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Replace those ageing Twin 25s with the **Playmaster Sixty-Sixty stereo amplifier Pt.1**

Behold the Playmaster Sixty-Sixty! This is the amplifier you have been waiting for to replace all those ageing Playmaster Twin Twenty-Fives, the Forty-Forties and the Mosfet stereo amplifier. The new amplifier offers a standard of performance far ahead of anything we have previously published and ahead of most commercial integrated stereo amplifiers.

by **JOHN CLARKE**

We have really excelled ourselves this time. This new amplifier is so good it is almost embarrassing.

Recently, quite a few readers have asked us to update the very successful Playmaster Twin Twenty-Five and Forty-Forty amplifiers. These were probably the most popular and reliable stereo amplifiers we ever published and they were very easy to build. Sure, readers were impressed with the recent Playmaster Series 200, 100 watt/channel amplifier but it was a no-holds-barred design possibly too ambitious for many tastes; and too big for many wallets.

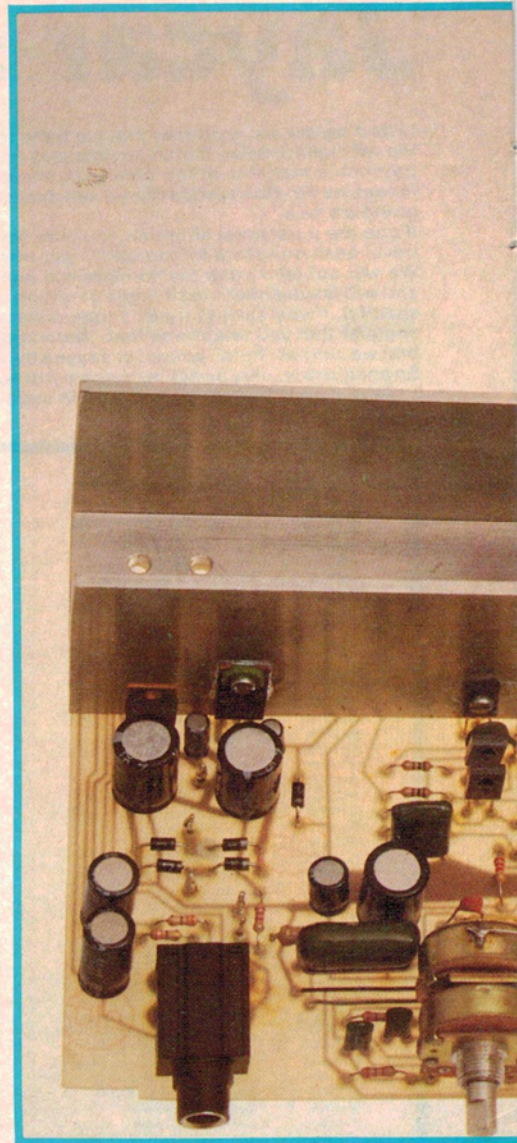
So we set out to design a replacement for the above-mentioned amps, using a lot of the experience gained in designing the Series 200. First, it had to be easier to build — much easier than the Series 200 but still without any shielded cable

wiring, indeed with as little wiring as possible. That meant a single board design with everything on it, including RCA input sockets and all the power supply, except for the power transformer.

At the same time, we did not want to incorporate CMOS signal switching, as we did in the Series 200. The need for all those buffer stages, to keep distortion as low as possible, plus the additional logic circuitry, means that the design becomes rather complicated.

This new amplifier had to be simple, use no shielded cable for the input wiring and yet we wanted the basic specs to be at least comparable with the Series 200. Could it be done?

We started out by deciding that we would not use power Mosfets. While they do have their advantages, they

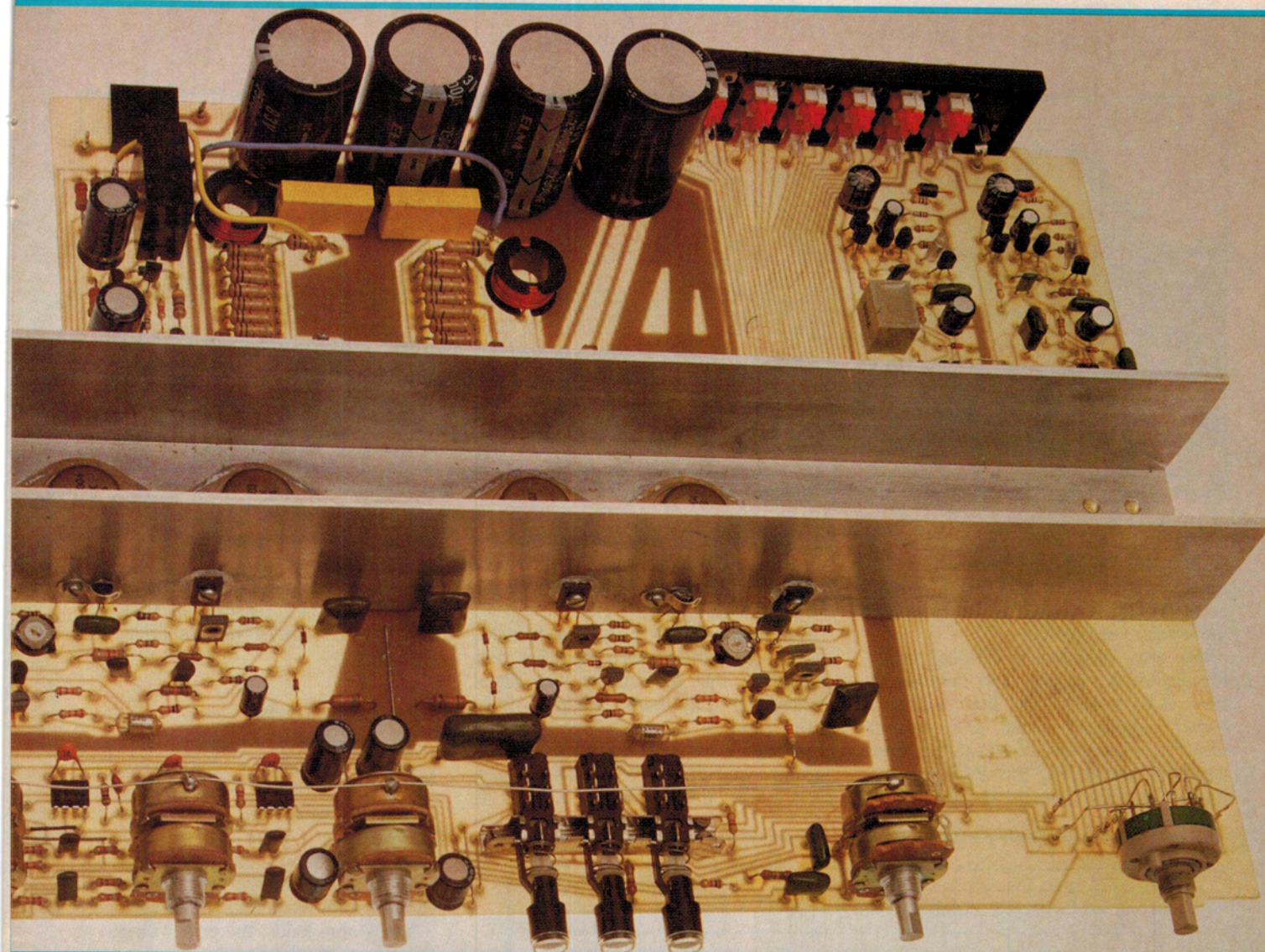


have a big drawback in that they require a high quiescent (no-signal) current. That means that they have to dissipate quite a lot of power at all times. They get hot.

Mosfets also have higher dynamic losses than bipolar transistors and so require bigger heatsinks. We wanted to use a U-shaped channel heatsink which would run across the width of the amplifier and be mounted directly on the printed circuit board. With Mosfets that would be unworkable. So we selected the most rugged bipolar transistors available at a reasonable price: MJ15003 and MJ15004.

These enabled us to design a very rugged output stage which is able to deliver very high currents and quite surprising amounts of power.

As far as the shielded cable wiring was concerned, we took the simple way out. Don't have any cables at all. Just



run the conductors from the high level inputs across the printed circuit board to the control circuitry at the front. And in between the signal conductors run earth conductors to keep crosstalk to a low value.

We pinched the basic layout concept from the Luxman L-215 amplifier. After all, why re-invent the wheel? The concept is elegant and eliminates the need for shielded cable, which is very tedious to wire into place.

The concept of no shielded cable works because all hifi program sources such as CD players, tuners and cassette decks have high level signals of around 500mV to 2 volts and they have low impedance outputs. That means that electrostatic signal pickup by the unshielded signal lines on the board tends to be swamped out by the low impedances and high signal levels.

Of course, it wasn't quite as simple as

that in practice. We discovered that earthing arrangements for the individual signal paths were very critical when it came to consistently achieving the very low distortion figures that we eventually obtained. We had to ensure that we obtained essentially the same distortion results no matter which set of inputs was selected and whether or not the tone

controls were in or out of circuit. That proved to be quite tricky to achieve.

We also discovered that we could not use wirewound emitter resistors in the power amplifier stages because they radiated substantial energy into the nearby input tracks. This caused high distortion at the higher frequencies and at high output powers.

Features of the new amplifier

- ☆ 60 watts per channel with both channels driven into 8-ohm loads
- ☆ Very low noise on phono and line level inputs — better than CD performance.
- ☆ Very low harmonic and intermodulation distortion
- ☆ Excellent headroom
- ☆ Tape monitor loop
- ☆ Tone controls with centre detent and defeat switch
- ☆ Mono/stereo switch
- ☆ Toroidal power transformer
- ☆ Easy-to-build construction
- ☆ Very little wiring

Playmaster amplifier



The Playmaster Sixty-Sixy is built into a rack-mounting case and matches the styling of our new Playmaster Stereo AM/FM Tuner.

That problem was solved by using several paralleled carbon resistors for the emitter resistors and keeping them at right angles to and as far from the input tracks as possible.

We also specified a toroidal transformer which has very low hum radiation. And it turns out that since the power amplifiers draw less current under no signal conditions, there is even less hum radiated by this 160VA transformer than the toroidal transformer in

the Playmaster Series 200. The net result is an even better noise performance than the Playmaster Series 200. That's the embarrassing part.

The final product is a very refined, simple high performance amplifier that challenges the performance of many commercial amplifiers, whether integrated models or even higher priced preamplifier and power amplifier combinations. And the price? That's the best part. At the time of writing it looks as

though it will go on sale for quite a bit less than \$250.00.

In real dollar terms it is much better value than the \$89 price of the Playmaster Twin Twenty-Five amplifier ten years ago.

Specifications

To put it into a nutshell, we have given this amplifier a continuous rated power of 60 watts per channel, with both channels driven. But it is capable of delivering a great deal more power than that. For example, when just one channel is driven, the power output at clipping is 74 watts into an 8-ohm load.

Into 4-ohm loads, the power output at the onset of clipping is 72 watts per channel with both channels driven and 88 watts with one channel driven. For short term power capability (music power), as measured by the Institute of High Fidelity specification IHF-A-202, the new amplifier can deliver 105 watts into an 8-ohm load for a single channel, and no less than 153 watts into a 4-ohm load under the same conditions. For an amplifier with a nominal rating of 60 watts per channel, that is an excellent performance.

(This IHF test for music power involves using a 1kHz +20dB toneburst superimposed on a constant 1kHz signal. The tone burst is 20 milliseconds long at a rate of two bursts per second.)

Rated harmonic distortion of the amplifier is less than .01% for all powers up to 60 watts per channel into 8-ohm loads, over the frequency range from 20Hz to 20kHz. For 4-ohm loads, the rated distortion is less than .015% for all powers up to 70 watts per channel,

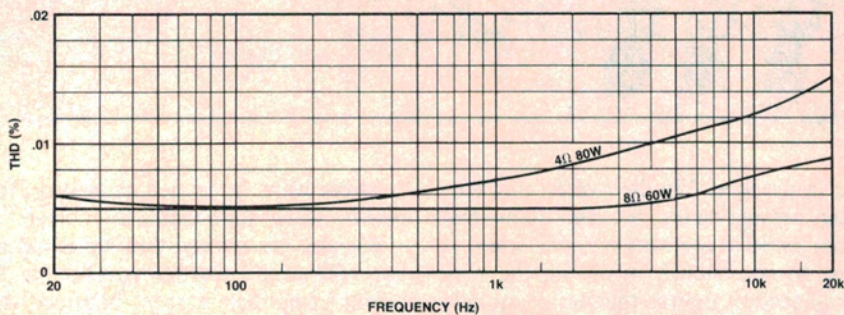


Fig. 1: graph showing total harmonic distortion (THD) versus frequency (see text).

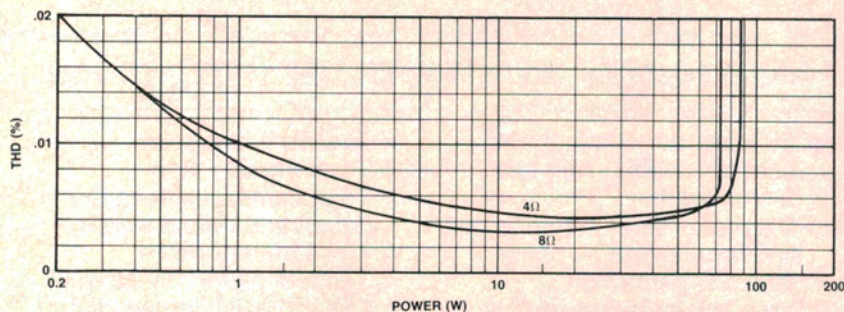


Fig. 2: THD versus power output for 4Ω and 8Ω loads at 1kHz. The apparent increase in THD below 10W is due to the increasing effects of residual noise.

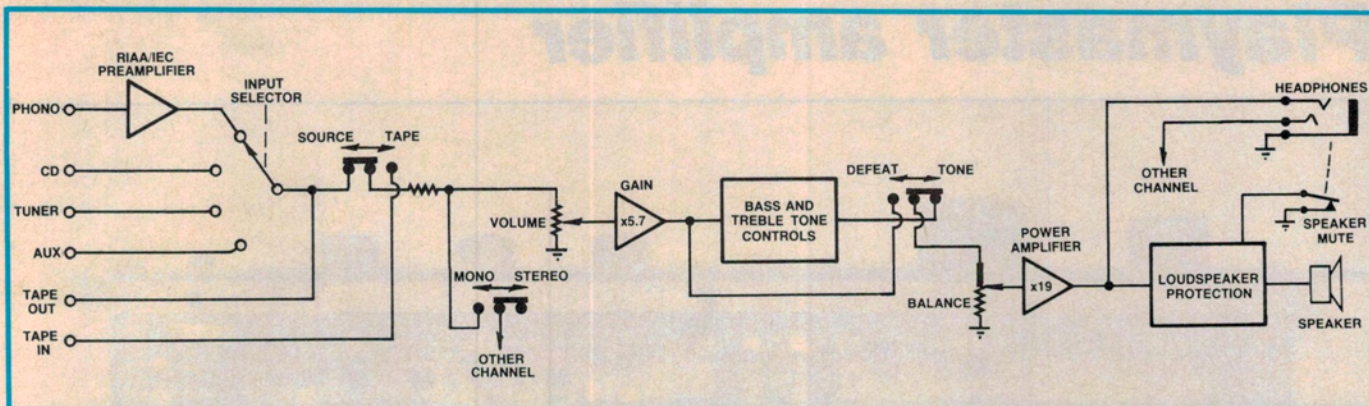


Fig.3: this block diagram shows the relevant features of the new Playmaster Sixty-Sixy stereo amplifier.

for the same frequency range.

At normal listening levels though, the distortion will typically be much lower, at around .005%. We have plotted graphs of total harmonic distortion (THD) versus power into 4-ohms and

8-ohm loads at 1kHz to give some idea of this trend. Note that the THD is shown as rising for powers below 10W but this is due to the increasing effect of residual noise rather than an actual increase in harmonic distortion.

PERFORMANCE OF PROTOTYPE

POWER OUTPUT	One channel	Both channels
4 ohms	88W	72W
8 ohms	74W	62W
Dynamic power (IHF-A-202)		
4 ohms	153W	120W
8 ohms	105W	95W

(all measured with 240VAC regulated supply)

HARMONIC DISTORTION

less than .01% for all powers up to 60W into 8Ω loads
less than .015% for all powers up to 70W into 4Ω loads
(see graphs)

INTERMODULATION DISTORTION

less than .01% for all powers up to 60W into 8Ω loads
less than .012% for all powers up to 80W into 4Ω loads

FREQUENCY RESPONSE

Phono inputs RIAA/IEC equalisation within ± 0.5 dB from 40Hz to 20kHz
Line level inputs -0.5 dB at 20Hz and -1 dB at 20kHz

CHANNEL SEPARATION

(measured at 60W)

10kHz	66dB
1kHz	75dB
100Hz	79dB

(undriven inputs loaded with 1kΩ)

INPUT SENSITIVITY

Phono inputs at 1kHz 4.3mV
Overload capacity at 1kHz 140mV
Line level inputs 270mV

HUM & NOISE

Phono (with respect to 10mV at 1kHz) 89dB unweighted, with typical moving magnet cartridge
High level inputs (with respect to 270mV) 103dB unweighted with 20Hz to 20kHz bandwidth

TONE CONTROL

Bass ± 12 dB at 50Hz
Treble ± 12 dB at 10kHz

DAMPING FACTOR

at 1kHz >80
at 30Hz >80

STABILITY

unconditional

Hum & Noise

Hum and noise figures for the amplifier are among the best we have seen in any amplifier. For all the line level inputs, the new Playmaster is actually better than any currently available compact disc player, with a signal-to-noise ratio of better than 103dB with respect to maximum sensitivity and full power.

Such a high figure really doesn't mean much to the average listener. In practical terms, it means that with a CD player plugged in, turned on, but with no music playing, and with the amplifier volume control turned right up, no sound will be heard from the loudspeakers. And that applies even if you place your ears right up against the speaker cones! It is really that quiet.

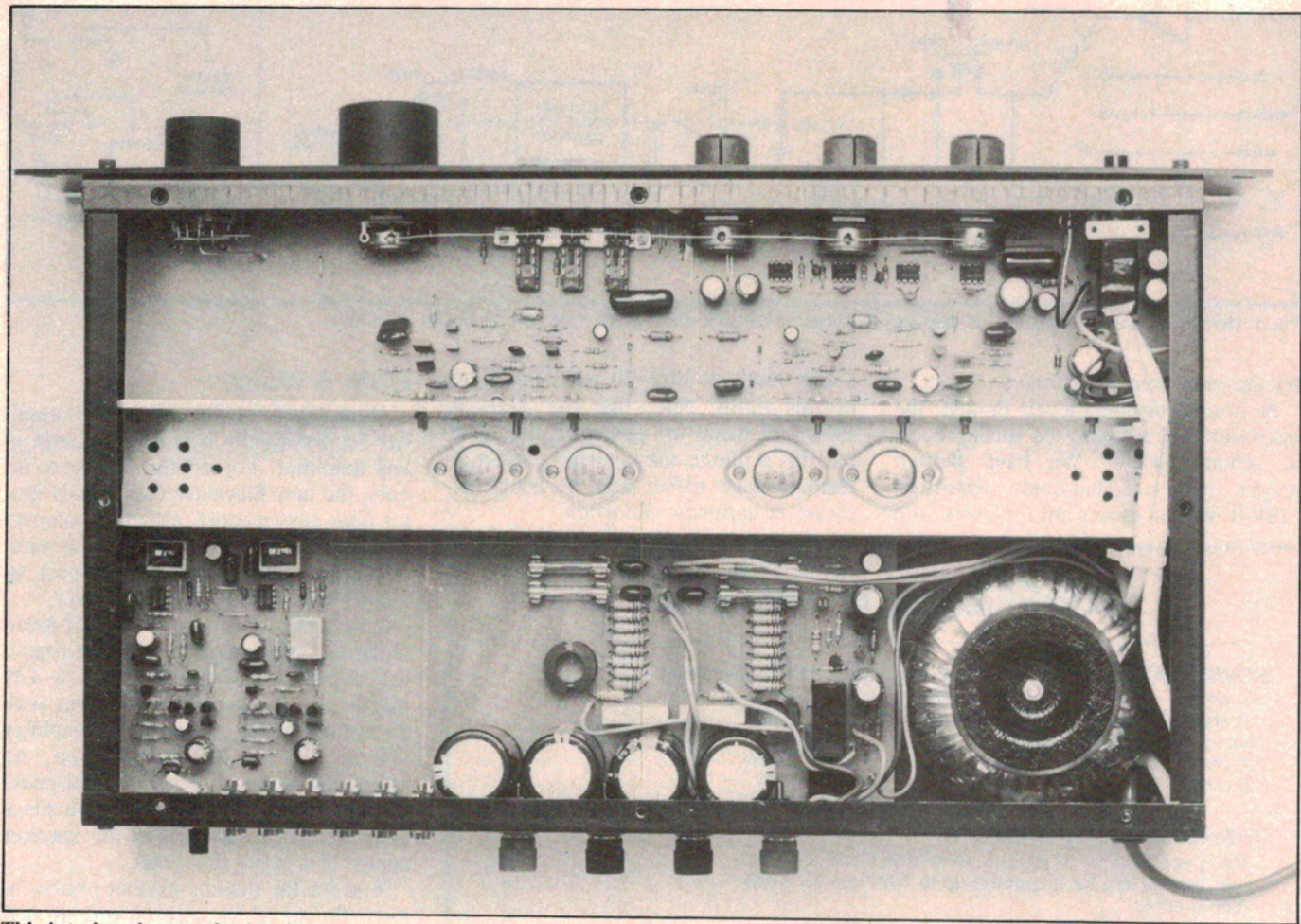
And for the moving magnet phono inputs, the signal-to-noise ratio is no less state-of-the-art at 89dB with respect to 10mV at 1kHz. These noise figures are unweighted by the way, which means that they are even better than the weighted figures used by some manufacturers.

Amplifier facilities

We have kept the operating features of the new Playmaster as simple as possible, to keep costs to a minimum and to simplify the design. That means that we have omitted switching for two pairs of speakers and comprehensive dubbing facilities for two cassette decks. We have also not included a muting switch which is a nice but seldom-used feature and moving coil cartridges are not catered for.

So the facilities are basic without being spartan. There are four sets of inputs, one for a moving magnet cartridge, and three line level sources: compact disc player, tuner and Aux (hifi VCR, musical instrument or whatever). There is also a tape monitor loop for connection of a cassette deck or

Playmaster amplifier



This interior view emphasises just how easy construction really is. Note the U-shaped heatsink running across the PC board.

graphic equaliser.

Unlike some commercial amplifiers, notably from England, we have included Bass and Treble controls. But if you don't like tone controls you can switch them completely out of the circuit with the Defeat switch. Not that it makes any difference to the measured distortion figures but there you are. You can have tone controls or you cannot. The choice is yours. You pay for them anyway.

So if you have a look at the front panel of the amplifier you will see that it has the normal knobs for Volume, Balance, Bass, Treble and Input Selector. There are four pushbutton switches, for Power, Mono/stereo, Tone defeat and Tape monitor.

There is also a stereo headphone socket which disconnects the speakers when the phones are plugged in.

Only one set of loudspeakers is catered for. The terminals for these are heavy-duty binding post-cum-banana terminals.

Overload insurance with CD players

Since the amplifier is so quiet, there is a risk that people will turn up the wick unreasonably before playing a compact disc. That brings with it the risk of blowing your loudspeakers as soon as the disc begins to play. To avoid that, we have marked the setting on the volume which corresponds to full power at the maximum CD 2V signal level.

The mark is an approximate guide only but if you turn the volume control beyond this setting you run the risk of over-driving the amplifier and perhaps blowing your speakers. So, it's included as an insurance feature. Ignore it at your own risk.

Another feature of the potentiometer controls is their smoothness and inclusion of detents. The volume control has 41 detents which makes it easy to repeat a wanted setting. Similarly, the tone controls and balance control have a cen-

tre detent to make it easy to find the normal "flat" or centre setting.

The pots are specially sourced from Japan and we strongly recommend that all suppliers use pots of equivalent quality. They really do make an important difference to the feel of the amplifier.

Overall size of the amplifier is 483 x 88 x 254mm which is the same as a standard two-unit high rack-mounting chassis.

Circuitry

In essence, the circuitry is the core of the Playmaster Series 200 but without the CMOS switching, logic circuitry and 20Hz rumble filtering. The power amplifier is also very similar to the Playmaster Series 200 but uses complementary bipolar power transistors in a Darlington configuration rather than MOS-FET devices.

Next month, we shall publish and describe the complete circuit of the new amplifier. 