



LINN

the only sound[®]

LK1 PreAmplifier Service Manual

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Introduction

About this manual

This manual is designed to help you as a Linn Retailer or Distributor to repair as many LK1 faults at your repair centre as is practical and so provide the best possible service for your customer should a problem arise.

If you have any suggestions or comments regarding this manual, please contact Paul O'Neill at Linn Products Ltd:

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Retailer & Distributor Obligations

Linn Specialist Retailers or Distributors are obliged to carry out the repairs in this manual under the terms of the contract & warranty agreements. You should return a faulty product to Linn for repair, only if the fault is not covered in this Service Manual. If a product, which is under warranty, is returned to Linn for repair and the fault is covered in the service manual, Linn may levy a charge and this charge should not be passed to the customer.

Spare Parts Availability and LK1 repair

Please note that the LK1 has been obsolete for some considerable time now and as such, we cannot guarantee the supply of spare parts – many are simply no longer available. Some part numbers are listed throughout this manual, but these are provided for information only and this does not imply that these parts will be available should you request them.

Linn guarantee that we will service a product until 5 years after the final build. We take this obligation very seriously and also go much further. Beyond this date, we will repair any Linn product that we possibly can, where it is within our power to do so. However, due to the difficulty with the availability of spare parts, as explained above, it is occasionally not possible to repair a product or supply parts for repair, as the necessary parts are not available and can no longer be sourced.

How to use this manual

The main body of this manual, the fault table, is designed to be as quick and simple as possible to use when you are confronted with a faulty product and so it is arranged by fault symptom as the symptom is usually all that you will know about the fault.

If you are unsure about the meaning of any words or phrases, look in the **Glossary**. (accessible via Linfo Website - Product Information)

Before embarking on any Service work, you should read the **Service Procedures** section (accessible via Linfo Website - Product Information), as there are certain procedures that must be followed in order to ensure the problem is resolved quickly and permanently

Table of contents & fault symptoms

Look firstly at the table of contents and find the category that covers the symptom you are seeing, then look down the list of faults in that section until you find the symptom or symptoms that best describe the problem.

Circumstances

Then simply follow the table along – the table specifies circumstances surrounding the fault symptom – e.g. whether the fault is likely to be intermittent or constant, if the fault only occurs within a range of serial numbers etc.



Possible causes

The next column details possible causes – this is effectively the most important section, probably the main reason you are looking at this manual at all. There may be several possible causes for the symptom you have – it is worth checking out all of these (and bear in mind that there may be more than one fault). For some faults, simple checks are detailed that you can use to rule out the problem without replacing any parts, whereas for other faults, the simplest way to rule out the problem is to replace the component(s) listed

Cure

Quite simply the action that you must take to cure the problem.

Installation

Important Safety Information

Mains connections

This appliance **must** be earthed – both for Safety and functional reasons.

Lethal Voltages

Inside the LK1, lethal voltages are present, although normally these are inaccessible inside the transformer casing and at the mains switch (which is insulated with heatshrink sleeving.) If the mains switch is properly insulated, none of the wires to/from it are damaged and the transformer casing is closed, the LK1 is quite safe to work on while powered up as only low voltages are found on the circuit boards (maximum 38Vac and 22V dc)

Installation Instructions

Important – the LK1 inverts the phase of the signal to the power amp, therefore to achieve absolute phase, connect the positive output of the power amp to the negative (black) loudspeaker terminal and the negative output to the positive (red) loudspeaker terminal.

If, however, you use a speaker switching box or a headphone adaptor box however, these must be wired IN PHASE or damage to the power amp, headphones etc can result.

Placement

Location & Environment

Do not locate near electronic products that may transmit RF, such as microcomputers, fax machines, TVs etc, or connect them to the same mains socket as these devices. Also avoid close contact with the mains or signal leads of such products – careful routing of the cable may be required.

Avoid locations where direct sunlight can shine on the display as sunlight (even diffused sunlight) is a strong source of infra-red light & this causes problems with the unit's remote control circuitry.

Avoid certain types of artificial lighting, such as low energy bulbs, fluorescent light etc, as these emit strong infra-red patterns that can lock up the LK1 control functions.

Although the LK1 can usually be stacked along with other products with no problem, it is better if possible to keep it apart from other products to prevent its operation being adversely affected by the heat and strong electrical field emitted by some products.

Avoid locations that have high humidity or the chance of the unit getting wet.

Avoid locations where there is a lot of dust.



Handling & general maintenance.

Always handle the LK1 with great care.

Always turn off the LK1 and any Power Amps connected to it before connecting or disconnecting any plugs to/from the sockets at the back of the unit. Wait at least 10 seconds after switching off the power amps before unplugging from the back of the LK1 to avoid damage to the speakers.

If you are carrying out any work on the LK1 with its' sleeve removed, **ALWAYS** take anti-static precautions as tiny static discharges from your body, which you may be completely unaware of, can damage electronic circuitry and cause major problems. Anti-static earth mats & wrist straps must be used when handling any of the circuit boards or any spare parts.



Power-up problems			
<u>Power up problems</u>			
Symptom	Circumstances	Possible Cause(s)	Cure
Won't power up. Display dead & no function	Constant	Fuse blown in unit and/or in mains plug.	Replace fuse(s) with correct value & type. Fuse in mains lead should be 5A. Fuse in LK1 should be "Slow Blow" – look for a 'T' before the rating on the fuse. Correct types are: 110/115V - T300mA antisurge 220/240V - T200mA antisurge
Won't power up - Power LED dead, no display & no function	May be intermittent	Mains lead faulty	Replace faulty mains lead.
Display dies intermittently & unit stops working for a while.	At any time	Mains voltage dropping too low for LK1 to function correctly (known as 'Brown outs' as these voltage drops also sometimes cause the house lights to dim.)	Consult an electrician or your power company.
Doesn't power up or Powers up (display LED lit) but no function.	May be intermittent	Wrong mains voltage for LK1 type – mains voltage is too low. (e.g. 240V LK1 being used with 115V mains supply.)	Check voltage rating at rear of LK1. If wrong, transformer will require replacement. Correct part numbers are: MCAS 002/100 for 100V mains MCAS 002/115 for 115V mains MCAS 002/220 for 220V mains MCAS 002/240 for 240V mains Our stock of these transformers is very limited, so it may not be possible to supply the part you require.
Doesn't power up or Powers up (display LED lit) but no function.	May be intermittent	One of the power supplies is dead or at an incorrect voltage level. Power supplies can be checked at the points listed below: +15V - U10 (regulator) output – middle leg. -15V - Q78 emitter (square pad) +Vref - U9 pin 7 -Vref - U9 pin 8 +8V - Q77 emitter (square pad)	Cannot suggest a simple fix as some fault finding is required to trace the cause of the fault. See PCAS 001 Circuit Diagram (accessible via Linfo Website - Product Information)



<u>Fuse blowing</u>			
Symptom	Circumstances	Possible Cause(s)	Cure
Fuse blowing	May be intermittent	Wrong type of fuse fitted	Replace fuse(s) with correct value & type. Fuse in mains lead should be 5A. Fuse in LK1 should be "Slow Blow" – look for a 'T' before the rating on the fuse. Correct types are: 110/115V - T300mA antisurge 220/240V - T200mA antisurge
Fuse blowing	May be intermittent	Mains surges	Consult an electrician or your power company.
Fuse blowing	Constant	Wrong mains voltage for LK1 voltage setting - mains voltage is too high, e.g. a 115V LK1 connected to 230V mains.	Check voltage rating at rear of LK1. If wrong, transformer will require replacement. Correct part numbers are: MCAS 002/100 for 100V mains MCAS 002/115 for 115V mains MCAS 002/220 for 220V mains MCAS 002/240 for 240V mains Our stock of these transformers is very limited, so it may not be possible to supply the part you require.
Fuse blowing	May be intermittent but usually constant	Transformer faulty. To check if it is definitely the transformer, power down the unit, replace fuse, disconnect the transformer output from the Main board and power up. If the transformer IS the cause, the fuse will continue to blow. If the fuse remains intact, the fault is more likely to be on the Main board.	Replace transformer. Correct part numbers are: MCAS 002/100 for 100V mains MCAS 002/115 for 115V mains MCAS 002/220 for 220V mains MCAS 002/240 for 240V mains Our stock of these transformers is very limited, so it may not be possible to supply the part you require.
Fuse blowing	Constant	Bridge rectifier – D3 on main board faulty (probably internally short circuit).	Replace D3 – Linn part no: MISS 002
Fuse blowing	Constant	Fault inside LK1, e.g. short circuit or similar.	See Introduction to Fault Finding section (accessible via Linfo Website - Product Information) for tips on tracing the fault. Also see circuit diagrams.



Display & Control problems

<u>General Display & Control problems</u>			
Symptom	Circumstances	Possible Cause(s)	Cure
Display dead or locked up.	Possibly intermittent	Unit not powering up correctly.	See ' Power up problems ' section above
Flashing lights on display (sometimes known as 'Disco lights' or 'Christmas tree lights') LK1 will not function.	Sometimes intermittent – may start doing this occasionally and then become more & more frequent. Symptoms may vary.	C12 on control board faulty	Replace C12 – Linn part no: CAP 022
Flashing lights on display (sometimes known as 'Disco lights' or 'Christmas tree lights') LK1 will not function.	Ensure that the above 'Flashing light' fault (C12) has been ruled out. Sometimes intermittent – may start doing this occasionally and then become more & more frequent. Symptoms may vary.	U9 (EEPROM) on control board faulty.	Please Note U9 is unlikely to be the cause of this fault (perhaps a 1 in 50 chance) but is easy to rule out IF you have another LK1 or a control board or a spare U9 that you can try in the faulty product. If you do not have the part available, ignore U9. Linn part no: IC 016 (ensure U9 is programmed – a programmed U9 will have its window covered with a sticker that will normally read 'MK3')
Flashing lights on display (sometimes known as 'Disco lights' or 'Christmas tree lights') LK1 will not function.	Ensure that the 'Flashing light' fault (C12) above has been ruled out. Sometimes intermittent – may start doing this occasionally and then become more & more frequent. Symptoms may vary.	U7 and U8 on control board faulty.	Replace U7 & U8 – Linn part no: IC 015 for both parts.



Display locked up – no function and no sources can be selected – input LEDs will not illuminate when input selection button is pressed.	Occurred after unit was switched off and then on again.	Battery faulty – if the battery is dead and the unit is switched off, the unit loses its memory. On most units, when this happens the unit functions okay afterwards but loses memory. On some units, however the display locks up and must be re-activated.	To re-activate the display, press and hold one of the input selection buttons for about 5 seconds. Once the display is re-activated it will stay active and work as normal until the unit is switched off and then this must be repeated. To fix permanently, replace back-up battery (BATT 1 on control board) and then re-activate the display.
Display locked up – probably one, two or more LEDs on front panel constantly lit. No function.	Probably constant	Control board requires upgrade. Check for the following on control board: Is a Pot (variable resistor) fitted at location VR1? Is a capacitor fitted at C16? Does the EEPROM (U9) have MK3 written on it? If the answer is yes to any of these questions, the control board requires upgraded.	See LK1 Control Board Upgrade sheet (accessible via Linfo Website - Product Information)
Display dead or locked up. May have occasional 'Disco Lights'	May be intermittent and symptoms may vary	Battery has leaked fluid onto control board, damaging components in that vicinity	Remove battery, clean board, replace any components that have been contaminated with battery fluid. Replace battery with a new one – Linn part no: MISS 011
Display locked up – amp will not function, perhaps one or two display LEDs permanently lit. May have occasional 'Disco Lights'	Probably constant Symptoms may vary	U7, U8 or C12 on control board faulty.	Replace C12 first (easy to replace) then replace U7 & U8.
Display dead or locked up.	Probably constant	Power supply fault on main board. The control board power comes from the emitter (square pad) of Q77 (attached to one of the heatsinks) on the main board. It should measure +8V	Firstly check which board is causing the fault – it could be the main board failing to supply the correct voltage or it could be the control board pulling the voltage down. If you have another LK1 try replacing the control board. See Introduction to Fault Finding section (accessible via Linfo Website - Product Information) for tips on how to trace fault. See also circuit diagrams. If the fault is located on the main board, try replacing Q77 – Linn part no: TRAN 006.
One or more display LEDs dim or dead	LK1 works okay otherwise.	Faulty display LED	Replace LED – Linn part nos: MISS 004 (green LED) MISS 005 (red LED)



LK1 loses all settings (volume setting, input selected, memory settings etc) when unit is switched off and back on.	Probably constant	Battery – BATT1 on control board faulty. To check, measure across the battery from one side to the other – it should measure about 3.5V dc. If it measures lower than about 2V, the battery is faulty.	Replace battery – Linn part no: MISS 011.
LK1 takes actions by itself – i.e. volume changes, selects inputs, unmutes etc.	Intermittent and random.	U7, U8 or C20 on control board faulty.	Replace C20 first (easy to replace) and if that does not fix it, try U7 & U8 Linn part numbers: U7 & U8 - IC 015 C20 - CAP 003

<u>Remote Control Problems</u>			
Symptom	Circumstances	Possible Cause(s)	Cure
LK1 cannot be controlled via remote handset. Works okay via front panel controls	Probably constant	Remote handset faulty or remote handset batteries require replacement.	Try fitting new batteries Try another working handset.
LK1 cannot be controlled via remote handset. Works okay via front panel controls	Probably constant	Remote control is not enabled on LK1 control board. On the LK1 remote handset, there is a button marked 'Pre' and several other buttons beside it in the same group. If one of these other buttons is pressed, this disables the remote control of the LK1 – to enable the remote again – press 'Pre'.	Press 'pre' on remote handset.
LK1 cannot be controlled via remote handset. Works okay via front panel controls	Probably constant	Remote receiver diode (D15 on Control board) is faulty.	Replace D15 – Linn part no: MISS 007
Poor control or no control via remote handset. Works okay via front panel controls	All the above Remote faults have been ruled out May be intermittent	U2 (remote receiver IC) or U6 (main processor IC) on Control board faulty.	Replace U2 (Linn part no: IC 010) or U6 (Linn part no: IC 017)



<u>Control via Front Panel</u>			
Symptom	Circumstances	Possible Cause(s)	Cure
One or more buttons either do not work at all or do not work well	May be intermittent	Membrane & switch contact require cleaning	Remove control board from Facia. With a dry, clean tissue or cloth, vigorously wipe the switch contacts on the control board. Clean membrane contacts (the black circular pads) in a similar way as switch contacts but with more care as it can be torn by rough handling.
No control via front panel – one of the display LEDs may be permanently lit.	Probably constant	U1 on control board (encoder IC) faulty.	Replace U1 – Linn part no: IC 009.
Some buttons work and some buttons do not	May be intermittent	Control board requires upgrade	See Control Board Upgrade procedure (accessible via Linfo Website - Product Information)



Amplifier problems

It is assumed at this point that the LK1 is definitely the cause of the fault – that you have traced the fault to the LK1 and ruled out all other aspects of the system (e.g. interconnect leads, power amp, speakers, sources etc.). If you have not, please do so before proceeding to ensure that you are not fault-finding on a product that is not faulty while the fault remains in the system.

<u>Audio (Listen) output</u>			
Symptom	Circumstances	Possible Cause(s)	Cure
No output from both channels	May be intermittent Display & control may be affected	Power up, display, or control fault – see these faults as listed above.	See Power up and Display & Control faults listed above.
One channel is louder than the other on all inputs	Probably constant	Balance is set off centre.	Centre the balance setting
Cross-talk from one (or more) input to other inputs. May also have a loud crackling noise intermittently	May be intermittent	One of the display LEDs on control board is leaking current.	See LK1 Cross-talk Repair Procedure (accessible via Linfo Website - Product Information)
Loud crackling, buzzing or electronic noise through speakers intermittently. May also have cross-talk between inputs.	Intermittent Symptoms may vary.	One of the display LEDs on control board is leaking current.	See LK1 Cross-talk Repair Procedure (accessible via Linfo Website - Product Information)
Cross-talk from one (or more) input to other inputs. May also have a loud crackling noise intermittently	Probably constant If the switches within the IC go faulty, they usually get jammed in the 'Closed' position. This means that the affected input will be permanently switched on and this causes cross-talk. E.g. if AUX switching IC is faulty and you are trying to listen to TUN while a source is playing on AUX, one channel of the AUX source may be heard on the TUN input.	Switching IC(s) faulty. Each input has its own switching IC, which switches Listen & Record for that input. If one input's IC fails it can affect the other inputs. The IC's in question are U1 – U6 and they are configured as follows: U1 – Phono U2 – Phono U3 – TP2 U4 – TP1 U5 – AUX U6 – TUN	Either replace all the switching IC's listed – Linn part no: IC 001 for all IC's; or by carrying out some checks, you may be able to narrow the fault down to the faulty IC(s) and replaced it/them only. If the symptom is cross-talk, then usually the faulty input will cross-talk to other inputs, but these inputs do not cross-talk back to the faulty one. If the symptom is loud thump, then usually the faulty input will be least affected by the fault.



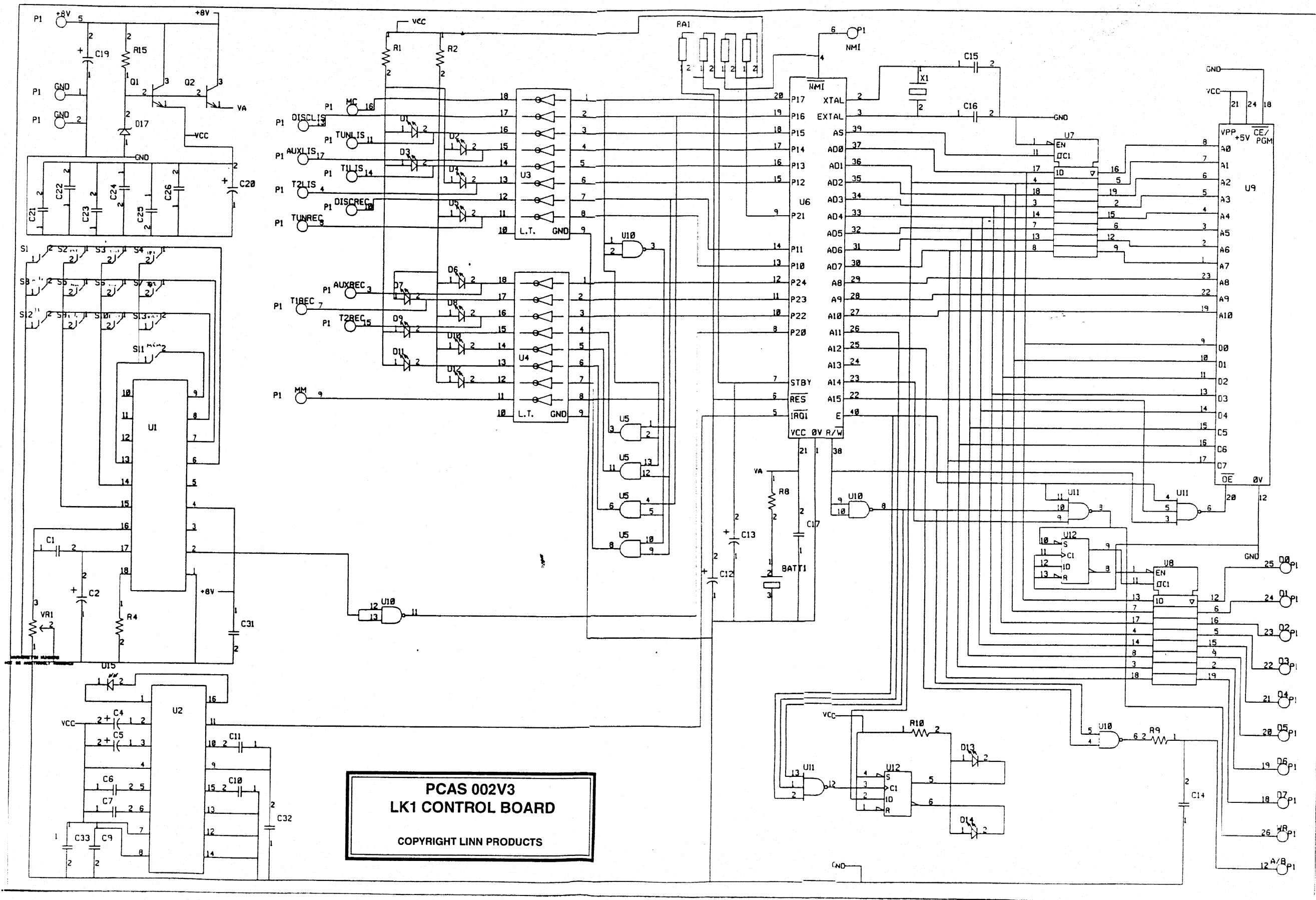
Crackling and/or rustling noise at the output of one channel	Firstly rule out the LED fault above. Probably intermittent. Noise varies in volume and intensity.	Transistor breaking down. You may be able to narrow down the fault by checking exactly what inputs/outputs are affected, whether the fault increases/decreases with volume etc.	See Introduction to Fault Finding (accessible via Linfo Website - Product Information) for tips on how to trace.
No output from all inputs.	Happens after unit has been switched off and then on again.	Backup battery (BATT1 on control board) faulty – causes sound to mute completely (volume is at absolute zero) on all inputs	To temporarily fix, simply turn up the volume when unit is first powered up. To fix permanently, replace the back-up battery – Linn part no: MISS 011
Output of one or both channels dead on all inputs	Probably constant	Volume control DAC faulty	Replace DAC – Linn part no: IC 003
When volume is set to minimum, the music is still heard.	Constant	This is normal. The lowest volume setting of the LK1 is NOT absolute zero. If absolute zero is required, press Mute. If the lowest volume is too loud, a mod can be done to reduce the gain of the LK1 by 8dB.	See LK1 Gain Modification sheet (accessible via Linfo Website - Product Information).
Slight hum on both channels of MM or MC input	May be intermittent and/or vary in volume & intensity.	A certain amount of noise is to be expected on the phono inputs due to the massive gain level required there.	Compare noise levels to another LK1 or another pre-amp phono stage – some low level hum is normal and unavoidable and cannot be eliminated.
Hum on both channels of MM or MC input	May be intermittent	Earthing lead between arm & LK1 casing is broken or not properly connected	Ensure continuity of Ground connection.
Loud hum on one channel of MM or MC input	Probably intermittent. Ensure firstly that the fault is not caused by turntable or interconnect leads etc. Rule out Phono hum faults above.	Ground (black) wire between phono socket and main board inside the LK1 is broken or not making good contact.	Repair the connection – re-solder or replace wire as necessary.
One channel of MM or MC input dead or distorted. Some crackling may occur	May be intermittent Symptoms may vary	Signal (red) wire between phono socket and main board inside the LK1 is broken or not making good contact	Repair the connection – re-solder or replace wire as necessary.



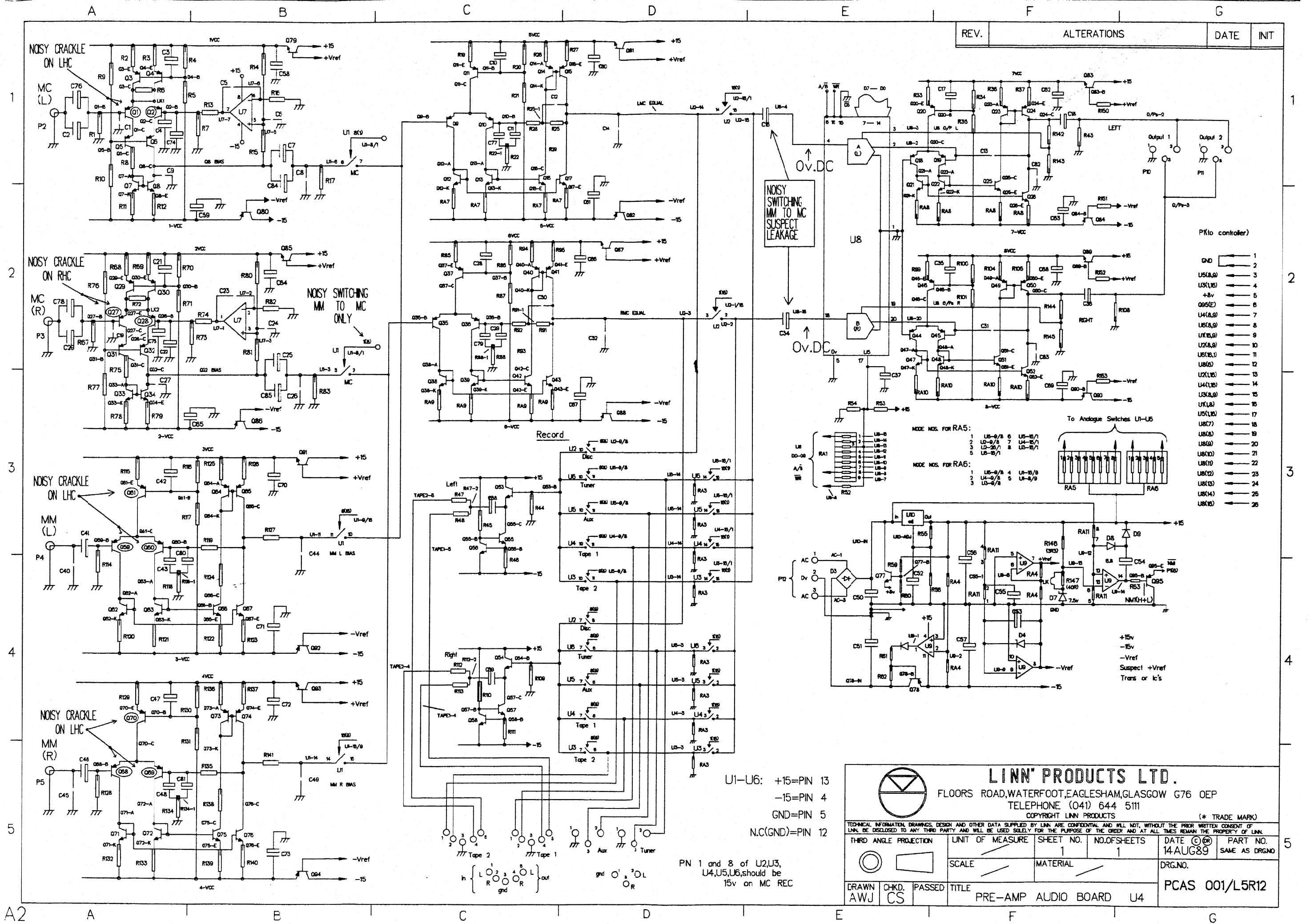
No output from one or both channels	All inputs May be intermittent	Faulty:- Power amp Speakers Interconnect leads Speaker cables	Find & repair or replace faulty part. Do not assume LK1 or any other part of system is faulty – check & fault find system. See Introduction to Fault Finding section (accessible via Linfo Website - Product Information) and also Service Procedures section (also accessible via Linfo Website - Product Information) for tips on how to fault find in a system.
No output from one or both channels	May be all inputs or possibly limited to one or two inputs. May be intermittent	Check that all input & output leads are inserted in the correct places Check that all input & output leads are pushed fully home. Check that the source selected on display corresponds with the source connected to the input. Check that the source is powered up, is playing and is working okay.	Find and fix the problem. See Introduction to Fault Finding section (accessible via Linfo Website - Product Information) and also Service Procedures section (also accessible via Linfo Website - Product Information) for tips on how to fault find in a system.

<u>Tape (record) Output</u>			
Symptom	Circumstances	Possible Cause(s)	Cure
Tape (record) output dead or – no recordings	Constant	Tape deck faulty	Repair/replace Tape deck.
Tape (record) output dead	Constant	Interconnect lead from LK1 to tape deck is wrongly connected Interconnect lead from LK1 to tape deck is faulty	Check, repair connections
Tape (record) output faulty. Possible Cross-talk from one record output to others. Possible loud thump when certain record outputs are switched.	Probably constant If the switches within the IC go faulty, they usually get jammed in the 'Closed' position. This means that the affected input will be permanently switched on and this causes cross-talk. E.g. if AUX switching IC is faulty and you are trying to record from TUN while a source is playing on AUX, one channel of the CD may be heard on the tape.	Switching IC(s) faulty. Each input has its own switching IC, which switches Listen & Record for that input. If one input's IC fails it can affect the other inputs. The IC's in question are U1 – U6 and they are configured as follows: U1 – Phono U2 – Phono U3 – TP2 U4 – TP1 U5 – AUX U6 – TUN	Either replace all the switching IC's listed – Linn part no: IC 001 for all IC's; or by carrying out some checks, you may be able to narrow the fault down to the faulty IC(s) and replaced it/them only. If the symptom is cross-talk, then usually the faulty input will cross-talk to other inputs, but these inputs do not cross-talk back to the faulty one. If the symptom is loud thump, then usually the faulty input will be least affected by the fault.





PCAS 002V3
LK1 CONTROL BOARD
 COPYRIGHT LINN PRODUCTS

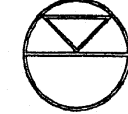


- PKto controller)
- GND ← 1
 - U8(A,9) ← 2
 - U3(L,16) ← 3
 - +8v ← 4
 - Q95(E) ← 5
 - U4(A,9) ← 6
 - U8(A,9) ← 7
 - U7(L,9) ← 8
 - U2(A,9) ← 9
 - U8(L,1) ← 10
 - U8(L,6) ← 11
 - U8(L,12) ← 12
 - U2(L,16) ← 13
 - U4(L,16) ← 14
 - U3(A,9) ← 15
 - U7(L,16) ← 16
 - U5(L,16) ← 17
 - U8(L,7) ← 18
 - U8(L,8) ← 19
 - U8(L,9) ← 20
 - U8(L,10) ← 21
 - U8(L,11) ← 22
 - U8(L,12) ← 23
 - U8(L,13) ← 24
 - U8(L,14) ← 25
 - U8(L,15) ← 26

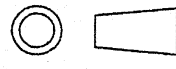
- NOTE NOS. FOR RA5:
- 1 U8-9/8 6 U5-16/1
 - 2 U2-9/8 7 U4-16/1
 - 3 U2-26/1 8 U5-16/1
 - 5 U5-16/1
- NOTE NOS. FOR RA6:
- 1 U5-9/8 4 U1-16/8
 - 2 U4-9/8 5 U1-8/8
 - 3 U5-9/8

U1-U6: +15=PIN 13
-15=PIN 4
GND=PIN 5
N.C(GND)=PIN 12

PN 1 and 8 of U2,U3,
U4,U5,U6 should be
15v on MC REC



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THIRD ANGLE PROJECTION	UNIT OF MEASURE	SHEET NO.	NO. OF SHEETS	DATE	PART NO.
	SCALE	1	1	14 AUG 89	SAME AS DRGNO
DRAWN	CHKD.	PASSED	TITLE	DRG. NO.	
AWJ	CS		PRE-AMP AUDIO BOARD U4	PCAS 001/L5R12	