Kensonic Accuphase
C-200 Control Amplifier
P-300 Power Amplifier

MANUFACTURER'S SPECIFICATIONS
C-200 Control Amplifier

Frequency Response: 20 to 20,000 Hz +0 –0.5 dB. **Distortion:** 0.05% at rated output level, 20 to 20,000 Hz. **Hum and Noise:** Tuner, AUX, and Tape, 90 dB below rated output; Disc and Mike, 64 dB below rated input, 78 below 10 mV input. **Output Level and Impedance:** Main, 2.0 v, 200 ohms; Headphones, 0.75 v into 8-ohm load, and Tape Rec., 200 mV, 200 ohms . **Maximum Output:** 10 V at 0.05% THD. **Input Sensitivity:** Disc 1 & 2, 2 to 6 mV, changeable; Mike, 2 mV; Tuner, 200 mV; AUX, 200 mV, and Tape Play, 200 mV.

C-200 Control Amplifier

Dimensions: 17½ in. W x 6 in. H x 14 in. D. **Weight:** 30.8 lbs. **Price:** $600.00.

P-300 Power Amplifier

Power Output: 200 watts continuous rms watts per channel into 4 ohms with less than 0.1% total harmonic distortion with both channels operating simultaneously at any frequency from 20 Hz to 20,000 Hz; 150 watts continuous rms watts per channel into 8 ohms with less than 0.1% total harmonic distortion with both channels operating simultaneously at any frequency from 20 Hz to 20,000 Hz. **Intermodulation Distortion:** Less than 0.1% at rated output for any combination of frequencies between 20 and 20,000 Hz. **Frequency Response:** 20 to 20,000 Hz +0 −0.2 dB at rated output. **Input Impedance:** 100k ohms. **Input Sensitivity:** 0.5 V for rated output at maximum level control. **Damping Factor:** 40 at 4 ohms, 20 at 8 ohms for any frequency from 20 to 20,000 Hz. **Dimensions:** 17½ in. W x 6 in. H x 14 in. W. **Weight:** 55 lbs. **Price:** $750.00.

P-300 Power Amplifier

The Kensonic Accuphase C-200 control amplifier is a quite attractive, well-built, and very flexible preamplifier which has quite a few very nice features. The construction uses a subplate, about an inch off the bottom, on which are mounted a row of plug-in PC boards, the transformer, filter capacitors, and regulator power transistor heat sinks. There is extensive internal shielding, which was removed for Fig. 1. The unit appears nicely made, with good quality components. Kensonic claims a 1 dB tracking error between channels in the volume control at any level, and measurement confirmed this, so this is an especially good volume control.

The P-300 power amp is a solidly built unit, weighing about 55 lbs. It also has a sub-chassis like the preamp, on which are mounted the nicely made power transformer, filter capacitors, and four PC boards. Two boards are power amp driver assemblies, containing all the transistors save the output devices; the other two are the protection circuit and the power supply regulator. The side-mounted heat sinks, essentially the height of the unit, are fairly large and have plenty of free-flow ventilation.

The front panel has two VU meters without power scales, however, pushbutton switches change the meter sensitivity from 0 to −10, or −20, zero being for 150 watts at 8 ohms, −10 15 watts, and −20 1.5 watts. This stepping of sensitivity is nice, as it's easy to remember that if you push −10, your scale is a factor of 10 different than the one above. The front panel also has a selector switch which selects *Main, Remote 1, Remote 2, Front Panel,* or *Main and Remote 1.* There are two level control pots, and a power switch which limits the amp to 50% or 25% of full output. On the bottom of the front panel is a nice hinged panel with a magnetic catch. Behind it are phone output and input jacks, a pair of front speaker output banana plugs, a filter switch which limits the bandwidth of the amp, and a switch between front and rear inputs.

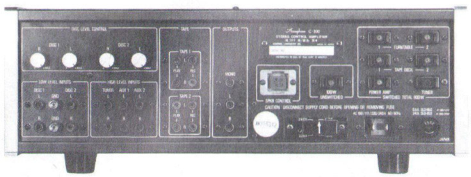

Fig. 1—Rear panel of control/preamplifier.

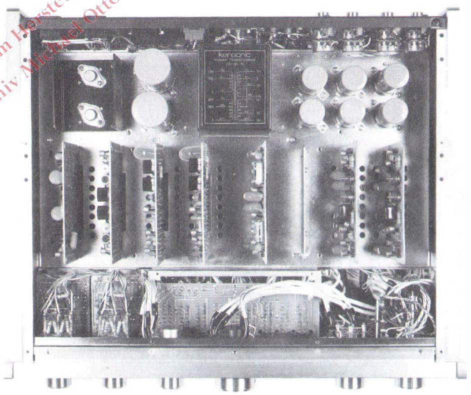

Fig. 2—Inside view of control/preamplifier.

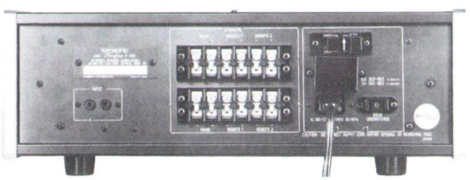

Fig. 3—Rear panel of power amplifier.

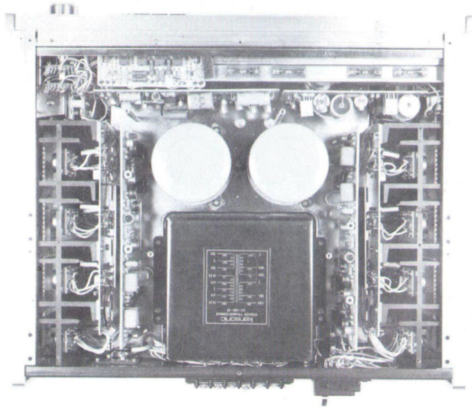

Fig. 4—Inside view of power amplifier.

On the rear panel is a set of high quality, barrier terminal strips for connection of three speaker sets, a pair of input jacks, a device to select 100, 117, 120, 220 or 240 V a.c., and an unswitched a.c. outlet, and the main a.c. fuse.

Preamplfier Circuitry

The C-200 design is unusual in several respects. First, it uses fully complementary circuitry and may have been the first on the market to do so. The block diagram, shown in Fig. 5, discloses six amp blocks per channel, phono preamp, high level amp also used for tone control action, low- and high-cut active filters, output buffer amp, and headphone amp. In normal use, when you're playing records and don't have the filters in, you go through the phono preamp, the high level amp, and the output buffer amp, making a total of three, with the C-200 driving a following power amp.

When the tone controls are switched in, a flat feedback network in the high level amp is replaced by switched RC networks. There is, therefore, little difference in performance when the tone controls are "in circuit," which is not the case with other designs that typically use another inverting gain-of-one amplifier. The high level amp is always in use, and when you use the tone controls you aren't adding any extra electronics. The high and low filters are, however, bypass switchable.

The C-200's design is also unusual in that the balance control comes after the high level amp, which follows the volume control; usually the balance and volume controls are together in a circuit. There is also a muting relay between the output of the high level amplifier and the balance control, which is connected to a time-delay circuit and prevents turn-on thumps.

The tape monitor facility has a tape-copy switch, separate from the monitor switch, which allows recording from one deck to another, independent of the signal to the speakers. This is a good feature, rather unusual, and works well.

The headphone amp is connected to the output of the main preamp output and in attenuated to about one-fifth of the main preamp's output voltage. It is a complete power amplifier that can drive 4, 8 or 16 ohm 'phones to about 200 mW. It has a low output impedance so that dynamic phones can get damping. This is unusual as most headphone amp circuits, which come in power amps, drop the feed to the 'phones through a large series resistor, so there is virtually no damping.

Figure 6 is a simplified schematic of the phono preamp, the most elaborate circuit used in the C-200; both the high level and headphone circuits are simplified versions. What is unusual about this phono preamp, aside from fully complementary design, is the high voltage used in the output stage of the preamp, ±60 V, which to my knowledge is the highest supply voltage for any present day solid-state preamp output stage. The high supply voltage, combined with the ability to lower the circuit gain from 40 to 30 dB at 1 kHz by means of back channel pots, makes it virtually impossible to overload this phono preamp with any magnetic pickup. Such unusually high signal acceptance is very good.

Q1 through Q4 form a complementary-differential input amplifier which drives complementary inverting transistors Q5 and Q6. The collectors of Q5 and Q6 have signal currents in phase, but even-order harmonic distortion products are out of phase, and thus cancel—if the devices are completely and perfectly complementary.

Q7 through Q10 constitute a complementary compound

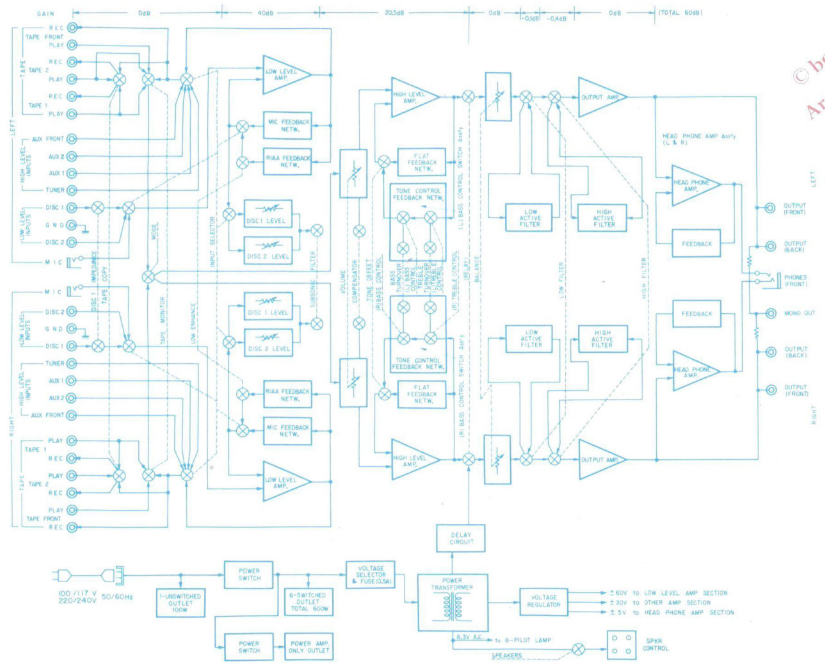

Fig. 5—Block diagram of control/preamplifier. Power supply is shown at bottom.

output stage with a closed-loop gain of about 25 to 1. With this gain, the collector of Q5 and Q6 would only have to swing about 2 volts for 50 volts out of the preamp. Since the required swings of Q5 and Q6 are somewhat lower, the supply voltage to the front end of the circuit can be lower. In fact, Q11 and Q12 are emitter-follower regulators to drop the voltage from ±60 to ±23 volts.

The overall circuit, then, has a very high open-loop gain, and the even-order distortion products should be cancelled out by the complementary action.

Phono equalization is accomplished by a feedback network that connects the output of the amplifier inverting input to the differential input pair, the righthand set of transistors.

The back-panel-controlled phono gain goes through shunt-feedback resistor which varies from 2.37K up to 7.37K. The 25-Hz low-cut filter for disc is accomplished by decreasing the size of the capacitor in series with the feedback resistor. The disc low-frequency enhance is accomplished by changing RC values of the bass-boost elements of the series RIAA feedback impedance.

This complementary circuit should drive the feedback network at all frequencies in the audio band symmetrically, and should have low 1 kHz difference tone distortion. Both are the case with this circuit, which has *extremely* low distortion. It is a challenge to measure it.

The mike function is accomplished by putting a flat series-feedback resistor in the feedback loop of the phono preamp, which then is set to provide a non-controllable gain of about 40 dB.

High Level Amplifier

After the selector switch and volume control is the high-level amp, a non-inverting amp with a closed-loop gain of about 10 to 1 when the tone controls are out. With the tone controls in and set flat, gain is still about 10 to 1. This circuit is a simplification of the phono preamp and, including the differential-input and inverting common-emitter transistors which follow, has a total of six devices. The collectors are directly tied together between the common-emitter output transistors, and this output feeds the following muting relay, the balance control, and then the filter amp. These last are active RC circuits with about unity gain.

The low-cut filter is an 18-dB-per-octave circuit with a cutoff frequency of 30 Hz, a desirable low frequency because it doesn't cut any of the musical content, but cuts subsonic energy very effectively. The high-cut filter is a 12-dB-per-octave circuit with a cut-off frequency of 5 kHz. The amps used for these filters are a simple complementary pair of emitter-followers.

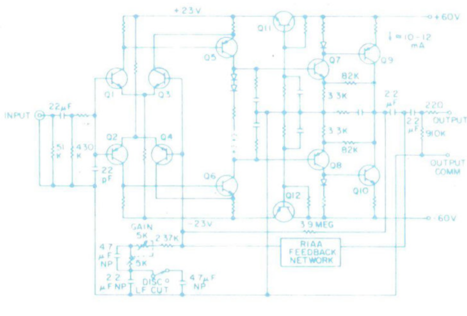

Fig. 6—Phono preamp circuit, showing simplified version of Disc 1, 2 LF enhance circuit.

The output buffer amplifier, always in circuit, is a complementary Darlington-connected set of emitter-followers providing low output impedance for the main preamp output.

The headphone amplifier is a small complete complementary power amplifier with a ±5.4 V supply. It uses the basic circuit found in the high level amplifier, with a pair of complementary emitter-followers in the output for a total of 8 devices. It has 100% internal feedback, or a gain of one, and is driven by signal that's about one-fifth of the main preamp signal.

The owner's manual for this unit mentions that when you're listening to headphones, since the signal coming from the main output is not switched off, you should turn your power amplifier off if you didn't want to hear your speakers too. This could create some problems if you were listening to the 'phones at high levels because some power amplifiers have input transistors which present a highly nonlinear input impedance when they are not active, actually acting as diodes. Therefore, if your power amp has input volume controls, it would be a wise idea to turn them down or even disconnect the unit, so there would be no possibility of non-linear loading on the output of the main preamp, as this is the signal which feeds the headphone amplifier.

The power supply consists of a nicely made, potted power transformer with several secondaries, and a pair of voltage regulators that develop ±60 V for the phono preamp and ±30 V for the high level amp, filter amp, and the output buffer amp. The headphone amplifier operates on an unregulated ±5.4 V, and 6.3 V a.c. is provided for the push-button function lights on the front panel. There is also a rectified 12 to 14 d.c. V for the muting relay. The primary of the power transformer has a rather flexible arrangement for line voltages, including 100, 117, 120, 220, and 240 V, so that it can be used anywhere.

Power Amp Circuitry

Functionally the signal path in the power amp goes through three blocks (see Fig. 7), the input amp, the band-pass filter amp, and the power amp proper. The input amp has a closed loop gain of about 6.3X and provides low output-impedance signal to drive the bandpass filter when it is switched in. The input amp is like the six-device circuit of the high-level block in the preamp, consisting of a complementary differential amp driving a complementary inverting amp with the collectors tied together. The supply voltage is ±25 V. The filter amplifier is an active RC circuit with a gain of about 1X, which provides an 18-dB-per-octave attenuation with cutoffs of 17 Hz and 24 kHz. The active filter amplifier is a complementary pair of emitter-followers. The supply voltage here is also ±25 V.

The main power amp is a little more elaborate, but again is a fully complementary circuit, starting with the complementary-differential input stage driving inverting Darlington-connected common-emitter amplifiers—8 transistors so far. Connected between the output collectors is the bias control network of the output stage, consisting of three diodes in one package mounted on the output transistor heatsink to control idling current versus temperature. In series with the diodes is a bias control rheostat, shunted by a thermistor.

The output stage is a complementary emitter-follower with three output devices in parallel per half cycle for a total of six output transistors. This output stage is driven by a pair of complementary emitter-followers.

Protection Circuit

The protection circuit is quite different from any other such circuit and rather elaborate. Basically, the power amplifier itself has dynamic instantaneous current limiting only. That is, if an instantaneous peak of excessive current comes along, this circuit limits the drive to the output stage, much like other such circuits except this one doesn't sense instantaneous voltage. The actual operation is through a speaker (output) relay, which opens whenever one of three things occurs—excessive voltage or current of the output stage, excessive output of long-term d.c. or subsonic voltages, or if the load impedance is too low. When the relay is opened, a multivibrator is turned on, which oscillates at about 1 Hz and in turn makes the meter lights flash. This circuit also provides the turn-on time delay of four or five seconds.

The power limiter circuit has two transistors connected to ground, an NPN and a PNP, which have their collectors essentially tied to the drive lines to the output stage, and the drive for these transistors comes from a selected division of the output voltage. Thus, when that power and output voltage is reached, it turns on these shunt-limiting transistors, which limit the drive to the output transistors by clipping it to 25% or 50% of full output.

The power supply is rather complicated, basically consisting of a large, nicely made transformer, a pair of 40,000 μF capacitors, which is the common power supply for both channels of the output stages. The main power supply voltage to the output stages is ±65 V. Additional taps on the main secondary windings of the transformer are used to rectify ±70 V for powering the predriver in front of the main power amp circuitry. They have a higher supply voltage than the output stage so that the output stage can be fully saturated. The raw ±65 V is then regulated to ±25 V, which is used to power the input amp, the filter amp, and part of the protection circuit. A separate winding on the transformer and rectifiers develop ±25 V, which is regulated to ±16 V for the rest of the protection circuit.

Unregulated −25 V from this last-mentioned supply is used to power a relay which shorts out a 3-ohm, 20-watt resistor in series with the power transformer primary winding, which reduces the line in-rush current. Thus, when the unit is turned on, there is three ohms in series with the primary. When the power supply is fully operative, it develops the voltage needed to pull in this relay and the direct connection to line. This is a good idea and has been used similarly in the Marantz 500.

Listening Tests

All of the functions of the C-200 preamplifier worked quite well. There were no clicks or pops, and all switches worked smoothly. From an operational standpoint, the unit was a pleasure to use. The phono cartridges used in the listening tests were a Shure V-15 III and a Supex with a special pre-preamp simple in design and quite neutral in character.

The sound of the C-200 was compared with those of several highly regarded phono preamps, both solid-state and tube type. The bass end was very firm and solid, and was judged to be at least as good or better than the transistor circuits.

The high end was relatively freer of edginess than most all of the other transistor circuits. Switching in the output amplifier caused no increase in edginess, though there appeared to be a slight decrease in definition.

The P-300 power amplifier was tested separately using a highly efficient, specially made set of speakers and then much-less-efficient Magnepans. With the high efficiency set, the unit was judged to be almost perfectly free of low-level edginess and sounded very, very good. A very good amplifier for this use.

With the Magnepans, which soak up a lot of power, the P-300 had a very good bass end, as good or better than any other in the A-B test—solid and tight. The high end seemed to be a little brighter than the other units' top end, and in one case, not as realistic.

Measurements

Gain at 1 kHz, for both *Disc 1* and *Disc 2* inputs, varied from 30 to 40 dB as the gain pot on the rear panel was varied from minimum to maximum. The input noise is about 3 dB worse in the minimum gain position, probably due to the higher source impedance of the inverting input of the input stage at low gain. In other words, the gain is lowered by raising the value of the shunt feedback resistor, which varies from about 2.3K to about 7.3K. That increase in resistance is probably what causes the increase in relative input noise.

RIAA equalization error with a noninductive 1K source is shown in Fig. 7 for an IHF load and for a 10K load with signal taken at *Tape Out*. Also shown is the effect on RIAA equalization of the low frequency enhance equalizer, which has *Zero*, *+½ dB*, and *+1 dB* settings (at 100 Hz).

Table 1—Bandwidth & gain vs. input noise, phono.

Bandwidth (Hz)	Gain Setting	Left Out (μV)	Right Out (μV)
400 - 20 K	Max. (40 dB)	0.46	0.46
20 - 20 K	Max.	0.98	0.91
400 - 20 K	Min. (30 dB)	0.66	0.65
20 - 20 K	Min.	1.57	1.30

Table 2—Phono overload vs. load, frequency, & gain.

Freq. (Hz)	Input (volts) IHF load	Input (volts) 10K load	Output (volts) IHF load	Output (volts) 10K load
20	0.052	0.045	43.5	33.0
100	0.103	0.1	44.0	43.5
1 k	0.47	0.47	44.0	44.0
5 K	1.18	1.18	42.5	42.5
10 K	2.26	2.26	41.5	41.5
20 K	4.4	4.4	42.0	42.0
20	0.17	0.15	43.5	34.0
100	0.32	0.31	43.5	41.5
1 K	1.45	1.45	43.5	43.5
5 K	3.7	3.7	43.0	43.0
10 K	7.0	7.0	42.0	42.0
20 K	12.5	12.5	42.0	42.0

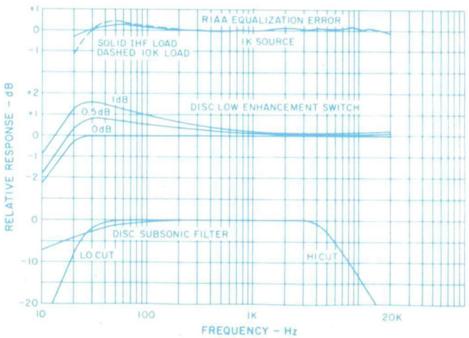

Fig. 7—Phono preamp response curves, including subsonic filter and 3-position LF enhancement switch.

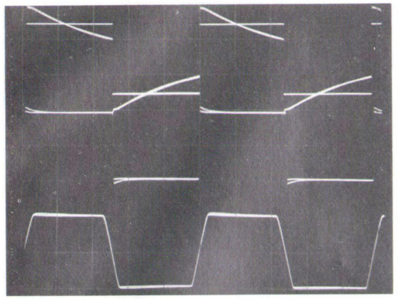

Fig. 8—Phono preamp square-wave response at 40 Hz (top), 1 kHz (middle), 1 and 10 kHz (bottom), with input and output traces overlapping.

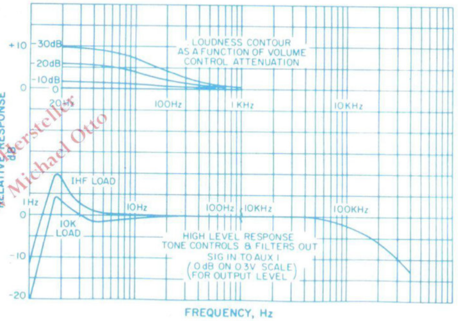

Fig. 9 —Preamplifier/control high level response (bottom) and loudness contour (top) curves.

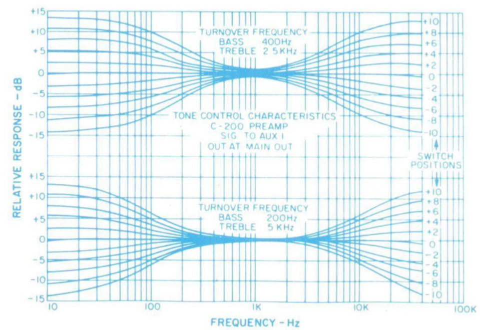

Fig. 10—Tone-control response curves.

The effect of nonideal 47K input resistance and possible interaction of reactive sources on the feedback equalization was checked with representative high- and low-inductance cartridges by comparing the response of the same cartridges and sources through a preamp specially made for this test. With the high-inductance cartridge, the response was within ½ dB to 10 kHz, down about 0.6 dB at 15 kHz, and down 1½ dB at 20 kHz. The low-inductance cartridge response is up about 0.3 to 0.5 dB over the 5 to 20 kHz region, a relatively small deviation from ideal.

Rather than just measuring the IM with this preamp, difference tone distortion was measured, that is the 1 kHz difference product of 10 and 11 kHz input signals. These were extremely hard to measure, but at 10 V rms out, IM distortion was about 0.002%, which decreased below that output level. At 10 V out, the 20 kHz THD was about 0.004% and decreased below that level. The 1 kHz difference tone distortion for 10 and 11 kHz equal amplitude at 10 V out was 0.002%. All these were into 10K loads, and the measurements were slightly better into an IHF load. These are truly outstanding measurements. Their significance is that the difference tone distortion is usually higher than either of the other two. In this preamp, at any given level, it is comparable or lower. This shows that it is able to drive the circuit symmetrically, and hence does not generate second harmonic distortion and the resulting difference tone distortion.

Phono overload versus frequency and gain and load is shown in Table 2. It is virtually impossible to overload this preamp with any present-day magnetic pickup, even at the 40 dB setting. Once the signal is above 100 Hz, signal acceptance is the same no matter what load is used. One circuit oddity is that if you do overload this preamp at 10 to 20 kHz, it does go into a low-frequency oscillation, but the probability of this happening is zero because of its high signal acceptance.

Performance of the output amp section of the preamplifier was measured next. The gain with all filters and tone controls out is 10 to 1. With the controls in, there is a slight (0.4 dB) loss at 1 kHz. The harmonic distortion of the output section of the preamp was 0.006% from 20 Hz to 20 kHz at 5 V or less with a 10K or higher load. IM distortion at 5 V out was 0.003% with the same loads. Switching in the tone controls doesn't alter the measurements since all that's happening is the use of different feedback networks.

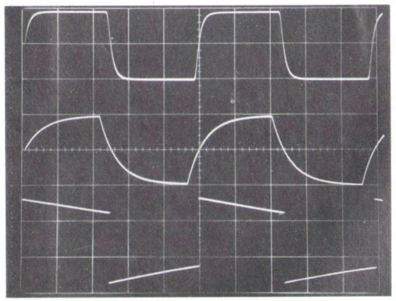

Fig. 11 —Square-wave response at output(s) of preamplifier/control. 20 kHz (top) output of phono preamp, IHF loading. 20 kHz (middle) at tape output, IHF loading. 20 Hz (bottom) output of phono preamp, IHF loading.

The high and low filters have a slight effect on harmonic distortion, though it is still below 0.02% from 20 Hz to 20 kHz. Frequency response is shown in Fig. 7. The low-cut filter has a good, steep 18-dB-per-octave slope and a useful cutoff frequency. The high-cut filter has a 12-dB-per-octave slope and about a 5 kHz cutoff.

The frequency response of the output amplifier with filters and tone controls out is shown in Fig. 10, along with loudness compensation versus volume attenuation. The peak in the high level response is in the high level amp, but it should not overload as the phono preamp has good subsonic attenuation.

Tone control characteristics are shown in Fig. 10. It should be noted that the variable inflection points aren't handled this way in most equipment, though it's easy to do when RC switching is used. These tone controls are actually switches which change the RC values in the feedback network of the high level amplifier. The curves are good ones, and the switches work very well.

Output noise is shown in Table 3 as a function of volume control position and bandwidth, and measurements were made with shorted inputs. The greater noise with the volume control clockwise is due to a 4.7K resistor in series with each high level input, and this resistor might affect the response of the *Tape* and *Main* outputs if one connects a capa-

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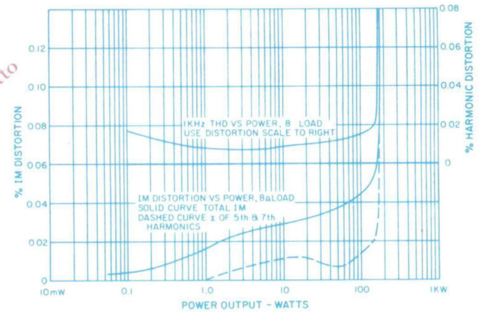

Fig. 12—Distortion curves for power amplifier, THD (top), and IM (bottom).

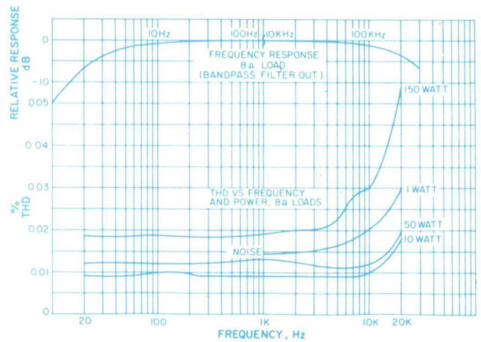

Fig. 13—Relative response at one-watt output (top), distortion vs. power and frequency (bottom).

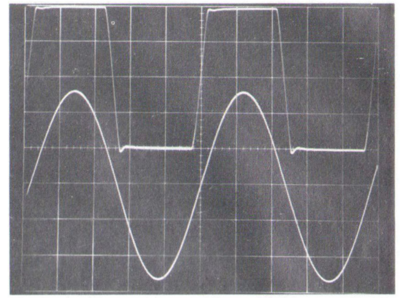

Fig. 14—20 kHz (top) square-wave response of power amplifier, 8 ohms, 200 watts. 20 kHz (bottom) sine wave response, 1 μF load, 40 volts RMS.

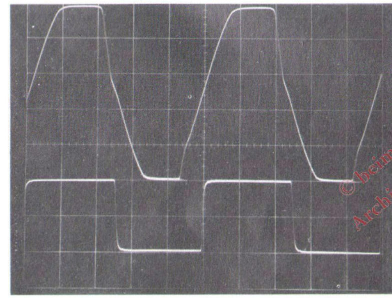

Fig. 15—20 kHz sine wave (top) and 10 kHz square wave (bottom) power amplifier output. Top trace shows 2 dB input overdrive just beyond onset of clipping at output. Bottom, 3.12 watts at 8 ohms.

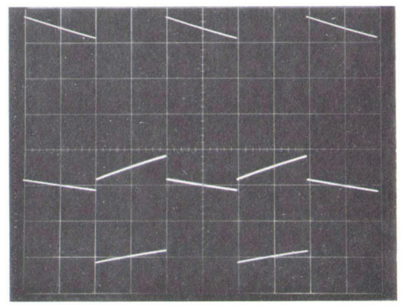

Fig. 16—50-Hz square waves into 8-ohm loads; top is 200-watt level, bottom is 3.12-watt level.

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citive load to the *Tape Out* jacks. An IHF load (1000 pF in parallel with 100K) causes a high frequency rolloff at 30 kHz. While the 1000 pF is rather extreme, if you do have some rather long *Tape Out* leads, you might get some audible high frequency rolloff. Output amplifier scope photos are shown in Fig. 11, and the amount of droop in the 20 kHz square wave about doubles when going from an IHF to a 10K load. When the filters are switched in, there is no increase in noise, as with some circuitry—a good feature.

Another good feature is that the balance control, due to its position past the high level amplifier, doesn't increase noise when it is rotated away from center.

Crosstalk between channels of the phono preamp at 20 Hz was about −68 dB, increasing to −61 dB at 1 kHz, and to −56 between 5 and 20 kHz. All measurements here are good. High level crosstalk, using *AUX 1* with the tone controls out, was −55 dB at 20 Hz, −72 at 1 kHz, and −49 dB at 20 kHz. With the tone controls in, the crosstalk is even better at high frequencies, about −62 dB at 20 kHz.

The maximum power output of the headphone amp is about 250 mW into 4 ohms, 245 mW into 8 ohms, and 202 mW into 16 ohms. The IM distortion here is mostly 2nd and 3rd harmonic, varying between 0.05% and a few tenths of a percent as voltage ranges from ½ V to 1½ V, depending on load impedance. The output resistance is about 0.16 ohms, which might make dynamic phones sound better at low frequencies because of better damping.

The power amplifier had a voltage gain with the pots wide open of 43 to 1, or 34.6 dB, which is higher than the 34 to 1 specified. This amp passed the new FTC one hour burn-in at 1/3 full power test with no apparent problems. THD and IM are shown in Fig. 12, with one-watt frequency response and THD versus frequency and power in Fig. 13. Note that the 1 watt distortion versus frequency curve begins at 1 kHz, since at this point the distortion began to climb above the noise, indicating a small amount of high frequency crossover distortion.

Overall this amplifier measures very well, though it does have a tiny bit of odd harmonic distortion, about 0.01% which is not likely to be heard. Introduction of the bandpass filters raised distortion slightly at high power levels—from 0.01% to 0.016% at 100 watts, 1 kHz. Scope photos of various waveforms through the amplifier are shown in Figs. 14 through 17.

This amplifier has *excellent* high frequency power capability, as shown by the 80 V peak-to-peak, 20 kHz square wave and the 80 V p-p 10 kHz square wave with a two uF load. Damping factor versus frequency varied from 100 at low frequencies to about 23 at 20 kHz, decreasing smoothly above 500 Hz.

Power at clipping was 301 watts into 4 ohms. At 8 ohms, it was about 185 to 190 watts, and at 16 ohms about 110 watts.

Next measured was the output noise, with input shorted, for two bandwidths. From 20 to 20,000 Hz, the output noise is 160 mV in the left channel and 183 in the right, mostly random noise. With a 400 Hz to 20 kHz bandwidth, output noise was 83 μV for the left channel and 87 for the right. All these are *very* good measurements, since for example, the 183 μV right channel is 105.5 dB below rated power of 150 watts.

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Table 3—Preamplifier noise vs. volume control position (Aux 1 input shorted).

Bandwidth (Hz)	Control Pos.	Right Out Noise (uV)	Left Out Noise (uV)
20 - 20 K	CCW	15	14
400 - 20 K	CCW	11	11
20 - 20 K	Worst case	97	82
400 - 20 K	Worst case	81	76
20 - 20 K	CW	28	25
400 - 20 K	CW	22	22

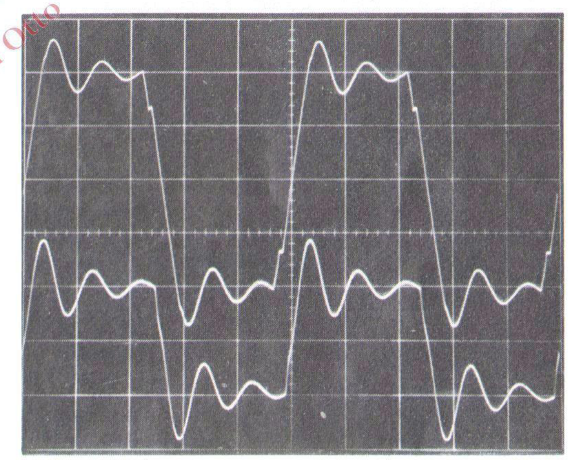

Fig. 17—10-kHz square waves into 2 μF resistive loads; top is about 160 VA, bottom about 3 VA.