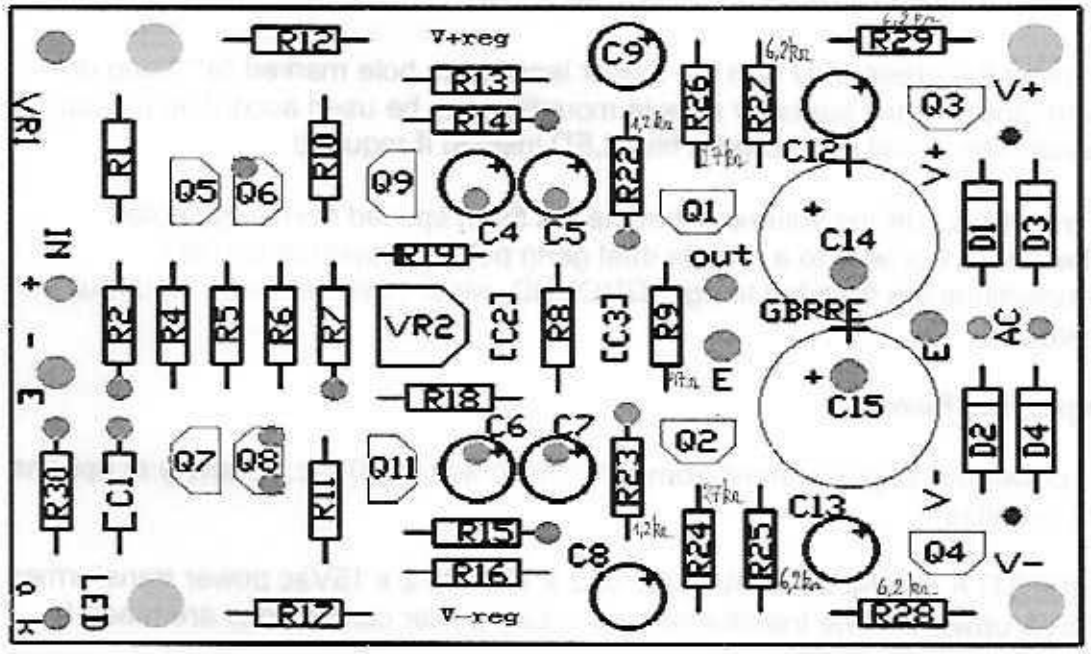
Assembly and Connectivity for SKpre

Stuffing Guide



Green pads are showing ground plane connections FYI; grey are mtg holes

R1,19	100K	D1,2,3,4	1N4004
R2,13,16	1K	LED	3mm grn
R4,5,6,7,9	47		
R8	3K	Q1,3,11	BC546B
R10,11,24,26,30	27K	Q2,4,9	BC556B
R12,17	6K2	Q5,6	BC546C
R14,15	150	Q7,8	BC556C
R18	wire link std		
R22,23	1K2		
R25, 27, 28, 29	6k2	VR1	10K vol taper
C1	100pF polystyrene	VR2	50K trimpot
C2	6 pF silver mica		
C3	not used std		
C4,5,6,7,8,9	10uF 50V electro		
C12,13	10uF 25V electro		
C14,15	2200uF 25V electro		

Assembly

1. Identify all resistors using a digital multimeter and insert as shown in the stuffing guide above. Clip and solder wires.

2. Insert the trimpot VR2 in the centre of board position and solder 3 pins under.

3. Identify the different types of small TO92 transistors and insert them with the correct orientation and locations and solder in position quickly. Be careful not to overheat them - by soldering quickly, one pin on each group then the second...

4. Insert diodes D1, 2, 3, and 4 with the correct polarity (line marked end).

5.Insert C1, then C4 through C15, taking care of polarity - THESE COULD EXPLODE if inserted the wrong way. There is no need to make solder connections to top side pads as the holes are 'through hole plated' and the pad on the bottom of the PCB is all that needs solder.

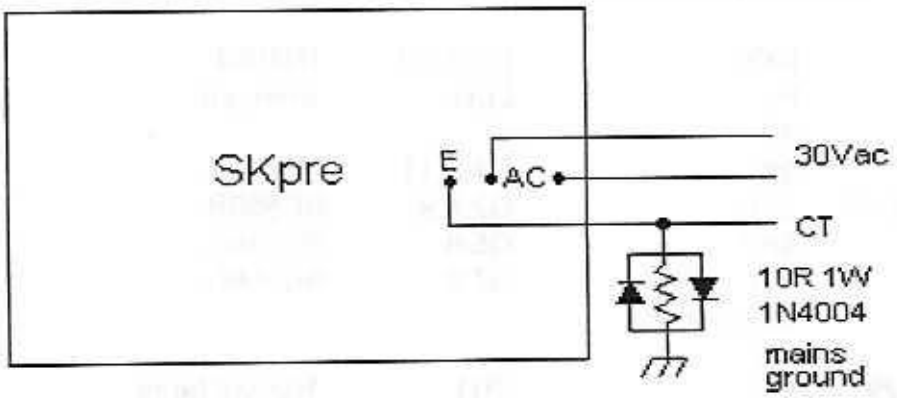
6. Insert the green LED with the longer lead in the hole marked "a". Long or short pins or flying leads for remote mounting can be used according to your needs. The circuit can power a blue LED instead if required.

7. Insert the 10K log volume pot in the 3 x 5mm spaced front edge holes labelled VR1 or wire to a remote dual gang pot or stepped attenuator. Connections are from left to right GROUND, wiper (volume level), input (full level).

Supplying Power

To power the single channel from either 120Vac or 240Vac, a variety of options are possible -

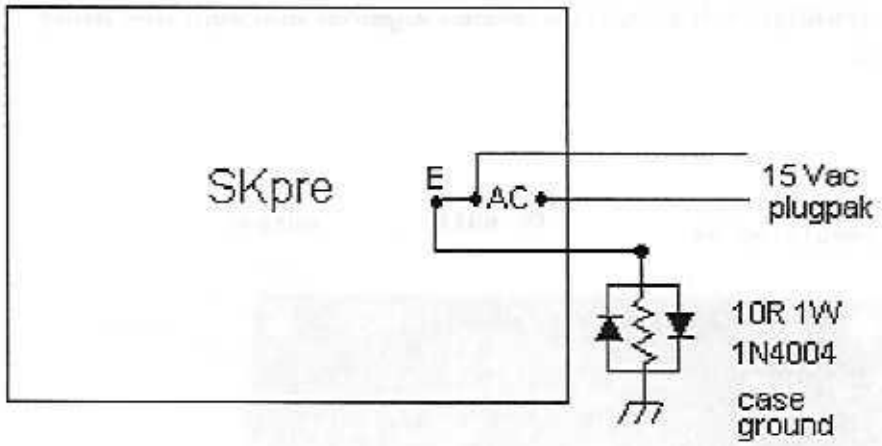
1. [BEST] A regular 24 - 30Vac CT or 2 x 12V –to 2 x 15Vac power transformer of 5VA upwards. The transformer secondary power connections are made to the AC and E as below -



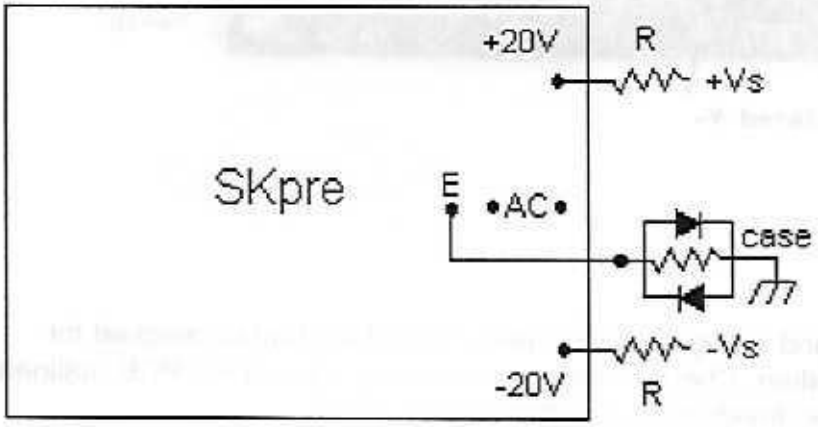
Make sure the transformer regulation is < 15% or use a lower voltage like 24Vac CT if it's greater than 15% regulation, as with some smaller ones.

2. A 12V or 15Vac supply like a plugpack/wallwart can be used but with 6dB higher ripple (still negligible). Connect one wire to the AC hole nearest the board edge and the other wire to the inner AC hole but linking across underneath to the E pad next to it. Since the plugpack will not have a mains ground you can connect a ground wire from the chassis to the chassis of the power amplifier to ensure the chassis is connected to mains earth.

If the plugpack is > 15% regulation it's better to use a 12Vac one so the rectified voltage does not exceed the 25V rating of the supply capacitors. Check this by measuring the output with DMM on AC volts, nothing connected. It should be < 17.25 Vac.



3. The unit can be powered from a +/-20V upwards DC supply from a power amplifier or other available supply. To power the board from an existing DC supply of between +/-20V up to +/-Vs, the V+ and V- rails can be connected directly through the blue holes (on the stuffing guide) through a resistor of value (Vs - 20) / 0.0075 ohms [example: for 50V supplies use a 3K9 1W resistor].



Use a pair of resistors to each module as these also provide valuable decoupling between the two modules.
Alternatively a pair of 24V zeners can be inserted in place of the diodes (same direction) and the resistor values reduced to ~ 2/3R value previously.

Wiring

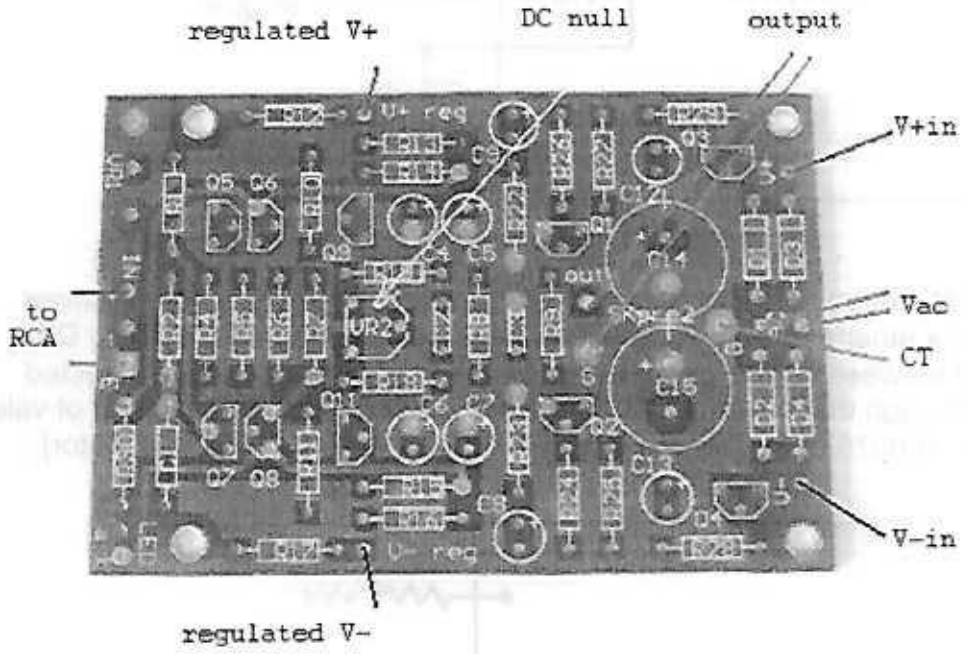
The PCB has a single input, marked "IN +" and "E", at the front edge (ignore the - input) and a single output marked "out" and "E" near the middle of the PCB. The E in each case is for the cable shield.

For multiple inputs the input wiring should go to an input selector switch which selects between the inputs available. The output should go directly to the output RCA through a 47 ohm at R9 location. This helps to isolate the FB loop from capacitative loads and RF pickup.

If the power transformer is to be located inside the preamp case, it should be far from the PCBs, input and output terminals and signal wiring for best hum and noise results, and preferably shielded in it's own internal steel box.
Alternatively, it can be located outside the preamp box for best results.

AC wires to the preamp PCB should be twisted together and kept well away from signal areas.

Connections



Testing

1. After assembly and wiring all components should be double checked for location and orientation. Check transistor positioning against the PCB outlines and check capacitor direction against the stuffing guide.

2. Connect the ac power and switch on. The LED should glow immediately.

3. Using the multimeter, measure firstly the +V (to E) and -V (to E) unregulated supplies on the outer end of the diodes. This should be close to 20V and not over 25V, the large capacitor rating.

4. Then measure the DC voltage at the end of R12 and R17 closest to the Vreg writing. This should be +15V and -15V (for +/-20V unregulated) or close to it.

5. Using a 200mV DC multimeter range, check the DC at the OUT wire (to E). This should be < 5mV. Turn VR2 to adjust this to zero. This setting will depend on having the volume control fitted or an external input connection. Re-check before connection to a power amplifier, at the output RCA, and trim to zero.

6. Connect to a signal source and power amplifier with the volume control turned down, check for minimal DC offset at the speaker output, then play some music through the module.

Alternative off-board Volume Control

If using an Alps blue DG 10K volume pot (or other) which has to be wired to

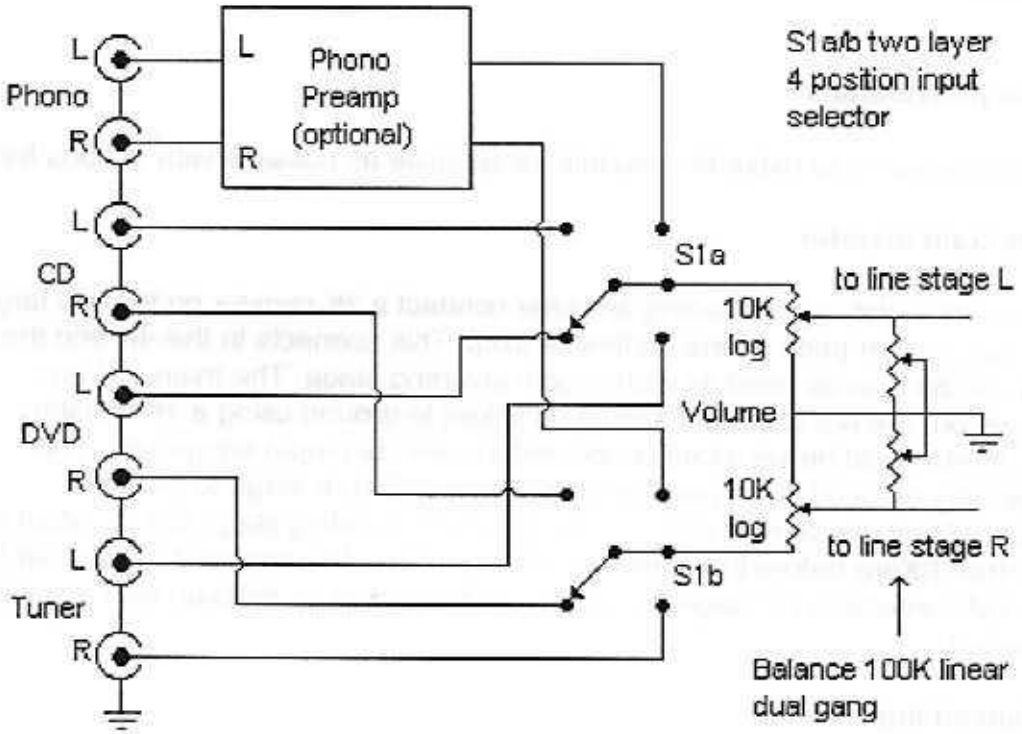
both modules to control stereo volume with one control, the 3 holes at the front edge of the PCB marked VR1 are the connections. They are, from front left - GND, Wiper, Input. The Alps pot will have the same connections.

Simplest is to mount the Alps pot to the front panel and locate the Left and Right modules just behind and either side. Attach 3 colour coded wires to the holes and mount the modules in the chassis. Spin the Alps around so it's pins are facing up and solder the wires in reverse order to the 3 pins in each row, one row for Left and one row for Right module connections. Then turn the Alps body back around 180 degrees so the pins are facing down for neatness and tighten the locknut. A small hole can be drilled in the panel to take the locating pin, or it can be filed off.

If you have a piece of copper sheet for a shield, this should be ~ 75mm (3") by 50mm (2"). A cut halfway down each side and in 25mm (1") will allow it to be folded into a box to cover the top and back and double side thickness. Fold the box and solder a wire on. Fit it on the Alps and ground it to the case. This will provide some shielding and crosstalk reduction. This will have a greater effect if the Alps is 50K rather than the preferred 10K.

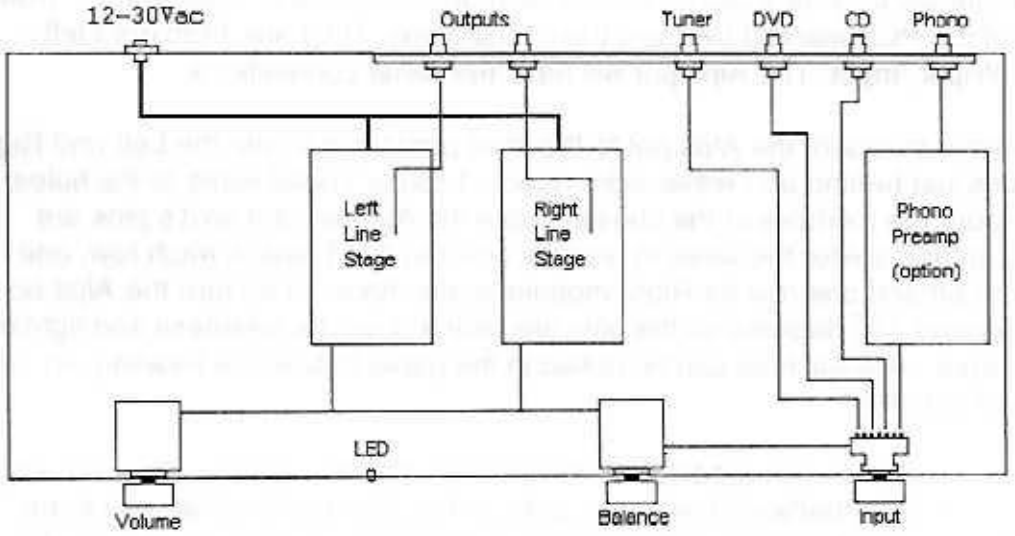
Chassis Signal Wiring

For a typical set of 1(stereo) phono and 3 stereo high level inputs, with volume and balance controls



Chassis Layout

Below is one possible chassis layout. 15Vac wiring should be twisted and run against the chassis well away from signal wiring. Chassis should be mostly of steel or aluminium to shield and for grounding. RCA's should be insulated from the case.



Tweaking

Some DIYers like to explore the possible sonic benefits of premium components such as Blackgate, Muse and Silvered Mica capacitors, and Bulk Foil resistors. Many of these are quite expensive and therefore it is worth knowing where these might be used to the best effect. Items outside the feedback loop are likely to respond most to change. C5, C7 should not be increased in value but may be bypassed under with a 100nF -1uF small film type. R18 and R2 can be Bulk Foil.

Other possibilities

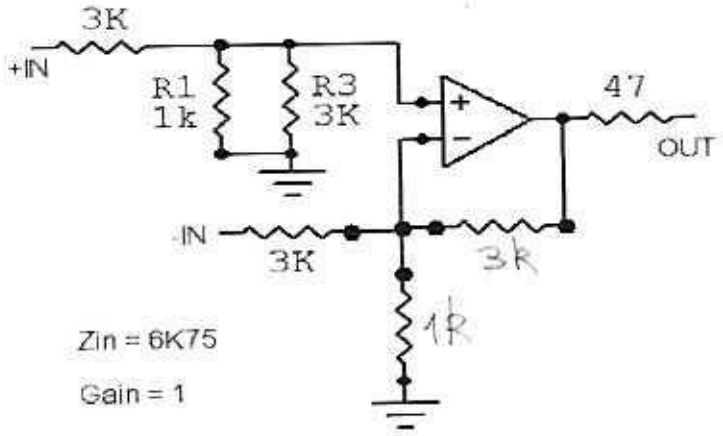
I have attempted to make this module as versatile as possible with options for-

Unity Gain Inverter

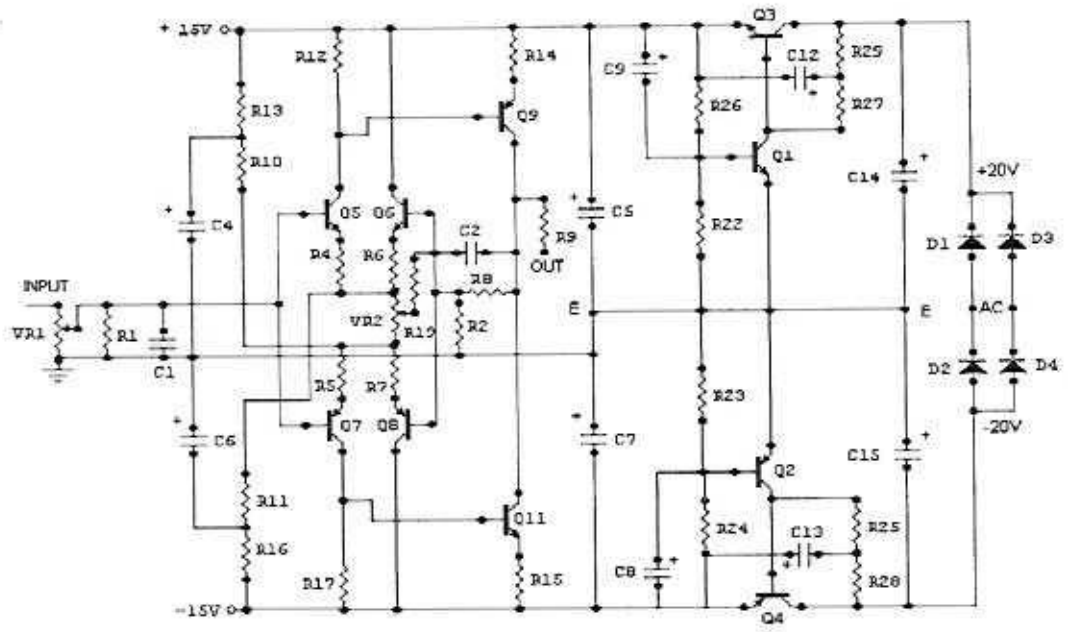
To use as a unity gain inverting amplifier connect a 3K resistor on the two large hole-less solder pads on the underside front. This connects to the -IN and the module can now be used as a unity gain inverting stage. The main +IN and volume pot are not used and should be linked to ground using a 1K resistor. DC offset should be set when connected to expected input equipment. This stage may be used in conjunction with a regular SKpre stage to produce balanced outputs. Simply connect the -IN of the inverting stage to the output of the other SKpre before the output 47 ohm resistor. The module may be used as a DAC interface I/V stage in this way, but DC must be blocked with a suitable capacitor.

Balanced Input

To use as a balanced in, unbalanced out unity gain buffer, remove the volume pot and insert a 3K resistor between the wiper and input (top of pot) holes. R1 needs to become 1K and R3 is changed to 3K. A 3K resistor is soldered to the pads under as for the inverting stage above. The +IN and -IN holes can now be used for a 6K75 Zin balanced input unity gain buffer. DC offset should be set when connected to the intended source.



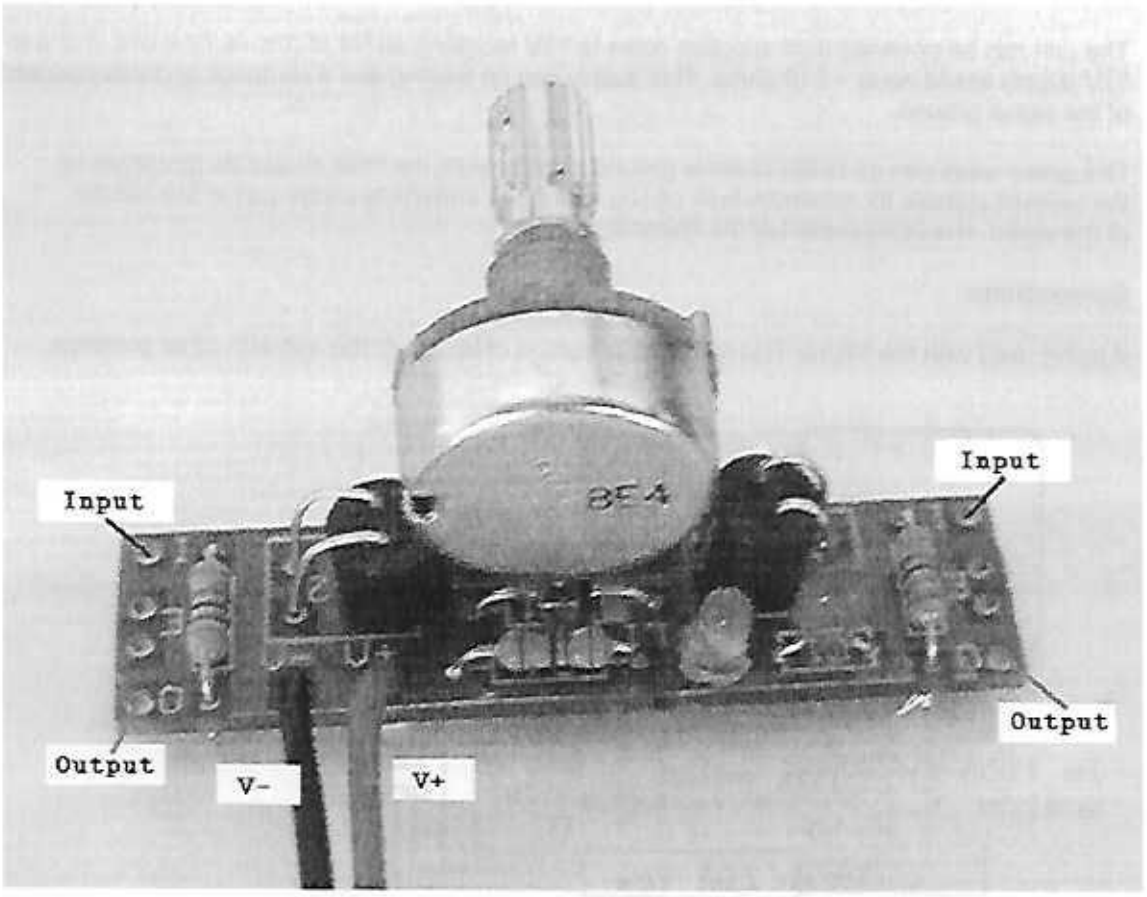
Schematic



Further application for RIAA phono preamp configuration and as DAC interface balanced I/V is pending.

END

OptiVol2



Parts List

R1, R2 = 27K ; R4 = 1K8 0.6W(for 25-30V supply)* see text
LDR1, 2 = NSL32SR2 ; C1 = 1uF 50V ; D1 = 4V7 500mW zener
VR1 = 100K single gang log volume pot 5mm pin spacing
L1 green LED

Assembly

1. Insert NSL units first with the white dot on each to the front hole (next to edge) closest to the pot. Insert the short leads directly with the long leads bent over and out to the outer holes as in the pic above.

2. Insert the LED with the long wire (anode) to the + hole.

3. Insert all other parts with the D1 zener correct way around as shown on the PCB. Last of all fit the pot with the body over the PCB.

Wiring

The wires shown above are for in (from source or selector) and out (to preamp) for each channel at each side, and V+ and V- at the rear. The supply should be 24-30V total for the

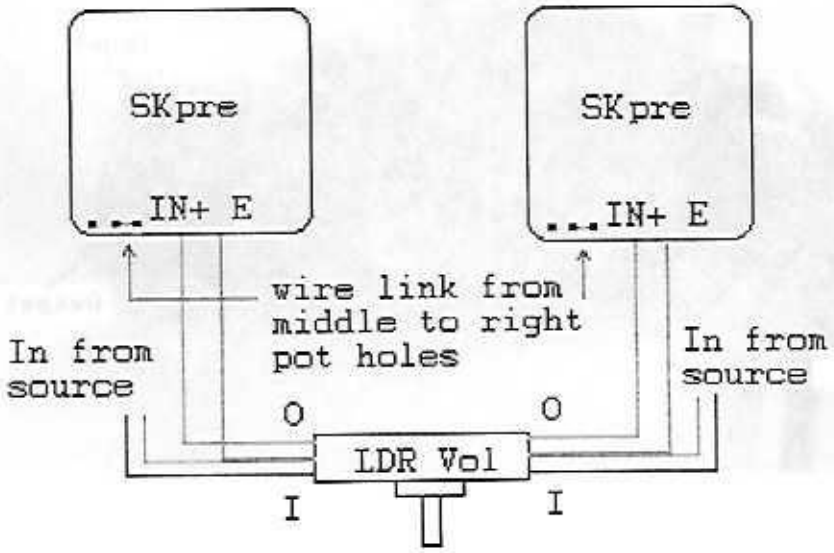
provided R4 = 1K8 dropping resistor and the supply should be capable of supplying 14mA, and can be +/-12V to +/-15V, or 0V and +24V to +30V.

The unit can be powered from supplies down to 12V requiring an R4 of (Vs –4.7)/ 0.014. For a 0-12V supply would need ~ 510 ohms. This supply can be floating like a plugpack and independent of the signal ground.

The green wires can go to the channel ground shields while the PCB should be grounded to the earthed chassis for minimum hum pickup, using the underside solder pad in the middle of the board. It is independant of the channel grounds.

Connections

If being used with the Skpre. This gives an indication of how to fit the unit with other preamps.



Testing

Once connected to power start by testing the operation of the OptiVol2 by turning it to minimum and measuring (low ohms range corrected for zero error) across OUT and E terminals for resistance of 40 - 60 ohms. If this is OK then play a low source of music to ensure full functionality. It should work in the same way as a standard volume control. The range of control will be limited to about 54dB due to practical limitations and it is best to have fairly low system gain for best results. As complete muting is not possible, a source selector switch with a mute (no signal) position is a good idea.

End