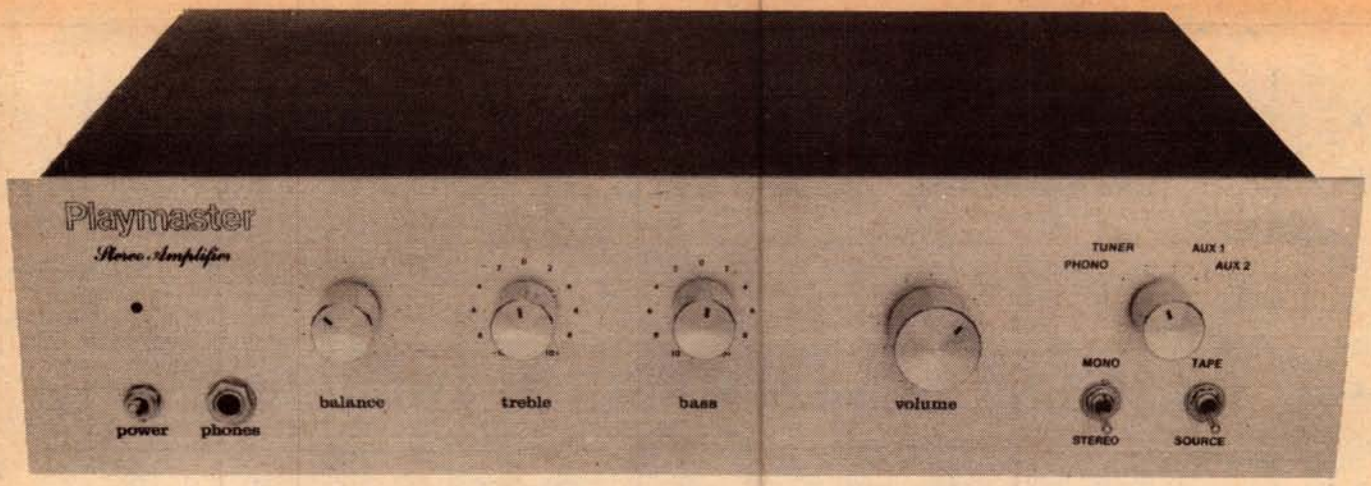


Combining high performance with modest power & cost . . .

A Playmaster Amplifier for flats and home units

Here is a new stereo amplifier which offers a lower cost alternative to our earlier — and still current — Twin-25 and Twin-40 watt Playmasters. With an output of about 10 watts per channel, it could provide an excellent basis for a good quality system scaled to the more modest needs of many flat and home-unit dwellers.

by RON De JONG

In these days of high power amplifiers, 10 watts RMS per channel, or 20 watts total, may seem a rather modest figure but, in fact, it represents a lot more power than most listeners use most of the time in an average home. Used with efficient loudspeakers, this new amplifier can make a surprising amount of noise!

While it could, of course, be mated with expensive peripherals, more logically we can imagine the constructor watching the advertisements for an attractively priced belt-drive turntable with magnetic cartridge and perhaps an attractively priced cassette deck. Add a couple of speaker systems like the Playmaster 3/26L and you could have some nice sound for not too much money.

In seeking to scale down the cost of an amplifier like the Twin-25, one does not have too many options if the basic input and control facilities are to be retained. However, in opting for a lower power output rating, one can specify a scaled-down output stage and a less costly power supply configuration. It's simply a matter of not paying for watts that you may never use!

One should hasten to add that, in scaling down an ouput stage, it is not necessary to scale up its distortion, noise, hum or non-linearity in terms of frequency response. As we shall see later, a modestly powered amplifier can be designed with the same care as one with much higher ratings.

In building up the prototype, we took the easy road by adapting existing metalwork, knobs and panel. Looking at the amplifier from the front, you would never know it from its bigger brothers. Nor, for that matter, would you be likely to pick the difference in sound, short of pushing it to the limit where one starts to clip and the other doesn't.

However, in the quest for lower cost, a less expensive front panel could be provided, while the resourceful constructor could produce his own sleeve casing from wood or particle board, suitably polished, lacquered or covered. We must leave that up to individual suppliers and constructors.

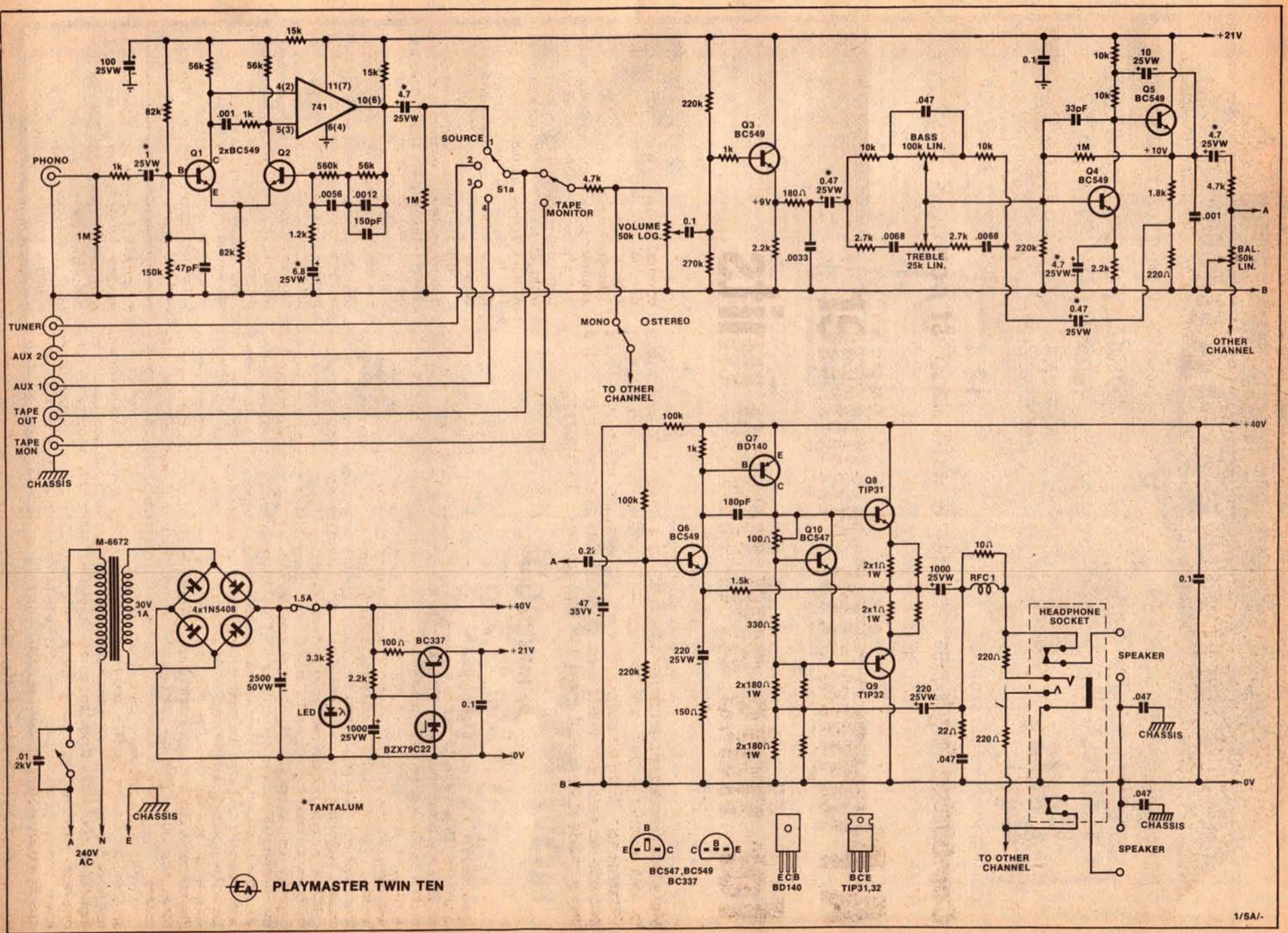
Now for a look at the basic design:

In seeking to simplify the power amplifier section and the power supply, our choice fell on a type of mains transformer which is currently available from at least two sources and from which can be obtained up to 30VAC at 1A. It is considerably cheaper than those specified for the twin-25 and twin-40 watt versions.

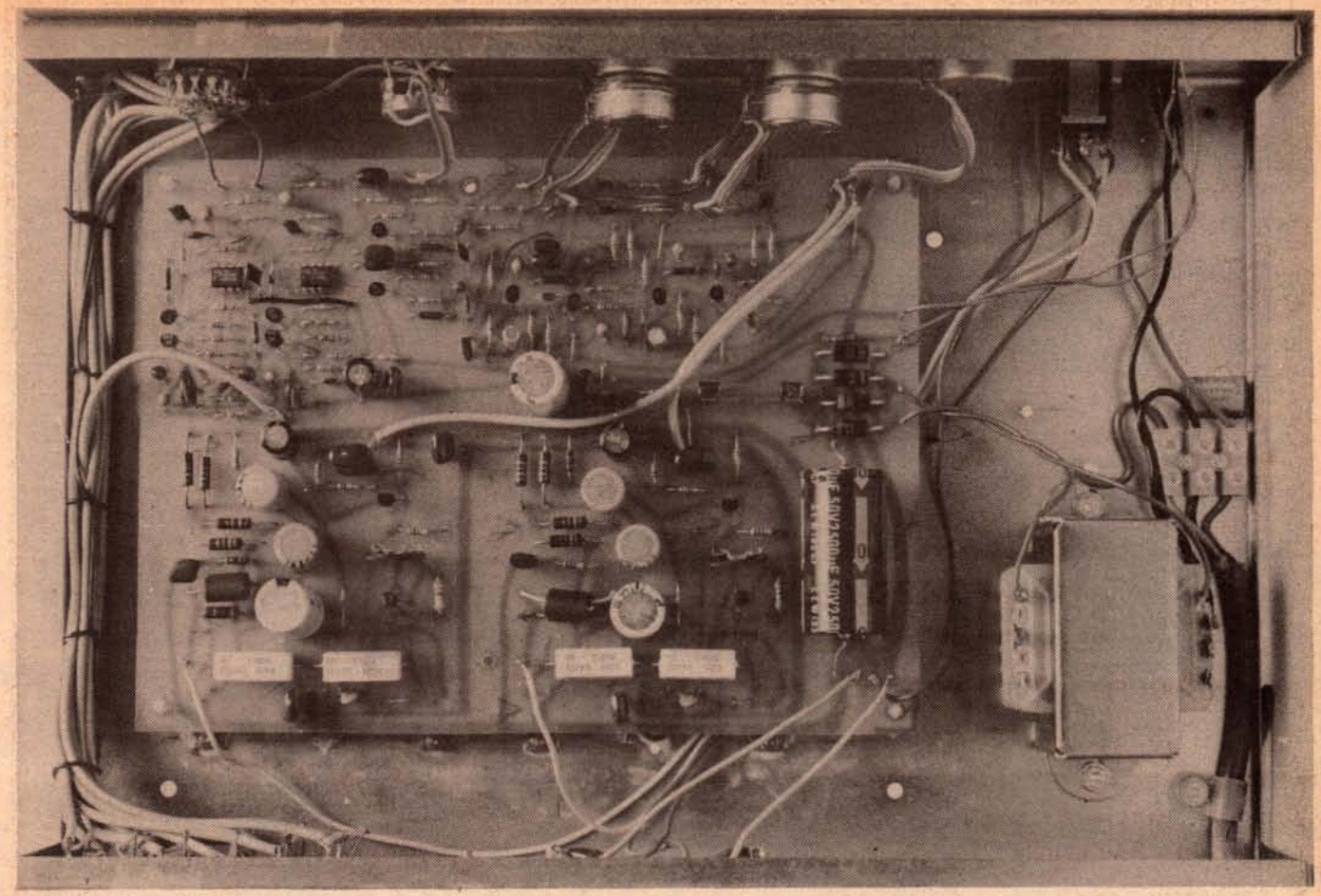
This transformer is used in conjunction with a bridge rectifier and a single large filter capacitor to provide a nominal 40V DC supply for the output stage. The supply is unregulated but it has the advantage, in this context, of maximising the voltage available to the output transistors when handling program material. This is simply another way of saying that, while the power output under sine-wave conditions (both channels driven) is nominally 10W per channel, the amplifier has considerable "headroom", and a clipping level of about 12W per channel on program.

The unregulated nature of the supply and its ripple content presents no

As pictured above, the new amplifier can use the same front panel as already sold for the Twin-25 and Twin-40. Alternatively, some suppliers may opt for a less ambitious finish. The circuit diagram for one channel is shown on the opposite page.



EA PLAYMASTER TWIN TEN



A NEW PLAYMASTER AMPLIFIER — continued

problem with the output and driver stages but a separate regulated and filtered source is necessary for the lower level stages. This is shown as a 21V line and is provided by a simple zener-referenced series pass regulator.

The 100-ohm resistor in the collector circuit of the BC337 pass transistor serves to protect it in the event of an accidental short circuit across the 21V line. In the base circuit, the 2.2k resistor serves to hold the zener at the mid-point of its plateau region while, at the same time, providing sufficient base drive to the transistor. It ensures that the zener will not come out of conduction, either as a result of mains fluctuations or of peak demands by the output stage on the 40V line.

So much for the power supply.

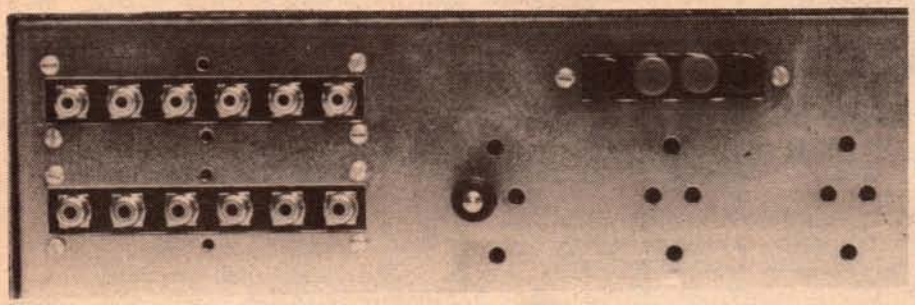
The magnetic pre-amp and tone control circuitry are similar to that in the Twin 40 except that the pre-amp no longer operates from a split supply. To make possible single supply operation, the first transistor of the differential pair is biased at about half the 21V supply voltage. To prevent noise or hum from entering the amplifier at this point the bias and supply voltages to the differential pair are heavily decoupled with a 15K resistor and 100uF capacitor.

A low-pass filter consisting of a 1k resistor and a 47pF capacitor is included at the input of the phono preamp, to attenuate any RF component which might otherwise penetrate the amplifier via the input leads. Of concern here are not just signals from nearby transmitters but RF pulses on the power lines initiated by switching transients.

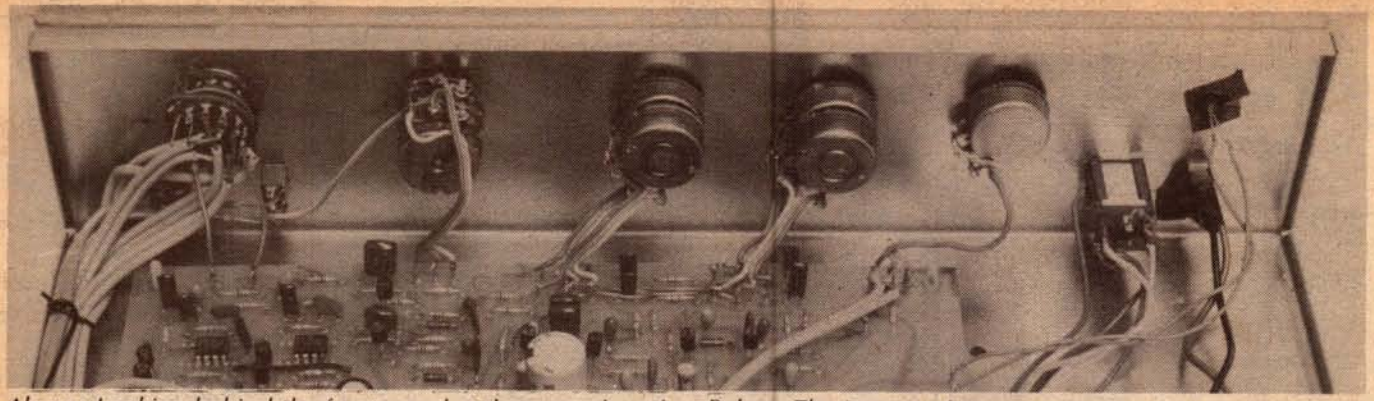
The additional complexity of a discrete differential stage preceeding the 741 is justified by improved noise performance and open loop gain over that of the op-amp alone. The collector current of the differential pair was selected to minimise noise, and the collector-to-emitter voltage was made as small as possible to reduce leakage noise.

Since the input stage is no longer referenced to earth potential, a 1M resistor has been included at the input of each pre-amp to prevent any charging current from entering the magnetic cartridge if it is connected while the amplifier is turned on.

The RIAA phono equalisation network bridging the 741 IC has been slightly modified to conform to the new IEC recommendation for roll-off at very low frequencies.

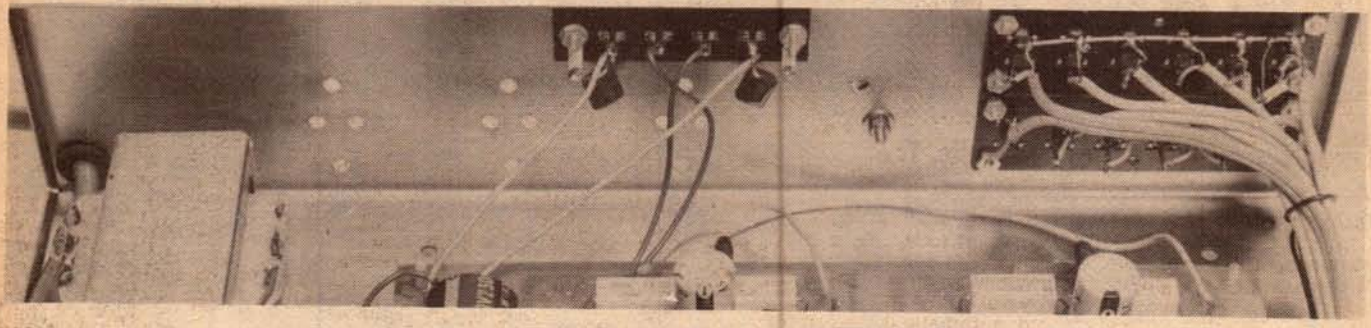


At the top of the page is a plan view looking into our new "Twin Ten" Playmaster amplifier. The uncrowded layout should make for easy construction. The partial back view shows the input sockets (left), the loudspeaker terminals (right) and an earth terminal for possible connection to the phono player deck. If the amplifier is built on the twin-25, Twin-40 metalwork, the output transistor mounting holes will remain unused.



Above: Looking behind the front panel at the controls and associated wiring. On the left is the selector switch and, almost hidden below it, the stereo/mono and tape monitor switches. The sequence of the other controls can be deduced by comparison with the front view on the title page. Note the use of lacing and of ribbon leads to the controls, in the interest of neatness.

Below: The input and output connectors on the rear panel are available as ready-assembled strips. It is important to note that, while certain of these terminations are ostensibly "earthy", the only connection to chassis should be that adjacent to the phono input to the rear panel. Full wiring diagrams, along with parts list and specifications will be presented next month.



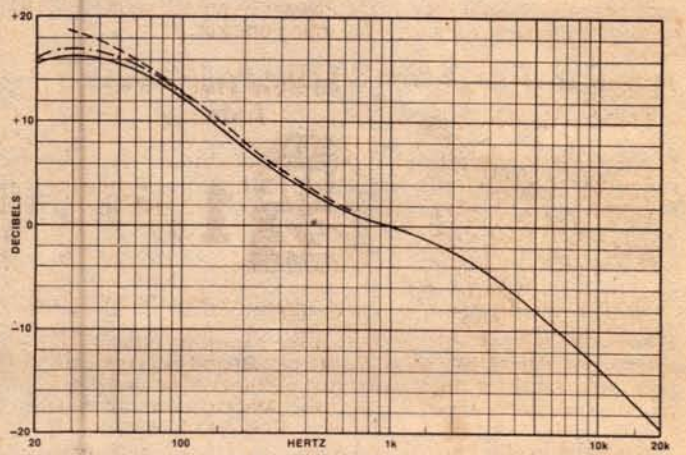
As originally set down, the RIAA equalisation curve calls for very high gain in the playback amplifier at very low frequencies — with the risk of amplifying turntable rumble. It is for this reason that most magnetic phono preamps include extra time constant components in the bass boost network to limit its effect below about 30Hz. The IEC is now recommending a time constant of 7950uS for this limiting action and this is provided by the 1.2k resistor and 6.8uF capacitor in the base circuit of Q2.

The equalisation curve obtained experimentally from the magnetic preamp is shown in the accompanying diagram. The response is within 1dB of the standard RIAA curve, except around 20Hz, where the low frequency (IEC) roll-off can be observed.

The output of the pre-amp along with inputs from the tape, tuner and auxiliary inputs are brought together at the source select switch. From there the selected signal passes to the Stereo/Mono switch and the volume control, and thence to an emitter follower. The high input impedance of the emitter follower stage minimises loading on the volume control, so preserving it's logarithmic response.

In normal stereo useage, the impedance presented by the amplifier to the various high level sources is about 40k, which can be regarded as an acceptable and convenient figure.

The emitter follower stage preceeding the tone control circuitry has also been modified from the original 40/40 circuit. The ferrite bead used in the base lead of transistor Q3 is replaced by a 1k "stopper" resistor which, in combination with the internal base emitter capacitance, inhibits any tendency to high frequency instability.



Above about 800Hz the magnetic phono compensation characteristic corresponds exactly with the RIAA curve. Below 800Hz it lies close to the new IEC curve (broken line). The old RIAA curve is shown dashed.

As explained in the article on the Twin-25, the tone controls have a constant turnover, variable slope characteristic, providing a subjectively smooth range of control for the user. Frequency response is flat when the potentiometers are electrically centered.

The associated amplifier involves a common emitter stage (Q4) and an emitter follower (Q5). A combination of emitter (or self) bias and collector biasing is specified for Q4, so that the DC operating point of its collector is very stable; it is set at half supply voltage.

The emitter follower imposes only minimal loading on Q4. Moreover, because of the 10uF "bootstrapping" capacitor from the emitter of Q5 to the junction of the 10k resistors, the effective collector load for Q4 is also very large, resulting in high gain.

The gain is proportional to the effective collector load and is limited only by the inherent output resistance of the transistor. The total available signal passes through Q5 and thence to the Balance Control network and to the power amplifier system. However, about one tenth of the signal at the emitter of Q5 is fed back to the tone control network.

(To be continued)