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ELECTRONICS

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CONSTRUCTION MANUAL

for the

1450
Shunt Feedback RIAA Phono Stage

Thank you for purchasing the Hart Linsley Hood 1450 Series RIAA Pickup preamplifier, the finest sounding vinyl amplification system on the market, regardless of price!.

This new preamplifier represents the ultimate standard of performance that is available from the microgroove long playing record medium. The combination of the preferred 'Shunt Feedback' concept and a very advanced discrete component circuit topology designed by John Linsley Hood give a result which is sonically better, with a greater 'openness' of sound than any circuit before. Having a specially optimised low-impedance front end it is particularly suited to use with moving coil cartridges and for this purpose it even surpasses the widely acclaimed integrated circuit RIAA preamplifier by the same designer.

Both moving coil and moving magnet cartridges can be used, the higher output of the latter being fed into an AC coupled input stage. There is also onboard provision for fitting loading capacitors where moving coil cartridges need this.

We now offer an SA (Series Audiophile) version of this excellent kit with even higher grade components than the normal version. This comes with capacitors using different dielectrics and with lower ESR electrolytics and selected semiconductors. These sets have 'SA' suffixes.

Normally the K1450 will be used in its own case as near as possible to the turntable to minimise the cable runs carrying the very low level, and therefore vulnerable, pickup cartridge signals. It can however be mounted inside our 1400 Series preamplifier, if desired.

SPECIAL POINTS ABOUT YOUR LINSLEY HOOD PRE-AMPLIFIER ASSEMBLY.

This kit has been completely engineered by HART separately from the publication of the articles and this means that there may be changes incorporated in the light of further experience, so please follow these instructions with the articles as a back-up guide rather than vice versa.

This is an ultra-high performance unit and to achieve the best results the component selections and board layout are extremely critical. We therefore only supply complete kits and will not support any units not built from our components.

As with any other kit, finding an incorrectly fitted resistor after the board has been assembled is almost impossible, we must therefore repeat our standard advice that ALL RESISTORS ARE CHECKED WITH A MULTIMETER BEFORE FITTING.

ASSEMBLY OF RIAA PRE-AMPLIFIER. PCB 1450.

As this is a stereo unit there are of course two of most components. The layout is largely symmetrical around the PCB longitudinal centreline, the only variation being that the first part of the circuit is a mirror image of its opposite channel and the second half is a largely identical repetition. Bearing this in mind when fitting the components will save a lot of hunting around.

Open resistor set 1451.

Fit 5 zero ohm links. The one next to C21 should be soldered on top of the board at each end.

Fit 10 x 2k2 resistors,R3 & 33,R6 & 36,R8 & 38, R11 & 41, R15 & 45. 2 x 120R resistors,R25 & 55. This value of R25 and R55 enables the unit to drive cables up to 50 metres long without HF loss.

Fit R4 & 34, R5 & 35, 3K9. R2 & 32, 47K. R2 needs to be soldered to the ground plane (PCB top copper surface) at one end and R32 needs to be soldered at both ends. These three top surface points are soldered before turning the board over and soldering ALL the bottom connections as normal. Fit R9 & 39, 12R. R22 & 52, 24 & 54. 47R.

Fit R13 & 43, 27 & 57, 82R, R28 & 58, 680R, R17 & 47, 20 & 50, 82k.R17 & 47 are soldered to the ground plane at one end first.

Fit R7 & 37, R12 & 42, 10k. R21 & 51, 26 & 56, 1M. R1 & 31, R23 & 53, 100R. R26, 31 & 56 are soldered on top of the board at one end.

Fit R14 & 44, 19 & 49, 5K6. R16 & 46, 18 & 48, 15K. R10 & 40, 150R. R14. 40 & 44 have one end soldered on top of the board.

Open Capacitor set 1452 or 1452SA. Fit all the small axial polystyrene capacitors. C2 & 32, 22 & 52, 220pf. C16 & 46, 680pf. C14 & 44, 1n. C15 & 45, 2n2.

Check your moving coil cartridge specification to see if it requires a 10n capacitor across its loading resistor. If yours is one of the rare ones that does then Fit C1 & 30, 10n Polyester/Polycarbonate Radial.

Open semiconductor set 1453 or 1453SA & hardware set 1454.

Fit 16 x BC559 Q3 & 33, 5 & 35, 7 & 37, 8 & 38, 9 & 39, 10 & 40, 12 & 42, 13 & 43. With all transistors it is important that these are fitted properly with the device spaced from the board by its 'D' pad. Leaving the transistor with longer leads than this not only looks unprofessional with the poor thing standing there with its "knickers round its ankles" but it can lead to instability.

Fit 8 x BC549, Q4 & 34, 6 & 36, 11 & 41, 14 & 44.

Fit IC 1, 78L05 on 'D' pad.

Fit 8 x 100n polycarbonate capacitors C5 & 6, 35 & 36, 4 & 12, 18 & 20.

Fit SK4 4-Way Header, the retaining step faces the adjacent link.

Fit 10 x 100uf 25v capacitor. Note polarity - they don't all point the same way. C24 & 54, 9, 39, 10 & 40, 3 & 11, 17 & 19.

Fit IC 2, 79L05 on 'D' pad.

Fit Q1 & 31, BD437. Q2 & 32, BD438. Note that the wider line on the ident indicates the metal back surface of the device, all face the bottom of the board, when the ident is the correct way up.

Fit C23 & 53, 1u0 polycarbonate.

Fit C7,8,37 & 38, 470uf 16/25v, observe polarity.

Fit 5-way top entry header for ribbon cable. Clip off retaining tag, not needed here.

Fit C13 & 43, 21& 51, 2u2 polycarbonate

Fit SK1 4 x Gold Plated Phono socket. Take care to get this flush and square on the board as it is used as the case mounting at this end.

To fit the Moving Coil/Moving Magnet Selector switch, a 4-pole changeover toggle switch, the PCB must be temporarily mounted on its intended panel. Four tinned copper wires, component offcuts are fine, are fed through the holes in the PCB that line up with the bottom row of four connections on the switch. Solder all these and then fit a further wire joining together the centre row of four connections and going to the remaining hole by C1.

If the preamp is to be used in its own case, ie not mounted internally within our 1400 Series preamp, then a 2-way phono socket for the output signal is fitted within the SK2 group position at the 'R26' end, and the power input PCB 1450A needs to be assembled.

ASSEMBLY OF PCB1450A Latest units come with a backplate that can be fitted with a 9way 'D' socket for the power inlet, replacing the 5Way DIN socket used previously. This 'D' socket fits directly onto PCB 1450A which carries extra smoothing capacitors and a header for the 5-way ribbon cable to go to the main 1450 board. Board layout is shown on page 6.

Open Set 1508/2.

Start assembly by fitting the two 100n capacitors C25 & 26.

Fit 9W 'D' connector.

Fit 'Faston' PCB Tab. This is a loose fit in its holes and will require propping while soldering to get it nice and square. This is not actually used in this application.

Fit 5-way vertical header with the open side towards the top edge of the board.

Fit C27 & 28 1,000uf 25v capacitors observing polarity.

The completed assembly is then fitted to the backplate by removing the 2 "screws" in the 'D' socket and using these to hold it in place, the shape of the slot in the backplate defining the orientation.

ASSEMBLY IN 1500/2 CASE.
Start by checking which way round the PCB fits on the baseplate so that the mounting holes above C13 and below C43 line up with two of the holes provided. It should not be necessary to clean the paint from around the

bottom surface of the hole below C43, the mounting pillar here being used to 'ground' the PCB to the case. Fit the two mounting pillars in place with shakeproof washers under the screw heads to ensure a good connection.

Identify the case front and back plates. The Back Plate (1503B) is used for the input end of the preamp and has a total of 7 holes, a group of 4 plus 1 mounting hole for the 4-way phono socket, one for the moving coil/moving magnet switch and one for the turntable earth socket.
The Front Plate (1502B) has a group for a 2-way phono socket for the signal outlet and another group of 3 for the 9W 'D' power supply input socket.

Take the back plate and check that there is no paint or anodising around the rear surface around the hole for the turntable earth terminal. Fit the 6BA 1/2" screw through this hole from the back with a solder tag under the head and a shakeproof washer between the tag and the rear surface of the panel. Hold in place with a 6BA nut, well tightened, taking care not to scratch the front plate. Put the brass terminal loosely in place. Bend the solder tag out to an angle of 45 degrees for easier access. If the moving coil/moving magnet switch has not already been fitted to the PCB then fit it now.

Fit the back plate to the PCB with one self tap screw in the centre of the 4-way phono socket and the switch nut. The correct procedure for dealing with the switch nuts in this instance is to place all the washers behind the panel leaving just the one nut on the front surface. This nut is then positioned with fingers so that it is nicely fitted just below the surface level of the threaded switch shank. The assembly is then tightened with the rear nut behind the panel. This needs a thin spanner and if one is not to hand then take care not to scratch the panel when tightening the front nut.

Now fit the front plate to the main board with two self tap screw in the phono sockets.

The PCB with its front and back plate may now be mounted on the base with its two pillars. Loosely put two 6BA or M3 x 5 screws through the PCB into the pillars with a solder tag and shakeproof washer under the head of the screw below C43.
Loosely fasten the front and back plates in place with M3 x 5 screws, tightening them when everything is in place. The case should be grounded as explained earlier by the pillar below C43 but to make doubly sure run a wire between the solder tags on the turntable earthing terminal and below C43.

The case outer sleeve is fitted in place with a plastic foot under each of the four securing screws. The cover fixing is symmetrical allowing the sloping end of the case to fit either way.

Although considerable smoothing is given on the 1450A PCB this unit **must** be used with a fully stabilised power supply with proper earthing arrangements capable of supporting its potential quality. The **K3565 'Andante'** Power Supply is our top specification unit. See our lists for further information.

ASSEMBLY INSIDE 1400 PREAMPLIFIER.

Make sure that the moving coil/moving magnet switch is fitted and wired as detailed above.

Open Set 1454A.
Fit two extra capacitors, 470uf 16/25v on the underside of the board across C17 & 19, observing the polarity of these.
Place the board in position to locate the four mounting holes in the chassis. Loosely fit the four M3 spacers in the holes in the chassis with M3 x 5 screws. When you are ready to fit the backplate to the preamp fasten the 1450 RIAA board in place with one self tap screw in the centre of the phono sockets and four M3 screws into the spacers. When everything is nicely in place the screws may all be tightened.

Open the Wire Kit 1459A and use the dual co-ax lead to connect SK4 on the RIAA Board to SK5 on 1430, the main signal switching board. Use the ribbon cable to connect SK3 on the RIAA board to SK15 on 1430. This simple procedure connects all the necessary power and signal feeds.

CHANGING UNIT GAIN. To suit your particular cartridge and pre amp combination.

This is very easily done by simply changing two resistors for small level differences or four to give a larger change.
To INCREASE gain:- Change R9 & R39 from 12R to 10R or change R19 & R49 from 5K6 to 3K9. If a greater increase is required then implement BOTH changes.

To DECREASE gain:- Change R9 & R39 from 12R to 15R or change R19 & R49 from 5K6 to 8K2. If a greater increase is required then implement BOTH changes.

RIAA MOVING COIL & MOVING MAGNET AMPLIFIER STAGE. Parts List.

RESISTORS

D/Rt	Left	
R1	R31	100R
R2	R32	47K
R3	R33	2K2
R4	R34	3K9
R5	R35	3K9
R6	R36	2K2
R7	R37	10K
R8	R38	2K2
R9	R39	12R
R10	R40	150R
R11	R41	2K2
R12	R42	10K
R13	R43	82R
R14	R44	5K6
R15	R45	2K2
R16	R46	15K
R17	R47	82K
R18	R48	15K
R19	R49	5K6
R20	R50	82K
R21	R51	1M0
R22	R52	47R
R23	R53	100R
R24	R54	47R
R25	R55	120R
R26	R56	1M0
R27	R57	82R
R28	R58	680R

CAPACITORS.

D/Rt.	Left	
C1	C30	10n PCR 5P0 (Only
C2	C32	220p PSA
C3		100u 25v CER 3P5
C4		100n PCR 5P0
C5	C35	100n PCR 5P0
C6	C36	100n PCR 5P0
C7	C37	470u 16v CER 5P0
C8	C38	470u 16v CER 5P0
C9	C39	100u 25v CER 3P5
C10	C40	100u 25v CER 3P5
C11		100u 25v CER 3P5
C12		100n PCR 10P0
C13	C43	2u2 PCR 22P5
C14	C44	1n0 1% PSA 10P0
C15	C45	2n2 1% PSA 10P0
C16	C46	680p 1% PSA
C17		100u 25v CER 3P5
C18		100n PCR 5P0
C19		100u 25v CER 3P5
C20		100n PCR 5P0
C21	C51	2u2 PCR 22P5
C22	C52	220p PSA
C23	C53	1u0 PCR 15P0
C24	C54	100u 25v CER 3P5
C25		100n PCR 5P0
C26		100n PCR 5P0
C27		1,000uf 25v
C28		1,000uf 25v

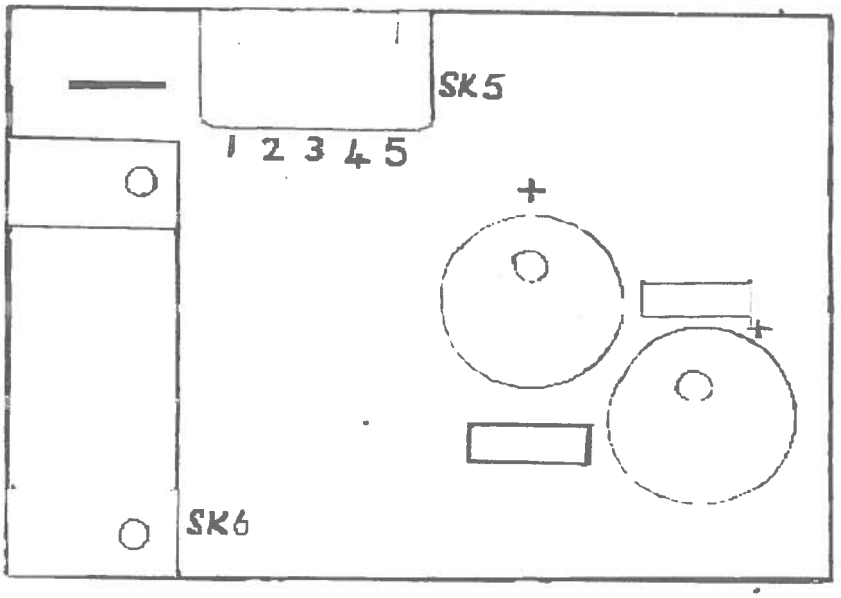
SEMICONDUCTORS

D/Rfitted	Left	(if required by cartridge)
Q1	Q31	BD437
Q2	Q32	BD438
Q3	Q33	BC559
Q4	Q34	BC549
Q5	Q35	BC559
Q6	Q36	BC549
Q7	Q37	BC559
Q8	Q38	BC559
Q9	Q39	BC559
Q10	Q40	BC559
Q11	Q41	BC549
Q12	Q42	BC559
Q13	Q43	BC559
Q14	Q44	BC549

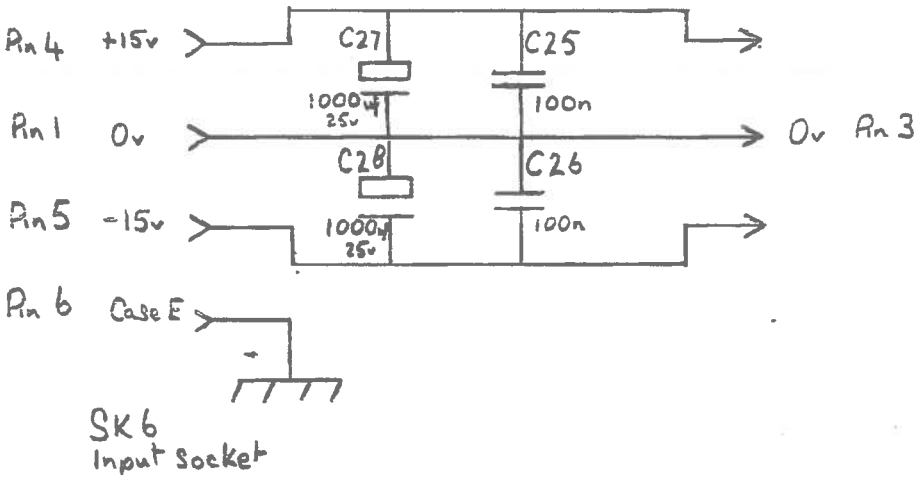
IC1 78L05
IC1 79L05

SOCKET DESIGNATIONS

SK1	4-Way Phono.	Inputs, DC & AC Coupled. Use AC for Moving Magnet Cartridges.
SK2	2-Way Phono.	Signal Output, External Mounted Version.
SK3	5-Way IDC Header, Vertical.	Power Supply Input.
SK4	4-Way Header.	Signal Output, Internal Version.
SK5	5-Way IDC Header, Vertical.	Power Supply. PCB 1450A to PCB1450
SK6	9-Way 'D' PCB Mtg.	Power Supply Inlet to case.



PCB 1450A Component Layout.



PCB 1450A Circuit Diagram.

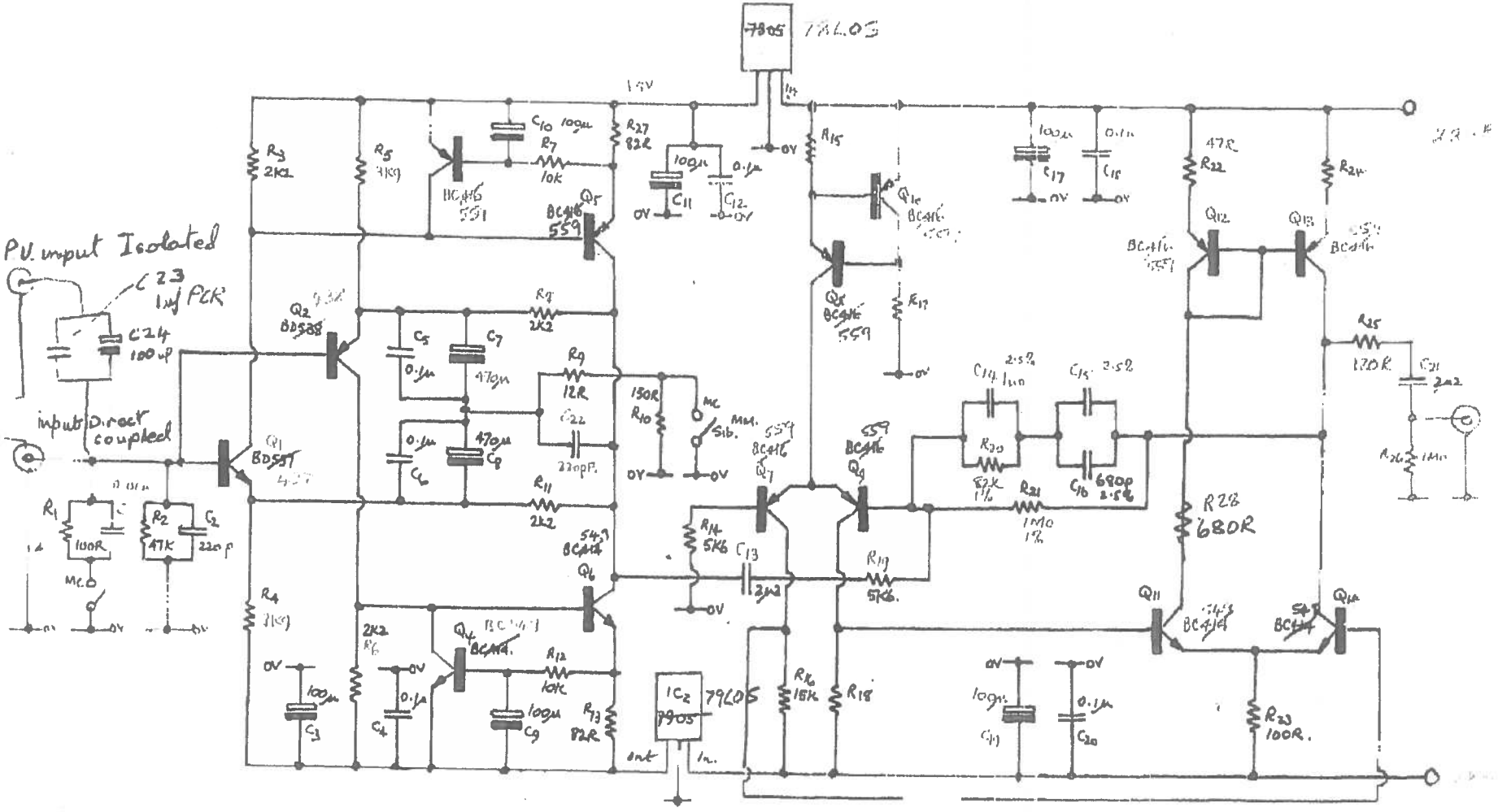


Fig 0 Buffered shunt-feedback R.I.A.A. equalisation stage.