Lecson AC1/AP1/AP2
Instruction Manual

lecson

1. Introduction

The Lecson audio amplifying system combines outstanding technical performance with simplicity and reliability of operation.

While the control unit, AC1, and power amplifiers, AP1/AP2, are intended to be used together they can be used separately, with different makes of ancillary equipment.

A typical stereo installation using the Lecson amplifiers is shown in Fig. 1.

Fig. 1

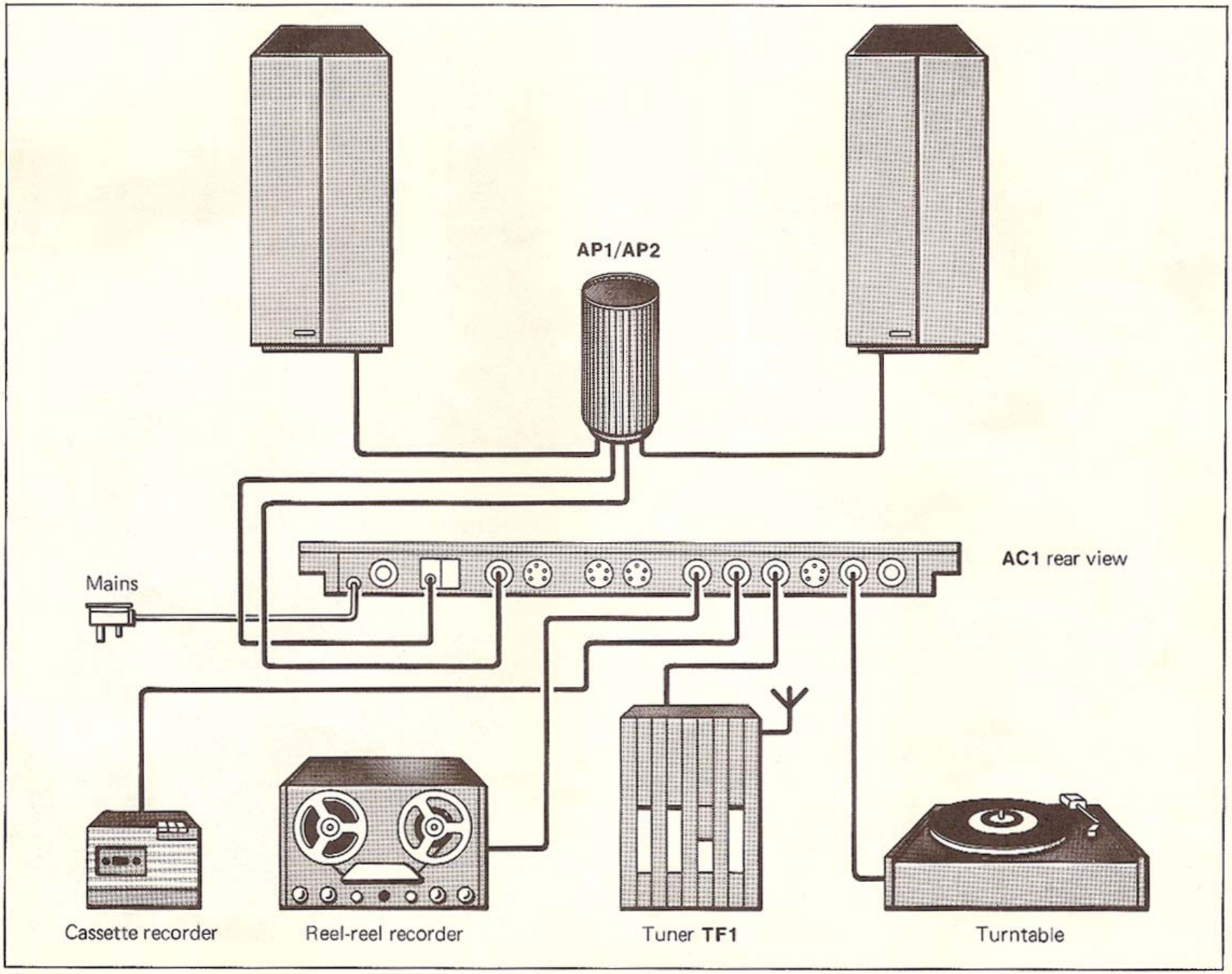
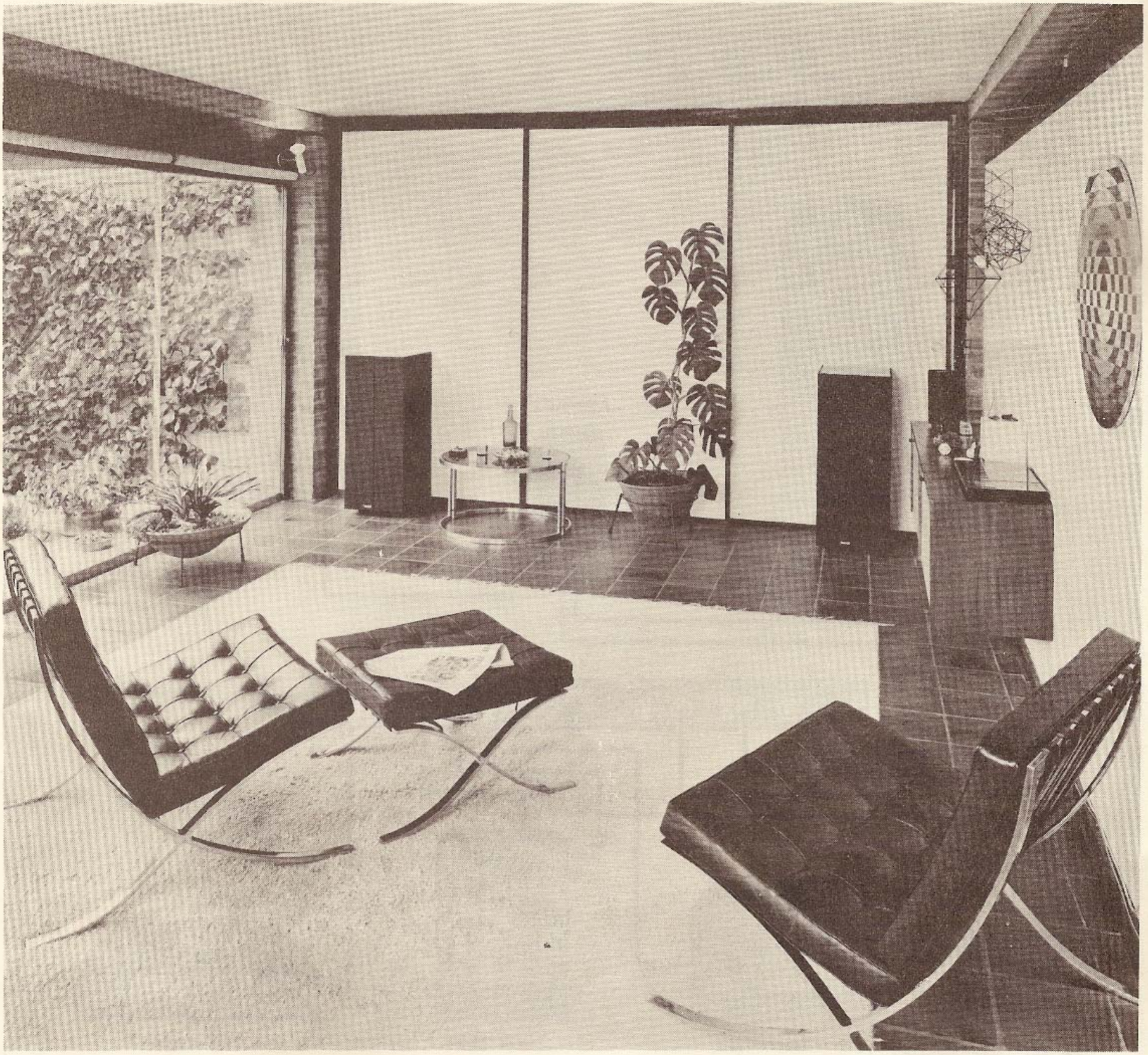


Fig. 2



2. Installation

Disposition The Lecson range is intended to be used free standing, although control unit AC1 can be wall mounted.

Generally it is not advisable to connect a turntable to an amplifier such as AC1 with a lead longer than 2 metres, and if possible the lead provided with the turntable or arm should be used. If the installation contemplated requires a connection much longer than this (as for example wall mounting of AC1 may) then expert advice should be sought.

Long leads to the amplifier will not upset its performance, but they may adversely load the pick-up cartridge, giving high frequency loss or ringing.

These considerations will decide the permissible separation of the record playing equipment and AC1. It is not so important that the other signal sources, tuner, tape etc. be so close to AC1 and the procedure for long leads is outlined in section 7.

AC1 will most likely be mounted on a table, bookshelf or wall. All connections are recessed at the rear so that interconnecting cables can be hidden (see Fig. 3). Ventilation is not an important consideration as the unit consumes only 3 watts, and no perceptible temperature rise occurs in operation. Mounting AC1 with the Lecson tuner, TF1, is covered in the handbook for the tuner.

Amplifiers AC1 and AP1/AP2 can be operated correctly up to 10 metres apart using approved connecting and extension leads (see section 10).

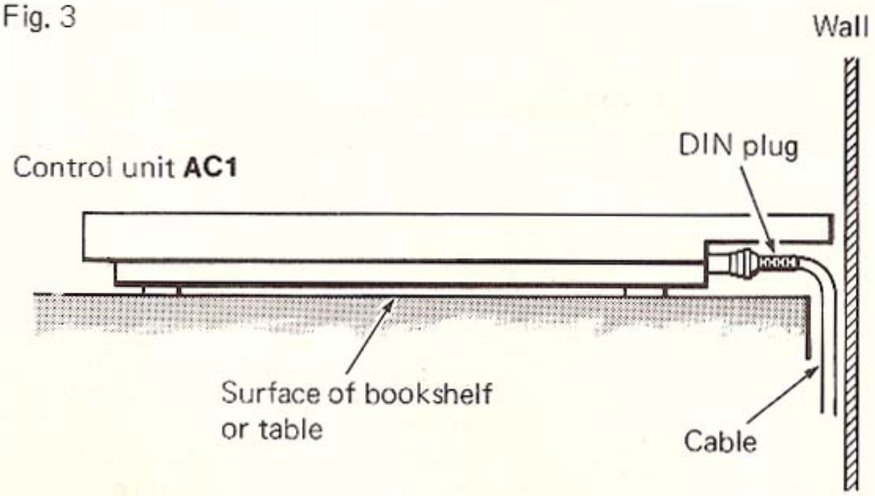
AP1 and AP2 are also intended to be free standing, and ventilation approximating to that of free standing conditions should always be provided. For normal use on musical programme the cylindrical case—which is the heat sink of the amplifier—will only rise a few degrees above room temperature.

Although the units will operate over a wide temperature range, it is not recommended that they be placed near radiators or in direct sunlight.

Do not place the control unit unnecessarily close to equipment with mains transformers, or hum may be induced.

Mains power for the power amplifier and the turntable or tuner can be obtained from the control unit, in which case these are also switched by it.

Fig. 3



3. Wiring up the system

AC1

Inputs are provided for two magnetic pick-ups, a tuner and two other auxiliary sources, which may be tape recorders. AUX 1 & 2 also provide outputs to a tape recorder, and AUX 2 can be used for tape monitoring.

It may be advisable to attenuate signals to or from AC1 to obtain lowest distortion, highest overload and most convenient volume control range. (See section 7).

All connections to AC1 use DIN plugs, and the inputs sockets have DIN standard connections. (See Fig. 4).

Fig. 5 shows how the DIN plugs should be wired for optimum performance. It can be seen that two techniques exist for earthing equipment with and without separate earth leads.

The circuits of AC1 can be destroyed by making incorrect connections. Plugs should be carefully checked for incorrect wiring, shorting etc. **If in doubt consult your dealer.**

Do not push in or pull out DIN plugs while AC1 is switched on.

Two mains outlets are provided which accept the standard American plug. Both outlets are switched by AC1 and protected by the fuse on the rear left of AC1.

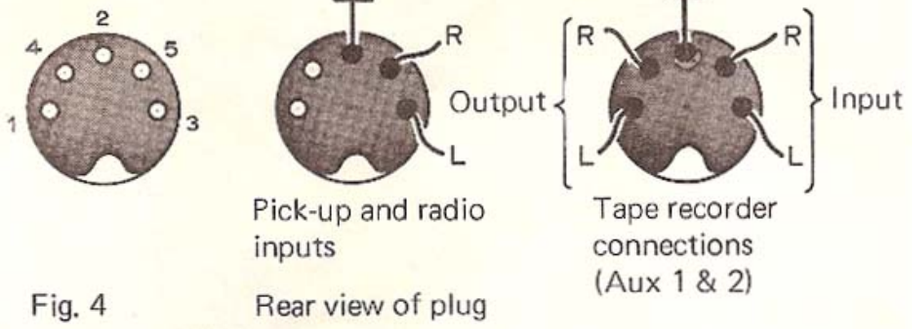


Fig. 4 Rear view of plug

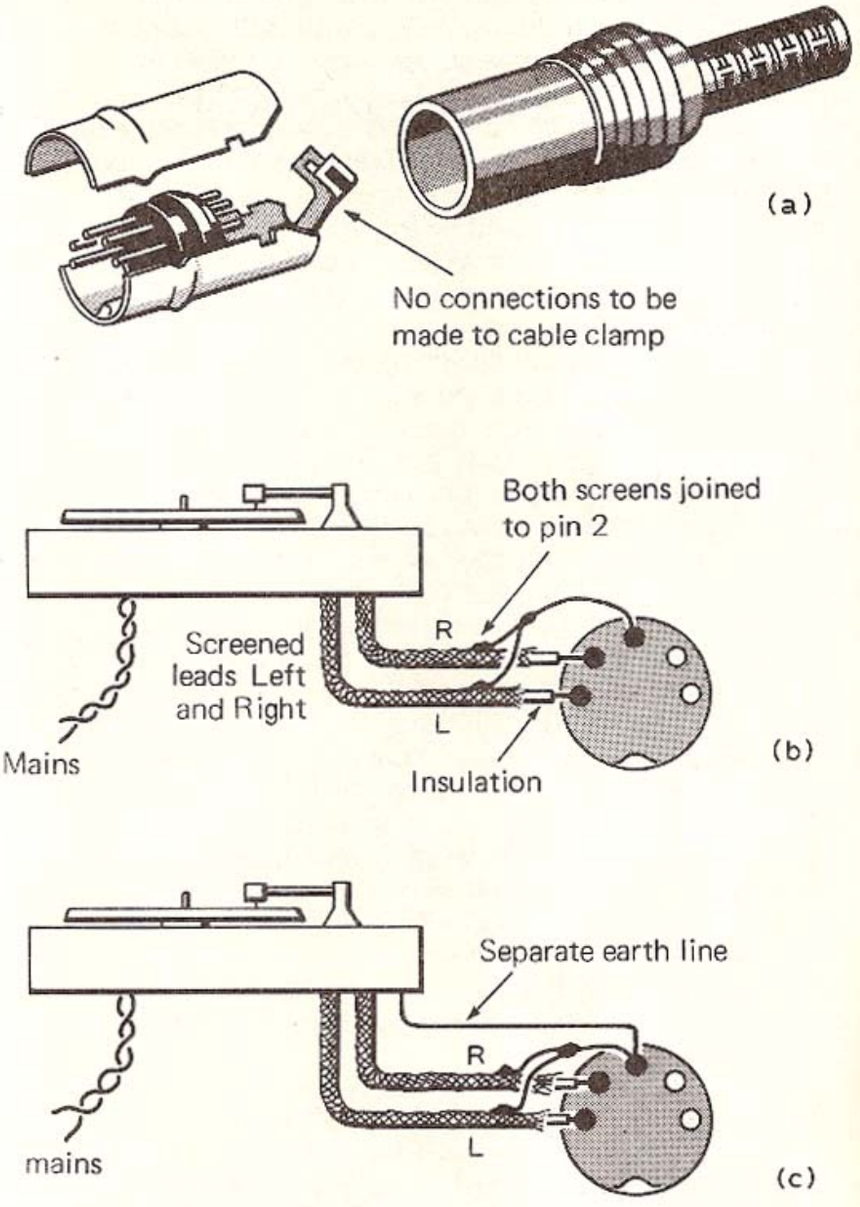


Fig. 5 Viewed from front of DIN plug

Fig. 1 showed a typical stereo installation. Signal leads are connected to AC1 using the DIN plugs as described above. Standard leads (part numbers AA100 to AA102, according to length) are used to connect the power amplifier to the control unit. A further connection between the units is made with the two-core mains lead, ***with reversible flat pinned plug,*** provided with the power amplifier, which is plugged into one of the outlets at the rear of the control unit.

Mains supply to the system is made through the three-core mains lead provided with AC1. It should be connected as shown in Fig. 6.

Unless written instructions to the contrary are included with the equipment the power amplifier should not be connected to mains earth or to a water pipe, neither should any earth connection be made other than in the plug (Fig. 6).

The amplifiers leave the factory set to either 120V or 240V 50/60Hz and the correct voltage is marked on the case. Two settings only are provided, and they may be changed over by removing the base cover of each amplifier as shown in section 6. This adjustment is best carried out by an expert.

The final requirement is the loudspeaker wiring. Two-core cable should be used and wherever possible the recommendations of the loudspeaker manufacturer should be adhered to with regard to the thickness of wire. Often, lighting flex will do, but the total resistance of the wire used should be less than 5% of the loudspeaker impedance. Observe the phasing of the loudspeakers, as this is important in stereo. (See section 5).

Connections to the amplifier are made as in Fig. 7. Two pairs of loudspeakers may be used, and a switch on the base of the amplifier (Fig. 7) allows either pair—a or b—to be selected, or both together (ab). Fuses are fitted in the loudspeaker and headphone outlets and these are also marked in Fig. 7.

Fuses rated at 2.5A are provided, but when 4Ω loudspeakers are used at high power level, or two 8Ω pairs of speaker used together (switch 'ab') at high levels, then 3.5A fuses should be fitted.

Where loudspeakers of modest power rating are used these fuses can be reduced in value to protect the loudspeakers to some extent. ***Never*** fit an anti-surge fuse in these positions.

The procedure for electrostatic loudspeakers is discussed in section 7.

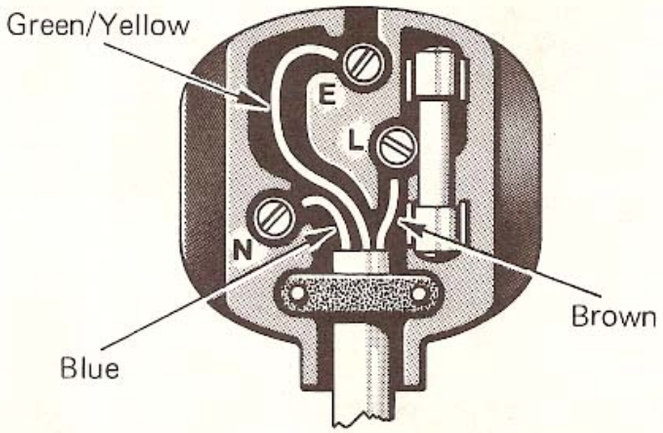


Fig. 6

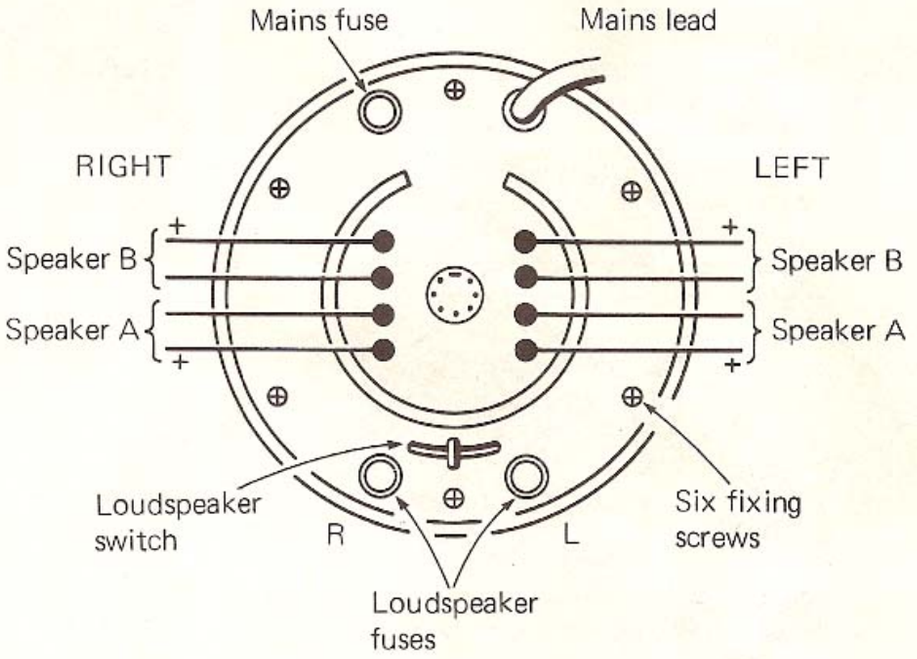


Fig. 7 Connecting to power amplifier

4. Control functions

The photograph in Fig. 8 shows the top face of AC1. The controls are shown in their normal position for playing records, and the functions are described below.

A Input selection determines which of the five possible inputs is connected to the system. The input which is selected here always appears at the tape outputs of sockets AUX 1 and 2 and this output is not in any way affected or changed by the setting of any other control.

PU 1 & 2 are used for playing records with a magnetic cartridge.

RAD Input at 125mV level intended for a tuner or similar source.

AUX 1 An input which also provides an output for a stereo tape recorder; in many systems this would be the ideal socket for a cassette tape machine.

AUX 2 As AUX 1, except that this input may be used for off–tape monitoring.

The input selection switch is not functional in the *remote* mode (B).

B Tape Monitor allows an instantaneous comparison of 'before' and 'after' on a tape recorder fitted with 3 leads. In the *off* position the signal on the selected input (A) is fed to the loudspeakers. This is the 'before' signal that is fed to the tape recorder. Pushing the switch to 'on' switches the signals so that the loudspeakers can reproduce the signal coming off the tape recorder on AUX 2.

It is important for useful monitoring that the levels of the signals *off* and *on* be the same and the ways in which this can be achieved are shown in section 5.

The third position of this switch – *remote* – allows the input selection of AC1 to be achieved remotely (see section 6).

C Volume This control sets the *loudness* of the final sound, it is good practice to reduce the volume to *0* before switching to another input on *A* and before switching the power *off* (K).

The law and track-matching of this control are such that accurate two-channel loudness variation is given over a wide dynamic range.

Note that the high input overload capacity of the amplifier can mean that it will accept high signals, and the useful range of movement of the volume control is restricted to the lower end of its scale without any distortion being apparent. This situation can be avoided by adjusting the signal level. (See section 7).

D Treble and E Bass The effect of the tone controls is to adjust the balance between treble (high) and bass (low) notes. Normally these controls will be 'flat' i.e. set to *0*, particularly if the ancillary equipment is of high quality.

The tone controls are most useful in obtaining the best results from a loudspeaker/room combination, where in some cases a setting of these controls other than *0* will produce the most pleasing sound. If however it is found necessary to use a setting greater than ±2 on either control then a fault in the ancillary equipment should be suspected.

Experience has shown that tone controls are of little use in compensating for deficiencies in programme material; for this, the filters (see H, I) are more satisfactory.

If there is any doubt the controls should be set to *0*, or having found a pleasing position they should be left unchanged.

F Balance This allows the relative levels of the two channels to be adjusted, which may be necessary because of programme deficiencies or room effects. It is unusual in operation in that movement away from *0* holds one channel at a fixed level while the other is attenuated.

G Mode usually set to *stereo*, movement to mono commons the two channels in the unit and allows a signal appearing on one input (left or right) to be fed to both channels of the power amplifier; or it may be used to sum both channels. This can be useful when phasing loudspeakers (see section 5).

The two positions *4ch 1* and *4ch2* are not functional unless a Lecson 4 Channel adaptor is fitted at the rear of the unit. Instructions on the use of these are provided with the adaptor.

H High Filter This control operates the high frequency filter, which affects only the extreme high frequencies of the signal. For most signal sources distortion rises rapidly at high frequencies, and it will be found that some programme material is improved by switching in the 12kHz (f1) or 8kHz (f2) filter positions. Filter f3 is fairly severe, and normally should be used only for old recordings.

Many amplifiers have poor filters, but the Lecson filtering system is carefully designed to give a pleasing effect. With the switch *out* the amplifier response is curtailed above 30kHz.

If in doubt about this control, set it to *out* for good modern recordings and f1 for other material.

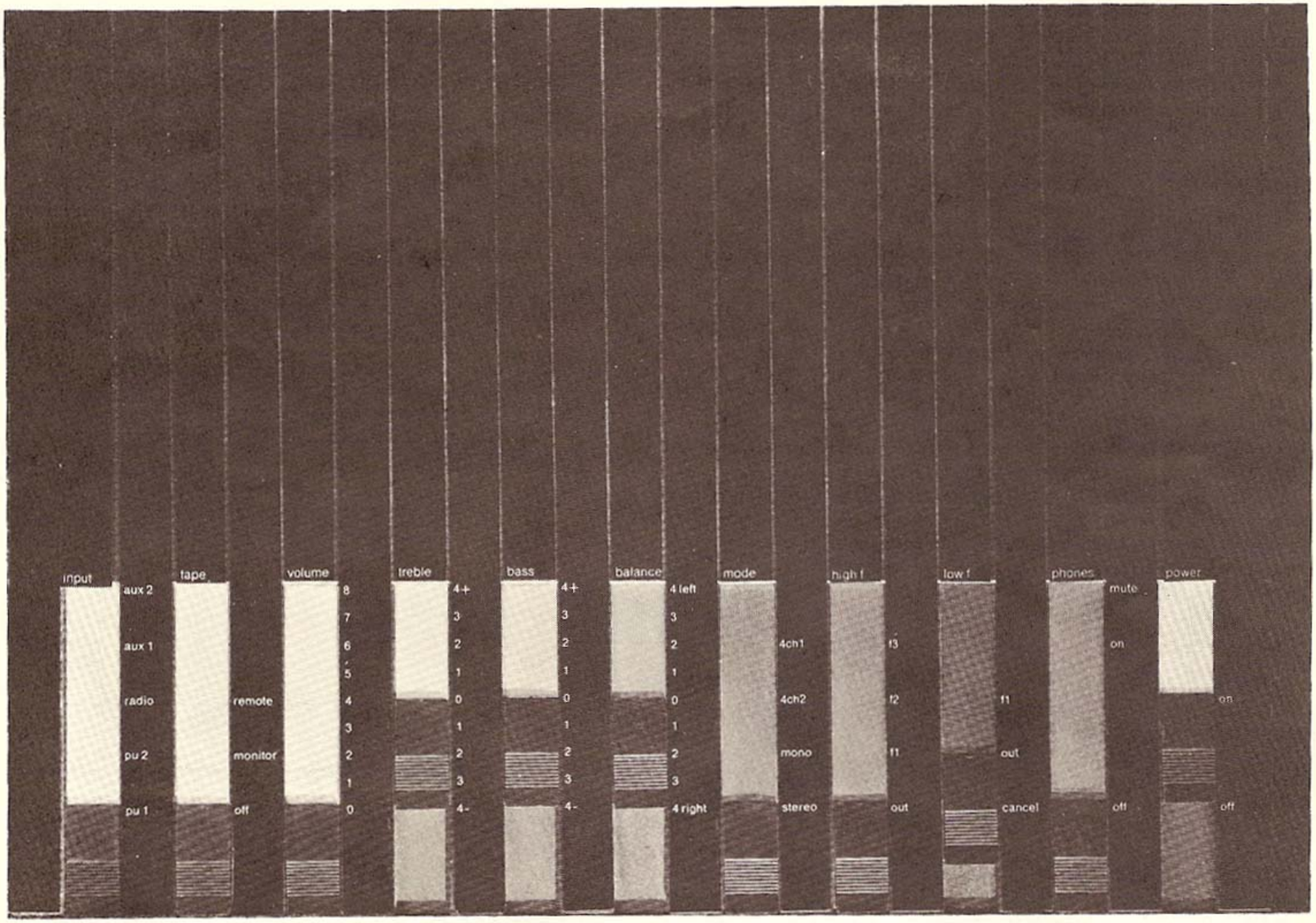


Fig. 8

I Low Filter Normally in the *out* position, moving this switch to f1 curtails the extreme low frequencies. This is useful where rumble is arising anywhere in the chain—record, turntable, tape-transport etc.

In the *cancel* position the filter and tone controls are set for a 'flat' response. Thus the effect of any tone setting other than *0* or a filter frequency can be evaluated by switching between *out* and *cancel* on this control. Avoid using the amplifiers normally in the *cancel* position as this extends the bandwidth unnecessarily beyond audibility.

J Phones Sliding this control up to *on* reveals the standard jack socket into which the headphone plug is inserted. (See the notes on headphone use in 5.) Moving the controls to *mute* allows the headphones to operate with the loudspeakers switched off (N.B. This applies only to systems using AP1 or AP2).

K Power This switches the mains supply to the amplifiers. Position *on* is indicated by a red light.

5. Operation

When the Lecson amplifiers have been connected into a system a check should be made that they have been adjusted to suit the mains supply (120V or 240V).

Set the input control to the desired source (e.g. PU1 for disc) and the other controls as shown below:

Tape	Off
Volume	0
Treble	0
Bass	0
Balance	0
Mode	Stereo
High filter	Out
Low filter	Out
Phones	Off
Power	Off

Now push the power switch to ***on***, a red light should shine and the system can be tested by playing a record and advancing the volume control.

When you are satisfied that all is working correctly, experiment with small movements of the tone controls and the filters.

If there are any problems, e.g. the unit fails to work or works incorrectly, switch off immediately and check all connections, control positions and fuses carefully. Should this not help, then consult your dealer.

Loudspeaker Phasing

A poorly defined stereo image will result if the loudspeakers are connected in antiphase.

If there is any doubt about this, switch the control unit to ***mono***. The image should be sharply defined in the centre between the loudspeakers. Reversing the leads to one speaker will show a difference. If changing the phase does not improve the stereo image, check that the loudspeakers are placed as they should be.

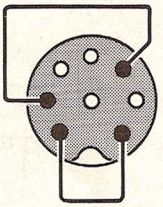
Headphone Listening

Signal for headphones is taken from the power amplifier, and this is brought to the control unit in the accessory connecting lead (AA100–AA102).

Phones with impedances between 3Ω and 600Ω can be used.

In certain circumstances phones of 600Ω impedance can be driven to moderate levels by AC1 on its own. In this case a special plug must be made up as shown in Fig. 9 to be inserted in the output socket on the rear of the AC1.

Headphone connections are standard stereo jack as shown in Fig. 10.



Rear view of plug

Fig. 9

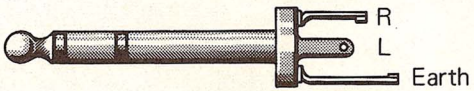


Fig. 10

6. Special facilities and adjustments

Selection of mains voltage
Unless the amplifier is an export model and has alternative instructions, it will be necessary to make internal adjustments to select either 120V or 240V operation.

AC1 Remove the mains plug from the power source.

Remove the base-plate by undoing the counter-sunk self-tapping screws shown in Fig. 11(a). The under side of the printed board will now be revealed.

Voltage selection is done by changing the wiring on the mains outlet sockets. Fig. 11(c) shows the correct wiring for 120V operation and Fig. 11(b) for 240V operation.

AP1 Unplug the amplifier and remove connections to AC1 and the loudspeakers. Remove the six self tapping screws from the base of the amplifier shown in Fig. 7. The base plate may now be moved away, and to one side of the main chassis. This will reveal the mains transformer as shown in Fig. 12.

Connections to the mains transformer for 120V or 240V operation are shown in Fig. 12.

Remember that the mains fuse ratings are 2·5A 240V and 5A 120V and these ***must*** be correct.

Fig. 11

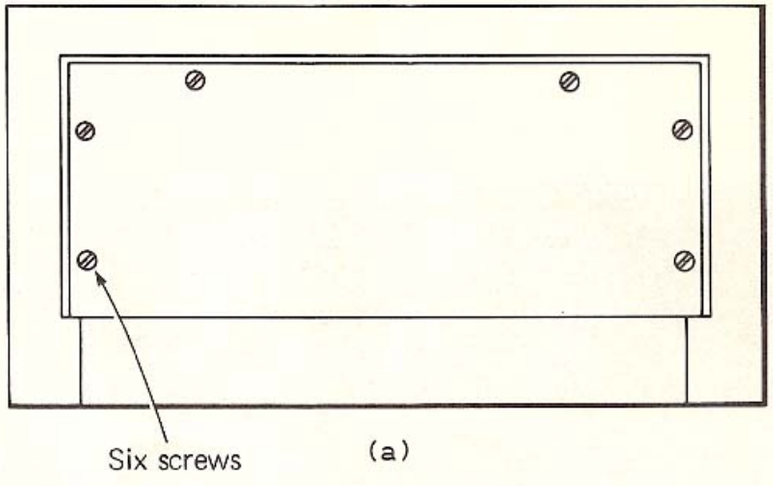


Fig 12a. 120V

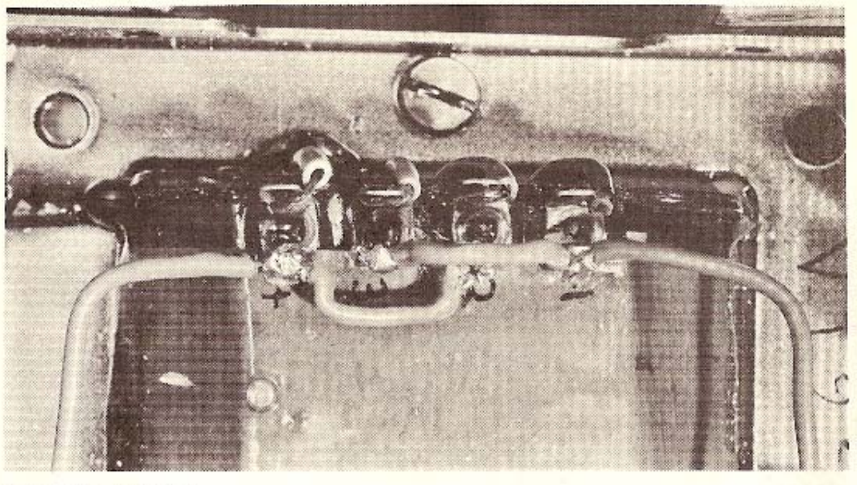
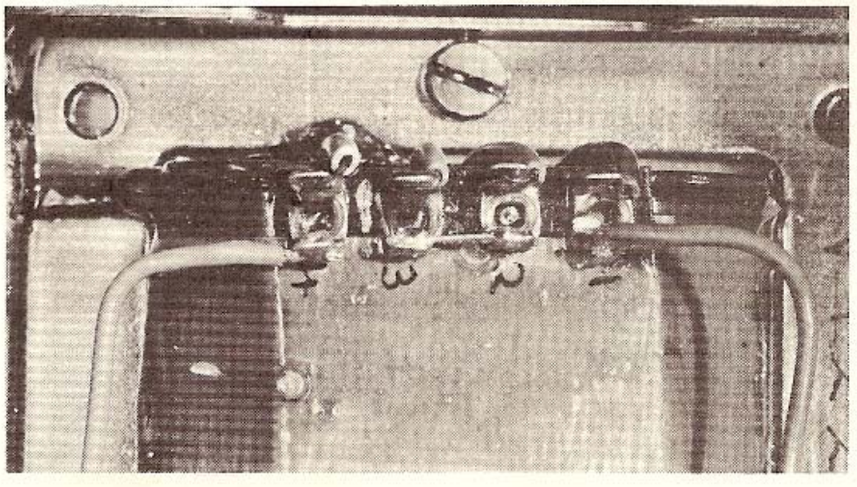


Fig 12b. 240V



Adjustment of output level of AC1
It is possible to change the output level of AC1 from 500mV to 1·2V. This is made possible so that AC1 may be used to drive power amplifiers of other makes.

We suggest that this adjustment be carried out by an expert.

To make this change the base cover is removed as described under 'mains voltage adjustment'.

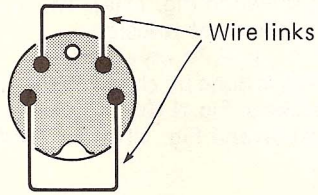
Inspection of the printed board will show (Fig. 13) two wire links soldered on the under side. These should be removed using a soldering iron or side-cutters.

Raising the output level to 1.2V reduces the effect of the tone controls to half the variation available normally.

Four channel operation
The AC1 control unit is provided with internal connections which make the 'mode' switch positions ***4 ch 1*** and ***4ch 2*** indistinguishable from stereo. When used with a Lecson 4–channel adaptor the wire links must be removed. Operation in the mono or stereo modes will be as before.

Important Once the wire links have been removed, the amplifier will not operate at all unless either the 4-channel adaptor is fitted according to the instructions supplied with it, or unless a shorting plug wired as in Fig. 14 is fitted to the four channel ***A*** socket at the rear.

The links are removed in the same way as those to change the output level, and are shown in Fig. 15.



Rear view of plug

Fig. 14

Fig. 13

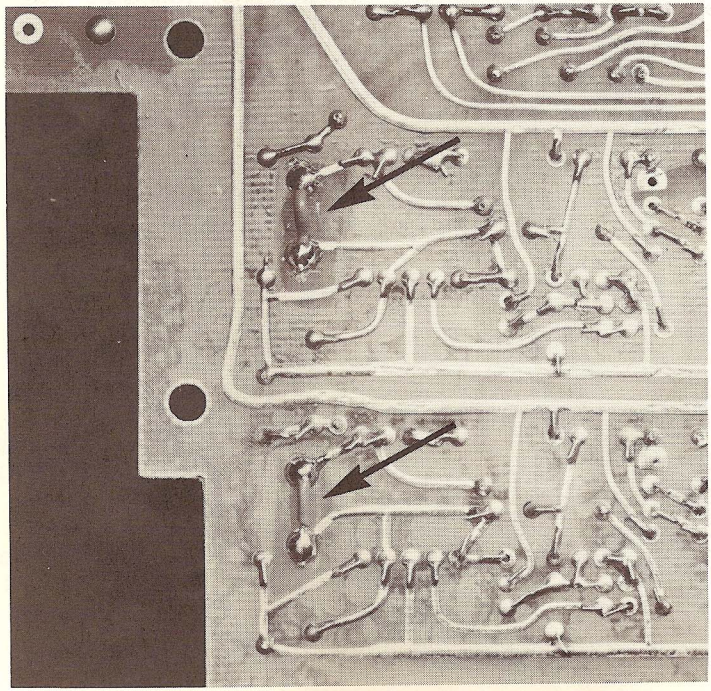
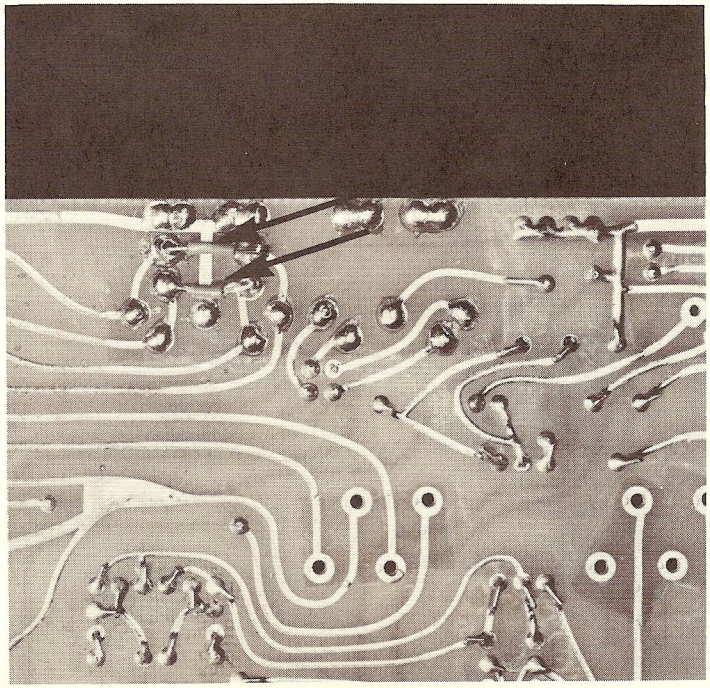


Fig. 15

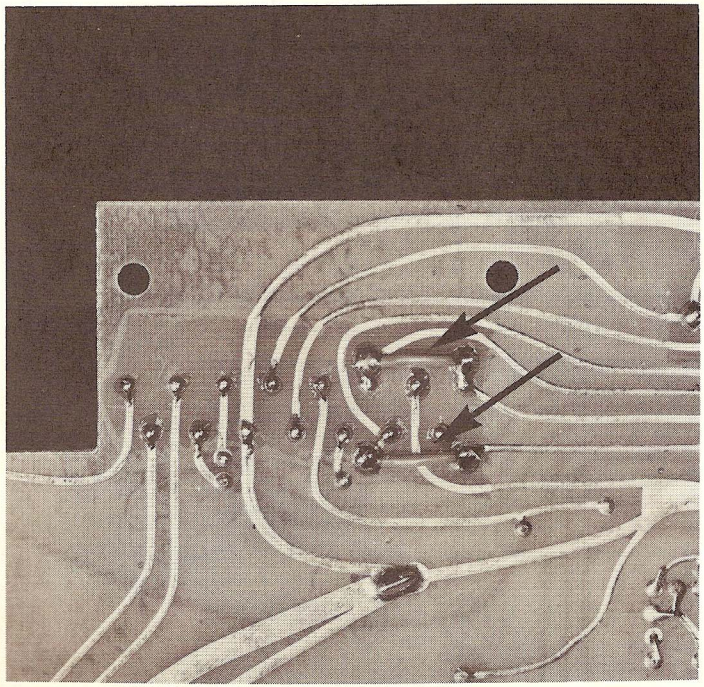


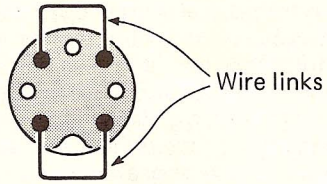
Remote control
Two remote-control sockets are provided at the rear of AC1. The first on the extreme right is used for remote input selection; the second (next to the output socket) can be used with the Lecson remote control unit to allow remote adjustment of volume level.

It is necessary to remove two wire links to allow correct operation of the remote controller. The links are removed in the same way as for the adjustment of output level and are illustrated in Fig. 16.

Important Once the wire links have been removed the amplifier will not operate at all unless either the remote controller is plugged in, or a shorting plug wired as Fig. 17 is fitted to the left remote socket on the rear of AC1.

Fig. 16





Rear view of plug

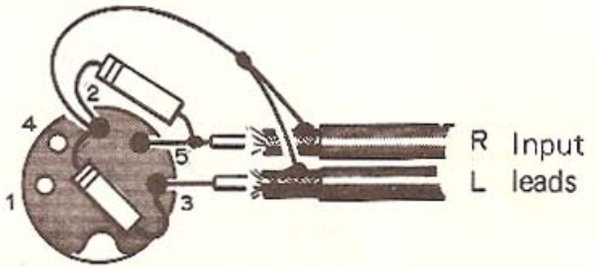
Fig. 17

7. Further connection details

Long input leads

Where it is desirable to operate the AC1 at a distance of more than 4 metres from signal sources other than a magnetic pick-up it may be advisable to fit a shunt resistor to the plug to avoid undue high frequency loss (as shown in Fig. 18). The value of this resistor should be 10kΩ for 5 metres of cable and proportionally less for greater lengths, e.g. 5kΩ for 10 metres, etc. However, at no time should this resistor have a value lower than the output impedance of the signal source – tuner, tape recorder, etc. Carbon film or metal oxide resistors of 1/8W or less can be used.

If any signal attenuation is also required the instructions in the next section will be helpful.



Rear view of plug

Fig. 18 Procedure for long input leads

Level adjustment

The rated sensitivity for the radio and auxiliary inputs is 120mV and it is good practice to adjust these signals at source if possible to this level. The control unit has a high overload capacity and no obvious distortion will be noted if high levels are fed in, particularly to the magnetic input.

To reduce the levels of signal fed into the unit, attenuating networks can be used as shown in Figs 19 and 20. Again carbon film or metal oxide resistors of 1/8 W or less can be used.

For tape monitoring the levels should be equalised using the output level control on the tape recorder, or if this is not possible, by using an attenuator as above.

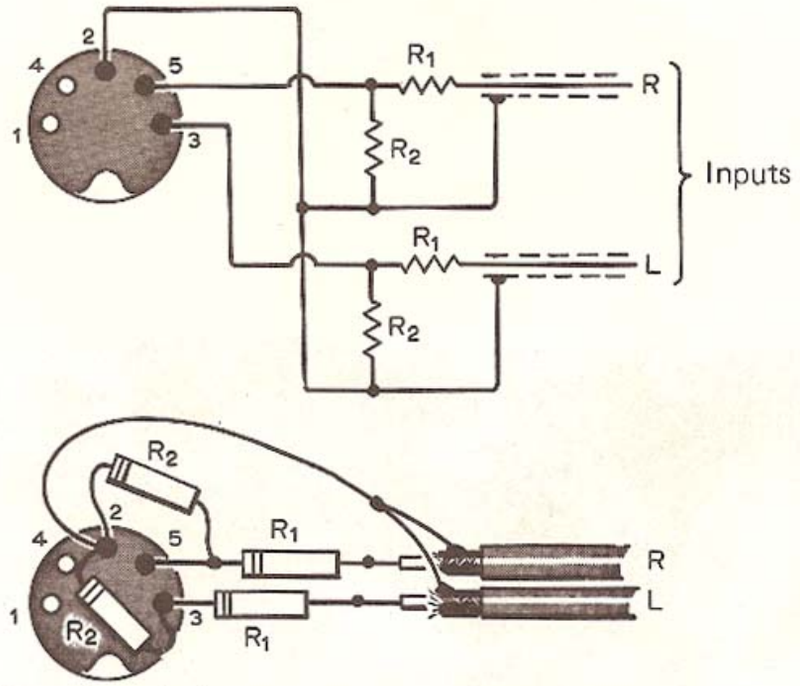
Connection of AC1 to AP1 or AP2

Standard leads are available from Lecson for this purpose, but for those who wish to make non-standard lengths, details are given in Fig. 21. Remember, incorrect connections can cause *serious* damage to the circuits.

Use of AP1 or AP2 with electrostatic loudspeakers

The power amplifiers are perfectly stable when connected to any load and can be used quite safely with any electrostatic loudspeakers.

However, it is good practice with any amplifier to place a resistance of 1Ω 2W in series with such a loudspeaker if this is not already fitted by the manufacturer, as for example Quad. The purpose of this resistor is firstly to limit in a controlled way the peak currents that may flow at any time, and also to allow the amplifier more precisely to follow transient information in the signal.



Rear view of plug

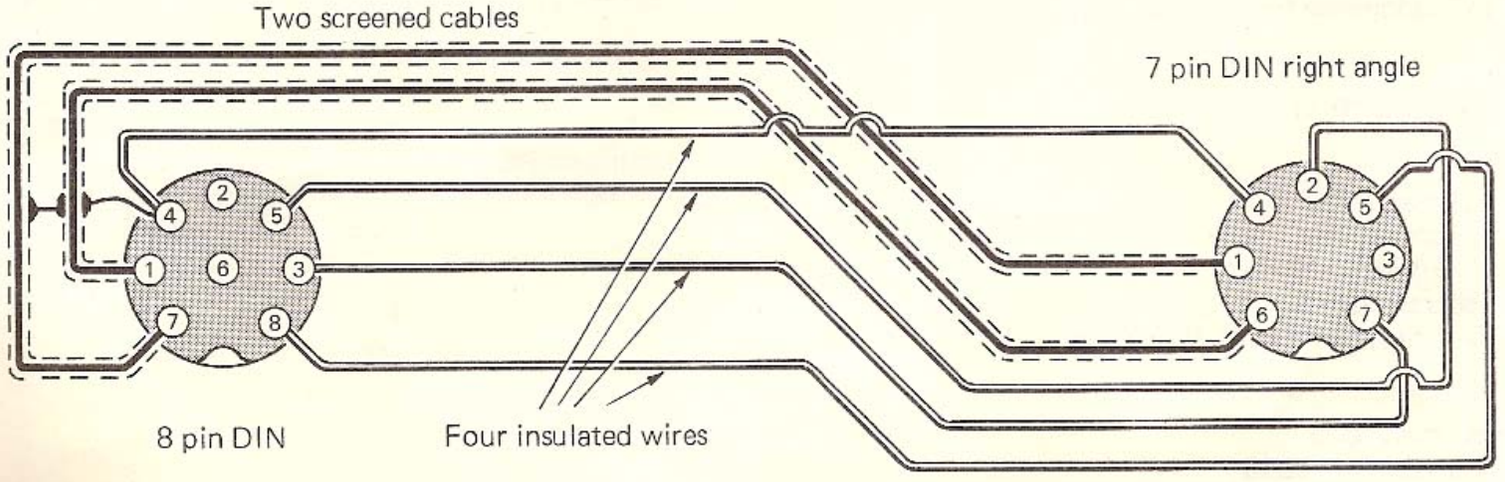
Fig. 19 Procedure for attenuating input signal

Source Impedance i.e. Output impedance of signal.

		Attenuation									
		2:1	3:1	5:1	10:1	30:1	100:1	2:1	5:1	10:1	30:1
		6dB	10dB	14dB	20dB	30dB	40dB	6dB	10dB	20dB	30dB
100Ω	R1	1K	2K2	2K2	2K2	2K7	10K	1K	2K2	2K2	10K
	R2	1K	1K	560Ω	220Ω	100Ω	100Ω	1K	1K	220Ω	100Ω
1KΩ	R1	5K6	10K	10K	10K	10K	10K	3K3	6K8	8K2	8K2
	R2	5K6	5K6	2K7	1K	330Ω	100Ω	3K3	1K8	820Ω	270Ω
10KΩ	R1	22K	33K	33K	33K	33K	33K	2K2	5K8	8K2	19K
	R2	22K	15K	8K2	3K3	1K	330Ω	8K2	6K8	2K2	680Ω
50KΩ	R1	47K	47K	47K	100K	100K	100K				
	R2	100K	68K	15K	10K	3K3	1K				
100KΩ	R1		2K2	100K	100K	100K	100K				
	R2		82K	82K	22K	6K8	2K2				
		Short leads						Leads > 5m			

Fig. 20 Attenuator values

Fig. 21



8. Specifications

All specifications are for 120/240V input 50Hz after two minutes.

AC1

Inputs

Inputs	Sensitivity for 0.5V o/p	Input impedance	Overload capacity	S/N (short circuit)
PU1 PU2	2.5mV for 1 cm/sec at 1kHz	47kΩ	50dB	>80dB CCIR >70dB unweighted
RAD AUX1 AUX2	125mV	68kΩ*	25dB	>90dB CCIR >80dB unweighted

* Input impedance of AUX2 on tape monitor is 10kΩ.

At no time must the input voltage exceed 10V rms or ±14V peak with respect to ground, or damage will result.

Outputs

500mV rms to power amplifier	(may be adjusted internally to 1.2V rms)
100mV rms to recorder	(RAD, AUX1 and AUX2)
100mV rms to recorder	(PU1 & 2 at 4 cm/sec, i.e. 10mV i/p)

Response

RIAA within 1dB	(PU1 & 2)
flat ± 0.5dB 30Hz–20kHz	(RAD, AUX1 & 2)
± 3dB 10Hz–32kHz	(controls *out*)
± 3dB 10Hz–50kHz	(*cancel*)

(2W max. to headphones from power amplifier)

Tone controls

± 14dB at 100Hz and 10 KHz

Filters

High F Bessel characteristic
–3dB at 5, 8 and 13kHz ± 10%
ultimate slope 18dB/octave.

Low F Bessel characteristic
–3dB at 35Hz slope ultimately 12dB/octave.

Crosstalk

Typically better than 60dB
Record/replay better than 60dB
(Depends on input source impedances.)

Total harmonic distortion (excluding noise)
At 1kHz at all times less than 0.05%. Typically less than 0.02%.
Controls flat at rated input and output less than 0.1%
30Hz–20kHz and typically less than 0.05%.
No transient distortion effects. Index 0.1.

Hum

Better than –70dB CCIR

Four channel facility for matrix decoding or synthesising.

Remote control facility for remote input selection and volume adjustment.

Tape monitor available on AUX2.

Power 100–130/200–260V 50/60Hz 3VA.

AP1

Input
500mV rms for 35W at 1kHz
10kΩ input impedance.

Output
Directly coupled to loudspeaker.
Rated power is 35W per channel. Typical maximum power in excess of 50W per channel, both channels driven into 8 or 4Ω loads.
Rated power into 4Ω is for music or intermittent use.

Total harmonic distortion 8Ω load
Less than 0.05% at all power levels up to 35W and all frequencies between 200Hz–20kHz.
Less than 0.1% at all power levels up to 35W and all frequencies in the range 20Hz–20KHz.
Distortion in the band 200Hz–10kHz lower than 0.02% and typically less than 0.005% at 1kHz 35W.
Typically less than 0.02% at 50W.

Noise
Below 35W –90dB CCIR
–80dB unweighted

Hum
Below 35W –80dB CCIR

Outlets
For two pairs of loudspeakers with switch to select a, a & b or b.
An internal relay mutes these outlets.

Protection
The amplifier is unconditionally stable and is fully protected against abuse.
Internal electronic protection senses the condition of the output transistors and prevents damage.
Fuses are fitted in the loudspeaker leads.
In the event of serious abuse or adverse ambient conditions, a thermal switch disconnects the mains supply if the case temperature of AP1 rises to 65°C ± 2.5°C.

Output impedance
Less than 0.2Ω

Response
± 1dB 10Hz–20kHz
An internal filter curtails the input at high frequencies, hence
± 3dB 5Hz–30kHz
This eliminates any possible r.f. breakthrough or transient distortion.

Transient distortion
Non-existent with applied signals up to 20kHz.
Index < 0.1.

Open-loop response
–3dB at 17kHz

Feedback factor
Typically 36dB.

Power 100–130/200–260V, 50/60Hz, 50–250VA (depends on drive).

AP2

As for AP1 except that rated power is 70W per channel.

Power 100–130/200–250V, 50/60Hz, 50–300VA.

9. Service and Maintenance

Cleaning

AC1 and AP1 or 2 are finished in hard black anodised aluminium and glass. Cleaning will normally be carried out with a dry duster or soft brush, or a damp chamois leather (and the unit disconnected from the mains).

The glass, if fingerprinted, can be polished with a dry cloth or nearly dry chamois leather. Do not attempt to use any proprietary glass cleaner on the amplifier.

Coloured strips may be cleaned by gently rubbing with a nearly dry chamois leather.

In case of failure

Should the units go wrong they should be returned to your dealer or to Lecson by prior arrangement.

Always retain the packing material so that safe transport can be assured.

A service manual can be bought from Lecson.

10. Accessories

			Part Number
Interconnecting leads	AC1/AP1 or AC1/AP2	2m	AA100
		5m	AA101
		10m	AA102
8 pin DIN plug			AA200
7 pin right-angled DIN plug			AA201
5 pin DIN plug			AA202
7 pin DIN plug			AA203
4 channel shorting DIN plug (5 pin)			AA300
Remote control shorting DIN plug (7 pin)			AA301
Mains extension lead American plug and socket for AP1 or AP2		3m	AA400
		8m	AA401
Fuse 2.5A a/surge mains	20mm		AA500
Fuse 2.5A l/s outlets	20mm		AA501

lecson

Lecson Audio Ltd, Burrell Road, St Ives, Huntingdon, England

Lecson Audio Limited,
Burrel Road, St Ives,
Cambridge, England PE17 4LE

Power Amplifier AP1/3

Serial No.	3388					
Maximum output power 1kHz 8 ohms		Left	58	w	Right	58 w
Distortion	w 1kHz 8 ohms	Left	0.010	%	Right	0.009 %
Sensitivity	420	mV				
Noise	-95/-95	dB				
Hum	-85/-85	dB				
Transient test	OK.					
Date	14/3/75					
Tester	A.R. Anderson					

Customer Test Certificate

LeCroy