

RESTORING THE LEAK TL12 - PART II

Last month Graham Tricker of G.T. Audio explained the history of the Leak TL12 valve amplifier. This month he gives details on the circuit and renovations.

As mentioned in Part I, the TL12 Point One got its name from being the first amplifier to achieve 0.1% distortion. It was able to reach this excellent figure by use of Leak's triple-loop feedback circuit. The 'triple loop' took the form of local feedback applied to the first valve via C2, and to the phase splitter through R8/R14 going to R11 undecoupled, this forming two loops. The third loop was overall feedback conventionally applied from transformer secondary back to the input valve's cathode. In Britain, negative feedback was first used commercially by H. J. Leak & Co. Ltd (1945) and its effects were often demonstrated in front of technical audiences.

The amplifier, without feedback, has a sensitivity of 7.5mV rms to produce full power of 12watts. Once the overall feedback loop is closed the sensitivity decreases to 150mV rms. The first driver stage of the circuit consists of an EF36 pentode valve which has a rather unusual feature in the fact that it has a grid top cap, hence the need for a peculiar looking shielding cap fitted over this valve on the chassis. This driver stage is capacitor coupled to the grid of the first triode in the ECC33 phase splitter.

The second triode has its grid connected to the first via a common cathode connection (via R11-R8). This type of connection causes a slight imbalance in the phase splitter, compensated by using unequal resistor values in R12+R13 (68k+57k), the anode load resistors of the phase splitter.

This compensation provides an equal voltage swing of opposite phase via the coupling capacitors C5/6 to the grids of the KT66 output tetrodes. They are triode connected, run in class A-B and are biased via the cathode bias resistors R16,17 to a

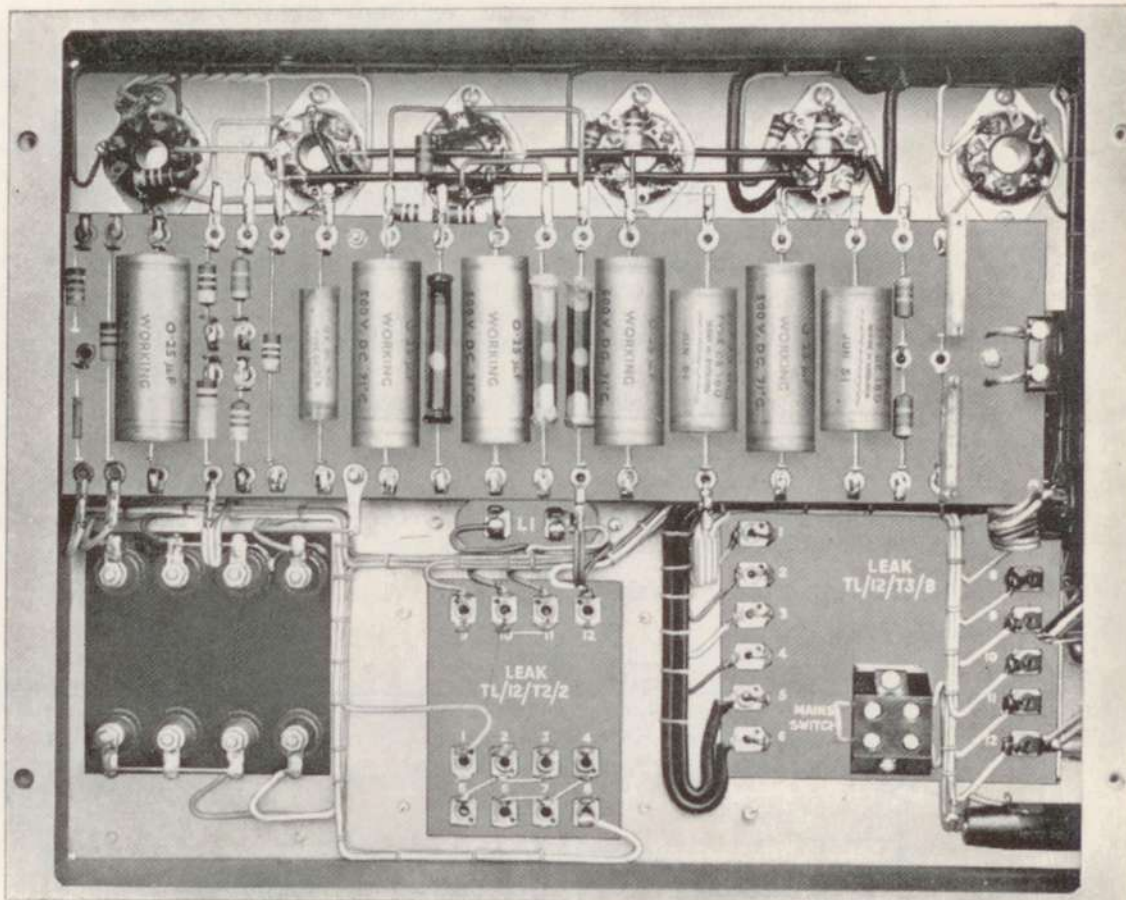
value of 62mA per valve. This arrangement provides self-biasing operation of the output valves, which limits power, but makes re-balancing unnecessary when changing valves.

The overall feedback connection has level/compensation components R18/C9 which must be selected according to the impedance setting chosen (2/8/16/32 Ω) in the output stage from the output transformer secondary. This returns via the cathode of the EF36 input stage. Depending on the selected load impedance for the speaker, the feedback within the amplifier (R18+C9) must be adjusted via Leak's recommendations in their service sheet to prevent possible instability in the amplifier.

GETTING THE BEST FROM THE TL12

Due to the high sensitivity of the TL12, matching pre-amps can be problematic. The original pre-amp designed for the TL12 was mono and so two pre-amps would be required when using TL12s as an everyday stereo power amplifier. Although the matching pre-amp was very good in its day, you should really be looking for something a little bit more modern, with inputs suitable for today's tuners, tape decks, turntables and CD players.

Modern pre-amps possessing gain are not ideal for the TL12 because of its high sensitivity; the volume control will have to be kept right down, the gain and the amplifying devices



providing it then being superfluous and unwanted. Suitable pre-amps need less gain, examples being the Croft Micro, World Audio Design KLP1 valve line-level pre-amp and Rose RV23. These have cathode follower output stages for low impedance coupling to the power amplifier.

Passive pre-amps can be used with the TL12, but it is not normally recommended as apparent loss of dynamics can occur when driving long interconnects for monoblock operation. As in all monoblock configurations the best place to mount the TL12 is very close to the loudspeakers, using short speaker cable. Long interconnects in excess of 5m are to be avoided due to the high sensitivity and the possibility of picking up hum and hiss. Other pre-amps can be used, but noise from the speakers may be unacceptably loud.

When connecting to the TL12 you should use a good quality coaxial screened interconnect.

Making connections

The TL12 originally came fitted with an octal socket for connection to its matching pre-amp. Matching octal plugs are not now available, except at audio jumbles etc., so the best method of connecting a pre-amp would be to either remove the octal socket and fit a 'blanking plate' in its place, complete with phono sockets or, where originality is desired, a coaxial lead with a flying phono socket can be fitted, allowing connection to be made

outside the amplifier.

Speaker connection is via a Bulgin two pin plug. These aren't commercially available either, but they can be found at audio jumbles, swap meets etc. If the amp does not have a two-pin plug then the socket could be removed and a plate screwed through the existing holes with two 4mm binding posts fitted.

If the amp comes with a two-pin plug then speaker cable can either be soldered or screwed into the plug.

Loudspeakers

The Leak TL12s will work best when they are connected to speakers of 90dB or more sensitivity. There are a number of manufacturers producing high efficiency designs so matching should not be a problem, especially since it has a low output impedance. The TL12 is so revealing that it would not be out of place coupled to the very finest loudspeakers.

We have obtained very good results with the original Quad ELS electrostatic loudspeaker. Although quite low in efficiency terms they do present a fairly even 15ohm load, so providing the output transformer is configured for 15ohms there should be no problem.

Restoration

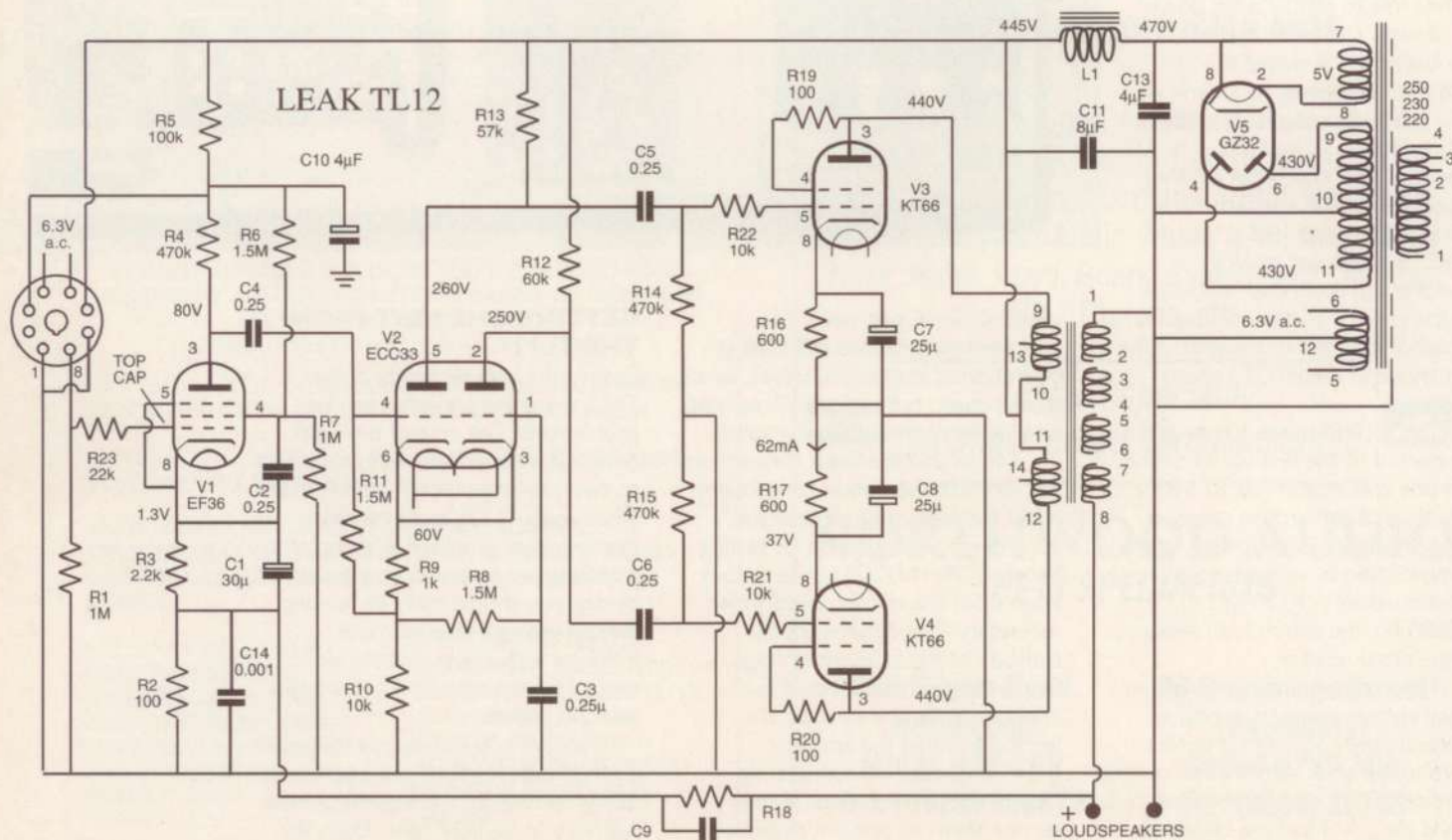
The power supply consists of a capacitor-choke-capacitor π filter configuration with further H.T. smoothing added at the EF36 driver stage.

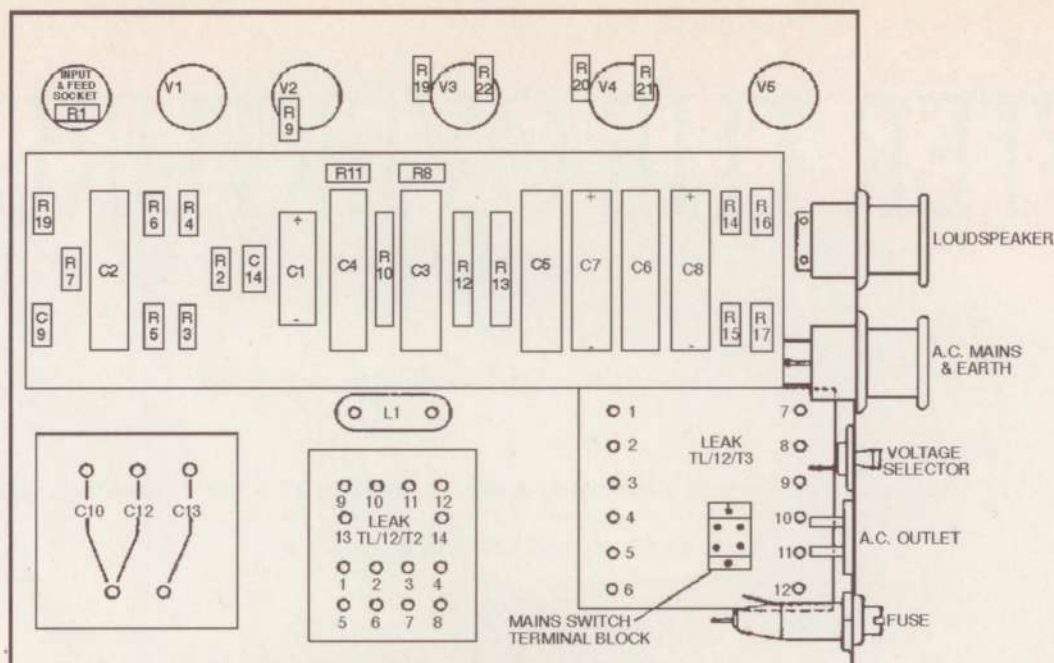
The power supply consists of three very high quality paper block 600V capacitors of 4, 8 and 4 μ F enclosed in a metal can. These capacitors, apart from their sonic qualities, offer a very long life and a high degree of reliability. However, leaking oil from around the base of the capacitor block may indicate future failure. Should these capacitors fail, which may be detected by either excessive hum through the loudspeaker or distortion during audio playback, they will have to be replaced. Modern equivalents can be made and mounted in a new, modern metal can, which needs to be larger than the original. We have sourced replacements and metal cans for this purpose.

Most of the resistor values will probably be out of their tolerance range. The coupling capacitors C4, C5 and C6 are metallised paper and will almost certainly be leaky. C2 and C3 will be the same. Paper and oil replacements can be used, but care should be taken as you may be substituting a leaky cap for one which is just as leaky. High quality polypropylene caps can be used for improved reliability and peace of mind as polypropylene has a very low leakage.

The cathode decoupling caps, C1, 7 and 8 are electrolytics and should be replaced with electrolytics of the same value, not exceeded in value any more than 20%

The cathode bias resistors on the





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output stage, R16 and 17 are of the wire wound variety and can be replaced with a high quality equivalent (3W min.).

Overall feedback components R18 and C9 must be set in accordance with the load setting on the output transformer. Failure to do this may result in instability and oscillation. Component selection for the rebuild is up to the choice of the restorer. The Leak amps were designed with particular detail surrounding the type and construction of the components in order to maintain maximum sound quality and reliability, so the amplifier will always sound at its best when using components of the original construction, i.e. carbon and wire wound resistors and paper capacitors.

Valves

A GZ32 rectifier tube gives the amplifier a soft start for the H.T. supply. The first stage uses an EF36 or EF37, the phase splitter uses a ECC33 driving two KT66s. The driver (V1), phase splitter (V2) and valve rectifier (V5) are ideally from Mullard and the KT66 originals made by GEC.

Leak do say that an EL37, 6L6 or 5881 can be used in the output stage. I have tried the Sovtek 5881, but it sounds out of character compared to the GEC valve in this particular circuit. KT66s are getting rare and very expensive and new old stock is practically impossible to find. All the other valves (V1, 2 & 5) are still available and can be obtained from Billington Export, P. M. Components or Langrex. However, the only supplier I know who has original GEC KT66s is Sussex Surplus.

Expect to pay between £5-10 each for the EF36/37, ECC33 and the GZ32s. However, an original GEC

KT66 will cost £65. I have heard from a friend in the States that these valves are fetching up to several hundred dollars each over there. P.M. Components can supply a version of the KT66 for £25.95 per matched pair and the American 7581 is similar.

Suggested Suppliers

P M Components
Springfield Enterprise Park,
Springfield Road,
Gravesend,
Kent.
DA11 8HD
Tel: 0474 560521

(EF36s ECC33s and GZ32, plus version of KT66 from China)

Billington Export
1 E Gillmans Industrial Estate,
Billingshurst,
West Sussex.
RW14 9EZ
Tel: 0403 784961

(EF36s, ECC33s, GZ32s and occasionally GEC KT66s).

Sussex Surplus
13 Station Road,
Horsham,
West Sussex.
RH13 5EZ
Tel: 0403 251302

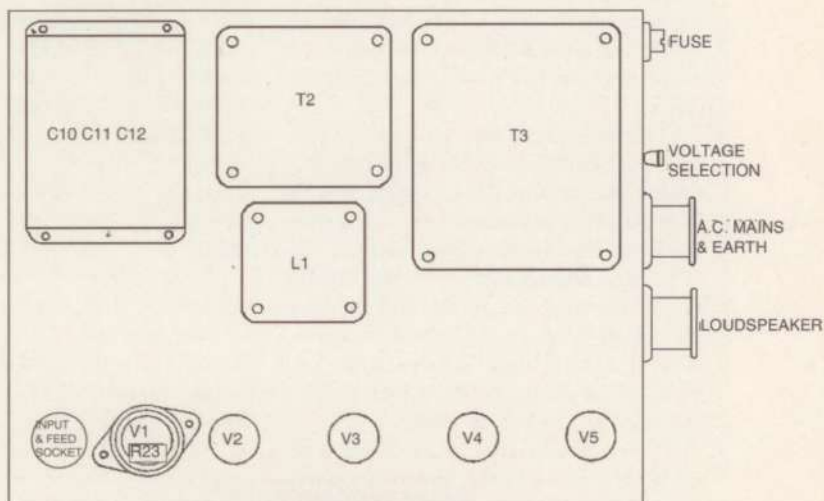
(GZ32 and GEC KT66s)

Langrex Supplies Ltd
1 Mayo Road,
Croydon,
Surrey.
CR0 2QP
Tel: 081 684 1166

(EF36, ECC33s + GZ32s)

G.T. Audio
5 Upper Road,
Higher Denham,
Bucks,
UB9 5EJ
Tel: 0895 833099

G.T. Audio supply all the components needed to restore Leak amplifiers, including capacitors and resistors. Restoration can also be undertaken on Leak amplifiers and all other classic equipment ●



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