Accuphase

WORLD EQUIPMENT REVIEWS

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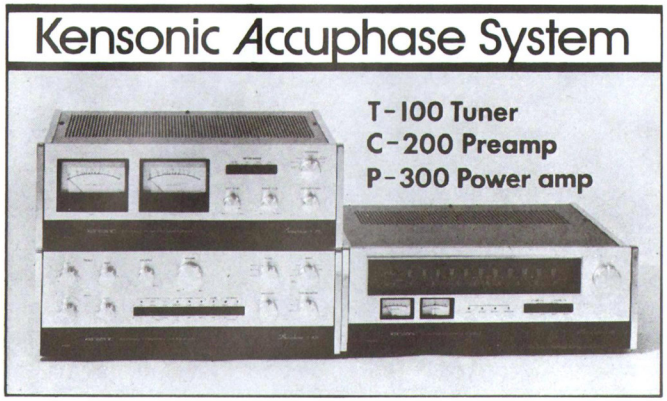
Kensonic Accuphase System



T-100 Tuner

MANUFACTURER'S SPECIFICATION

Mono performance. IHF sensitivity: 2 μV, S/N 50 dB: 3·5 μV. **Ultimate S/N:** 72 dB (100 μV input). **Ultimate THD:** not exceeding 0·1% 1 kHz; 0·1% 100 Hz; 0·2% 10 kHz (50 μV input, 100% modulation). **AM rejection:** 50 dB S/N 45 dB; 1 mV input 60 dB; 1 V input 52 dB. **Frequency response:** 20 Hz–15 kHz +0 dB −1 dB. **Alternate ch. selectivity:** 70 dB at 100 μV input. **Capture ratio:** 1·5 dB. **Image rejection:** 100 dB all frequencies. **IF rejection ratio:** 100 dB. **Spurious rejection:** 100 dB. **Output:** 1·5 V 100% modulation. **Stereo performance. Ultimate S/N:** 70 dB 2 mV input. **Ultimate THD:** will not exceed 0·2% 1 kHz or 100 Hz; 0·5% 10 kHz. **Stereo and muting threshold:** 5 μV/20 μV (switchable). **Stereo separation:** 40 dB 1 kHz; 30 dB 100 Hz and 10 kHz. **SCA rejection:** 60 dB. 19 kHz and 38 kHz rejection: 50 dB. **AM Performance. Sensitivity:** 15 μV (IHF). THD: 0·5% 1 kHz 30% modulation. **Image rejection:** 70 dB. **General. FM aerial Z:** 300 ohms balanced; 75 ohms unbalanced. **Output Z:** fixed 200 ohms; variable 2·5 k. **Dimensions:** 6×17½×14 in. **Weight:** 14 kg. **Price:** £315·00 retail plus VAT. **Distributor: Pyser Limited, Fircroft Way, Edenbridge, Kent, TN8 6HA.**

HIGH quality and high price are intrinsic partners in this tuner, which is one unit of the 'Rolls Royce' class Japanese Accuphase hi-fi system. Other new Accuphase units are a 150+150 W power amplifier and a matching control unit/preamplifier, both of advanced design. Reviews of these items accompany this test report.

The tuner, however, is perfectly acceptable for use with almost any other type and make of amplifier, so it could be purchased on its own. It is capable of delivering high quality mono and stereo audio signals from FM radio, and its sensitivity, selectivity and spurious response rejection make it eminently suitable for fringe area activities and for DX-ing. However, its price cannot really be justified on these counts alone, for there are other less costly units of similar high specifications, such as the Trio KT-8005 and the Pioneer TX-9100, which are also well engineered.

The T-100, though, has a tight specification, which is guaranteed, and this in practical terms means close tolerance components and close attention to small points of detail, engineering functions that tend to burn up money! It is thus a tuner which has been designed up to a guaranteed quality rather than down to a price, and as shown by the test results all the parameters are well met or exceeded.

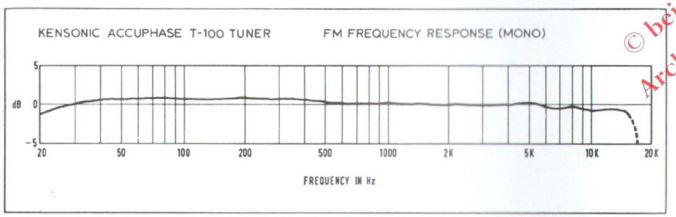
The fascia is 'brushed aluminium' with a dark upper scale section occupying almost the entire width. The FM band covers 88–108 MHz and is accurately calibrated, while AM is medium wave only from about 540 to 1600 kHz. The tuning scales are clearly printed and the tuning mechanism of good mechanical quality and free from backlash or slip. A useful size tuning knob is located at the right of the scale section and two fairly large meters occupy the fascia at the bottom-left of the scale section. One meter responds in proportion to signal strength, saturating at about 200 μV and starting to indicate at about 1 μV, and the other one is centre-reading for tuning balance. The centre point correlates closely to the tuning required for the least distortion and highest S/N ratio.

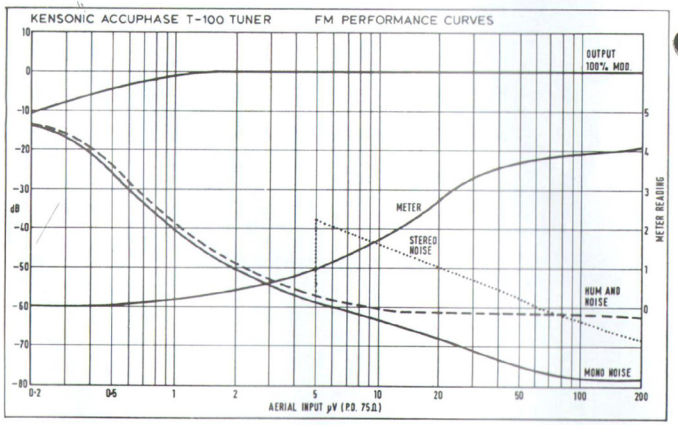
A subpanel below the fascia is exposed by pulling down a magnetically retained flap. This panel carries a third meter, but smaller than the others, which indicates multipath signal response. This is illuminated when the flap is opened. Below the flap are also level presets for FM and AM (one for each), a two-level muting switch with an off position, a stereo noise filter switch and a switch offering a choice of two dial illumination intensities.

Balancing the two fascia meters at the opposite side of the scale section is a row of four push buttons operating local/distant attenuation on AM and mono/auto-stereo switching on FM. Between the meters and the push buttons are four small, coloured indicators that illuminate appropriately on stereo, muting 1 or 2 and when the stereo filter is switched on. Mains power is operated by a larger push switch, which protrudes through the subpanel flap at the extreme left.

The rear is equipped with a ferrite rod aerial for AM and with FM aerial inputs for both 300 ohms balanced feeder and 75 ohms coaxial feeder, though the latter is connected by a non-British type of plug/socket (supplied).

Terminals are also provided for an external aerial and earth, and RCA 'phono' type sockets for both fixed and variable (*via* the sub-panel presets) left and right output signals. There is also a socket delivering signal direct from the FM detector to facilitate the connection of a 'quadraphonic' multiplex decoder should ever our FM signals be so encoded. Two sockets are provided for the conveyance of signals to the X and Y inputs of an oscilloscope for those who would like to examine multipath effects on an oscilloscope.





KENSONIC ACCUPHASE T-100 TUNER PERFORMANCE		COMMENT
FM Section (tests at 95 MHz and signals PD 75 ohms)		
IHF: least usable sensitivity	1·4 μV	Towards the ultimate attainable.
30 dB quieting	0·8 μV	Towards the ultimate attainable.
50 dB quieting	2·2 μV mono; 20 μV stereo	Excellent.
Full limiting	1·5 μV	Excellent.
Ultimate S/N ratio	78 dB mono; 75 dB stereo	Excellent.
Ultimate hum and noise	−62 dB	Mostly ripple content (See S/N ratio)
Output 30% modulation	540 mV fixed; 0–540 mV var.	Two pairs of outputs.
Muting threshold	(1) 5 μV; (2) 20 μV	Two positions and off.
Tuning accuracy	within 1%	Excellent.
Rated IHF capture ratio	less than 1·5 dB	Excellent.
Rated IHF alternate ch. selectivity	80/100 dB	Outside range of test equip.
Adjacent ch. selectivity	16 dB approx.	See text.
Front-end selectivity (figure of merit)	>100 dB	Test equipment limits.
Image rejection ratio	100 dB	Outside range of test equip.
Repeat spot suppression	100 dB	Test equipment limits.
AM rejection ratio	60 dB	At 1 mV input. Excellent.
Distortion factor	0·05% mono; 0·2% stereo	30% modulation and 1 kHz.
Stereo separation	46 dB approx.	At 1 kHz and 1 mV input.

It is noteworthy that when an FM tuner receives the main signal and a small fraction of a second later another signal, due to some reflection of the main signal, a rather special type of interference results, called multipath interference. This can yield amplitude modulation, so tuners likely to suffer more from this effect are those not endowed with particularly good AM rejection ratio and capture ratio. The effect can also give rise to harmonic distortion and stereo separation trouble, so it is always as well to orient the FM aerial in those areas prone to signal reflections (hilly country, etc) for maximum discrimination against reflected signals.

This is not generally a very easy matter, for it is necessary to listen for a reduction in distortion while the aerial is being turned! The multipath meter of the T-100 indicates in terms of multipath response (i.e. to the AM content), so by using this meter the aerial can be adjusted for the least deflection. Alternatively, an oscilloscope can be attached, as already mentioned.

Most of the parameters measured were towards the maximum limits of the test equipment employed. The FM performance curves depict a tuner of high sensitivity and low noise, both mono and ultimate stereo, though the ripple content, I felt, should be a little better than it is. The tuning meter has a reasonably useful dynamic range, but like all such meters saturation tends to start occurring round the 200–500 μV mark. From the point of view of tuning this is inconvenient when there is no other tuning balance indication which, of course, is not the case with the T-100, since it is equipped with a second centre-reading meter.

Distortion factor overall, both mono and stereo, was desirably low, so the tuner is capable of providing a good audio signal as well as being endowed with very acceptable signal parameters. The nature of the distortion factor at 1 kHz and 100% modulation (corresponding to a mere 0·09%—mono) is shown by the accompanying oscillogram, and is essentially second harmonic, as can be seen.

In this review I have also included two additional oscillograms, which are sweep frequency displays of the overall bandwidth at two levels of limiting. On both oscillograms the horizontal divisions correspond to about 75 kHz, so it can be seen that the bandwidth is a little over 150 kHz at 6 dB limiting and about 450 kHz at 60 dB limiting. The intrinsic selectivity, of course, does not decrease with increasing signal level and hence increasing limiting. What happens is that the increasing depth of limiting cuts across the response characteristic at progressively lower and lower depths, and since the side skirts can never be truly vertical the bandwidth is obviously bound to be greater at the bottom than at the top, particularly over a limiting range of 60 dB or more!

It must also be remembered that a weak adjacent channel signal would have far less chance of causing interference when the wanted signal is some 60 dB stronger than the unwanted signal. This in spite of the wanted signal resulting in a limiting action at a level on the response characteristic where the bandwidth is such that the side frequencies of the unwanted signal trespass further into the passband than when both signals are equally strong. On the other hand, a wanted weak signal close to a strong signal would result in less limiting action, so discrimination against the strong signal would be provided by the smaller bandwidth at the top of the response characteristic.

For maximum fidelity of stereo signals the −6 dB bandwidth need not be greater than about 250 kHz (though it is understood that a BBC computer calculation has indicated a smaller frequency than this). If the bandwidth between the −6 dB points is much in advance of 250 kHz adjacent channel interference can be troublesome without any improvement in stereo quality, though other aspects of tuner design come into this. It was found that the 250 kHz bandwidth of the T-100 occurred at around 10 dB limiting input, corresponding to about 4 μV (PD), a level below which one would not normally expect to obtain good stereo anyway.

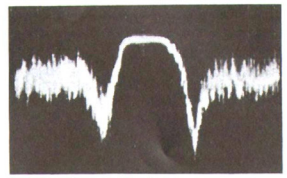
The rated IHF alternate channel selectivity (100 μV input) was very good, but with the increasing utilisation of Band II it is the adjacent channel selectivity—and the input capability of the front-end—which are becoming of greater importance, hence the value of the sweep frequency oscillograms, which we hope to include in all future tuner reviews.

The IF selectivity is provided by a linear phase filter consisting of 15 tuning circuits, and the gain by integrated circuits. Front-end selectivity is under the control of four variable-tuned circuits up to the mixer (excluding the local oscillator tuning) using mechanical capacitors as distinct from varicaps. The state-of-art design includes no fewer than 45 bipolar transistors, 9 integrated circuits, 7 field effect transistors and 41 diodes.

The audio response falls swiftly into 19 kHz pilot tone suppression (−61 dB) and 38 kHz subcarrier suppression (−55 dB), and in spite of this good subchannel filtering the overall FM frequency response is virtually flat (referred to 50 μsec pre-emphasis) right up to 15 kHz.

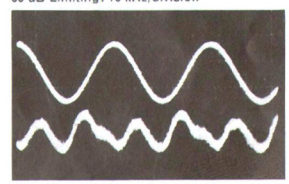
The AM section performed better than some less exacting designs, this being aided by two variable-tuned stages prior to the mixer,

KENSONIC T-100 TUNER
SQUARE WAVE PERFORMANCE



6 dB Limiting: 75 kHz/division

60 dB Limiting: 75 kHz/division



Dist. Factor 100% mod. 1 kHz. Mono: 0·09%

Fig. 1.

KENSONIC :

I - le préamplificateur

La firme japonaise Kensonic propose aujourd'hui aux amateurs et aux professionnels une série d'amplificateurs et de préamplificateurs stéréophoniques. Leurs caractéristiques et leur fabrication nous permettent de les classer dans la gamme des matériels les plus remarquables.

Nous nous proposons, dans cet article, d'examiner le préamplificateur Accuphase C 200 et l'amplificateur P 300.

LE PRÉAMPLIFICATEUR ACCUPHASE C 200

Le simple aspect extérieur montre immédiatement qu'il s'agit d'une réalisation de caractère professionnel, dans laquelle toutes les fonctions ont été conçues de façon très rationnelle.

L'utilisateur dispose, sur le panneau avant de l'appareil, de toutes les commandes.

Le sélecteur d'entrée permet de choisir :

- Deux entrées phono dont le niveau est réglable de façon progressive à l'aide d'un atténuateur, de la sensibilité maximale à une valeur inférieure de 10 dB. Sur l'entrée 1, on peut choisir l'impédance de charge du phonocapteur : 20 kΩ, 30 kΩ ou 47 kΩ. L'entrée 2, a une impédance de 47 kΩ. Une accentuation de 0,5 dB ou de 1 dB peut être effectuée dans le registre grave de la correction RIAA.
- Une entrée micro.
- Une entrée adaptateur MF.
- Trois entrées Auxiliaires dont l'une est située à la partie inférieure du panneau avant, fermée par un cache que l'on fait pivoter à l'aide d'une simple pression.

Les entrées et les sorties microphone, de même que les entrées et les sorties magnétophone, sont disponibles sur cette partie inférieure.

Une commande de Monitoring permet d'opter pour la source choisie à l'aide du sélecteur d'entrée, ou de contrôler trois magnétophones. Le sélecteur de mode permet de choisir entre : l'emploi en stéréophonie, en stéréophonie avec inversion des canaux en sortie, en monophonie sur les deux canaux et en disposant du canal droit ou du canal gauche sur les deux canaux de sortie.

Un contacteur permet la copie d'un magnétophone sur l'autre. L'utilisateur dispose en outre des possibilités suivantes :

— Un correcteur de tonalité à plot sur chaque canal avec le choix de la fréquence de transitoire 200 Hz et 400 Hz pour le registre grave, 2,5 kHz et 5 kHz pour le registre aigu.
— Une commande de niveau.
— Un contrôle de balance.
— Deux filtres passe haut et un filtre passe bas.
— Une compensation physiologique pour l'écoute à bas niveau (+ 9dB à 50 Hz pour un niveau de −30 dB).
— Une télécommande de deux séries de haut-parleurs lorsque l'appareil est utilisé avec un amplificateur de puissance de type P 300.
— Une sortie casque.

L'examen du schéma complet montre que les ingénieurs de Kensonic ont employés pour cette réalisation 80 transistors et 35 diodes. Nous nous bornerons à examiner les circuits d'entrée Micro et Phono. Ils sont composés d'un système d'amplification push-pull différentiel, alimenté par une tension élevée (±60 V) ce qui assure une gamme dynamique élevée. La courbe de réponse et le gain (40 dB à 1 kHz) sont déterminés par la boucle de réaction négative. La figure 6 illustre cette partie du schéma.

Essais et résultats des mesures

- *Gain :*
  — Entrées phono et micro : 60 dB à la sortie des préamplificateurs.
  40 dB sur les sorties magnétophone.
  40 dB sur la sortie casque.

• ACCUPHASE C 200

TABLEAU I

Entrée	Non pondérée 2 Hz-200 kHz	Courbe A
Phono.	−114,4 dB	−114,4 dB
Aux.	−82,8 dB	−94,4 dB

— Entrées adaptateur MF et Auxiliaire :
20 dB à la sortie du préamplificateur.
0 dB sur les sorties magnétophone.
6 dB sur la sortie casque.

- *Niveau de sortie maximum :* 12 V (Z = 200 Ω).
- *Niveau de saturation des entrées phono :* 450 mV (il faut signaler la

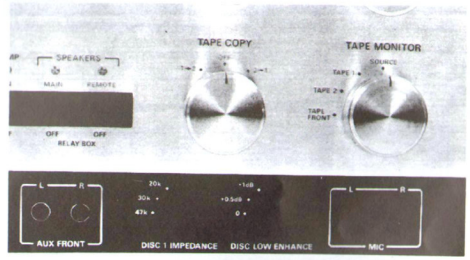


Fig. 2. — Vue inférieure gauche du panneau avant : on remarquera des entrées Micro et Auxiliaire disponibles à l'avant, le réglage d'impédance et la commande de correction de la courbe RIAA.

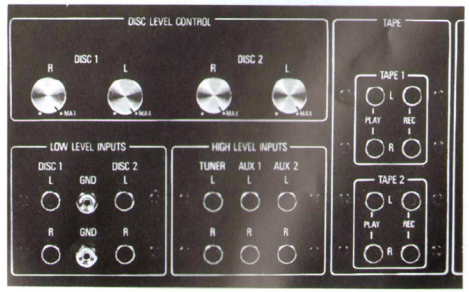


Fig. 3. — Vue partielle du panneau arrière : les entrées et les sorties.

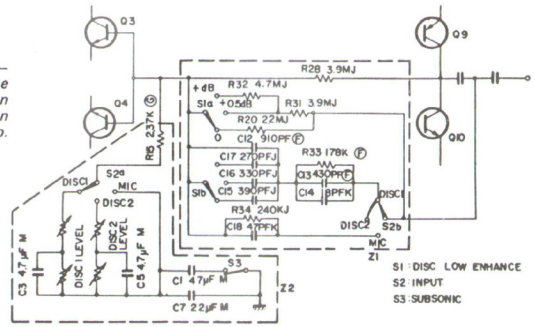


Fig. 4. — Schéma de principe de l'égalisation et de l'amplification Phono et Micro.

valeur exceptionnelle de cette caractéristique).

- *Bruit de fond* (par rapport à 1 V) : tableau I.
- *Distorsion par harmoniques :* elle a été mesurée pour une tension de sortie de 10 V (tableau II).
- *Distorsion par intermodulation :* on a employé les fréquences 7 000 Hz/ 50 Hz avec un rapport de 1/4 (tableau III).

TABLEAU II

Fréquence	20 Hz	1 kHz	20 kHz
Canal gauche	0,02	0,02	0,032
Canal droit	0,022	0,024	0,036

TABLEAU III

Niveau de sortie	Canal gauche	Canal droit
10 V	0,018	0,03
1 V	< 0,01	< 0,01

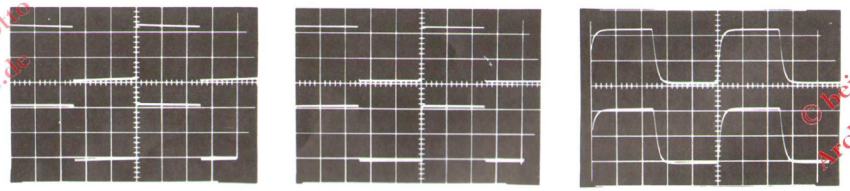


Fig. 5 et 7. — Restitution d'un signal rectangulaire de fréquence respectivement 20 Hz, 1 kHz et 20 kHz.

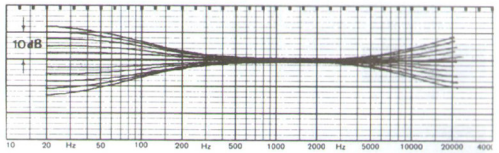


Fig. 8. — Courbe de réponse du correcteur de tonalité fréquences de transition 200 Hz et 5 kHz).

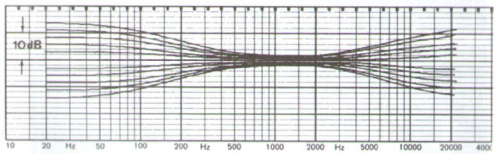


Fig. 9. — Courbe de réponse du correcteur de tonalité fréquences de transition de 400 Hz et 2,5 kHz).

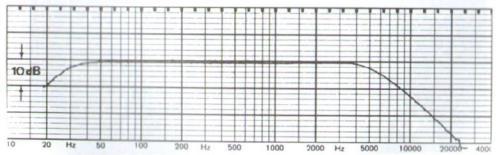


Fig. 10. — Courbe de réponse des filtres Passe-haut et Passe-bas.

- *Restitution des signaux rectangulaires :* les figures 7 à 9 montrent l'excellente restitution à partir des entrées auxiliaires.
- *Contrôle de tonalité et filtres passe haut et passe bas :*
  — Grâce aux contacteurs à plots il est possible d'effectuer une correction précise de la courbe de réponse. Les figures 10 et 11 illustrent les courbes réalisées en fonction des fréquences de transition choisies.

KENSONIC : II - l'amplificateur ACCUPHASE P 300

Il s'agit d'un amplificateur de forte puissance dont la conception et la réalisation ont fait l'objet d'un soin exceptionnel. On a utilisé pour sa fabrication 73 transistors, 88 diodes et 2 thermistors.

Avec cet appareil l'utilisateur amateur ou professionnel, dispose d'un élément de très haute qualité.

Sur le plan pratique, la modulation peut être appliquée à des connecteurs

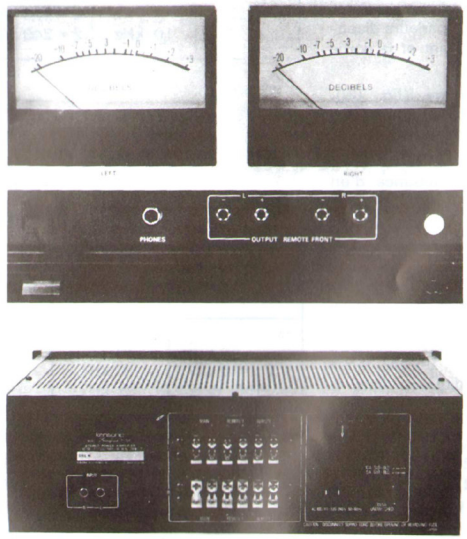


Fig. 12 . — Vue du panneau avant gauche.

Fig. 13. — Vue du panneau arrière de l'amplificateur ACCUPHASE P 300.

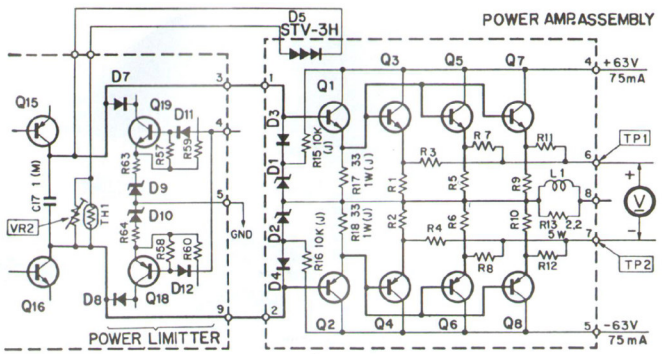


Fig. 14. — Schéma de principe de l'étage de puissance de sortie.

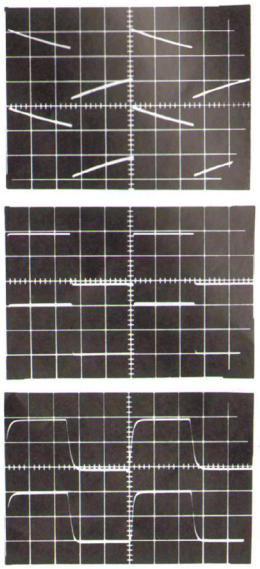


Fig. 15, 16, 17. — Restitution d'un signal rectangulaire de fréquence respectivement 20 Hz, 1 kHz et 10 kHz.

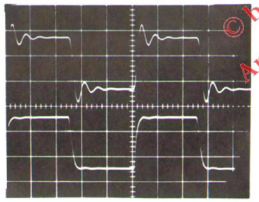


Fig. 18. — Restitution d'un signal rectangulaire de fréquence 10 kHz (charge de 1 µF en parallèle avec une résistance de 8 Ω sur le canal supérieur.)

d'entrée CINCH sur le panneau avant ou sur le panneau arrière, la commutation s'effectuant à l'aide d'un contacteur situé dans la partie inférieure du panneau avant. La figure 00 montre les réglages sur la partie droite du panneau avant pour le niveau d'entrée de chaque canal, la commande de la puissance utilisable (maximale, 50 % ou 25 %), le sélecteur des groupes de haut-parleurs et le clavier de commande de la sensibilité des VU-mètres.

La figure 00 montre les VU-mètres ainsi que les sorties haut-parleurs disponibles sur le panneau avant et la sortie casque.

Sur le panneau arrière (fig. 00), on remarquera les trois autres groupes de sorties pour haut-parleurs.

La figure représente le schéma de principe du circuit de puissance d'un canal.

TABLEAU I

Impédance de charge	Fréquence	Puissance nominale
8 Ω	20 Hz	2 × 182 W
	1 kHz	2 × 190 W
	10 kHz	2 × 180 W
	20 kHz	2 × 165 W
4 Ω	20 Hz	2 × 290 W
	1 kHz	2 × 290 W
	10 kHz	2 × 240 W

TABLEAU II

Impédance de charge et puissance	Fréquence	Distorsion (%)	
		Canal gauche	Canal droit
Z = 8 Ω 150 W	20 Hz	0,024	0,022
	1 kHz	0,014	0,015
	10 kHz	0,024	0,022
	20 kHz	0,04	0,038
Z = 4 Ω 200 W	20 Hz	0,034	0,026
	1 kHz	0,032	0,018
	10 kHz	0,042	0,036

Essais et résultats des mesures

Puissance maximale

Cette caractéristique a été relevée en alimentant les deux canaux simultanément. En fonction de la fréquence et de la charge résistive utilisée, on a obtenu les valeurs indiquées dans le tableau I. Il est intéressant de noter que dans ses spécifications, le constructeur annonce des valeurs beaucoup plus modestes (2 × 200 W sur 4 Ω et 2 × 150 W sur 8 Ω). Il en est d'ailleurs de même pour d'autres caractéristiques.

TABLEAU III

Puissance (W)	Canal gauche	Canal droit
180	0,064	0,06
18	0,028	0,022
1,8	0,02	0,018
0,18	0,01	0,01

Distorsion par harmoniques

La mesure a été effectuée pour une puissance de sortie légèrement inférieure : 150 W sortie sur 8 Ω et 200 W sur 4 Ω pour chaque canal. Le tableau II fournit les résultats.

Distorsion par intermodulation

La mesure a été effectuée uniquement sur une charge de 8 Ω avec des fréquences 7 000 Hz/50 Hz avec le rapport d'amplitude habituel de 1/4. Le tableau III résume les valeurs trouvées pour les différentes puissances. Notons que tous les résultats sont exceptionnels.

Facteur d'amortissement

On a mesuré la valeur suivante : 50 sur une charge de 8 Ω à la fréquence de 1 kHz.

Réponse à des signaux rectangulaires

Les figures 15 à 17 fournissent la restitution pour des signaux carré de fréquence de récurrence respectivement 20 Hz, 1 kHz et 10 kHz sur une charge de 8 Ω.

La figure 18 montre la restitution à 10 kHz lorsque l'un des canaux se trouve chargé par une capacité de 1 µF en parallèle sur la résistance de 8 Ω, test sévère qui montre l'excellente stabilité de cet amplificateur.

Bruit de fond

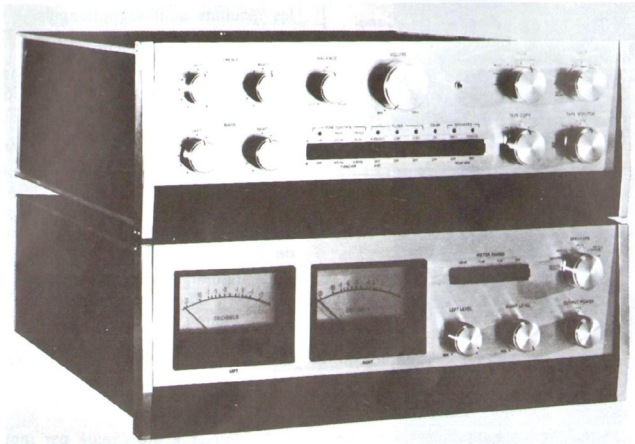
Ce dernier a été évalué par rapport à la puissance de 180 W. On a relevé la valeur de −101 dB sur chaque canal.

CONCLUSION

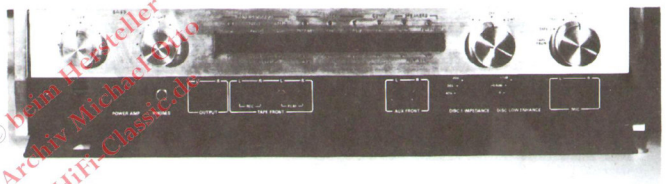
Mieux que tous commentaires, les mesures effectuées sur le préamplificateur Accuphase C 200 et l'amplificateur Accuphase P 300, montrent que l'amateur et le professionnel sont assurés d'obtenir avec ces appareils une qualité électroacoustique exceptionnelle. Une réalisation prestigieuse dont le prix seul pourra limiter le nombre des utilisateurs.

Prix approximatif du C 200 : 5 700 TTC.
Prix approximatif du P 300 : 7 800 TTC.

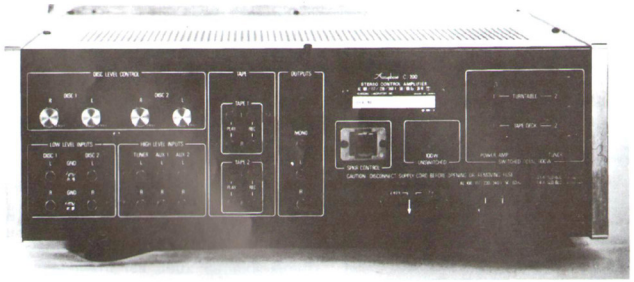
Testreihe Verstärker



Kensonic Accuphase C-200 (Vorverstärker) P-300 (Endverstärker)



1 Bedienungselemente und Anschlußbuchsen des Vorverstärkers C-200 bei geöffneter Klappe



2 Rückseite des Vorverstärkers C-200

3 Bedienungselemente und Anschlußbuchsen des Endverstärkers P-300 bei geöffneter Klappe

Unter der Bezeichnung „Accuphase" bietet die japanische Kensonic Laboratory Inc. ein Sortiment hochwertiger HiFi-Einzelbausteine an, für dessen Entwicklung ihr in Japan der „Grand Prix Award" in Gold zugesprochen wurde. Neben dem Empfänger T-100, dem ebenfalls ein Bericht in diesem Heft gewidmet ist, haben wir den Vorverstärker C-200 sowie die Endstufe P-300 untersucht, wobei wir die Ergebnisse der beiden letzteren Geräte im vorliegenden Testbericht zusammengefaßt haben. Das gesamte Programm von Kensonic, das daneben noch die kleineren Modelle T-101 (Empfänger) und E-202 (Vollverstärker) umfaßt, wird in Deutschland von der Firma Boyd & Haas in 5039 Sürth/Köln, Unterbuschweg, vertrieben. Um in den Besitz der kompletten Anlage aus T-100, C-200 und P-300 zu kommen, muß man nach Angabe des Importeurs etwa den Gegenwert eines VW-Käfers investieren. Dabei kostet der Vorverstärker etwa 2600 DM, die Endstufe knapp 3000 DM.

Beschreibung

Sämtliche Geräte werden, wie unser Bild im Titel erkennen läßt, zunächst als nüchterner Einschub ohne Holzgehäuse geliefert. Das untere Viertel der Frontplatte wird einheitlich bei allen Geräten von einer dunklen, herabklappbaren Abdeckplatte eingenommen, hinter der sich die nicht so häufig benötigten Bedienungselemente sowie zusätzliche Anschlußmöglichkeiten befinden. Beim Vorverstärker C-200 findet man hier (Bild 1) die Anschlußbuchse für einen Kopfhörer, zwei Ausgangsbuchsen, ein Anschlußfeld für Tonbandaufnahme und -wiedergabe sowie Eingangsbuchsen für einen hochpegeligen Eingang (Aux) und ein Mikrophon. Zwei kleine Drehschalter gestatten es, zum einen die Eingangsimpedanz des Phono-Vorverstärkers I zwischen den Werten 47, 30 und 20 kΩ umzuschalten, zum anderen kann man mit dem Schalter „disc low enhance" bei Phonobetrieb eine geringfügige Baßanhebung von 0,5 dB bzw. 1 dB gegenüber der exakten RIAA-Entzerrung einschalten. Der Netzschalter am linken Rand ist durch eine Aussparung in der Klappe auch von außen zu bedienen, so daß man den Deckel nicht jedes Mal herunterklappen muß.

Die übrigen Bedienungsfunktionen sind auf insgesamt 10 Drehknöpfe sowie eine Reihe von Drucktasten verteilt, die sich unterhalb des zentral liegenden und durch seine Größe deutlich hervortretenden Lautstärkestellers befinden. Die linken drei Tasten beeinflussen das Klangregelnetzwerk, das mittels der äußersten Taste bei Bedarf ganz abgeschaltet werden kann. Ist es eingeschaltet, so können die Einsatzfrequenzen des Baß- und Höhenreglers zwischen 200 und 400 Hz bzw. zwischen 2,5 kHz und 5 kHz umgeschaltet werden. Die nächstfolgenden drei Tasten schalten ein Tiefen- und ein Höhenfilter sowie ein Rumpelfilter (subsonic), das nur bei geschaltetem Phono-Eingang wirksam ist und eventuelle Rumpelgeräusche des Plattenspielers unterdrückt. Mit der nächsten Taste wird die gehörrichtige Lautstärke eingeschaltet (comp), die bei geringen Lautstärken die verminderte Empfindlichkeit des menschlichen Gehörs für bestimmte Frequenzbereiche kompensiert. Die letzten beiden Tasten dienen zum Ein- und Ausschalten zweier Lautsprecherpaare über ein separates, an der Rückseite anschließbares Relaiskästchen. Die vier Drehknöpfe am rechten Rand sind Eingangs-Wahlschalter und Betriebsartwähler.

Die Rückseite des Gerätes (Bild 2) enthält neben einer Vielzahl von Anschlußbuchsen noch vier Stellschrauben, mit denen die Eingangsempfindlichkeit der beiden Phono-Eingänge Disc I und Disc II für jeden Kanal einzeln eingestellt werden kann. Daneben weist der C-200 noch drei weitere hochpegelige Eingänge (tuner, aux I, aux II) auf sowie Ein- und Ausgänge zum Anschluß von zwei Tonbandgeräten. Alle Buchsen einschließlich der Ausgänge zum Anschluß des Endverstärkers sind in Cinchausführung. An der rechten Seite stehen noch sieben Netzsteckdosen amerikanischer Norm zur Verfügung, davon steht eine dauernd unter Spannung, während die anderen sechs, an die man beispielsweise Plattenspieler, Tonbandgeräte, Empfänger und Endstufe anschließen kann, alle gemeinsam mit einem an der Frontseite neben dem Netzschalter befindlichen Druckschalter ein- und ausgeschaltet werden können.

Die Schaltungstechnik des C-200 ist recht aufwendig. Die Versorgungsspannungen aller Verstärkerstufen sind symmetrisch, sie betragen im allgemeinen +30 V, die Phono/Mikro-Vorverstärker werden gar mit ±60 V versorgt. Alle Verstärker sind direkt gekoppelt und bereits in den Eingangsstufen komplementär-symmetrisch aufgebaut.

Das Gesicht des Endverstärkers P-300 wird im wesentlichen durch die zwei großflächigen Aussteuerungsinstrumente auf der linken Gerätehälfte bestimmt. Daneben sind vier Drucktasten, mit denen man die Instrumente, falls einen das ewige Gezappel der Zeiger stört, abschalten oder zwischen drei verschiedenen Anzeigeempfindlichkeiten wählen kann. Die Drehknöpfe unter der Drucktastenreihe erlauben eine separate Pegeleinstellung für den rechten und linken Kanal. Mit dem oberen der beiden Knöpfe am rechten Rand kann man zwischen vier Lautsprecher-Anschlußmöglichkeiten wählen, mit dem unteren Knopf kann man die maximale Ausgangsleistung auf 50 bzw. 25% der Nennleistung reduzieren, falls dies im Interesse der angeschlossenen Lautsprecher geboten erscheint.

Unter der herabklappbaren Blende am unteren Geräterand (Bild 3) erkennen wir wiederum eine Kopfhörerbuchse sowie vier Bananenbuchsen für den Anschluß zweier Lautsprecherboxen. Rechts außen sind zwei Cincheingangsbuchsen, mit dem daneben liegenden Schalter (input) kann man von diesen Buchsen an der Frontseite auf die entsprechenden an der Rückseite umschalten. Der Schalter „bandpass filter" begrenzt in Stellung ON den Übertragungsbereich des Verstärkers auf 20 Hz bis 20 kHz.

Die Rückseite des P-300 (Bild 4) enthält neben den Schraubklemmen zum Anschluß von insgesamt drei getrennten Lautsprecherpaaren nur noch zwei Cincheingangsbuchsen. Rechts neben den Schraubklemmen befinden sich der Netzanschluß mit Sicherungshalter und Spannungswähler sowie eine dauernd unter Spannung stehende Netzanschlußdose amerikanischer Norm.

Ergebnisse unserer Messungen

a) Vorverstärker C-200

Alle nachfolgend angegebenen Werte wurden, wenn nichts anderes angegeben ist, an einem Lastwiderstand von 4,7 kΩ gemessen. Die Fremdspannungsabstände, Übersprechen etc. sind wie üblich auf eine Ausgangsspannung von 2 V (≙ +6 dBV) bezogen.

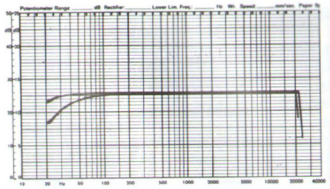
Maximaler unverzerrter Ausgangspegel

an 400 Ω	8,5 V ≙ 18,5 dBV
an 4,7 kΩ	12,8 V ≙ 22,1 dBV
an 47 kΩ	13,2 V ≙ 22,4 dBV

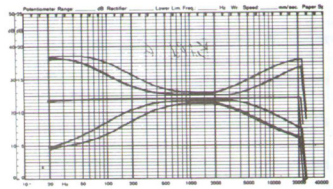
Innenwiderstand
am Ausgang 220 Ω

Übertragungsbereich (–3 dB) 7 Hz bis 100 kHz

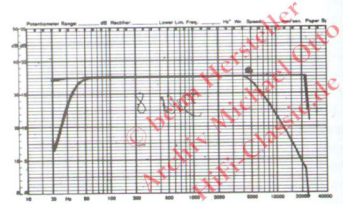
4 Rückseite des Endverstärkers P-300



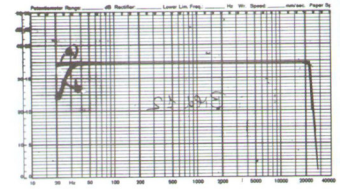
5 Frequenzgang über Eingang Phono, gemessen über Verzerrer nach RIAA in beiden Kanälen a) ohne Filter b) mit Subsonic-Filter



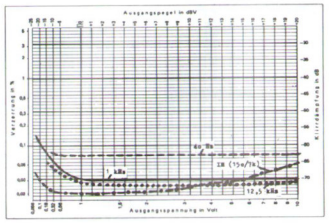
6 Regelumfang der Klangregler bei maximaler Anhebung bzw. Absenkung der Bässe und Höhen, gemessen in beiden Kanälen für die Einsatzfrequenzen 200 Hz und 400 Hz bzw. 2,5 kHz und 5 kHz



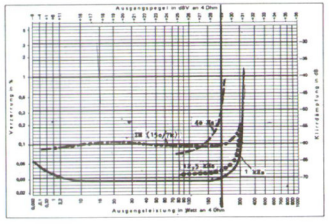
8 Frequenzgang des Höhen- und Tiefenfilters



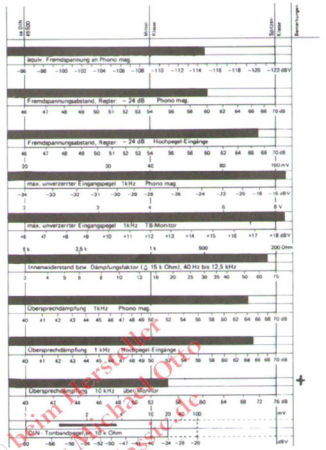
12 Frequenzgang des Endverstärkers P-300, gemessen an 4 Ω Lastwiderstand a) ohne Filter b) mit eingeschaltetem Bandpass-Filter



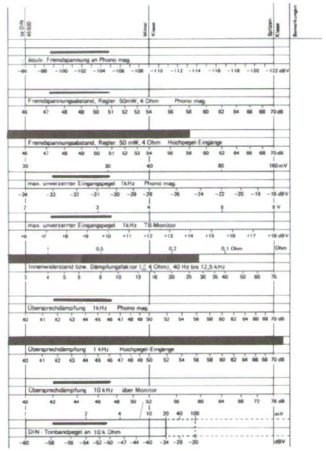
9 Verzerrungsdiagramm des Vorverstärkers C-200, gemessen mit 4,7 kΩ Abschlußwiderstand



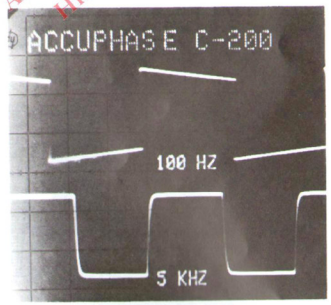
13 Leistung-Verzerrung-Diagramm des Endverstärkers P-300



10 Balkendiagramm des Vorverstärkers C-200

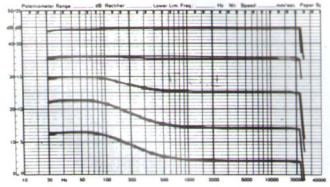


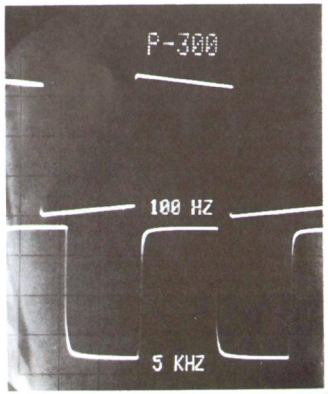
14 Balkendiagramm mit den wichtigsten Qualitätsmerkmalen des Endverstärkers P-300



11 Rechteckübertragungsverhalten, aufgenommen mit 4,7 kΩ Lastwiderstand bei den Impulsfolgefrequenzen 100 Hz und 5 kHz

7 Frequenzgang bei gehörrichtiger Lautstärkeregelung (Comp), gemessen bei Nennausgangsspannung in beiden Kanälen und Stellungen des Lautstärkereglers von 0 dB (a) bis –40 dB (e)





15 Rechteckübertragungsverhalten des Endverstärkers P-300, gemessen ohne Bandpass-Filter

Eingangsempfindlichkeiten
für Ausgangspegel 2 V ≙ +6 dBV an 4,7 kΩ

Aux, Tuner, Tape	200 mV ≙ –14 dBV
Disc I, II	einstellbar
Pegelregler max:	2 mV ≙ –54 dBV
Pegelregler min:	6,3 mV ≙ 44 dBV
Einstellbereich	10 dB
Micro	2 mV ≙ –54 dBV

Maximaler unverzerrter Eingangspegel

Monitor	14 V ≙ + 23 dBV
Disc Pegelregler max:	470 mV ≙ –6,5 dBV
Pegelregler min:	1,43 V ≙ +3,2 dBV
Übersteuerungsfestigkeit Disc	47,5 dB (!)

Ausgangspegel für Tonbandaufnahme
für 5 mV an Disc I,
Pegelregler max. 500 mV = –6 dBV

Anmerkung: nur Cinchausgänge vorhanden, kein DIN-gerechter Stomausgang

Übersprechdämpfung

	Aux	Monitor
40 Hz	62 dB	62 dB
1 kHz	≧56 dB	65 dB
10 kHz	40 dB	47 dB

	Disc	Tuner	Micro
40 Hz	≧54 dB	62 dB	59 dB
1 kHz	64 dB	≧56 dB	≧62 dB
10 kHz	≧63 dB	40 dB	≧54 dB

Übersprechen Monitor 10 kHz

Hinterband auf Aufnahme	67 dB
Vorband auf Wiedergabe	54 dB

Signal-Fremdspannungsabstand
Spitzenwert, bezogen auf +6 dBV an 4,7 kΩ

Aux, Tape, Monitor, Tuner	83,5 dB
Disc I, II	61 dB
Micro	60 dB
bezogen auf 2 x 100 mV ≙ –20 dBV an 4,7 kΩ	
Aux, Tape, Monitor, Tuner	67 dB
Disc I, II, Micro	60 dB

Äquivalente Fremdspannung
Eingang Phono –115 dBV

Frequenzgang (20 Hz bis 20 kHz) +0/–0,5 dB
(Bild 8)
maximale Abweichung zwischen den Kanälen
im Bereich 0 dB bis –40 dB ≦0,5 dB

Phonoentzerrung

20 Hz bis 20 kHz	+0/–2 dB
50 Hz bis 20 kHz	±0 dB
mit Subsonic-Filter (–3 dB)	40 Hz bis 20 kHz
(vgl. hierzu Bild 5)	

Klangregelung

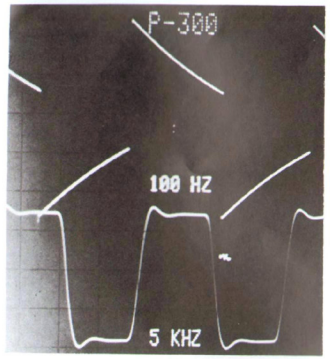
a) Regelumfang der Klangregler	Bild 6
b) Gehörrichtige Lautstärke	Bild 7

Filter
Frequenzgang bei eingeschaltetem
Höhen- und Tiefenfilter Bild 8

Klirrgrad Bild 9

Intermodulation (150/7 kHz) Bild 9

Rechteckübertragungsverhalten
gemessen über Eingang Aux 1
bei 2 V ≙ +6 dBV Bild 11



16 Wie 15, jedoch mit eingeschaltetem Bandpass-Filter

b) Endverstärker P-300

Sinusausgangsleistung
für 1% Klirrgrad bei 1 kHz und gleichzeitiger Aussteuerung beider Kanäle

an 4 Ω reell	2 x 330 W ≙ 31,25 dBV
an 8 Ω reell	2 x 220 W ≙ 32,5 dBV
an 16 Ω reell	2 x 125 W ≙ 33,0 dBV
Power-Schalter in Stellung 50%	
an 4 Ω	2 x 185 W ≙ 28,75 dBV
Power-Schalter in Stellung 25%	
an 4 Ω	2 x 85 W ≙ 25,25 dBV

Aussteuerungsinstrumente
Anzeige 0 dB 31,75 dBV ≙ 185 W an 8 Ω

Übertragungsbereich (–3 dB)

an 4 Ω	<5 Hz bis 130 kHz
mit Bandpass-Filter	17,5 Hz bis 24 kHz

Leistungsbandbreite
gemessen ohne Bandpass-Filter, bezogen auf
Nennleistung 2 x 200 W an 4 Ω <5 Hz bis 80 kHz

Eingangsempfindlichkeit
für 2 x 200 W an 4 Ω 0,8 V ≙ –2 dBV

Signal-Fremdspannungsabstand

bezogen auf Vollaussteuerung	≧94 dB
bezogen auf 2 x 50 mW an 4 Ω	≧58 dB

Übersprechdämpfung

40 Hz	≧83 dB
1 kHz	≧75,5 dB
10 kHz	≧59,5 dB

Dämpfungsfaktor
im Bereich von 40 Hz bis 12,5 kHz ≧28

Klirrfaktor Bild 13

Kommentar zu den Ergebnissen unserer Messungen

Betrachtet man die von uns ermittelten Meßergebnisse und Diagramme, so kann man verstehen, daß die Japaner der Kensonic Laboratory Inc. für diese Geräte einen Preis verliehen haben. Beim Vorverstärker C-200 besticht insbesondere die enorm hohe Aussteuerbarkeit, die an 4,7 kΩ Lastwiderstand sogar diejenige eines erst vor kurzem von uns getesteten Röhrenverstärkers (!) deutlich übertrifft. Diese Ausgangsspannung steht an einem bemerkenswert geringen Ausgangswiderstand von nur etwa 200 Ω zur Verfügung, so daß auch niederohmige Endstufen oder Monitorboxen ohne Schwierigkeiten angesteuert werden können, ebensowenig ist auch bei sehr langen Verbindungskabeln ein Höhenabfall durch die Kabelkapazität zu befürchten. Trotz der hohen Aussteuerbarkeit bietet der C-200 ausgezeichnete Fremdspannungsabstände, wobei zu berücksichtigen ist, daß die angegebenen Zahlenwerte nicht etwa auf die maximale Ausgangsspannung bezogen sind, sondern wie bei allen Vorverstärkern auf +6 dBV, also auf eine Ausgangsspannung von 2 V! Der Empfindlichkeits-Einstellbereich der Phono-Vorverstärker ist praxisgerecht, die Übersteuerungsfestigkeit erreicht mit 47,5 dB einen Wert, den wir nie zuvor in unserem Labor gemessen haben. Die Eingangsstufe des Phono-Vorverstärkers kann mit Eingangsspannungen bis zu 470 mV (≙ –6,5 dBV) angesteuert werden, ohne daß sie Verzerrungen liefert, bei Reduzierung der Empfindlichkeit auf ihren Minimalwert sind es sogar nahezu 1,5 V (≙ +3,5 dBV).

Bei allem Enthusiasmus, den derartige Meßwerte einem leidgeprüften Tester entlocken können, fanden wir jedoch auch zwei kleine Schönheitsfehler: Zum einen ist die Auslegung der gehörrichtigen Lautstärkeregelung (Bild 7) nicht ganz praxisgerecht, da die Baßanhebung nur sehr gering ist und die zugehörige Höhenanhebung gänzlich fehlt, zum anderen vermißten wir einen DIN-gerechten Tonbandanschluß. Das an den Tonband-Ausgangsbuchsen des C-200 verfügbare Signal würde ein nach DIN ausgelegtes Tonbandgerät hoffnungslos übersteuern, da der Ausgang viel zu niederohmig ist und das Signal viel zu hochpegelig. Durch den Einbau eines geeigneten Vorwiderstandes (in den Verstärker, in die Leitung oder in das Tonbandgerät) kann dieses Problem zwar gelöst werden, allerdings sollte der Hersteller, der ein solches Gerät nach Deutschland exportiert, bereits daran denken und dies nicht dem Kunden überlassen.

Auch die Endstufe P-300 bietet sehr gute Meßwerte. Die vom Hersteller angegebene maximale Ausgangsleistung von 2 x 200 W an 4 Ω bzw. 2 x 150 W an 8 Ω wird bei 1 kHz weit übertroffen, wie unser Leistung-Verzerrung-Diagramm (Bild 13) deutlich erkennen läßt. Die Anzeigegenauigkeit der beiden Aussteuerungsinstrumente erwies sich in beiden Kanälen als gut, für den Betrieb mit kleineren Lautsprechern ist eine einfache Begrenzung der maximalen Ausgangsleistung möglich. Trotz der vergleichsweise recht hohen Eingangsempfindlichkeit haben wir ausgezeichnete Werte für den Fremdspannungsabstand ermittelt, dabei sind die im Balkendiagramm (Bild 14) angegebenen 58 dB in Anbetracht der enormen Ausgangsleistung höher zu bewerten, als es der ohnehin schon recht lange Balken auf den ersten Blick vermuten läßt. Die Verzerrungen sind in allen Frequenz- und Leistungsbereichen, auch bei kleinen Ausgangsleistungen, minimal, wie auch Bild 12 erkennen läßt. Die in den Kurven angegebenen Werte liegen in der Nähe des Eigenklirrfaktors unserer Meßgeräte.

Betriebs- und Musikhörtest

Bestechend bei beiden Geräten sind die vielseitigen Anschlußmöglichkeiten und der hohe Bedienungskomfort, wobei es sich als sehr zweckmäßig erweist, daß die wichtigsten Anschlüsse auch von der Frontseite her zugänglich sind. Die Leistungsreserven der Endstufe sind gewaltig, in den meisten Fällen ist es für verzerrungsfreie Wiedergabe bei HiFi-gerechter Lautstärke ausreichend, den Endverstärker mit reduzierter Ausgangsleistung zu betreiben; hierzu kann man den Schalter „output power" getrost auf 50% oder gar nur 25% stellen. Die Lautstärkeregelung erfolgt am besten vom Vorverstärker aus, dabei sollten die beiden Pegelregler des Endverstärkers jedoch nicht voll aufgedreht sein, da sonst bei eingeschalteter gehörrichtiger Lautstärkeregelung (Comp) die Baßanhebung viel zu früh einsetzt. Die richtige Stellung ermittelt man am besten durch Versuche, sie sollte im Idealfall so sein, daß man bei voll aufgedrehtem Lautstärkesteller des Vorverstärkers gerade die maximal gewünschte (oder vom Nachbarn noch geduldete!) Lautstärke erreicht. In dieser Stellung hört man bei geschaltetem Phono-Eingang über die Lautsprecher kein Brummen und nur minimales Rauschen. Die geringfügige Baßanhebung des Schalters „disc low enhance" macht sich gehörmäßig so gut wie überhaupt nicht bemerkbar. In Verbindung mit qualitativ entsprechenden Lautsprecherboxen erfüllt das Klangbild auch die höchsten Ansprüche, der Klangcharakter oder eventuelle Verfärbungen werden dabei ausschließlich von den Boxen bzw. den jeweiligen Eigenschaften des Abhörraumes beeinflußt.

Zusammenfassung

Mit dem C-200 und dem P-300 ist eine Verstärkerkombination auf dem HiFi-Markt, deren technische Leistungen nahezu allen Ansprüchen gerecht werden. Die Übertragungsdaten des Vorverstärkers stehen ohne Ausnahme auf höchstem Qualitätsniveau, wünschenswert wäre lediglich noch ein DIN-Tonbandausgang sowie eventuell eine andere Auslegung der gehörrichtigen Lautstärkeregelung. Die Leistungsreserven der Endstufe sind gewaltig, die Übertragungsdaten auch hier voll überzeugend. Die mechanische Konstruktion beider Geräte sowie ihre Verarbeitung sind gleichermaßen ausgezeichnet, beide Geräte bieten hohen Bedienungskomfort. mth

implying the use of a tuned RF amplifier stage. Adequate signal pick-up was provided by the rear ferrite rod aerial for all regional stations, but an external aerial helped for the reception of more distant Continental stations. The AM reception also appeared to be less troubled by adjacent channel signals than some designs.

The main quality of the tuner, though, lies in the FM section, and by any standard this would take some beating. Here, then, is a tuner for the true connoisseur, provided his pocket is sufficiently deep. It is metal encased and complete with 'gold' plated side pieces. A joy to behold and use.

C-200 Control Amplifier

MANUFACTURER'S SPECIFICATION

Frequency response: +0 dB −0·2 dB high level inputs; +0·2 −0·2 dB low level inputs, both 20 Hz–20 kHz. **Distortion:** less than 0·05% at rated output, 20 Hz–20 kHz. **Inputs:** disc 1 2–6 mV (preset); disc 2 ditto; mic. 2 mV (47 k); tuner 200 mV (130 k); auxiliaries 200 mV (130 k); tape play (all circuits) 200 mV (130 k). *Note:* impedance of disc 1 switchable over 20 k, 30 k and 47 k and impedance of disc 2 fixed at 47 k. Max. disc input: 400 mVrms level control max. and equaliser gain 40 dB; 1·2 Vrms level control min. and equaliser gain 30 dB for 0·05% distortion at 1 kHz. **Outputs:** main 2 V (200 ohms); headphones 0·4 V (0·3 ohm); tape recording 200 mV (200 ohms); mono 0·42 V (38 k). **Maximum output:** 10 V for 0·05% distortion. **Hum and noise:** 90 dB below rated output high level and 74 dB below 10 mV (or 64 dB below rated input) low level. **Tone controls:** treble ±10 dB at 10 kHz (2·5 kHz turnover) or *ditto* at 20 kHz (5 kHz turnover); bass ±10 dB at 100 Hz (400 Hz turnover) or *ditto* at 50 Hz (200 Hz turnover). Controls 2 dB steps. **Disc low enhancement:** 0 dB, 0·5 dB and 1 dB at 100 Hz ref. RIAA. **Compensator (loudness):** 9 dB at 50 Hz (volume −30 dB). **Filters:** Disc subsonic 25 Hz 6 dB/octave; low 30 Hz 18 dB/octave; high 5 kHz 12 dB/octave. **Dimensions:** 6×17½×14 in. **Weight:** 14 kg net. **Price:** £295·00 net plus VAT. **Distributor: Pyser Limited, Fircroft Way, Edenbridge, Kent TN8 6HA.**

THIS control unit/preamplifier is a part of the Kensonic Accuphase hi-fi system whose main purpose is to feed processed source signal to the P-300 power amplifier. The general styling of the C-200 is in most ways similar to that of the power amplifier and tuner, the three items forming a hi-fi system of high order.

The main panel is equipped with the primary controls for treble and bass (controls for each channel), balance, volume, mode selection, source selection, tape monitor selection (there are two tape circuits and a separate selectable 'front' tape circuit) and tape copy allowing dubbing from circuit 1 to 2 or from 2 to 1 relative to an 'off' position. A row of press keys along the bottom centre of the main panel switch the tone controls, filters, loudness and loudspeakers, the latter *via* a relay box. Treble and bass controls can be switched on or off and their turnover frequencies can be switched over 200/400 Hz bass and over 5/2·5 kHz treble. There are three filter functions, one *subsonic* of f_0 *circa* 25 Hz and 6 dB/octave, one *low* of f_0 *circa* 30 Hz and 18 dB/octave and the other *high* of f_0 *circa* 5 kHz and 12 dB/octave. The loudspeaker keys operate only in conjunction with a special relay box (optional equipment) which is connected to a socket provided at the rear of the C-200. The P-300 review shows provision for four pairs of loudspeakers—main and three remote—with associated switching, so the relay box is not essential for normal operation of the C-200/P-300.

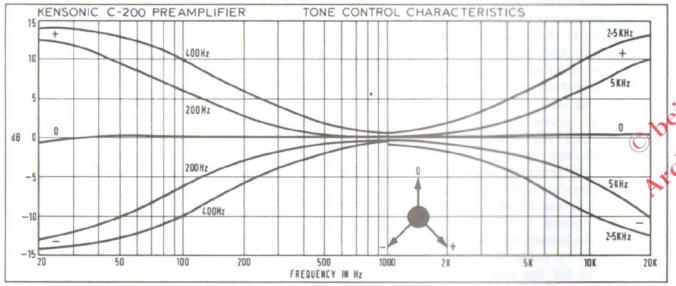
A subpanel directly below the main panel is exposed by hinging down a magnetically retained flap. This panel accommodates push switches (protruding through the flap) for power switching of the P-300 and the C-200, the former when the P-300 is energised from a power outlet at the rear of the C-200. There are also a headphone jack socket deriving low-impedance signal from the pre-amplifier itself (meaning, of course, that headphone listening is possible without the P-300, although this unit also has its own headphone jack socket), left and right 'phono' output sockets for power amplifier testing, left and right tape recording and replay 'phono' sockets, left and right auxiliary 'phono' sockets, a magnetic pickup loading switch with positions corresponding to loads of 20 k, 30 k and 47 k, a switch that provides 0·5 dB or 1 dB low-frequency (*circa* 100 Hz) enhancement of the pickup signal against the normal RIAA characteristic (obtained by setting the switch to zero) plus left and right microphone 'phono' sockets suitable for microphones of 600 ohms impedance.

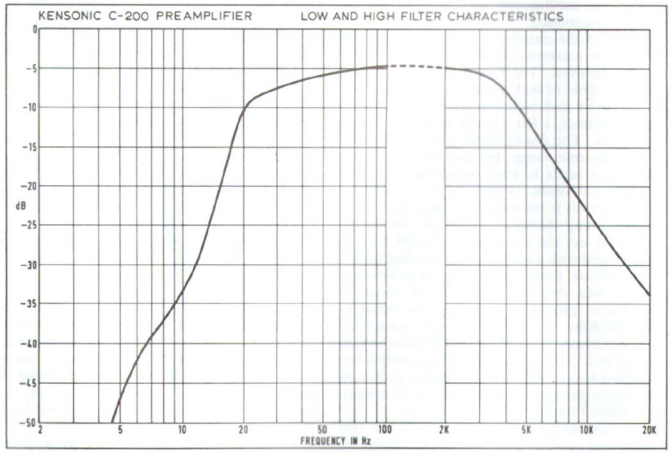
The main panel also carries a power 'on' pilot light and small indicator lights showing the facilities selected by the press keys. The front (subpanel) tape and auxiliary inputs only become operative when the source and tape monitor selector switches are set to the 'front' positions (this has nothing to do with four-channel operation). Other sources selectable are microphone, disc 1 and disc 2, tuner, auxiliary 1 and auxiliary 2. All these with the exception of microphone (whose inputs are on the subpanel) are connected to rear 'phono' sockets. There are no DIN socket duplications for the tape circuits.

The rear is also equipped with left and right level controls for both disc 1 and disc 2, but the pickup load switch on the subpanel operates only on disc 1. In addition to the main left and right outputs (which connect to the inputs of the P-300) there is a mono output that delivers the sum of the left and right signals. All these are 'phono' type.

There are no fewer than seven American style mains outlets, one *via* the subpanel power amplifier switch already noted, five *via* the main power on/off switch for the tuner, two turntables and two tape machines and the seventh direct from the mains input (unswitched). The rear array also has mains voltage adjustor, mains power receptacle, loudspeaker control socket and accessible fuse.

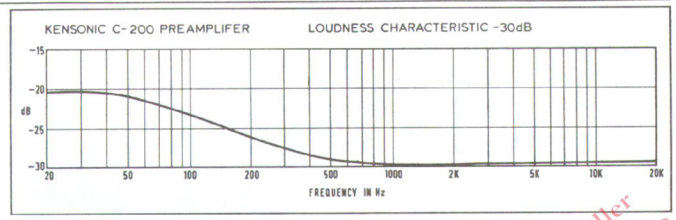
The circuitry is highly engineered and includes such things as complementary Class-A amplification, separate power amplifier for headphone listening, regulated power supplies and direct-coupled push-pull drivers in all stages.





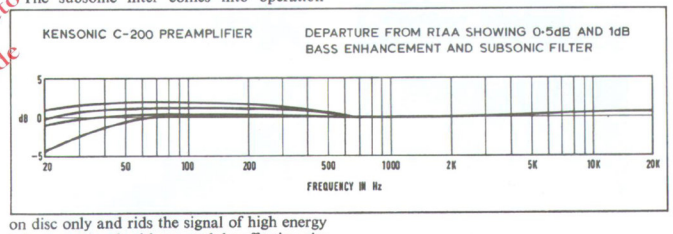
KENSONIC ACCUPHASE C-200 PREAMPLIFIER

PERFORMANCE		COMMENT
Output for rated sensitivity	2 Vrms 20 Hz–20 kHz	Matches power amplifier input.
Distortion factor at 2 Vrms	0·01% 20 Hz–20 kHz	Excellent
Input for 2 Vrms output:		
Aux. 1 and 2	215 mV (130 k)	Useful values which agree closely with the specification.
Tuner	210 mV (130 k)	
Mic	2 mV (47 k)	
Disc 1	2·2–6 mV*	
Disc 2	2·2–6 mV (47 k)	
Tape play	210 mV (130 k)	
* *Load switchable 20 k, 30 k and 47 k.*		
Pickup overload (RIAA preamplifiers)	450 mV	Excellent.
Hum and noise ref. 2 Vrms		All acceptable.
Auxiliaries	−94 dB	
Tuner	−94 dB	
Disc	−63 dB	
Mic	−63 dB	
Residual	110 μV approx.	
Tape output (all circuits)	200 mV	Too high for DIN machines.
Mono output (L+R mix)	750 mV	Different from specification.
Headphone output	400 mV	Useful.



For the tape enthusiast three tape machines can be connected simultaneously, and it is possible to copy from one to another while listening to an entirely different programme source, which is achieved by the tape copying switch being independent of the tape monitor switch.

The subsonic filter comes into operation on disc only and rids the signal of high energy infra-bass signal without unduly affecting the required bass frequencies. How this filter starts to roll-off the low-frequency end of the spectrum relative to the normal RIAA response is shown along with the 0·5 dB and 1 dB enhancement curves. The responses of the low and high filters are plotted separately. All these are quite acceptable, but for the price one might expect a choice of high-frequency filter turnovers, surely? The 'loudness' response, too, is unusual in providing only bass boost.



The tone control responses at both sets of turnover frequencies are also plotted, found to be very desirable and accurate. It is noteworthy that for most of the time during subjective trials the 200 Hz and 5 kHz turnovers were selected. Having a turnover frequency choice I invariably find that the best results are obtained when the tone controls have the least effect on the middle frequencies.

In partnership with the P-300 the C-200 worked without flaw. It was not particularly difficult to connect up or operate, but it requires a few weeks' use to become accustomed to the various controls.

Full details of the test results, with appropriate comment, accompany this review.

P-300 Power Amplifier

MANUFACTURER'S SPECIFICATION

Power output: 200 W continuous per channel into 4 ohms; 150 W ditto 8 ohms; 75 W ditto 16 ohms (with both channels operating simultaneously over 20 Hz–20 kHz). **IMD:** will not exceed 0·1% at rated power, 0·05% at −3 dB; 0·1% at 50 mW at any frequency from 20 Hz to 20 kHz. **Frequency responses:** 20 Hz–20 kHz + 0 dB −0·2 dB. **Damping factor:** 40 at 4 ohms; 20 at 8 ohms. **Input:** 1 V (100 k) for rated output at maximum level setting. **Hum and noise:** 100 dB below rated power. **Power level meters:** calibrated to read 0 dB at 150 W 8 ohms; range switch for 10 dB and 20 dB sensitivity increase. **Output load:** 4, 8 and 16 ohms. **Bandpass filter:** low 17 Hz and 18 dB/octave; high 24 kHz 18 dB/octave. **Power limiter:** full power, −3 dB and −6 dB of full power. **Dimensions:** 6×17½×14 in. **Weight:** 25 kg net. **Price:** £395 net plus VAT. **Distributor: Pyser Limited, Fircroft Way, Edenbridge, Kent TN8 6HA.**

THIS is the most expensive item of the Accuphase system which, with 10% VAT, works out to £434·50, the price of a good secondhand car! One would certainly need to be dedicated to the sonic art to contemplate the acquisition of the complete outfit which, including the T-100 tuner and VAT, would set the bank balance back by some £1,105·50—or put it that much more in the red. Then there are the loudspeakers and ancillaries to go with it, so £1,500 would be more to the mark.

Market research, however, has revealed that lucky people with this sort of hard currency matched by enthusiasm are abroad, and to those this set of reviews will have practical significance. To most of us, though, the reviews will be essentially of academic interest, showing how much more (or little) many more pounds sterling are likely to enhance our listening enjoyment.

There is no doubt that the P-300 is one of the most advanced power amplifiers on the world hi-fi market today. It has almost enough audio urge to keep the laboratory warm on a cold morning, and to exploit this power fully, the loudspeakers need to be something out of the ordinary. Even when two pairs of loudspeakers are driven together the power is sufficient to destroy the less robust ones unless handled carefully. Facilities are provided for three remote loudspeaker pairs as well as for the main pair, the main and two remote pairs by rear terminals and the third remote pair by two pairs of subpanel sockets. A main panel switch selects the main or any remote pair separately, switches all pairs off, or switches the main and remote 1 pairs on together.

A useful feature for such a powerful amplifier is a power output limiting switch. This has three positions, one giving the full available power, another giving 50% of full power and the third limiting the output to 25% of the full power. The switch has no effect on the overall sensitivity and it can be operated while

KENSONIC ACCUPHASE P-300 POWER AMPLIFIER

PERFORMANCE

		COMMENT
Power capacity for 0·5% distortion factor, both channels driven 8 ohms		
20 Hz	160+160 W	This very high power must be used with prudence! Power limiting switch included for reduction to 25% or 50% of full power. Power suitable for large loudspeakers and large listening room.
1 kHz–20 kHz	180+180 W	
Rise time	2 μsec.	This corresponds to upper frequency −3 dB point of 175 kHz.
Distortion factor, both channels driven together into 8 ohms		Excellent linearity. Accompanying oscillograms show minimal crossover discontinuity at full power and 10+10 W.

Power	20 Hz*	1 kHz	20 kHz
150+150 W	0·3%	0·012%	0·05%
75+75 W	0·021%	0·01%	0·02%
37+37 W	0·024%	0·012%	0·017%
10+10 W	0·02%	0·009%	0·011%
1+1 W	0·025%	0·015%†	0·011%

* Includes ripple components.
† Mostly noise.

One of the lowest distortion power amplifiers currently available.

Sensitivity	1 Vrms	For rated output.
Damping factor	20 approx.	At 40 Hz and 2 W ref. 8 ohms. Could be higher.
Residual noise	120 μV	Across 8 ohms. Very good indeed.
Meters	0 dB — 150 W	0 dB can be switched to correspond to −10 dB and −20 dB of 150 W.

All tests made with 240 V 50 Hz mains exactly

the amplifier is under drive. Oscilloscope testing revealed that the circuit is truly of the clipping or limiting type, which means that the peak-to-peak output of the amplifier is conclusively established by the switch setting, irrespective of drive signal amplitude.

As with the partnering items, the fascia consists of a main panel and a subpanel below, which is exposed by dropping down a magnetically retained flap. A ruling feature of the main panel is a pair of large dB meters, one monitoring the output of each channel. These are placed side-by-side on the left-hand section. The meters are illuminated and easily read, and the bulbs that illuminate them also serve as overload or short-circuit warning devices, by flashing intermittently when the amplifier is driven hard into abnormally low load impedances—*i.e.*, short-circuit. When this happens the output circuits are automatically removed from the loads.

Four press buttons to the right of the meters adjust the deflection sensitivity such that 0 dB can be made to correspond to 150 W (full power), 75 W (half power) or 37·5 W (quarter power), all referred to 8 ohms. The meters are thus useful for determining just how much average power is being pumped into the loudspeakers, but it is as well to remember than on music signal the RMS peaks could be 10 dB or more above the reading indicated.

Below the push buttons are two controls for independent adjustment of the levels of the left and right channels. The loudspeaker and power limiting switches are located at the extreme right of the main panel.

On the subpanel beneath the flap are the remote loudspeaker sockets already noted, the power on/off press switch protruding through the closed flap, a headphone jack socket, a pair of front input sockets, a bandpass filter switch and a switch. This selects either the subpanel front input sockets or a second pair of input sockets located at the rear of the amplifier.

Also at the rear are three pairs of loudspeaker terminals, a mains voltage adjuster and power input receptacle. Socketry is to the American 'phono' standard.

The designer opted to combine high- and low-pass filtering to the one switch which gives the bandpass characteristic shown. Whether this is a good thing or not is debatable. Many people, I feel, would prefer to be able to operate either filter separately. Nevertheless, the bandpass characteristic is very acceptable, having rapid rates of roll-off and desirable turnover frequencies. In most cases the power amplifier would be run with the bandpass filter active, thereby ensuring the least transient intermodulation distortion. The output devices are very fast, so by rolling the driver stages off at around 25 kHz the power stages will never be in a position to receive transient information which is faster than the feedback operating time. Transient intermodulation distortion results when the opposite is true; that is, when transient information outpaces the negative feedback loop response time. When this happens the power amplifier input stage tends to block (resulting in 100% transient intermodulation distortion) owing to the delayed corrective feedback signal.

As shown by the test results, the distortion factor over the entire spectrum and power range is of a very low order, and the actual harmonic components are below noise at normal operating levels. The distortion residual at both full power 150+150 W at 8 ohms and at 10+10 W, both at 1 kHz, is shown by the accompanying oscillograms. A fair amount of the distortion shown, in fact, is from the test signal itself.

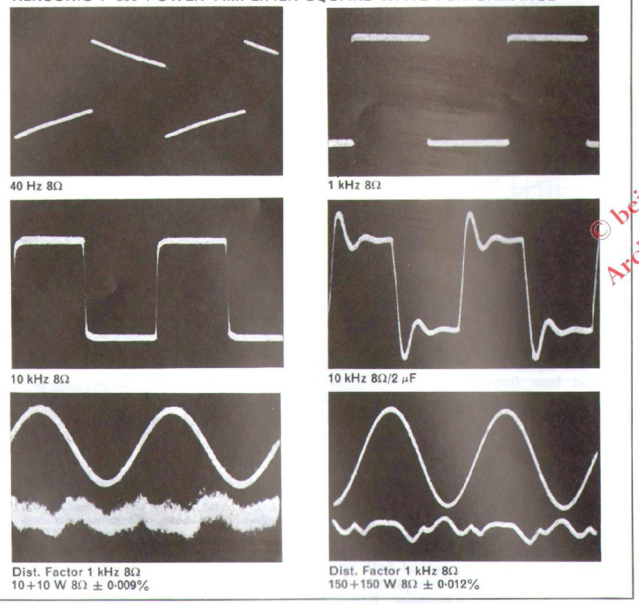
Squarewave performance is shown by the series of half power oscillograms, which indicate the excellent low-frequency and high-frequency performance and the text-book 1 kHz display. Some overshoot, however, was evoked into 8 ohms in parallel with 2 μF.

A frequency response characteristic is not included because there was less than 0·5 dB change from 20 Hz to 20 kHz. Half power bandwidth was between less than 10 Hz and 175 kHz.

Certainly a most remarkable amplifier, with an incredible performance and one which sets a new standard in power amplifier design. As with the other items from the Accuphase range, the manufacturer's specification is guaranteed, and this the test results prove.

Gordon J. King

KENSONIC P-300 POWER AMPLIFIER SQUARE WAVE PERFORMANCE



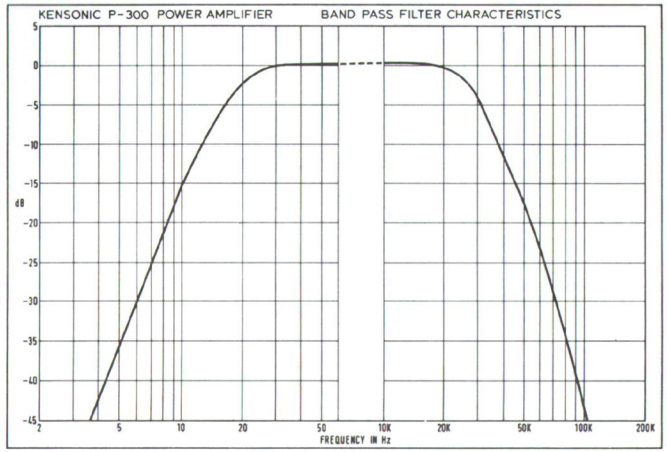
40 Hz 8Ω — 1 kHz 8Ω

10 kHz 8Ω — 10 kHz 8Ω/2 μF

Dist. Factor 1 kHz 8Ω
10+10 W 8Ω ± 0·009%

Dist. Factor 1 kHz 8Ω
150+150 W 8Ω ± 0·012%

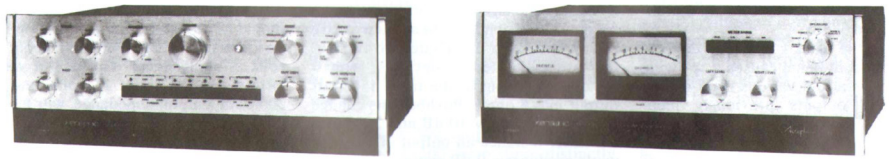
KENSONIC P-300 POWER AMPLIFIER BAND PASS FILTER CHARACTERISTICS



EQUIPMENT TEST REPORTS

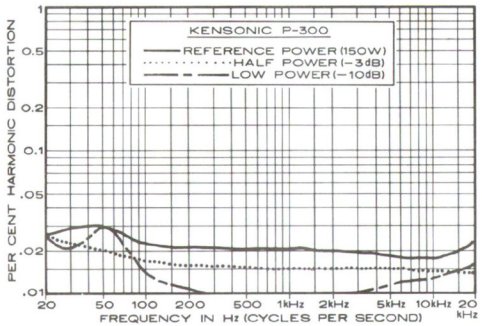
By Hirsch-Houck Laboratories

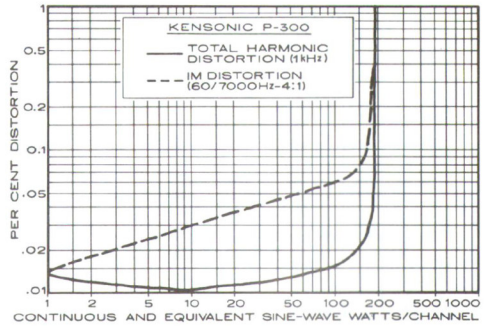
Kensonic Accuphase C-200 Stereo Preamplifier and P-300 Stereo Power Amplifier



● THE Kensonic "Accuphase" line of deluxe high-fidelity components, distributed in this country by Teac, are products on which no expense has been spared in respect to quality of materials and workmanship. We tested the Kensonic C-200 stereo preamplifier and the P-300 power amplifier, which are designed as companion pieces.

Both units employ completely push-pull, complementary-symmetry circuits in every stage, from the phono preamplifier to power-output stages. The preamplifier tone controls are separate, eleven-position bass and treble controls for each channel. At the right side of the panel of the C-200 are four operating-mode controls. The MODE switch provides stereo, reversed stereo, mono (L + R), and either the L or R input through both output channels. The INPUT SELECTOR offers a choice of MIC (through two front-panel jacks), two DISC (phono) inputs, TUNER, two high-level AUX inputs, and a third front-panel AUX input. Two tape decks can be connected to the





preamplifier's rear jacks, and a TAPE COPY switch interconnects them for dubbing a tape from either machine onto the other without disturbing the normal program playing through the system. A separate TAPE MONITOR switch connects the preamplifier to the playback output of either tape deck or to that of a third tape recorder plugged into front-panel jacks. There is also a pair of front-panel tape-output jacks for use by a third machine.

A large knob operates the master VOLUME control, and the BALANCE control is detented at its center position. Across the center of the panel are nine pushbuttons with blue lights above them indicating when they are engaged. One activates the tone-control circuits (which are otherwise bypassed), and the next two select turnover frequencies of 200 or 400 Hz (bass), and of 2,500 or 5,000 Hz (treble). There are LOW- and HIGH-cut filters, with cutoff frequencies of 30 and 5,000 Hz and slopes of 18 dB per octave and 12 dB per octave, respectively. A third SUBSONIC DISC filter operates only on the phono inputs and has a 25-Hz cutoff with a 6-dB-per-octave slope. The COMP switch introduces loudness compensation, and there are selector buttons for MAIN and REMOTE speaker systems. The latter operate at the output of the power amplifier through an optional relay control box.

Pressing the black strip along the bottom of the front panel causes it to swing down to reveal the various front-access inputs and outputs previously mentioned, plus a separate POWER AMP switch that energizes one of the rear a.c. outlets independently of the setting of the preamplifier power switch. The stereo PHONES jack is driven by separate output stages designed to drive 8-ohm phones, and a second pair of output jacks parallels the ones in the rear. The two MIC jacks are also located behind the hinged panel. A small knob adjusts the phono-cartridge load resistance to 20k, 30k, or the standard 47k (47,000) ohms. Another knob marked DISC LOW ENHANCE adds a small low-frequency boost (either 0.5 or 1 dB) to the phono playback signals. The rear panel of the Kensonic C-200 contains all the input and output jacks, plus four knobs that separately adjust the phono gains over a 10-dB range to match the cartridge outputs to those of high-level input sources. There is a MONO output as well as the normal L and R outputs. A socket accepts the optional speaker remote-control accessory. There is one unswitched a.c. outlet and six switched outlets that will accept a total load of 600 watts.

Removing the black metal covers from the Kensonic C-200 reveals another complete set of internal shield covers, beneath which are seven plug-in circuit boards. The internal structures of the C-200 are supported by heavy extruded side brackets, and the end result is an exceptionally rugged (and heavy—31 pounds) piece of equipment. The C-200 is 17½ inches wide, 6 inches high, and 14 inches deep. Price: $600.

The companion P-300 power amplifier, like the C-200 control amplifier, uses push-pull stages throughout and is rated to deliver 150 watts per channel into 8 ohms. The heavy-duty power supply has a very large power transformer and two 40,000-microfarad filter capacitors—the largest we have seen used in such an amplifier. The amplifier is fully protected against overload or short-circuit damage by a relay and electronic circuits (the meter lights blink when these are activated).

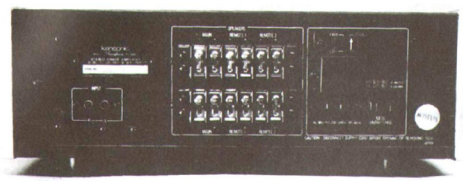
The two large illuminated power meters are calibrated in decibels, with 0 dB corresponding to the rated 150-watt output into 8 ohms. Pushbuttons change the meter range by 10 dB and 20 dB (in the latter instance an output of only 1.5 watts produces a 0-dB meter reading), or shut them off completely. There are separate input-level controls for the two channels, and a SPEAKERS switch that connects the MAIN speakers, either of two pairs of REMOTE speakers or MAIN + REMOTE 1. Other positions of this same switch turn off all speakers, or connect the amplifier outputs to a pair of front-panel speaker outputs. An OUTPUT POWER switch limits the maximum output of the P-300 to 50 or 25 per cent of its rated power for use with speakers not designed to handle the full power.

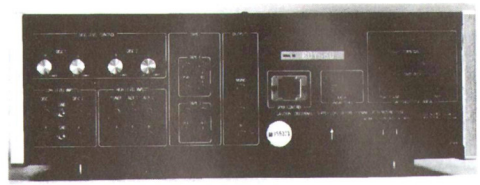
The hinged lower section of the front panel swings down when pressed to reveal a headphone jack, four speaker-output jacks on standard ¾-inch centers for twin banana plugs, and a second pair of input jacks. A small knob connects the amplifier inputs either to these jacks or to the normal rear inputs. Another knob provides a choice of wide-band frequency response or a response limited to 20 to 20,000 Hz. The rear of the P-300 contains the three pairs of speaker outputs (screw-type barrier terminals), the signal inputs, and an unswitched a.c. outlet.

The construction of the Kensonic P-300 power amplifier is of the same quality as that of the C-200, with large heat sinks and six output transistors for each channel. As the massive power-supply components suggest, the P-300 is a heavy amplifier weighing 55 pounds. Its external dimensions and styling match those of the C-200 preamplifier. Price: $750.

● ***Laboratory Measurements.*** Up to its rated 10-volt maximum output, the harmonic and intermodulation (IM) distortion of the Kensonic C-200 preamplifier did not exceed 0.01 per cent, except for a rise to 0.025 per cent at 20 Hz and 10 volts! To put this in perspective, it should be stated that no power amplifier we know of requires more than about 2.5 volts of input signal. The output waveform clipped at about 13 volts, and the 200-ohm output impedance will let the preamplifier easily drive any power amplifier input impedance (the P-300's input impedance of 100,000 ohms, incidentally, is high enough to avoid problems with any preamplifier).

The C-200's input sensitivity, for a 1-volt reference output, was 94 millivolts (mV) on high-level inputs and 0.94 mV on the phono inputs. The respective noise levels (unweighted) were very low at −78 dB and −74 dB—both referred to a 1-volt output. The Kensonic C-200 had by far the greatest dynamic range on the phono input we have ever measured:





The rear panel of the Kensonic P-300 (above, left) has connectors for three pairs of speakers. These can be switched at the P-300's front panel or through a remote-control box that connects to the rear of the C-200 preamp (above, right) and activates its speaker switches.

overload occurred at a 440-mV input with maximum phono sensitivity, and at 1.35 volts with the minimum-sensitivity phono-input setting.

The tone controls permitted a wide range of frequency-response tailoring with minimal effect on the mid-range frequencies. The loudness compensation was relatively mild, boosting only the low frequencies to a maximum of 8 dB. The filters were among the best conventional types we have used. The low-frequency filter had no effect above 60 Hz, yet reduced the 20-Hz response by 10 dB. The high-frequency filter response was down 3 dB at 5,500 Hz and sloped off at a 12-dB-per-octave rate above that point.

The RIAA phono equalization was accurate within ±0.5 dB over its full range. The subsonic disc filter began to roll off below 100 Hz, to −6 dB at 20 Hz. The low-frequency enhancement circuit raised the output below about 1,000 Hz by either 0.5 dB or 1 dB. Because of the differential amplifier circuitry of the C-200, the phono-equalization circuits are completely unaffected by the inductance of the phono cartridge used.

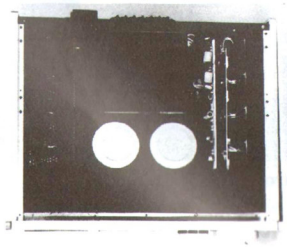
The P-300 power amplifier outputs clipped at about 184 watts per channel, with both channels driven into 8 ohms. Into 4 ohms, the output at clipping was 280 watts; 110 watts were available into 16 ohms. The harmonic distortion with a 1,000-Hz test signal was under 0.02 per cent at all power levels up to the rated 150 watts, while the IM distortion decreased smoothly from 0.08 per cent at 150 watts to about 0.015 per cent at usual listening levels and rose only slightly to 0.055 per cent at a few milliwatts output. At rated power, the harmonic distortion was 0.03 per cent or less from 20 to 20,000 Hz (typically 0.02 per cent), and it decreased at lower power outputs. At 15 watts, for example, the distortion was 0.01 per cent over most of the audio range, reaching 0.03 per cent only at 50 Hz and below.

An input signal of 0.2 volt drove the amplifier to a reference 10-watt output at maximum gain. We could not measure the output noise, which was less than our minimum meter reading of 100 microvolts (roughly −100 dB referenced to 10 watts). The power-limiter circuit reduced the power at clipping to 69 watts (50 per cent setting) and 30 watts (25 per cent setting) with 8-ohm loads. The meter calibrations were very accurate and provided a valid indication of the amplifier output into 8-ohm loads.

The frequency response of the P-300 in its wide-band condition was down less than 0.4 dB at 10 Hz and 30,000 Hz, and down 2.6 dB at 200 kHz. The square-wave rise time was 1.5 microseconds at maximum gain, and a −6-dB setting of the level controls increased the rise time to 5 microseconds. With the band-pass filter switched in, the amplifier response was down 1.3 dB at 20 Hz and 0.9 dB at 20,000 Hz. The filter slopes were quite steep, cutting the response to −31 dB at 5 Hz and −17 dB at 50,000 Hz.

The amplifier's protection circuits appeared to be foolproof. Any serious overload actuated the relay instantly, while an output short circuit shut down the amplifier and caused the meter lights to blink on and off as an unmistakable warning.

A view of the P-300's large power transformer and 40,000-microfarad filter capacitors.



● ***Comment.*** We judged the Kensonic C-200 and P-300 from three distinctly different viewpoints: construction quality, human engineering (including operating flexibility), and sound quality. In ruggedness, attention to detail, and quality of electrical and mechanical components, the Kensonic products fully live up to advance publicity. These components show no sign of the cost-cutting techniques that are routine in even the best mass-produced audio equipment. All the operating controls had a combination of silky smoothness and positive action that is equally rare in equipment of any price. Everything feels "right"—no "slop" or looseness in any control action, no electrical switching transients or other unwanted side effects, and there is a sense of precision which could not fail to impress even the most casual user.

With provision for four high-level inputs, two phono inputs, and three tape decks—all of which can be set up in any reasonable combination from the front panel—the C-200 has extreme versatility. The tone controls and filters are more effective than most, although we suspect that in this respect the Kensonic resembles its top-ranking competitors. The low-frequency phono enhancement system was rather too subtle for us—we could not hear any significant difference when using it, and certainly not enough to warrant the inclusion of a separate control and the necessary circuit elements. On the other hand, it is possible that some users with a given combination of speakers, records, listening-room acoustics, and hearing acuity will find this feature worthwhile.

The ruggedness and conservative design of the P-300 power amplifier should make it a component that can literally be installed and forgotten. While we hesitate to call it "blowout proof"—there is always *some* way to destroy an amplifier—we never found the combination of conditions that would do that job. We feel that the band-pass filter of the power amplifier is a really worthwhile feature that should be incorporated in most amplifiers. Although it produces no audible change in the sound character, it should prevent certain forms of transient intermodulation distortion and also protect speakers against damage from excessive subsonic levels. On the other hand, we did not find the power-limiting feature to be particularly useful. It seems pointless to buy such an expensive and powerful amplifier and use it with speakers that could not handle its output.

With regard to the sound quality of the two components, since they add neither noise nor distortion, there is little to be said. If you are looking for the proverbial "straight wire with gain," this combination meets all the requirements. Its noise level is extraordinarily low on all inputs, no phono cartridge we have ever seen

could come close to overloading it, and even its miniscule distortion consists mostly of low-order harmonics, with no evidence of crossover or other more irritating and exotic distortions.

We see the Kensonic line as occupying a place in audio analogous to that of the Rolls-Royce among automobiles. While the strictly utilitarian features of a Rolls do not surpass those of any number of cars selling for far less, its elegance and quality of construction inspire a pride of ownership. In our view, this analogy can be applied to the Kensonic Accuphase units; all things considered, they are not even unduly expensive at current audio prices.

Circle 105 on reader service card

Reprinted from December 1974 issue of Stereo Review Magazine.

Equipment Profiles

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

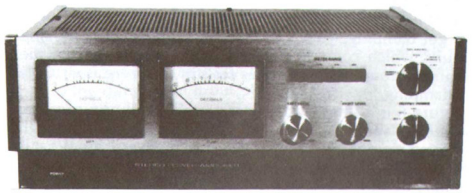
MANUFACTURER'S SPECIFICATIONS
C-200 Control Amplifier

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

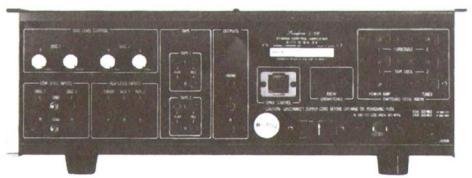


Fig. 1—Rear panel of control/preamplifier.

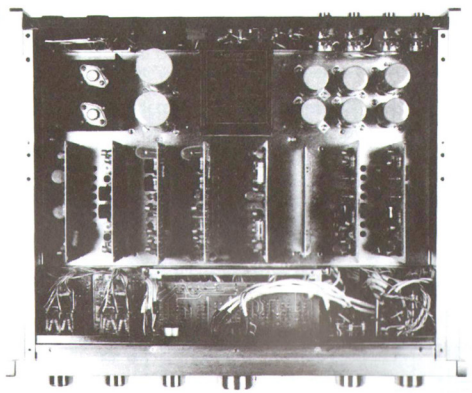


Fig. 2—Inside view of control/preamplifier.

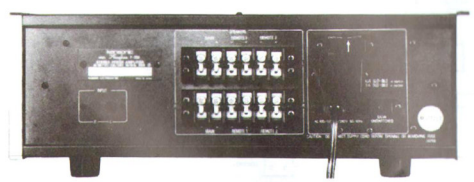


Fig. 3—Rear panel of power amplifier.

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.

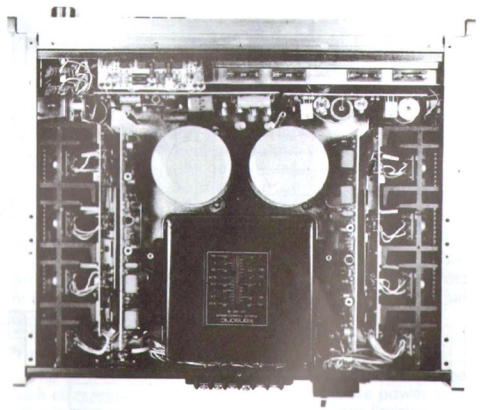


Fig. 4—Inside view of power amplifier.

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

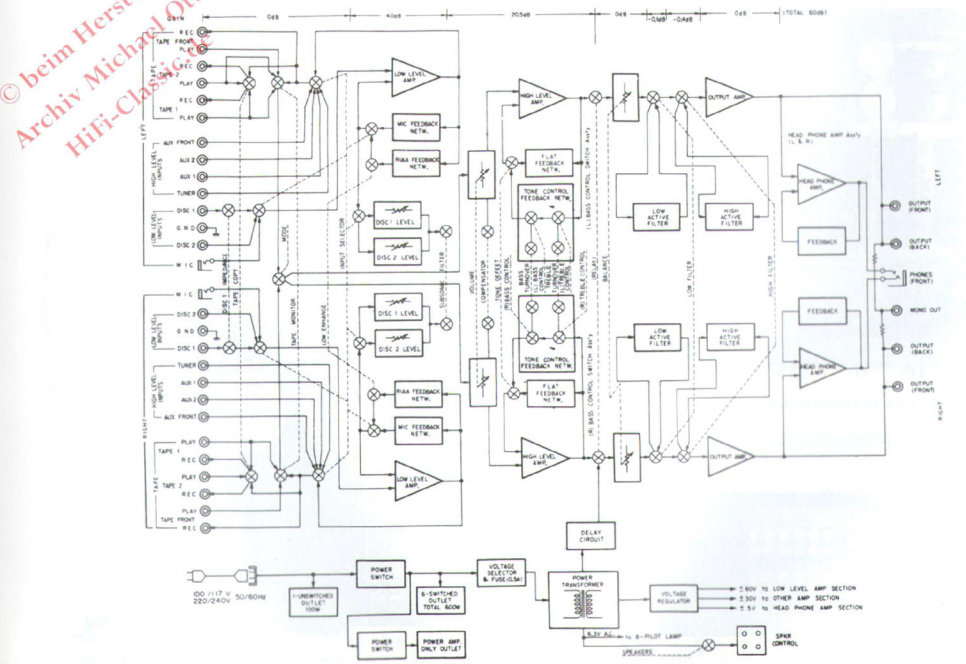


Fig. 5—Block diagram of control/preamplifier. Power supply is shown at bottom.

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.

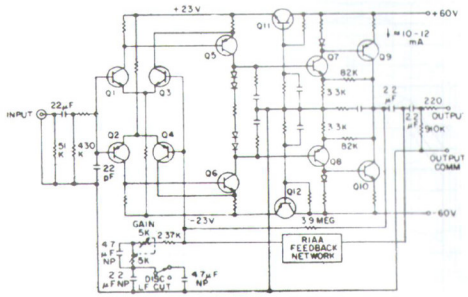


Fig. 6—Phono preamp circuit, showing simplified version of Disc 1, 2 LF enhance circuit.

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 bandpass 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

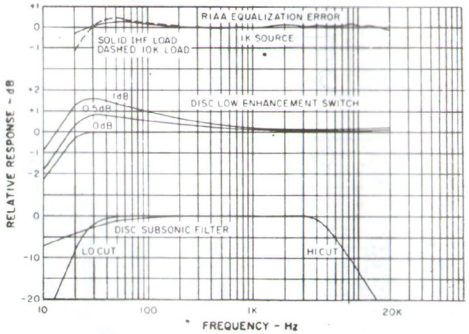


Fig. 7—Phono preamp response curves, including subsonic filter and 3-position LF enhancement switch.

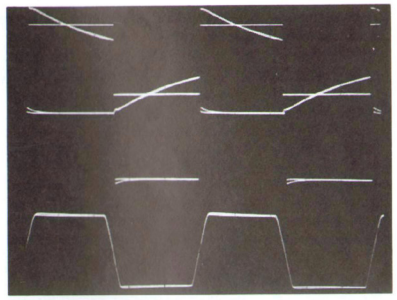


Fig. 8—Phono preamp square-wave response at 40 Hz (top), 1 kHz (middle), 1 and 10 kHz (bottom), with input and output traces overlapping.

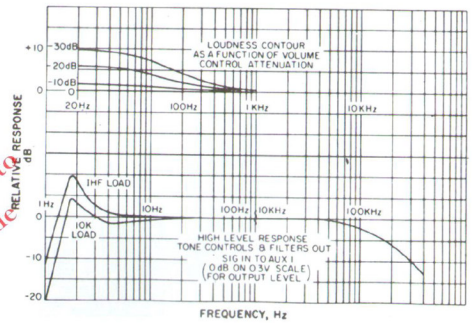


Fig. 9—Preamplifier/control high level response (bottom) and loudness contour (top) curves.

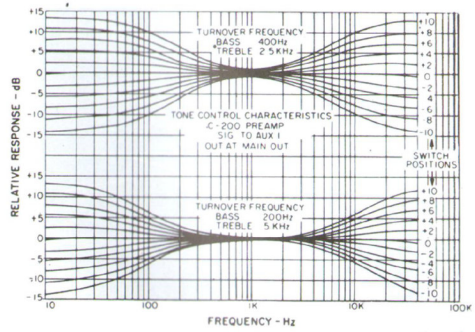


Fig. 10—Tone-control response curves.

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.

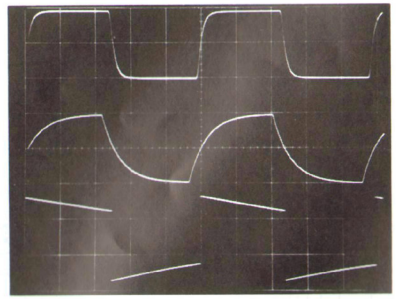


Fig. 11—Square-wave response at output(s) of preamplifier/control. 20 kHz (top) output of phono preamp, IHF loading. 20 kHz (middle) at tape output, IHF loading. 20 Hz (bottom) output of phono preamp, IHF loading.

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 capacitive 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.

Bascom H. King

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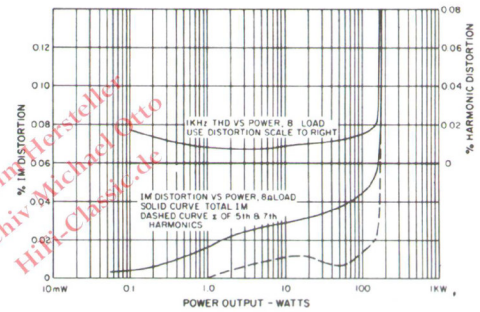

Fig. 12—Distortion curves for power amplifier, THD (top), and IM (bottom).

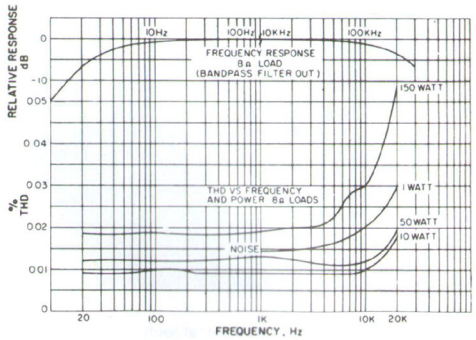

Fig. 13—Relative response at one-watt output (top), distortion vs. power and frequency (bottom).

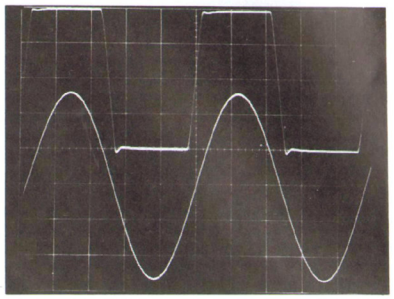

Fig. 14—20 kHz (top) square-wave response of power amplifier, 8 ohms, 200 watts. 20 kHz (bottom) sine wave response, 1 μF load, 40 volts RMS.

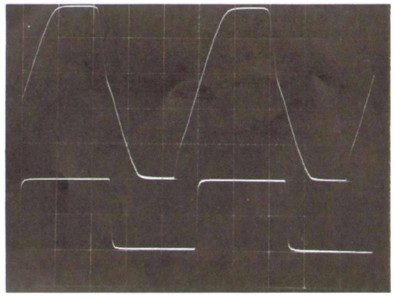

Fig. 15—20 kHz sine wave (top) and 10 kHz square wave (bottom) power amplifier output. Top trace shows 2 dB input overdrive just beyond onset of clipping at output. Bottom, 3.12 watts at 8 ohms.

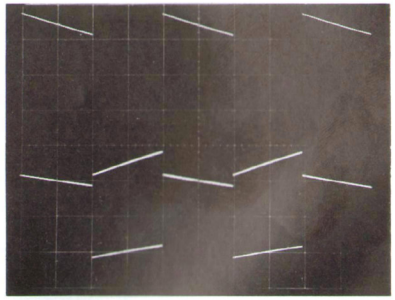

Fig. 16—50-Hz square waves into 8-ohm loads; top is 200-watt level, bottom is 3.12-watt level.

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

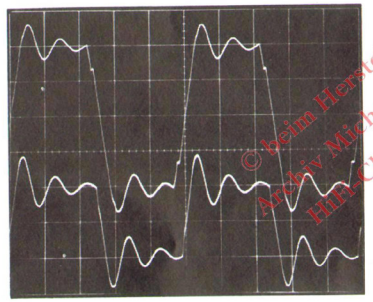

Fig. 17—10-kHz square waves into 2 μF resistive loads; top is about 160 VA, bottom about 3 VA.

Reprinted from March 1975 issue of Audio Magazine.

Fig. 1.

KENSONIC :

I - le préamplificateur

La firme japonaise Kensonic propose aujourd'hui aux amateurs et aux professionnels une série d'amplificateurs et de préamplificateurs stéréophoniques. Leurs caractéristiques et leur fabrication nous permettent de les classer dans la gamme des matériels les plus remarquables.

Nous nous proposons, dans cet article, d'examiner le préamplificateur Accuphase C 200 et l'amplificateur P 300.

LE PRÉAMPLIFICATEUR ACCUPHASE C 200

Le simple aspect extérieur montre immédiatement qu'il s'agit d'une réalisation de caractère professionnel, dans laquelle toutes les fonctions ont été conçues de façon très rationnelle.

L'utilisateur dispose, sur le panneau avant de l'appareil, de toutes les commandes.

Le sélecteur d'entrée permet de choisir :

- Deux entrées phono dont le niveau est réglable de façon progressive à l'aide d'un atténuateur, de la sensibilité maximale à une valeur inférieure de 10 dB. Sur l'entrée 1, on peut choisir l'impédance de charge du phonocapteur : 20 kΩ, 30 kΩ ou 47 kΩ. L'entrée 2, a une impédance de 47 kΩ. Une accentuation de 0,5 dB ou de 1 dB peut être effectuée dans le registre grave de la correction RIAA.
- Une entrée micro.
- Une entrée adaptateur MF.
- Trois entrées Auxiliaires dont l'une est située à la partie inférieure du panneau avant, fermée par un cache que l'on fait pivoter à l'aide d'une simple pression.

Les entrées et les sorties microphone, de même que les entrées et les sorties magnétophone, sont disponibles sur cette partie inférieure.

Une commande de Monitoring permet d'opter pour la source choisie à l'aide du sélecteur d'entrée, ou de contrôler trois magnétophones. Le sélecteur de mode permet de choisir entre : l'emploi en stéréophonie, en stéréophonie avec inversion des canaux en sortie, en monophonie sur les deux canaux et en disposant du canal droit ou du canal gauche sur les deux canaux de sortie.

Un contacteur permet la copie d'un magnétophone sur l'autre. L'utilisateur dispose en outre des possibilités suivantes :

— Un correcteur de tonalité à plot sur chaque canal avec le choix de la fréquence de transitoire 200 Hz et 400 Hz pour le registre grave, 2,5 kHz et 5 kHz pour le registre aigu.
— Une commande de niveau.
— Un contrôle de balance.
— Deux filtres passe haut et un filtre passe bas.
— Une compensation physiologique pour l'écoute à bas niveau (+ 9dB à 50 Hz pour un niveau de −30 dB).
— Une télécommande de deux séries de haut-parleurs lorsque l'appareil est utilisé avec un amplificateur de puissance de type P 300.
— Une sortie casque.

L'examen du schéma complet montre que les ingénieurs de Kensonic ont employés pour cette réalisation 80 transistors et 35 diodes. Nous nous bornerons à examiner les circuits d'entrée Micro et Phono. Ils sont composés d'un système d'amplification push-pull différentiel, alimenté par une tension élevée (±60 V) ce qui assure une gamme dynamique élevée. La courbe de réponse et le gain (40 dB à 1 kHz) sont déterminés par la boucle de réaction négative. La figure 6 illustre cette partie du schéma.

Essais et résultats des mesures

- *Gain :*
  — Entrées phono et micro : 60 dB à la sortie des préamplificateurs.
  40 dB sur les sorties magnétophone.
  40 dB sur la sortie casque.

• ACCUPHASE C 200

TABLEAU I

Entrée	Non pondérée 2 Hz-200 kHz	Courbe A
Phono.	−114,4 dB	−114,4 dB
Aux.	−82,8 dB	−94,4 dB

— Entrées adaptateur MF et Auxiliaire :
20 dB à la sortie du préamplificateur.
0 dB sur les sorties magnétophone.
6 dB sur la sortie casque.

- *Niveau de sortie maximum :* 12 V (Z = 200 Ω).
- *Niveau de saturation des entrées phono :* 450 mV (il faut signaler la

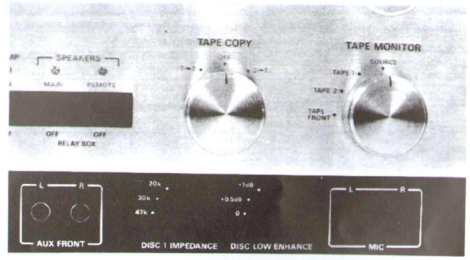

Fig. 2. — Vue inférieure gauche du panneau avant : on remarquera des entrées Micro et Auxiliaire disponibles à l'avant, le réglage d'impédance et la commande de correction de la courbe RIAA.

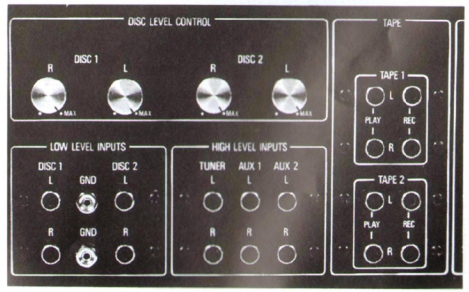

Fig. 3. — Vue partielle du panneau arrière : les entrées et les sorties.

Accuphase

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