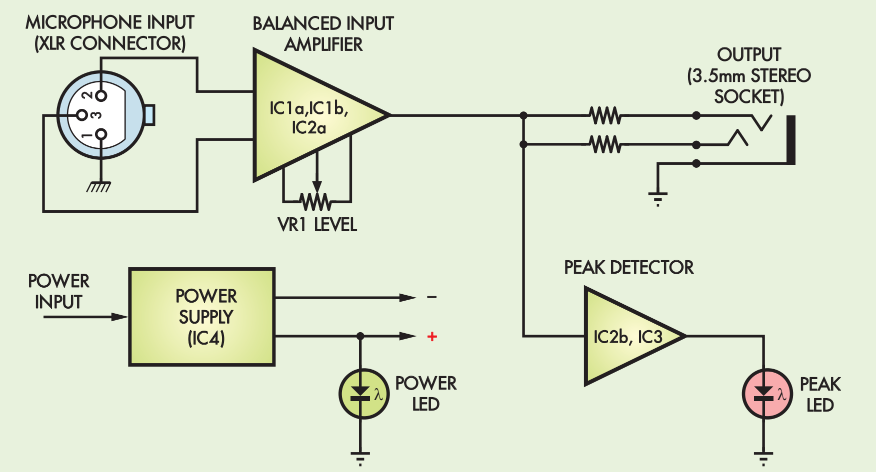
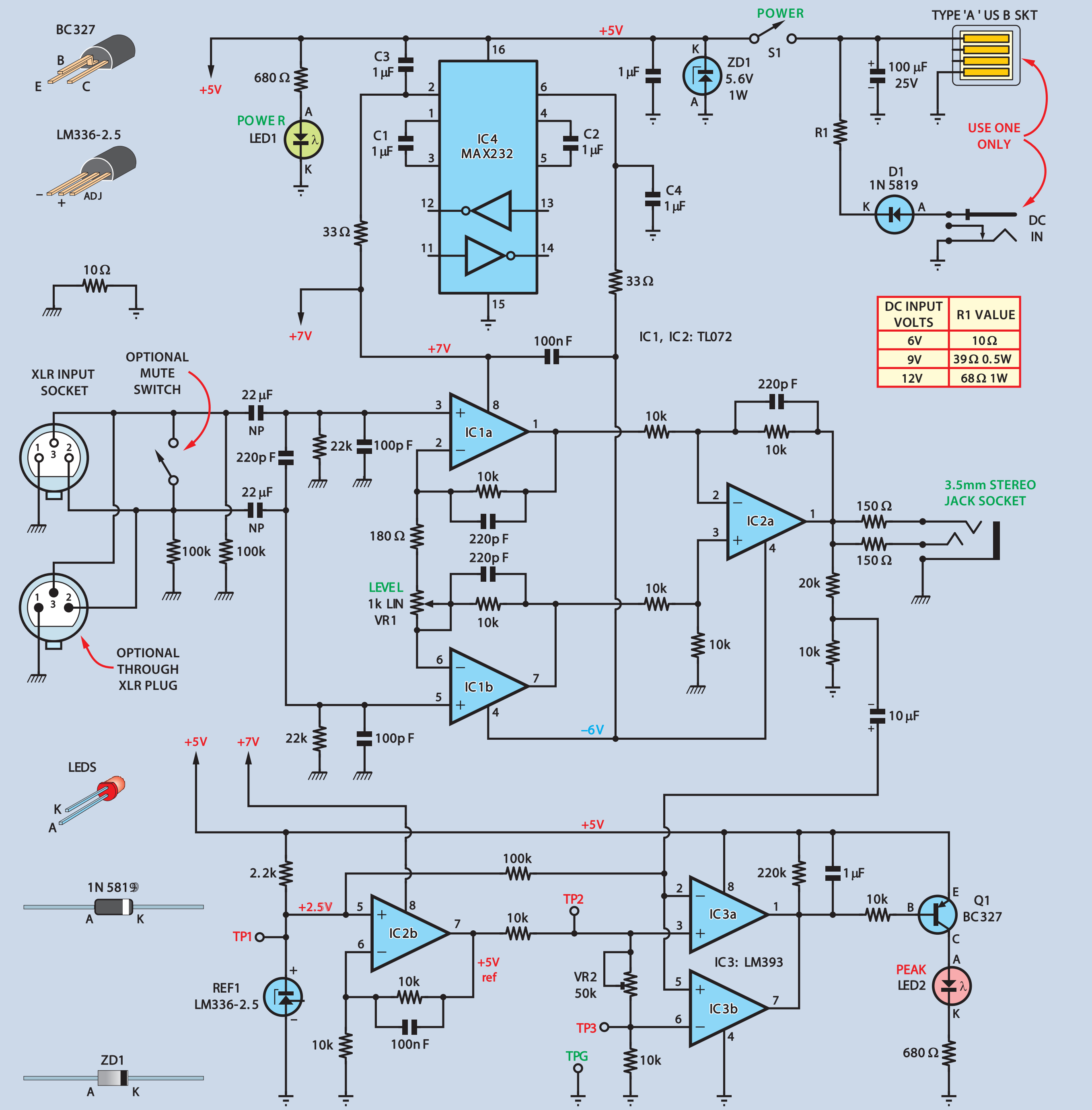


Fig.2: the block diagram of the Balanced Microphone Preamplifier. The balanced signals from the XLR socket are amplified by IC1a and IC1b and summed in IC2a to give an unbalanced output that is fed to the output socket. IC2b, IC3 and the associated LED provide peak level indication,



MICROPHONE PREAMP FOR COMPUTERS AND MP3 PLAYERS

Fig.3: the full circuit diagram. IC4 functions as a charge-pump converter to provide +7V and –6V supply rails for IC1 and IC2. IC1a and IC1b are wired as non-inverting amplifier stages, while IC2a sums their outputs. IC3a and IC3b function as a window comparator. They compare a sample of the output signal with reference voltages set by REF1, IC2b and VR2.

Recording at line levels also helps to minimise noise. That's because the signal does not have to pass through an internal preamplifier in the computer or MP3 player.

How it's connected

How the *EPE* Microphone Preamplifier is connected to a computer is shown in Fig.1. It includes the 3-pin XLR connection for the microphone lead and a stereo 3.5mm jack socket output. The connection is made to the computer using a 3.5mm stereo jack-to-jack lead or a 3.5mm stereo jack to phono plug lead if the computer has phono inputs.

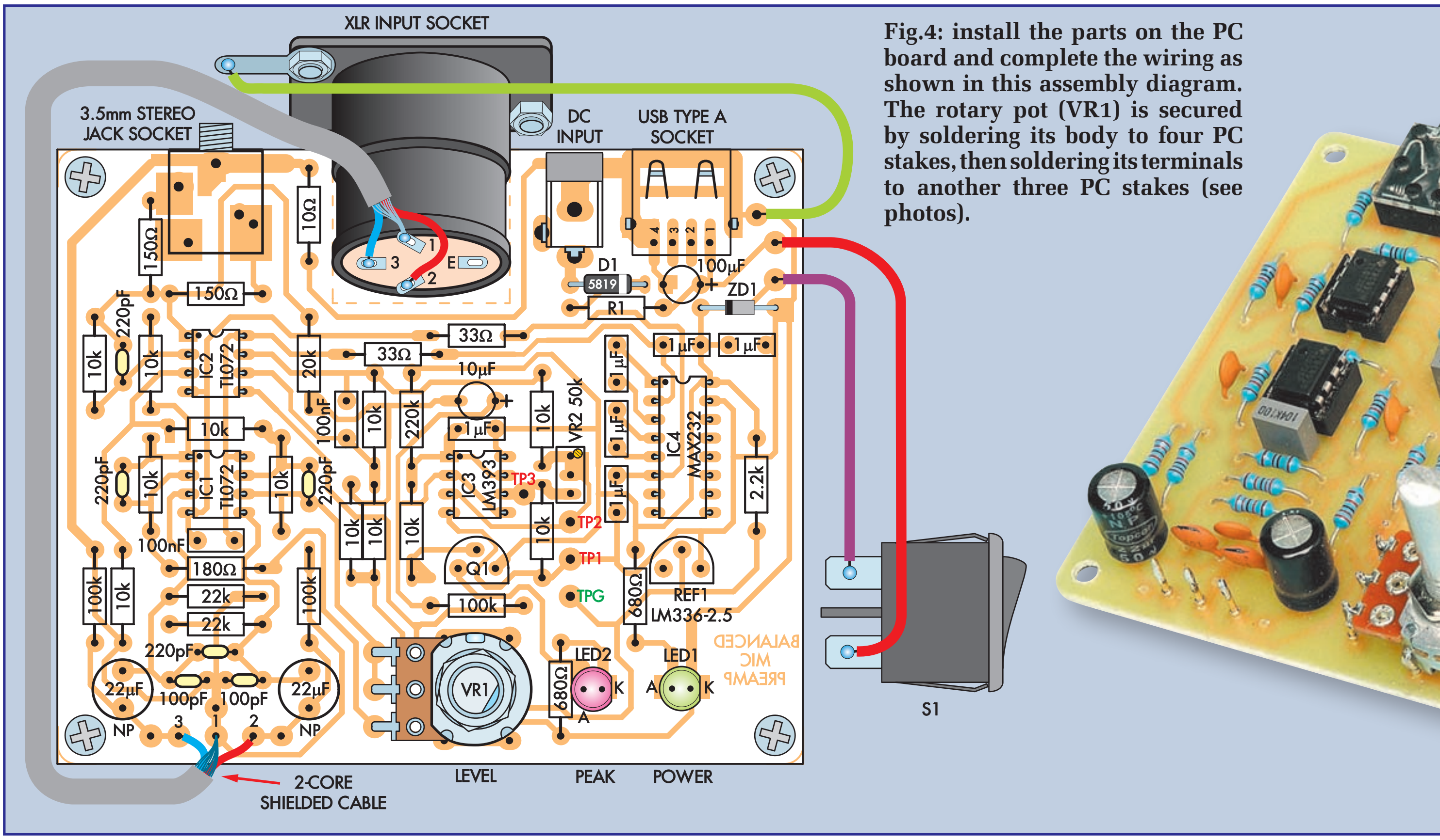


Fig.4: install the parts on the PC board and complete the wiring as shown in this assembly diagram. The rotary pot (VR1) is secured by soldering its body to four PC stakes, then soldering its terminals to another three PC stakes (see photos).

Power for the unit can come from either a DC plugpack supply or from the computer's USB port. In the latter case, the USB port provides a +5V rail to the preamp via a standard 'A' Male to 'A' Male USB connector lead.

In operation, the preamp is switched on and off via a power switch on the side of the case and a 'Power' LED lights when the unit is on. The output signal level is adjusted using a pot (VR1) and a peak indicator LED lights when the signal exceeds line level.

If the peak indicator LED lights, then the signal level is too high. This will cause clipping and distortion in the recording. In practice, it's simply a matter of adjusting the level to avoid any peak indication during microphone use.

Fig.2 shows the block diagram of the Microphone Preamplifier. The balanced microphone signal is fed in via the XLR input socket, and the two anti-phase signals are then amplified by op amps IC1a and IC1b. The signals are then subtracted in IC2a and fed to the output stereo jack socket.

The peak detector circuit monitors the output signal level and flashes the Peak indicator LED when the signal exceeds the threshold level. This circuit comprises IC2b and IC3, plus the LED itself.

Circuit details

Refer now to Fig.3 for the complete circuit details.

As shown, the balanced input signals from the microphone are coupled in via 22µF non-polarised capacitors and fed to the non-inverting inputs of op amps IC1a and IC1b (pins 3 and 5). These input signal lines (ie, pins 2 and 3 on the XLR socket) are each tied to ground using a 100kΩ resistor, to prevent them from floating with no input connected.

The 220pF capacitor across the two inputs shunts radio frequencies, while the two 100pF capacitors at pins 3 and 5 also shunt RF signals to ground.

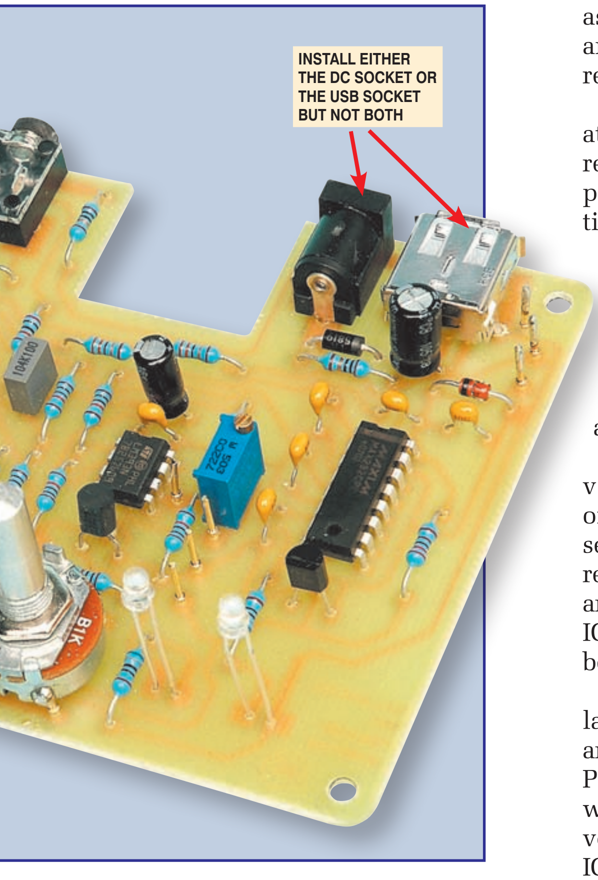
Pins 3 and 5 of the op amps are each tied to ground via a 22kΩ resistor, again to prevent spurious operation in the absence of an input signal. Note, the signal ground and supply ground are isolated in this part of the circuit to reduce earth loops, and this is the reason for the different earth symbols shown.

Op amp IC1a amplifies the pin 3 microphone signal, while IC1b amplifies the pin 2 signal. Both are configued as non-inverting amplifiers with 10kΩ feedback resistors, while a 180Ω resistor and a 1kΩ pot (VR1) are connected in series between their inverting inputs. The 220pF capacitors across the 10kΩ resistors roll off the high-frequency response above 70kHz.

The Level control, VR1, varies the gain of IC1a and IC1b between about 9 and 56. The outputs from these op amps appear at pins 1 and 7, and are summed in unity gain differential amplifier IC2a.

For signals coming from IC1a, IC2a functions as an inverting amplifier with a gain of –1, as set by its 10kΩ feedback resistors. However, for signals on its pin 3 input, IC2a operates as a non-inverting amplifier with a gain of 2. Because of this, the signal from IC1b is divided by two using a 10kΩ resistive divider before being applied to IC2a.

This means that each signal path from IC1a and IC1b has overall unity gain through IC2a. However, IC2a inverts the signals from IC1a, so that they are now in phase with the signals from IC1b. As a result, both signals add to provide an overall gain of 2 for the stage (ie, IC2a sums its two input signals).



The resulting unbalanced signal appears at pin 1 of IC2a and is fed to the left and right terminals of a 3.5mm stereo jack socket via 150Ω isolation resistors. The 220pF feedback capacitor across IC2a rolls off the high-frequency response of this stage.

Peak detector

IC2a's output also drives the peak detector circuit. This consists of op amps IC3a and IC3b, which are wired as a window comparator, plus IC2b and REF1, which provide an accurate reference voltage for the comparator.

As shown, the signal level is first attenuated using a 20kΩ and 10kΩ resistive divider and then coupled to pins 2 and 5 of IC3a and IC3b respectively via a 10µF capacitor.

REF1, an LM336-2.5, is used to provide a 2.5V reference, and this is applied to the pin 5 input of op amp IC2b. This stage operates as a non-inverting amplifier with a gain of 2, and provides a +5V reference at its pin 7 output.

This reference voltage is fed to a voltage divider network consisting of a 10kΩ resistor, trimpot VR2 and a second 10kΩ resistor to ground. As a result, two different reference voltages are applied to pins 3 and 6 of IC3a and IC3b, with VR2 used to set the voltage between these inputs.

These two reference voltages are labelled as TP2 and TP3 on Fig.3, and are equally spaced either side of 2.5V. Pin 3 of IC3a is set to the TP2 voltage, while pin 6 of IC3b is biased to the TP3 voltage. The pin 2 and pin 5 inputs of IC3a and IC3b are biased to the 2.5V reference set by REF1 via a 100kΩ resistor. As a result, the signal from IC2a swings above and below this 2.5V reference.

Note that IC3's outputs are open collector, so the outputs can be tied together. They are connected to the +5V rail via a 220kΩ resistor and so are normally held high.

Signal levels

Provided that the signal level at pins 2 and 5 does not exceed the reference thresholds (ie, doesn't go above or below these levels), the outputs of IC3a and IC3b will remain high due to the pull-up resistor. Conversely, if the signal exceeds one of these reference threshold voltages, the corresponding op amp will switch its output low.

Thus, if the voltage on pin 2 of IC3a goes above the reference voltage on pin 3, IC3a's output will switch low. Similarly, if the voltage on pin 5 of IC3b goes below the voltage on pin 6, output pin 7 of IC3b will switch low.

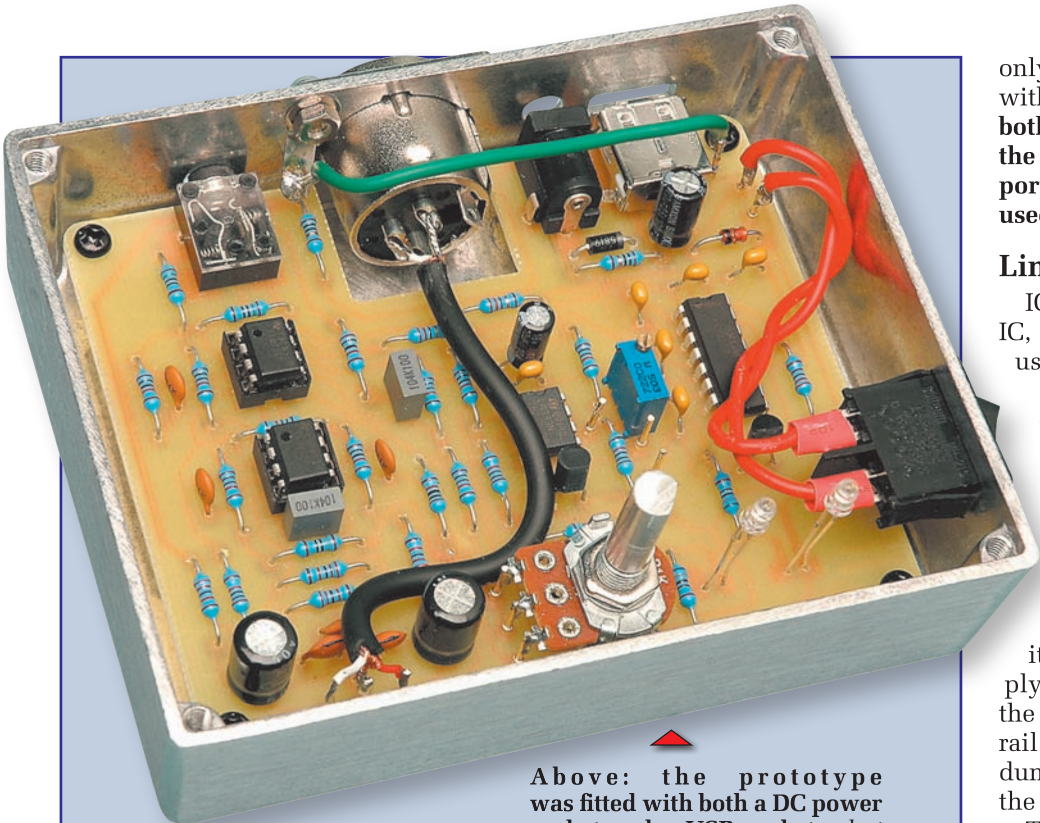
This output low from either comparator then turns on *PNP* transistor Q1 and lights the Peak indicator LED (LED2). The associated 1µF capacitor between the op amp outputs and the +5V rail ensures that the outputs remain low for 200ms after the comparator switches off, so that very fast overload transients aren't missed.

In practice, trimpot VR2 is set so that the TP2 and TP3 reference voltages are 442mV above and below the 2.5V reference respectively. This corresponds to a 1V RMS sinewave signal at IC2a's output.

Note that for a 1V RMS sinewave, the peak voltage is 1.414V. This is divided by 3.2 using the resistive divider on IC2a's output and the 100kΩ resistor at pins 2 and 5 of IC3a and IC3b. As a result, the 1.414V peak is reduced to 441.8mV, which is why trimpot VR2 is adjusted for 442mV above and below 2.5V at 'test' points TP2 and TP3 to give peak indication when IC2a's output signal goes above the 1V RMS level.

Table 1: Resistor Colour Codes

❏	No.	Value	4-Band Code (1%)	5-Band Code (1%)
❏	1	220kΩ	red red yellow brown	red red black orange brown
❏	3	100kΩ	brown black yellow brown	brown black black orange brown
❏	2	22kΩ	red red orange brown	red red black red brown
❏	1	20kΩ	red black orange brown	red black black red brown
❏	11	10kΩ	brown black orange brown	brown black black red brown
❏	1	2.2kΩ	red red red brown	red red black brown brown
❏	2	680Ω	blue grey brown brown	blue grey black black brown
❏	1	180Ω	brown grey brown brown	brown grey black black brown
❏	2	150Ω	brown green brown brown	brown green black black brown
❏	1	68Ω	blue grey black brown	blue grey black gold brown
❏	1	39Ω	orange white black brown	orange white black gold brown
❏	2	33Ω	orange orange black brown	orange orange black gold brown
❏	1	10Ω	brown black black brown	brown black black gold brown



Above: the prototype was fitted with both a DC power socket and a USB socket – *but you should only fit one or the other* **– see text.**

The rear panel carries the XLR socket and has access holes for the USB connector (left), the adjacent DC power socket and the line output jack.

Power supply

As mentioned previously, the unit can either be powered from a USB port or via a DC plugpack. Diode D1 provides reverse polarity protection if a DC plugpack is used, while series resistor R1 depends on the plugpack voltage (see table on circuit).

In practice, any 300mA DC plugpack with an output voltage of 6V, 9V or 12V can be used.

A 100μF capacitor filters the incoming supply rail, while S1 is the power on/off switch. Zener diode ZD1 ensures that the resulting supply rail is limited to 5.6V to prevent damage to IC4, while R1 is necessary to prevent excessive current through ZD1.

Note that no reverse supply protection is provided for the USB supply since this uses a polarised connector that cannot be reversed. Note also that only one type of supply should be used with this preamplifier. **DO NOT install both a USB socket and a DC socket on the PC board, as damage to the USB port could occur if both supplies were used at the same time.**

Line driver

IC4 is a MAX232 RS232 line driver IC, but the line driver section is not used in this circuit. Instead, we are simply using it to generate the necessary *plus* and *minus* supply rails for the rest of the circuit.

Basically, the MAX232 includes two internal charge pumps that convert the +5V supply to nominal unloaded ±10V rails. The first converter switches capacitor C1 and dumps its charge into C3 to double the supply to derive the +10V rail. Similarly, the second converter inverts this +10V rail by switching C2 at a rapid rate and dumping the charge into C4, to provide the –10V rail.

This switching of C1 and C2 takes place at a nominal 400kHz rate.

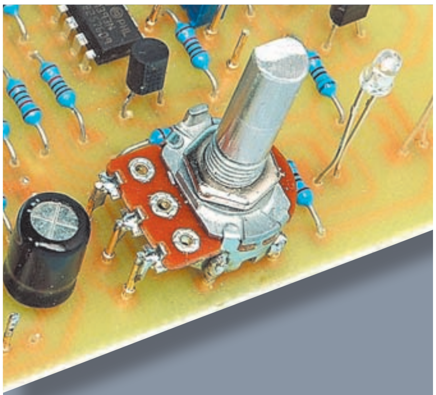
In practice, the resulting supply rails are loaded down to about +7V and –6V by op amps IC1 and IC2. Note, however, that the LM393 op amps (IC3a and IC3b) are powered directly from the +5V supply rail, to prevent excessive loading on IC4.

The positive and negative supply rails generated by IC4 appear at pins 2 and 6 respectively and are decoupled using 33Ω resistors. In addition, these rails are bypassed using a 100nF capacitor to minimise supply noise. The power LED (LED1) is driven from the +5V rail via a 680Ω resistor.

Finally, note that the signal earth for the preamplifier and the earth for the power supply are isolated via a 10Ω resistor. This reduces any current flow in the ground when the preamplifier is connected to a computer using both USB power and the stereo 3.5mm jack to feed in the signal. This is necessary because in this case there would be two earth paths between the unit and the computer – one via the USB connector and the other via the audio connection.

Construction

Construction is straightforward, with most of the parts mounted on a single-sided PC board, code 780, measuring 102mm × 83mm. This PC board is available from the *EPE PCB*



This close-up view shows how the Level Control potentiometer (VR1) is mounted on the PC board.

Service. The board is housed in a die-cast aluminium box measuring 119mm × 94mm × 34mm.

Begin construction by checking the PC board for any defects such as shorted tracks and breaks in the copper tracks. Check also that the hole sizes are correct by test fitting the major parts, ie, the 3.5mm stereo jack socket and either the DC socket or the USB socket. The holes for the four-corner mounting screws should be 3mm in diameter.

Finally, check that the PC board fits into the box and that the cutout has been made for the XLR socket.

Board assembly

Fig.4 shows the parts layout on the board. The resistors can be installed first. Table 1 shows the resistor colour codes, but a digital multimeter should be used to check each resistor before soldering it in place.

Follow these with the ICs, taking care to ensure that they are correctly oriented. Make sure also that the LM393 goes in the IC3 position. We used sockets for IC1 and IC2, but this is unnecessary and you can solder the ICs straight in if you wish.

Next on the list are PC stakes for all the following: test points TP1 to TP3, TP GND, the GND terminal, the switch terminals, the potentiometer mounts and its terminal connections, and the three input terminals (to terminate the stereo shielded cable from the XLR socket). Note that four PC stakes are used to support the metal body of VR1, which sits about 1mm above the PC board (see photos).

Transistor Q1 (BC327) and the LM336-2.5 voltage reference (REF1) can now be installed, followed by diode D1 and Zener diode ZD1. Take care to ensure that they are all oriented correctly and don't get Q1 and REF1 mixed up (they look alike). Note that D1 and ZD1 face in opposite directions.

The capacitors can go in next. Be sure to orient the electrolytic types as shown in Fig.4. That done, install the 10-turn trimpot VR2, then solder potentiometer VR1's metal body to its four PC stakes.

To do this, first bend the pot's three terminals down at right angles, then

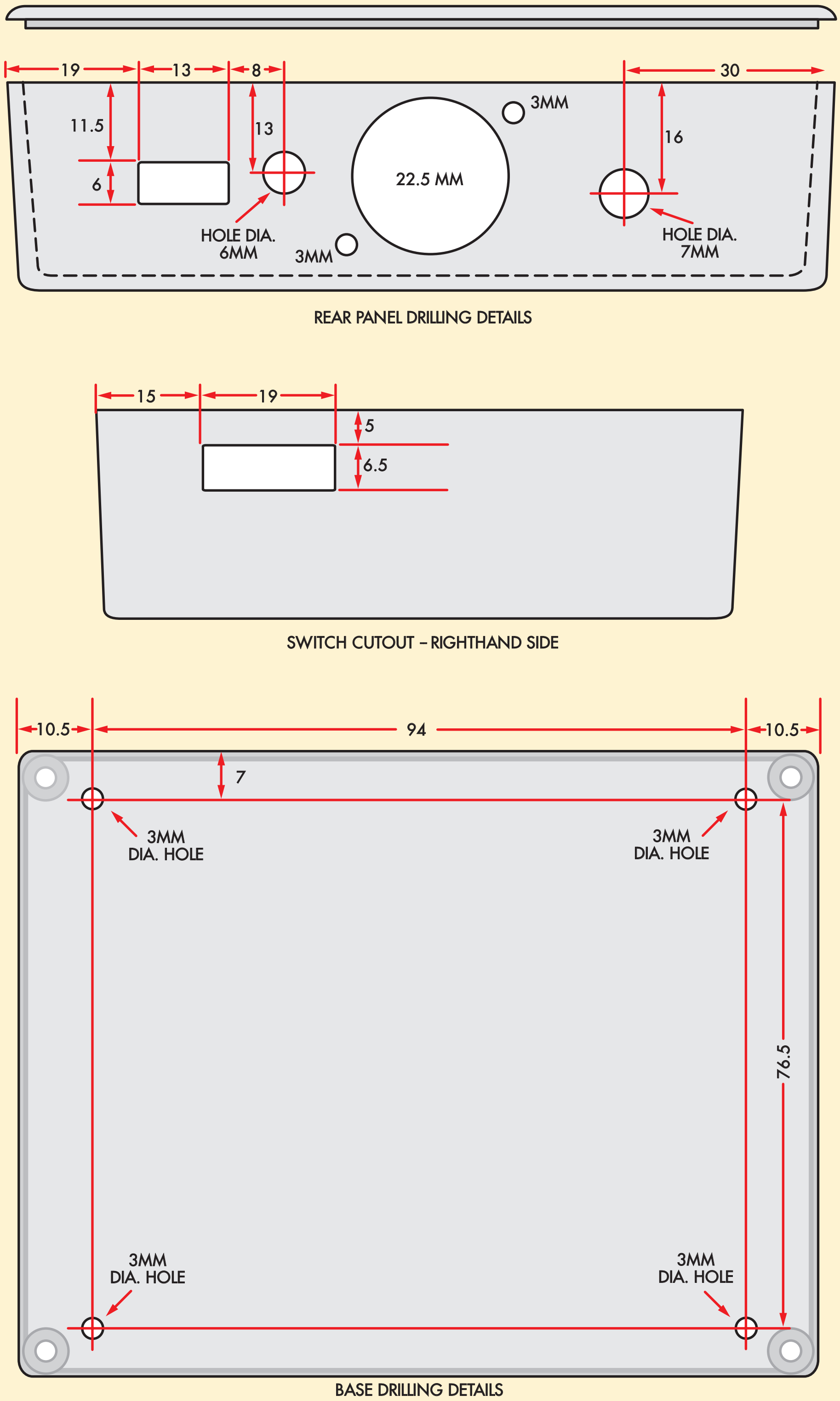


Fig.5: follow this diagram to mark out and drill the holes in the metal case. Alternatively, the diagram can be photocopied and used as a drilling template.

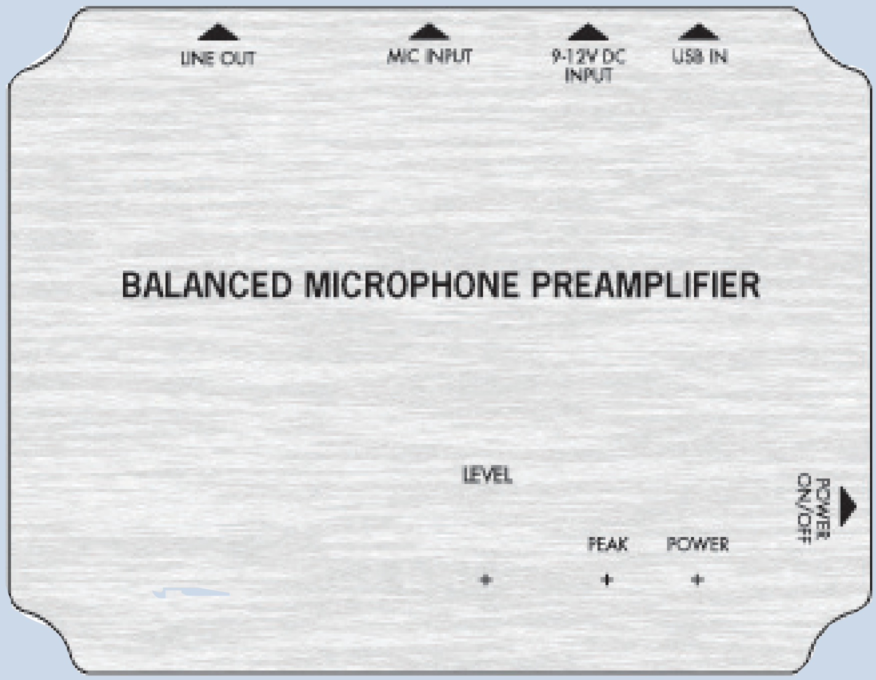


Fig.6: this full-size front panel artwork shows the hole locations for the Level control and the two LEDs. Drill the Level control hole to 7mm and the holes for the LEDs to 3mm

position the potentiometer vertically on the board and push its metal body down between the four PC stakes until it sits about 1mm proud of the board. Mark the solder points on the body, then remove the pot and scrape away the anodised coating at those points.

Next, cut the pot shaft off about 17mm from its threaded boss, then reposition the pot on the board and solder it's body to the four PC support stakes. The pot mounting can then be completed by soldering its three terminals to the adjacent PC stakes.

The two LEDs are mounted with the tops of their lenses exactly 25mm above the PC board. A 20mm-wide cardboard strip slipped between the leads of each LED makes a handy 'stand-off' tool when soldering them in position. Note that in each case, the anode (A) lead (the longer of the two) goes to the left.

Finally, you can complete the PC board assembly by installing the 3.5mm stereo jack socket and **either the DC power socket or the USB socket (but NOT both).** This depends, of course, on how you intend to power the unit. As previously stated, **you must not fit both because the computer could be damaged if both supplies were connected at the same time.**

Case preperation

If you buy a complete kit for this design, it will probably be supplied with all the case holes pre-drilled and with a screen printed front-panel label. If not, you will have to drill the holes yourself.

The full-size front panel layout is shown in Fig.6. This can be photocopied and used as a drilling template. You will need to drill 3mm holes for the Power and Peak indicator LEDs, plus a 7mm hole for the Level pot shaft. The latter is best made by drilling a pilot hole and then carefully enlarging it using a tapered reamer.

Next, you will have to drill holes in the rear panel for the 3.5mm jack socket, the XLR socket and either the DC input socket or the USB socket. Fig.5 shows the drilling details.

You will need to drill a 6mm hole for the DC input socket, while the stereo jack socket requires a 7mm hole. The square cutout for the USB socket can be made by first drilling a row of small holes and then carefully filing to the final shape.

The large hole for the XLR socket is a bit trickier to make. This hole is too big for most tapered reamers, so you will have to drill a series of holes around the inside circumference, then knock out the centre piece and carefully file it to shape. Its two mounting screw holes are each drilled to 3mm.

Next, a square cutout for the power switch must be made in the righthand side of the case – see Fig.5. Again, this is made by drilling a series of holes, then knocking out the centre piece and filing the hole to shape, until the switch clips into position.

Finally, four 3mm mounting holes for the PC board must be drilled in the base of the case. This is best done using Fig.5 as a template.

Once the box has been drilled, the next step is to **insulate the threaded ferrule of the 3.5mm jack socket with a short piece of heatshrink tubing, to prevent it making contact with the case.** This heatshrink tubing should be shrunk on using a hot-air gun, but be careful not to apply too much heat, otherwise you could damage the socket's plastic casing.

Internal wiring

The PC board can now be installed in the case. To do that, secure four 6.3mm tapped stand-offs to the base using M3 × 5mm screws, then place the board in position and secure it using another four M3 × 5mm screws and four M3 washers.

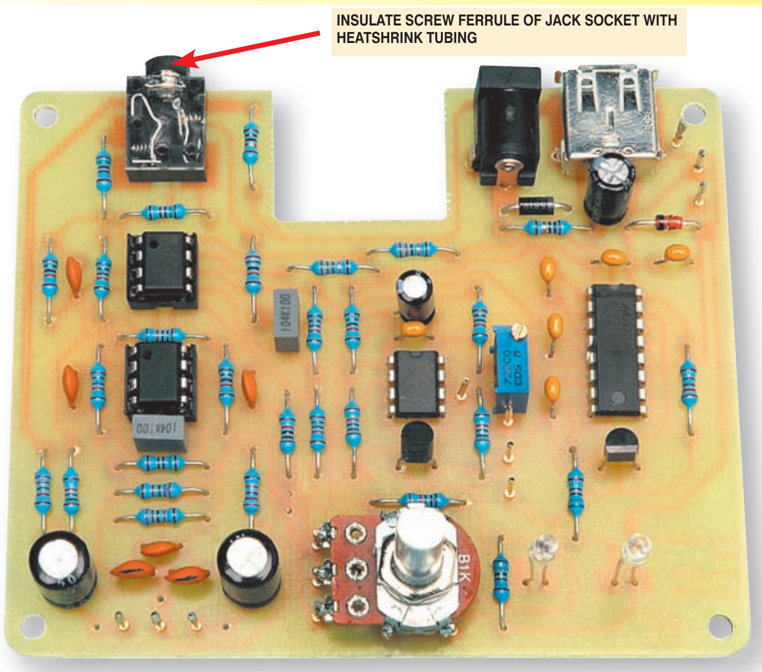
With the board in place, you can now fit the XLR socket and complete the wiring as shown in Fig.4. Note that 2-core shielded cable is used for the connections between the PC board and the XLR socket and that the pin 1 terminal on the XLR socket is the ground or shield pin. Note also that a solder lug is fitted under one of the XLR socket's mounting screws, to terminate the earth wire from the PC board.

Testing

To test the unit, first apply power and check that the power LED lights. Now measure the voltage between TPGND and pin 16 of IC4 – you should get a reading of 5V for a USB supply, or 5.6V if a plugpack supply is used. Check also that pin 4 of IC1 is about –6V, pin 8 of IC1 is at about +7V and that TP1 is at about 2.5V (with respect to ground).

If any of these voltages is incorrect, switch off immediately and check the supply wiring. Check also that IC4 has been installed correctly.

Assuming everything checks out so far, adjust trimpot VR2 so that the voltages at TP2 and TP3 are 442mV above and below 2.5V respectively (ie, TP2 should be +442mV with respect to



Be sure to insulate the threaded ferrule of the line output jack socket with heatshrink tubing. This ensures that it cannot make contact with the case and cause an earth loop which would lead to hum.

TP1, while TP3 should be –442mV with respect to TP1). This sets the peak level indication.

Note that because of resistor tolerances, you will not be able to adjust VR2 so that TP2 and TP3 are exactly the same value above and below TP1.

Note also that if you intend using this Balanced Preamplifier with a computer, then it's a good idea to set the peak indicator so that it agrees with the level indicator in your recording software.

Alternatively, if using this preamplifier with an MP3 player (ie, via the line input), adjust VR2 for the ±442mV levels at TP2 and TP3, then check that the sound is undistorted for all levels unless the peak level is exceeded.

The assembly can now be completed by fitting four stick-on rubber feet to the underside of the box, then attaching the front-panel label, the lid and the control knob. Make sure that the two LEDs just protrude through their holes in the lid.

The front panel label (Fig.6) can be colour photocopied and trimmed to size. It can then be attached to the panel using either double-sided tape or a thin smear of silicone sealant.

Options

If you wish to have a through XLR plug (so that you can feed through the signal to another preamplifier or mixer), then you will have to use a diecast box measuring 119mm × 94mm × 57mm. Extra positions for PC stakes have been included on the PC board (at the front, left) for this wiring.

Finally, a switch can be added to close the connection between pins 2 and 3 of the XLR socket for microphone muting. *EPE*