

**Application & Purpose:**

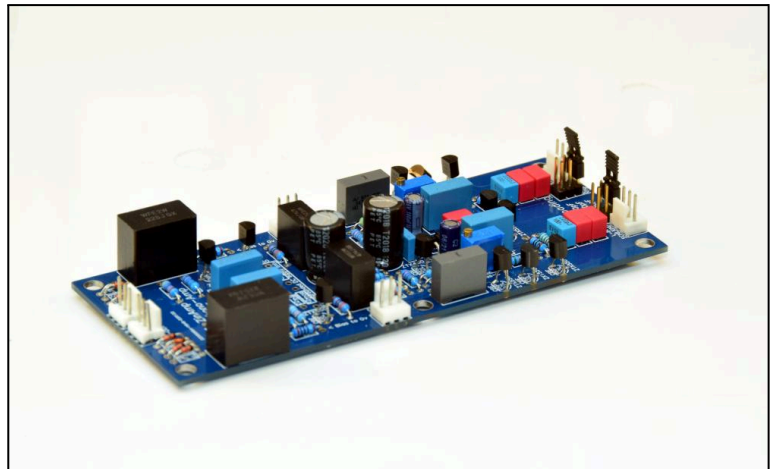
Exceptionally high quality stereo solid state phono-amp, featuring two complementary BJT pairs; one as a gain stage, the other as a follower. RIAA equalisation occurs after the first and in the second pair. Achieves very low levels of THD < 0.006% mostly lower 2nd order.

Suitable for MM phono cartridges

Input capacitance loading can be adjusted with jumper switches; 50pf, 100pf, 220pf and zero

Low output impedance with sufficient current to drive a pre-amp or power amp, plus an additional line-level output.

*WARNING: DC voltages may cause a shock. Take Care!*



**Specification:**

<b>PCB Dimensions</b>	139mm x 56mm x 1.6mm
<b>Channels</b>	Two (stereo)
<b>Frequency Response</b>	RIAA
<b>Input Capacitance</b>	Selectable - 50pf, 100pf, 220pf, 320pF or none
<b>Input Loading</b>	47k
<b>Devices</b>	Low noise 2N4401/03 transistors in main signal path
<b>Output Impedance</b>	< 500Ω
<b>Supply Voltage</b>	Min: -/+5v DC Max: -/+24v DC
<b>Idle Supply Current</b>	approx 80mA - 40mA per channel
<b>Power Supply</b>	ZinAmp Pre-amp Regulated Supply - requires 18-0-18V toroidal transformer 30VA. 50VA if also running with Pre-Amp module
<b>Earth Nets</b>	Power and Audio (separated by loop breaker)
<b>THD</b>	Typically < 0.006% - mostly lower 2nd order

## Details:

An exceptionally high-quality stereo audio phono-amplifier featuring a dual gain stage with feedback and a current follower. Low output impedance with sufficient current to drive a pre-amp or power-amp plus an additional line level input.

Low-distortion design, featuring a switchable input capacitance loading that can be adjusted with jumper switches; 50pF, 100pf, 220pf and zero.

## Setup and Usage:

This module is usually installed in a ZinAmp enclosure with the input at the front of the amp; this may appear to be back-to-front. This is to keep the input away from the transformers and eliminate any electromagnetic noise from the transformer windings. It is usual to fit an audio grade (low flux) toroidal transformer with a goss band around its outer diameter in order to further suppress EMI which may cause hum.

Low Flux audio grade toroidals are available from [Airlink Transformers](#) in the UK. We recommend 30-50VA with a secondary voltage of between 2x15vAC and 2x30vAC. Low flux means the transformer is made with more windings to reduce its core flux density. This is not critical, but may make the transformer less likely to cause hum in your enclosure.

This module requires a minimum of -12/+12v and a maximum of -21/+21v i.e. a split rail supply. Each channel (l & r) needs to be biased using the two trimmer pots on the board. The bias is measured at the points indicated on the board (next to R13L and R13R) and must be set to as close to zero volts as possible (i.e. within +/- 0.5v). Place one terminal on the bias point and the other on the ground/mid-point of the power supply to measure this voltage.

Individual ground nets separate the audio and power grounds, eliminating hum. Power ground should make its own separate direct connection to the ground star or mid-point of the power-supply. Audio ground should be connected to the preamp or line-in audio ground.

Do not mix or directly connect these grounds on the module PCB, otherwise hum will result.

## Power Supply Requirements:

This module has -/+ split rails. The min voltage is -/+5v and the max is -/+24v. -/+12-15v is optimal.

## Biassing:

Both channels require biasing to ensure the input of the amplifier is as close to 0v as possible. This is simple to do and requires a multi-meter and a small screwdriver.

There are two points on the board marked with < **Bias to 0v**. Place the black (-ve) probe of your meter on the power ground and the red (+ve) probe on one of the bias points. Rotate the blue trimmer with a screwdriver until the meter reads -/+1v or as close to 0v as possible.

Repeat for the other bias point and rotate the corresponding trimmer to as close to 0v as possible.

**Note:** you may see the bias voltage settling or changing as you reach 0v. It may take 2 or 3 minutes for the voltage to completely settle as you adjust the trimmer, so take your time. The amplifier will play music within 5 seconds of switching on, once the bias has been set.

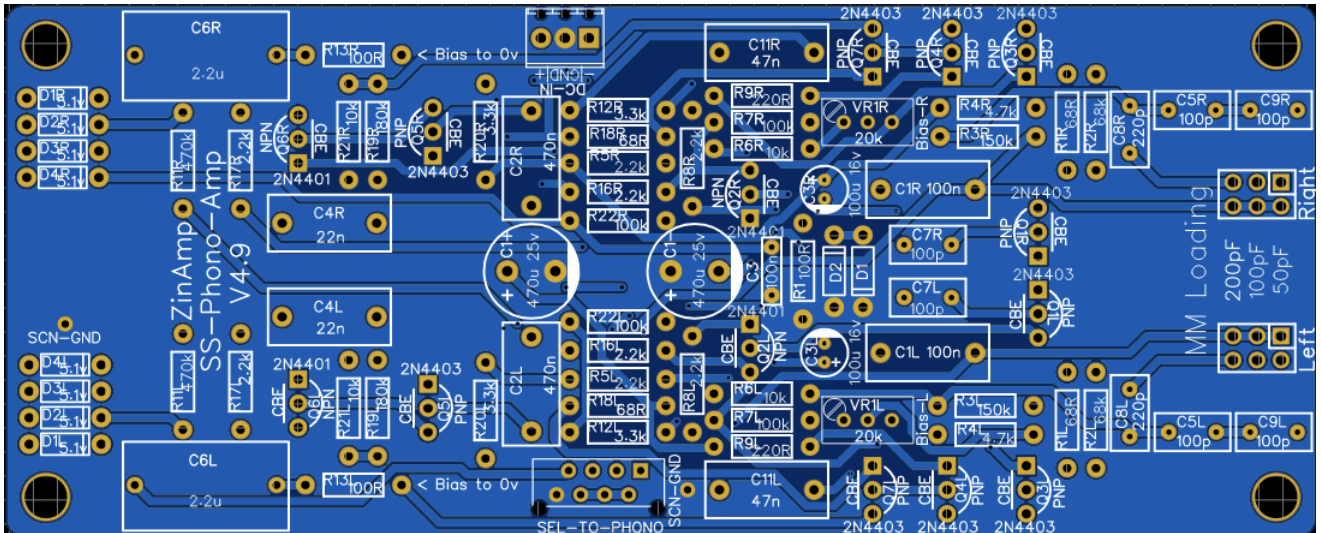
## Optional Components

- D1L,D2L,D3L,D4L,D1R,D2R,D3R,D4R - 3.3v Zener Diodes. These form a voltage clamp at the output to prevent high voltages reaching your power amp or subsequent pre-amp. Omit at constructors' own risk!
- C5L,C5R,C8L,C8R,C9L,C8R - These provide a choice of capacitive loading for the phono cartridge using a three-row jumper switch for each channel. These capacitors can be omitted as required, along with the three row jumper pins and jumper link.
- C8R and C8L - these can be swapped for lower values e.g. 1uF if the input impedance to the next stage is > 30k and the volume Pot is >150k, otherwise the higher value of 2.2uF is recommended to avoid loss of low-frequency response.
- Gain can be increased from 40dB to 45dB by changing R7L and R7R from 82k to 150k. Conversely, gain can be reduced with a value like 68k. Increasing gain introduces a small risk of turntable-rumble inducing low frequency or 'motorboating' oscillation. Motorboating can be heard as a purring or throbbing sound triggered by low frequency noise or vibration from your turntable. This is extremely unlikely with the standard design.

## Safety Note:

This module runs with DC voltages as high as 48v between negative to positive rails. This is enough to give you a very unpleasant shock and possibly worse. Unlike AC current, DC is more dangerous when touched as you will tend to stick to it rather than be repelled from it as with AC. Before handling this module, switch off, disconnect the AC power lead and discharge the power supplies in your amplifier.

## Bare PCB:



## Connections:

There are two sets of terminals on the PCB, one marked DC-IN, the other marked SEL-TO-PHONO.

DC-IN comprises -|GND|+. This requires a split rail supply min -/+5vDC and max +/-24vDC

GND is the Power Ground and is separated from the audio ground on the board. Do not mix these as doing so will form a ground loop which will result in hum.

SEL means selector switch but it doesn't have to be a selector switch, rather it can be a set of RCA inputs connected directly to the board.

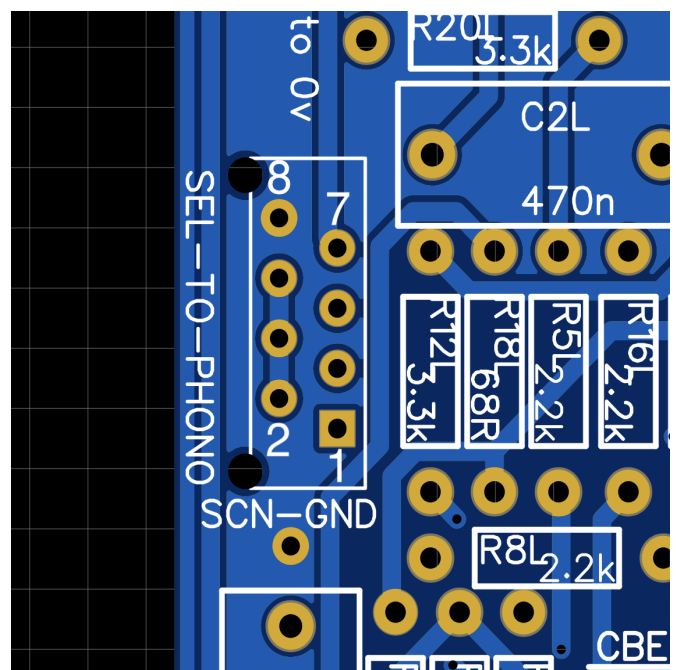
The image below and the pin numbers show which pin is which and how to wire it in a bespoke installation:

**Pins by Number** - note 3,4,5,6 are not marked but follow the same R-L pattern from bottom to top:

1. Left - IN
2. Input Ground
3. Right - IN
4. Input Ground
5. Left - Out
6. Output - GND
7. Right - Out
8. Power Ground

SCN-GND is connected to Power Ground and can be used to ground a cable screen. SCN is an abbreviation of SCN.

Note: do not let pin 8 touch any of the other ground pins i.e. 2,4 or 6 otherwise you will create a ground loop and you will hear hum.



## Parts List:

CONNECTORS: Both blank and ready-built PCB requires connectors be purchased and soldered on by the constructor. This is to give the constructor a choice of how they wire their own particular installation. Terminal block connectors are indicated in the list below in [blue](#) and can be swapped for equivalent 2.54mm pitch connectors e.g. Molex KK254 headers, which are provided to the constructor in self-wire kits.

Component values **highlighted in yellow** below may differ from your PCB. Please use the value shown in the table, not on the PCB.

Designator	Value/Spec	Qty	Manufacturer	Manufacturer Part	Supplier Part
C1+,C1-	470u 25v	2	Nichicon	UVY1E471MPD	739-5285
C1L,C7L,C11R,C1R	47n	4	Kemet	R71PF24704030K	<a href="#">171-9210</a>
C2R,C2L	470n	2	Panasonic	ECWFE2W474P1	<a href="#">105-1083</a>
C3	100n	1	Epcos	B32529C1104K000	896-1332
C3L,C3R	100u 16v	2	Rubycon	16PK100MEFC5X11	763-9396
C4R,C4L	22n	2	Kemet	R463F222050N0K	165-0046
C6R,C6L	2.2u	2	Panasonic	ECWFE2W225JA	105-1076
C7L,C9R,C9L,C5L,C5R,C7R	100p	6	Wima	FKP2/100/100/5	484-1978
C8R,C8L	220p	2	Wima	FKP2/220/100/5	484-1984
D1,D2	50v 1A	2	Vishay	1N4001-E3/54	<a href="#">628-8931</a>
D1L,D2R,D4R,D3L,D4L,D2L,D3R,D1R	3.3v	8	Nexperia	BZX79-C3V3,113	544-3531
D2-,D2+	10v	2	Nexperia	BZX79-C10,113	544-4461
DC-IN,PHON-L,PHON-R	3 Pole Terminal (self-wire only)	3	RS-PRO	790-1092	790-1092
IN-L,IN-R	2 Pole Terminal (self-wire only)	3	RS-PRO	790-1098	790-1092
L,R	3 Row Jumper	2	Harwin	M20-9980346	745-7046
L,R	Shorting Link	2	RS-PRO	251-8575	251-8575
Q1L,Q1R,Q3L,Q3R,Q5L,Q5R,Q7L,Q7R,Q4R,Q4L	BC559 or ZTX751	10	On Semi   Zetex	BC559 or ZTX751	803-1144 or 295-523
Q2R,Q2L,Q6R,Q6L	BC550 or ZTX651	4	On Semi   Zetex	BC550 or ZTX651	803-1125 or 295-501
R1	10R	2	Vishay	MBB02070C1009FCT00	<a href="#">125-1154</a>
R11L,R11R	470k	2	TE Connectivity	LR1F470K	149-149
R12L,R12R,R20L,R20R	3.3k	4	Vishay	LR1F3K4	125-1162
R16L,R16R	750R	2	Vishay	MRS25000C7500FCT00	683-4008
R17L,R17R	1.5k	2	Vishay	MRS25000C1501FCT00	683-3219
R18L,R18R	56R	2	Vishay	MRS25000C5609FCT00	683-4203
R19L,R19R	180k	2	Vishay	MRS25000C1503FCT00	683-3049
R2-,R2+	220R	2	TE Connectivity	LR1F220R	<a href="#">148-348</a>

R25L,R10L,R10R,R25R,R6L,R6R	15k	6	Vishay	MRS25000C1502FCT00	683-3055
R2L,R2R	150k	2	MRS25000C1503FCT00	Vishay	683-3049
R3L,R3R	68k	2	Vishay	MRS25000C6802FCT00	683-3957
R4L,R4R	4.7k	2	Vishay	MRS25000C4701FCT00	683-3799
R6L,R6R,R21R,R21L	10k	4	TE Connectivity	LR1F10K	125-1164
R7L,R7R, R22R,R22L	100k	4	TE Connectivity	LR1F100K	125-1168
R8L,R8R,R17L,R17R,R5L,R5R,R16L,R16R	2.2k	8	Vishay	MRS25000C2201FCT00	683-3449
R9L,R9R	82R	2	Vishay	MBB02070C8209FCT00	506-4784
R9L,R9R,R13L,R13R	68R	4	TE Connectivity	LR1F100R	125-1155
VR1L, VR1R	30k	2	Bournes	3296W-1-303LF	785-9749

Parts available from [RS Online](#) unless indicated. Also try [Farnell](#), [Mouser](#) and other online suppliers.

Parts from different manufacturers can be substituted where spec is sufficient

Supplier trading names may differ by country.