decks redeemable, or should it be consigned to the scrap-heap?

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The Mullard and Williamson designs differ considerably in their circuit topologies. The 5-20 was a later design using quite a large amount of feedback and high-gain valves (EF86 and ECC83) with an EL34 ultra-linear output stage. It gave a reasonably large maximum output (35W), low distortion and was cheap and easy to make.

The Williamson circuit could be seen as a more purist design using triode connected KT66 output valves and low-impedance L63/6J5 single or B65/6SN7 double triodes for the preceding stages, but the Williamson circuit is rather more complex and has a limited output of 15W.

In my experience the Mullard circuit gives a warm, rounded sound but can be slightly compressed and lacking in the finest detail. The Williamson is more open and tonally accurate as well as having better dynamic scale, but it is also drier and lacks overall power. The original G.E.C. KT66 valves used in the Williamson circuit are my favourite power pentodes/tetrodes, and a well designed amplifier built using good output transformers, components and original KT66s will walk over most of today's amplifiers.

There are valve kit suppliers (such as ourselves) offering interpretations of classic circuits like these, for example our K5881 kit uses Russian Military 5881 beam tetrodes, the closest current replacement for a KT66, but in a circuit configuration more like the 5-20. This amplifier has the sweetness of the 5-20 with the clarity of the 5881 output tetrodes, it also has a well finished steel chassis and large, generously rated transformers.

I have used Sowter transformers in the past and they were fine, but you will really have to suck it and see if you are going to develop a project of your own. The phase shifts caused by the output transformer are an unknown quantity so you can't really just drop it into a circuit. Some experimentation is necessary with the feedback network. This is one of the advantages of buying a full kit - the circuit has already been optimized.

It is not absolutely necessary to use separate power supplies for each channel but it can help. Solid-state rectifiers are much more efficient than valve rectifiers and help reduce the cost of an amp, but for sonic purity and output valve longevity I can recommend valve rectification.

The 401 can be tweaked up to a very high standard. There are several companies advertising in this magazine offering this service, for example Loricraft, Slate Audio and Technical and General Supplies. **AG**

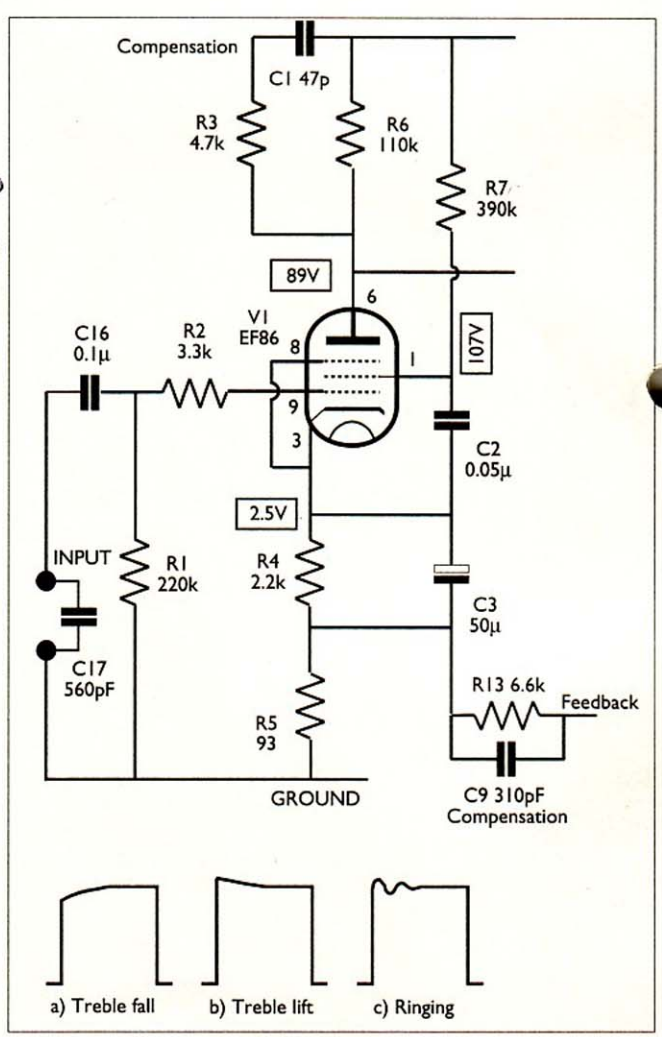
It's very nice to see the original Mullard Circuits For Audio Amplifiers now being reprinted. I still have my original version from the Sixties, which was a source of wonder and much fun at the time. However, more recently I have had to sort out a modern Mullard 5-20 that didn't work properly because of incorrect feedback compensation components, and I have met similar but larger problems with GEC's 50W design.

As Andy says, you have to set these feedback component values depending upon phase shifts around the amplifier, those in the output transformer being particular to the transformer used. Modern transformers often differ significantly to those used by Mullard and the feedback component values have to be adjusted accordingly, those given by Mullard and GEC commonly being unsuitable.

The experimenter can get a long way by applying feedback progressively, starting off with a high-ish value series "dropper" resistor in the feedback loop (say 8k) and dropping slowly until the amp breaks into oscillation, probably around 3-4k. Then increase the value by around 20% to give the unit a reasonable stability margin.

This is a bit ad hoc, but providing you err on the side of caution, meaning a high resistor value (6-8k) and least feedback, then the amp will be plenty stable enough into all loads. Do not try to use maximum feedback; it will not improve sound quality and the amp may well burst into occasional oscillation, which could destroy tweeters. Valve amps like this sound fine with low-ish feedback and in this state they are most stable.

Having set feedback level, the capacitor across R13 (C9) and that in series with resistor R3 (C1), should be adjusted for best square wave response. Use a 1kHz square wave driving 3V into an 8Ω resistor (3-11W). Viewing on an oscilloscope, make sure there's no significant leading edge droop as in a), indicating treble fall and a warm or dull sound, or leading edge peaking as in b), indicating treble lift and a bright or sharp sound. Try to minimise ringing too, as in c), which is indicative of a sharp supersonic treble peak attributable to leakage inductance and winding capacitance forming a resonant circuit. This trimming may increase your stability margin and feedback can be increased a little after if desired. **NK**



Feedback components have to be set depending on phase shift around the circuit. A scope can be used to view square wave performance which gives a useful guide.