



'TL/12 PLUS' POWER AMPLIFIER

INSTALLATION • OPERATION • MAINTENANCE

NOTES ON THE CHOICE AND PERFORMANCE OF LOUDSPEAKER SYSTEMS

OPERATION

1. The 'TL/12 PLUS' may be fed from the LEAK 'VARISLOPE MONO' pre-amplifier, or from any other suitable source. A source impedance higher than 25,000 ohms will tend to raise the hum level above the advertised figure of 82db below 12 watts. An input of 125mV r.m.s. will give a power output of 12 watts.

INSTALLATION

2. Check that all valves (tubes) are correctly seated in their holders and that the markings on the valves correspond with those on the chassis adjacent to the holders. The amplifier will work equally well with any of the alternative valves.
3. The amplifier should stand on its base in a well-ventilated position. If placed in a case or cabinet, ventilation must be provided. Four separate fixing feet with screws are provided with the amplifier.
4. On the British model the mains transformer is tapped for voltages of 205, 225 and 245 and the voltage selector plug on top of the mains transformer (see 'TOP CHASSIS' drawing) should be set appropriately. On the U.S.A. model the mains transformer is tapped for voltages of 110, 117 and 124 and the voltage selector plug should be set appropriately. The A.C. power supply should be connected to the two terminals nearest the guide key on the removable plug portion of the mains connector marked 'A.C. POWER'. In order that the amplifier may be remotely controlled we have provided two terminals marked 'SWITCH' underneath the mains transformer (see 'UNDER CHASSIS' drawing). The amplifier will not work unless these terminals are electrically joined, and when the amplifier leaves our factory a wire link joins the terminals. A remote switch may be run from the 'SWITCH' terminals, after removing the link, the flex being passed through the adjacent grommet marked 'SWITCH CABLE'. The flex should be knotted behind the grommet to avoid strain on the 'SWITCH' terminals. Most users will wish to make use of the switch incorporated in the volume control of an associated LEAK pre-amplifier, which is supplied with a plug and twin flex for this purpose. Full details are given in the installation sheets which accompany every pre-amplifier.
5. A double socket marked 'A.C. OUTLETS' is fitted as a convenient source of power supply for gramophone motors, self-powered radio tuners, etc. The power taken from this socket should be limited to 100 watts or thereabouts. This socket is not fused but is controlled by the amplifier switch.
6. Many British tuner units have no built-in power supplies and require a source for heater and anode currents. The octal socket marked 'SPARE SUPPLIES' on the back of the amplifier is provided for this purpose. The pins are numbered as indicated on the circuit diagram, and connections should be made to the pins similarly numbered on the removable plug which is supplied. The high tension supply is 300V and on some tuner units it may be necessary to provide a dropping resistor of suitable value, and some units may also require a condenser for smoothing and/or decoupling after the dropping resistor. An earth connection should not be made directly to the tuner unit, as this is automatically effected by the above connections via the power amplifier. The maximum current available from the 6·3V terminals is 2·1A and the maximum high tension current is 40mA.
7. A connection to earth (ground) should be taken from the third terminal on the removable plug portion of the 'A.C. POWER' connector. This terminal is the one furthest away from the guide key and its corresponding terminal on the fixed portion of the connector is marked on the chassis by the symbol \oplus . It is very bad practice to omit this connection, which may be made to the water system or to the steel conduit encasing the house wiring, providing that these systems themselves are properly grounded. No other earth connections should be made elsewhere, particularly when a pre-amplifier is also used, if freedom from 'earth loops' and hum is to be obtained.

8. The loudspeaker should be connected by a *twisted* pair of wires to the terminals marked 'LOUDSPEAKER'. It will be seen from the circuit drawing that one side of the loudspeaker winding is connected to the chassis, and no part of the loudspeaker wiring should be earthed elsewhere. The D.C. resistance of the connecting wires should be as low as possible, and not more than one-tenth the D.C. resistance of the loudspeaker. It is bad practice to operate any power amplifier without a loudspeaker, and if it is desired to mute the loudspeaker by switching it out of circuit this should be accomplished by use of a change-over switch which replaces it with a resistor of corresponding value and rating. The selector plug on top of the output transformer (see 'TOP CHASSIS' drawing) should be adjusted for the nearest match to the advertised impedance of the loudspeaker.

GENERAL NOTES ON MAINTENANCE

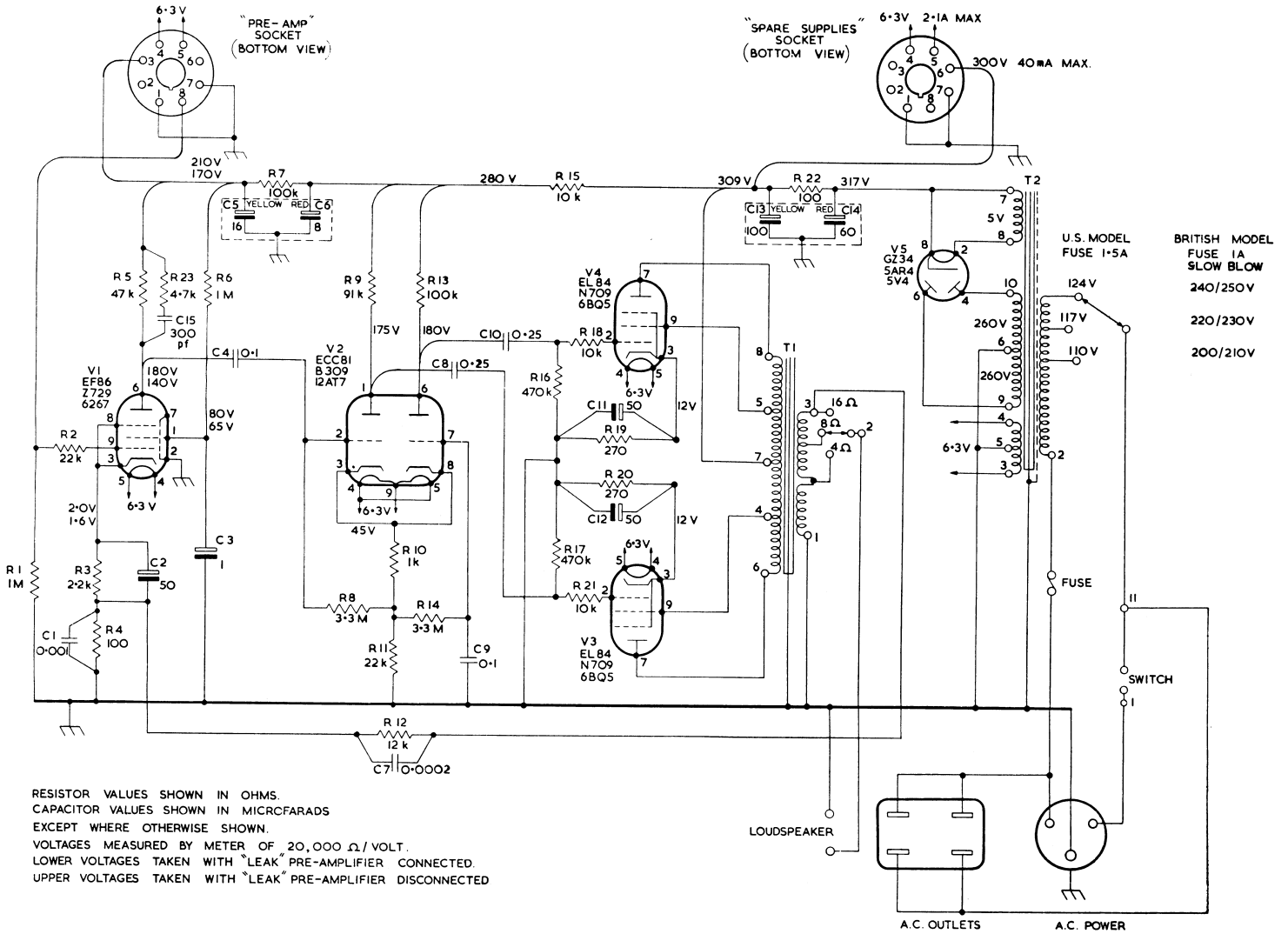
The circuit diagram provides a qualified engineer with all information required for servicing. However, the following points may be of interest:—

- (a) The 'TL/12 PLUS' does not depend upon the output valves (tubes) being a matched pair to give the stated performance, and if one output valve fails it is not necessary to replace both.
- (b) Should it ever be necessary to replace the reservoir capacitor C14 (which is in the same can as C13) note that C14 must be of a type capable of handling a heavy ripple current. The C14 fitted has a very high margin of safety, being capable of handling 380mA. The values of 60mfd. and 100mfd. are made high for the sole purpose of minimising the hum resulting from the unavoidable 'earth loop' which must be occasioned by the connection of non-powered tuner units.

NOTES ON LOUDSPEAKER SYSTEMS

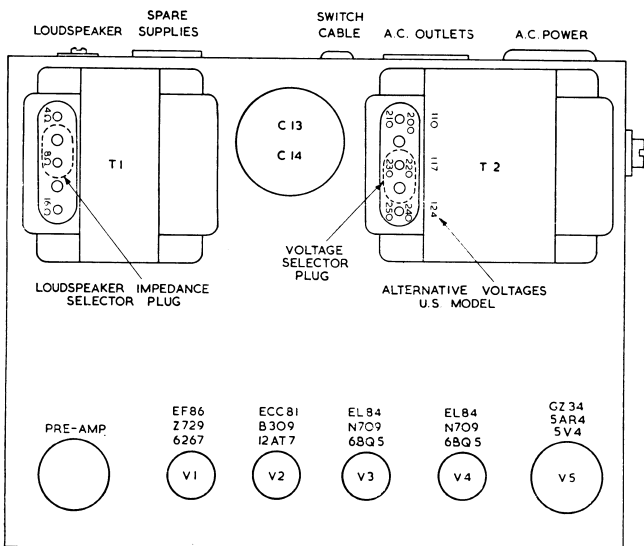
Space does not allow for detailed explanations on this vast subject, but the following points should be noted:—

- (a) You *cannot* get high fidelity results if you mount a loudspeaker in the same cabinet as the turntable and pickup.
- (b) The assembly commonly called a 'loudspeaker' consists of a magnet, a moving coil and a diaphragm (or 'cone'). This assembly is a 'motor'. You do not listen to a motor; you listen to a loudspeaker system, which consists of one or more motors mounted in a housing (baffle, box, cabinet, or horn). The housing plays a profound part in determining the quality of reproduction. The effects of various housings are discussed by L. L. Beranek in *Acoustics*, McGraw-Hill Publishing Co. Ltd., 1st Edition.
- (c) One good motor, properly housed, is capable of giving fairly good results, but two good motors, properly housed, will give noticeably better results: in this case one motor is designed to reproduce bass, and the other, treble. A filter ('dividing network') must be used in conjunction with the two motors.
- (d) Remember that even the best conventional loudspeaker systems are by far the weakest link (i.e., the greatest source of distortion) in a high fidelity chain, and that such systems are relatively expensive. The fundamental weaknesses of conventional loudspeakers are discussed succinctly in a paper by H. J. Leak, *High Fidelity Loudspeakers: The Performance of Moving-Coil and Electrostatic Transducers*, Journal of the British Institution of Radio Engineers, Vol. 16, No. 12, December, 1956. Copies are available from the Institution, 9 Bedford Square, London, W.C.1, price 7/-. However, such systems have become out-moded by the revolutionary Leak invention of the composite 'sandwich' diaphragm. The basic principles are described by D. A. Barlow, M.Sc. (Head of the Leak Transducer Research Department) in *Wireless World*, December, 1958. A further paper describing the complete Leak 'Sandwich' loudspeaker system was delivered to the British Institution of Radio Engineers by D. A. Barlow and H. J. Leak on January 24, 1962, and will be published in a forthcoming journal of the Institution.

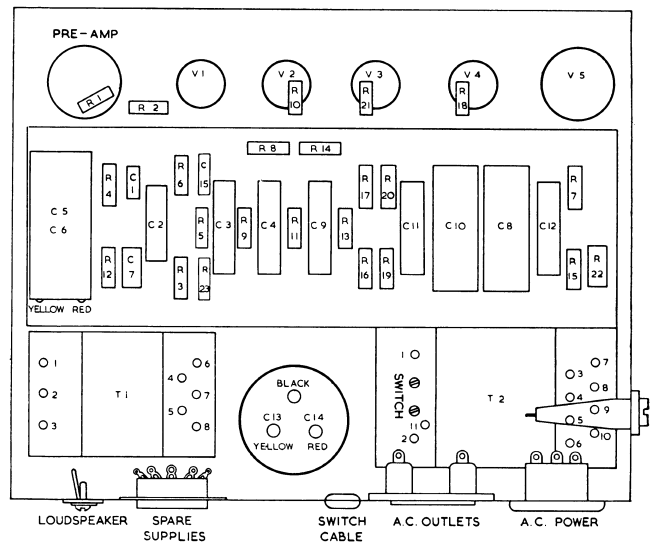


CIRCUIT DIAGRAM

TOP CHASSIS



UNDER CHASSIS



A MAJOR LOUDSPEAKER INVENTION*

THROUGHOUT the history of broadcasting and recording, certain exceptional developments have become milestones in the progress of sound reproduction.

ONE such milestone was the world's first very-low-distortion amplifier, the famous original Leak 'Point One', in 1945.

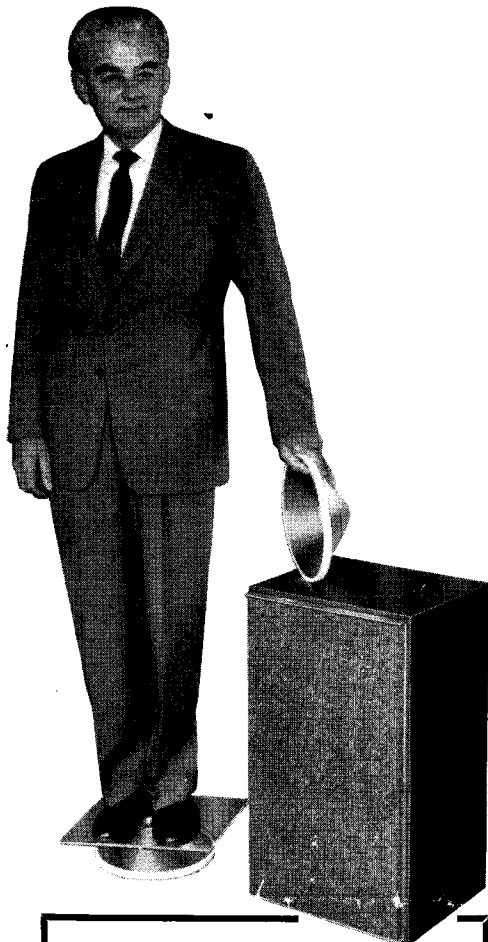
WE now pioneer another major breakthrough, the invention of the fantastically rigid 'Sandwich' cone diaphragm, which is demonstrably of great strength and hundreds of times stiffer than all conventional forms of cone. The photographs on this page illustrate the astonishing superiority of the Leak 'Sandwich' invention.

THE 'Sandwich' diaphragm is the invention of Donald A. Barlow, M.Sc., who leads the Leak Transducer Research Team. The theoretical treatise on his invention was given by Mr Barlow in the *Wireless World*, December, 1958.

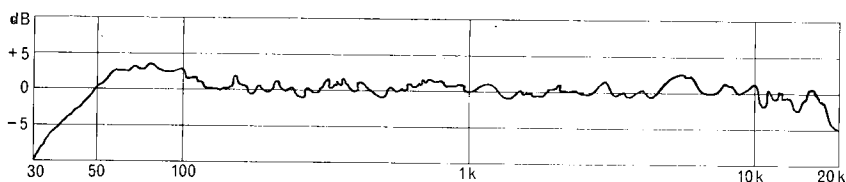
TO understand the impact of this invention one must remember that to obtain low distortion the movement of a loudspeaker diaphragm or cone should follow as accurately as possible the waveform of the signals applied to its speech coil. The ability of the cone to follow these impulses accurately depends upon the LIGHTNESS and STIFFNESS of the cone assembly.

CONVENTIONAL cones (paper, impregnated fabric, plastics, aluminium) suffer from low stiffness. This results in significantly large areas of the cone vibrating in motions uncontrolled by the speech coil. These uncontrolled motions produce transient 'hangover', amplitude distortion (peaks and hollows in the frequency response) and intermodulation distortion (lack of clarity and spurious tones). These shortcomings are inherent in all direct-radiator loudspeaker systems using conventional cones, irrespective of cost.

ALL the above shortcomings of conventional cone loudspeakers are overcome by the Leak Piston-Action 'Sandwich' construction. Using engineering design principles as applied to air-frame construction, the 'Sandwich' cone comprises stiff aluminium skins for the outer surfaces where the stresses are greatest, bonded to a thick core of featherweight expanded plastic where the stresses are lowest, giving far greater stiffness than the same total weight of either material used separately. This use of the most suitable materials in optimum proportions and dispositions gives immense stiffness and rigid piston-action over a range of more than six octaves, and for the first time in audio history gives a direct-radiator diaphragm which reproduces the signal applied to the speech coil totally free from mechanical break-up and its associated distortions. The result is a remarkably smooth frequency response free from violent peaks or troughs over a very broad frequency range indicative of excellent transient response (see graph below).



Harold J. Leak demonstrates immense stiffness of piston-action 'Sandwich' diaphragm which supports his weight below plate glass square.



AXIAL PRESSURE RESPONSE OF 'SANDWICH' SYSTEM

The illustration shows a section of a paper cone flexing under the weight of one $\frac{1}{2}$ d., and a section of the immensely stiff 'Sandwich' cone, which weighs the same as the paper cone supporting the weight of 100 halfpennies. The revolutionary Leak cone comprises two skins of very thin aluminium separated by a filler of very light plastic material expanded to a thickness of $\frac{1}{8}$ inch.



* U.S. Patent Number 3,111,187 granted to applicants D. A. Barlow and H. J. Leak & Co., Ltd.

H. J. LEAK & CO., LTD.

BRUNEL ROAD • WESTWAY FACTORY ESTATE • LONDON W.3

Telephone: SHEpherds Bush 1173 (Private Branch Exchange)

Telegrams: Inland: Sinusoidal, Ealux, London Foreign: Sinusoidal, London