Accuphase

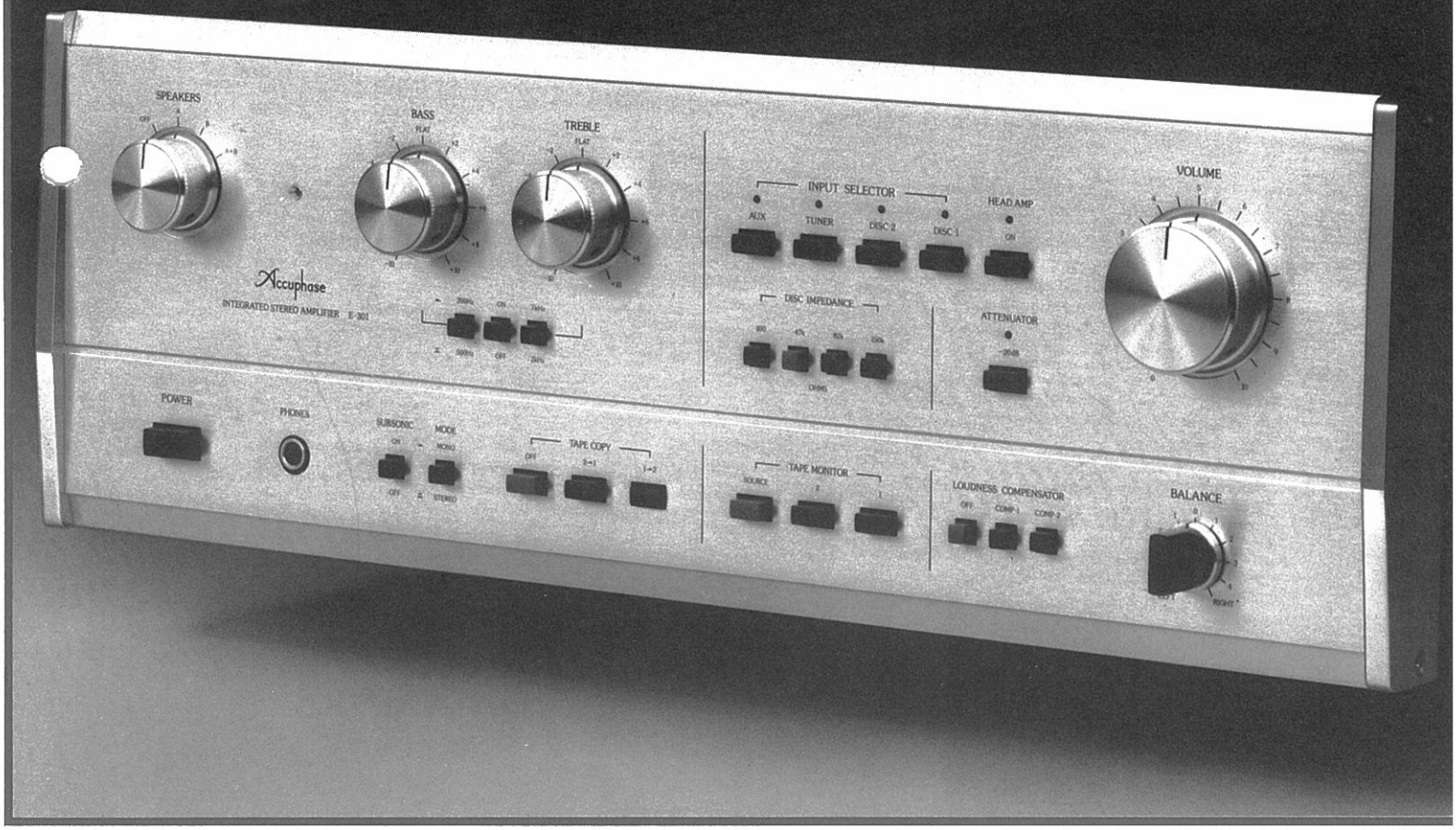
Integrated Stereo Amplifier

E-301

- 110W/CH REALIZED WITH PARALLEL PUSH-PULL MOS FETs
- PURE DC AMPs REALIZED WITH DC SERVO CONTROL SCHEME
- BUILT-IN, SYMMETRICAL, PUSH-PULL HEAD AMPLIFIER
- MULTIPLE POWER SUPPLY SYSTEM

Power MOS FET

110W/ch



The E-30l Integrated Stereo Amplifier is one of the latest Accuphase products that have been perfected with Accuphase's long standing, superior amplifier design technology.

It employs MOS FETs, the most ideal power amplification device, in a parallel push-pull output stage that delivers a powerful 110 watts at 8 ohms into both channels driven simultaneously, and with distortion held within 0.0l%.

DC Servo Control systems are employed throughout its Power Amplifier, High-level Amplifier and Equalizer Amplifier sections to give it a straight amplifier character that is completely free of coupling capacitors, all the way from its DISC MM (Moving-magnet) input through the final power output stage and to the speakers. Therefore, it ranks at the highest level among present-day integrated amplifiers, both in overall characteristics, as well as sound quality performance.

The E-301 also provides a complete range of functions. It has a built-in head amplifier, with push-pull circuit throughout, which permits direct connection of Moving-coil phone cartridges.

The E-30l is also provided with inputs to which two tape recorders can be connected simultaneously for mutual dubbing, etc.

1 110W/ch DELIVERED BY PARALLEL PUSH-PULL MOS FETs AND DC SERVO CONTROLLED POWER OUTPUT STAGE

The power output stage employs MOS FETs, a most excellent power amplification device, about which further details are given in another section.

Among the advantages of MOS FETs which relate to sound quality is that they are voltage controlled devices with wideband characteristics. This helps to prevent notching distortion which is harmful to high frequency sound quality. Also MOS FETs require only small driving power from the previous stage since they are voltage controlled. This means fewer limitations and easier operation of the preceding stage, which, with superior devices for improved performance, opens the way for large improvements in the overall power amplifier characteristics.

Also the wideband characteristics of a final stage that is centered on MOS FETs makes possible a wider band NF (Negative Feedback) loop response. This prevents harmful TIM (Transient Intermodulation Distortion) which is caused by large dynamic passages.

These excellent performance qualities of the final stage would, of course, be meaningless without an equally substantial input stage. The E-301 is well provided here with dual FETs in its buffer input, followed by a push-pull differential amplifier configuration, and use of push-pull circuitry in every stage that guarantees top performance.

Moreover, DC Servo Control systems are employed to ensure high stability and perfect, direct-coupled amplifier sections in which all input capacitors have been completely eliminated.

2 DC SERVO CONTROLLED HIGH-LEVEL AMPLIFIER SECTION

The lineup of the high-level amplifier section includes the use of dual FETs in the input buffer stage, followed by a high performance operational, differential amplifier that feeds a wideband complementary-symmetry final stage. This preamplifier section supplies amplified, undistorted signal voltages of the highest order to the following circuits.

Here again, as in the power amplifier section, DC Servo Control is utilized to prevent DC drift and ensure pure DC operation. This, together with the use of FETs at the input, has made possible perfect direct coupling of all sections, all the way from the input to the output without using coupling capacitors. Sound coloration has thus been eliminated, giving the E-301 the capability to deliver a more faithful signal reproduction with improved sound transparency

3 EQUALIZER AMPLIFIER INCLUDES DC SERVO CONTROL AND MILLER EFFECT CANCELLING CIRCUITRY

The equalizer amplifier which determines the sound quality of disc reproduction is a very important part of an integrated amplifier. Therefore, the input of the E-301's equalizer amp was designed to permit direct coupling, and eliminate the coupling capacitor by using an FET buffer input stage.

This FET input also combines a Miller Effect Cancelling Circuit to prevent cartridge inductance and stray capacitances from affecting the frequency response characteristics of the E-301 itself, and distorting its sound. This Cancelling Circuit assures undistorted reproduction of the cartridge signal and full enjoyment of the cartridge's pure sound characteristics.

The substantial equalizer circuitry that follows this FET input attests to the priority given to sound quality in its design. It is formed with Darlington Pair Differential Amplifier and a final complementary-symmetry push-pull circuit.

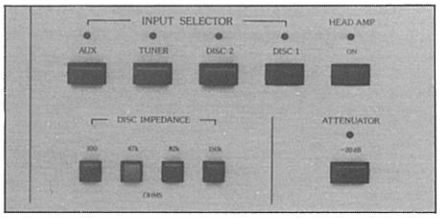
DC Servo Control is utilized to stabilize the entire Equalizer Amp circuitry. This has eliminated the need for an output capacitor, and made possible pure direct coupling throughout the E-301 from its DISC MM (Moving-magnet) input all the way to the speaker.

A Disc Impedance Selector switch is provided in this section to accommodate various type high-level MM cartridges. It permits selection of 100 ohms, 47k ohms, 82k ohms and 150k ohms to match the input impedance to various MM cartridge impedances.

4 HEAD AMPLIFIER FEATURES ICL (Input Capacitor-Less) COMPLEMENTARY-SYMMETRY PUSH-PULL FORMATION

The function of the Head Amplifier is to raise the low level output of MC (Moving-coil) cartridges to the same level of Moving-magnet type cartridges. Therefore, the head amplifier can greatly influence the sound quality of MC cartridges. The E-301's Head Amplifier is formed with an ICL (Input Capacitor-Less), direct coupled, push-pull differential amplifier input stage and complementary push-pull output stage. It represents an ideal all push-pull lineup from input stage to output. This Head Amplifier is capable of providing the ultimate in S/N performance with its ultra-low noise transistors and low impedance circuitry.

Moving-coil cartridge outputs can be connected directly to either DISC 1 or DISC 2 inputs.



5 MULTIPLE POWER SUPPLY SYSTEM

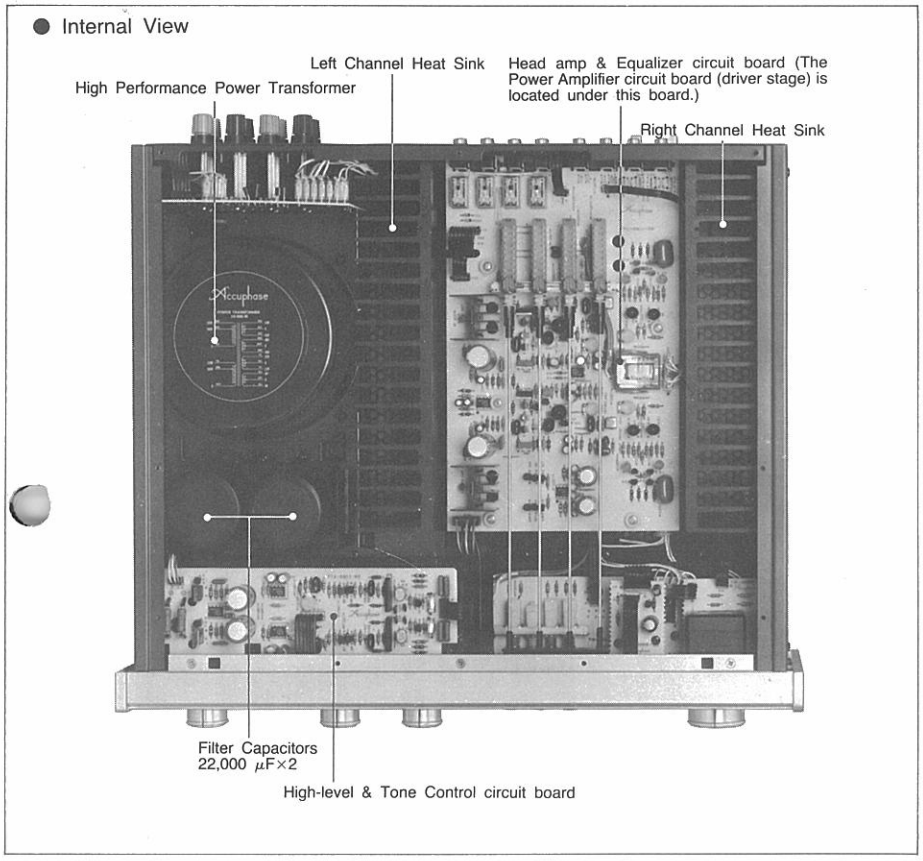
The E-301 has a multiple power supply system which provides independent voltage regulated power to the high-level amplifier, equalizer amplifier and head amplifier sections separately. This system prevents cross interference between amplifier sections, and also helps to keep circuit impedances at a minimum over a wider band range.

These independent power supplies are mounted directly on their respective amplifier circuit boards to enable the shortest leads to respective transistors, etc. This system is an ideal way to supply power to amplifier sections. It has greatly improved the E-301's bass response, its treble reproduction stability and the clarity of the sound image that it projects.

6 TURNOVER SELECTOR SWITCH

A turnover selector switch is provided to expand the tone control function. This provides selection of 200 Hz and 500 Hz turnover frequencies for BASS, and 2 kHz and 7 kHz for TREBLE. The turnover selections of 200 Hz and 7 kHz are especially effective for smooth control over the widest range from the deepest bass to the highest treble tones. Furthermore, a 10-step detent type control permits accurate 10-step tonal variations as well as on/off switching of the tone control circuit.

● Internal View



7 TWO-STEP LOUDNESS COMPENSATION

Two-step Loudness Compensator switch provides a choice of two sound energy balancing curves to make up for the deficiency of the human ear to detect certain audio frequencies during low-level reproduction. This switch also helps to balance out listening room characteristics. COMP 1: +6 dB at 50 Hz and COMP 2: +10 dB at 50 Hz and also +6 dB at 20 kHz. (above values with volume control at −30 dB).

8 SUBSONIC FILTER

The provision of filters was based on practicality, and only a 17 Hz 12 dB/oct subsonic filter is provided. It is an active filter that was designed to cut off frequencies below 17 Hz that sometimes might cause intermodulation distortion in the audible frequency range.

9 COMPLETE TAPE RECORDER FUNCTIONS

Two tape recorders can be connected simultaneously and mutual dubbing can be carried out by using the Copy switch. Monitoring either the source or tape-recorded signals can also be done by using the Monitoring switch.

10 OTHER FUNCTIONS

The E-301 has complete provisions for other useful functions including a convenient Attenuator switch which provides −20 dB attenuation for starting off records or tapes; a Mode Selector switch for monophonic or stereophonic reproduction; a Speaker Selector switch that provides switch selection of two sets of speaker systems; Headphone Jack for private listening, etc.

"POWER MOS FETs"

The special characteristics of MOS FETs (Metal-Oxide Semi-conductor Field Effect Transistors) that make them the most ideal power amplification device had been known for a number of years by those concerned in the audio world. However, their availability did not take place for a long time because of technical production difficulties that delayed their commercial feasibility. A breakthrough was finally made here in Japan ahead of the world in developing a practical means of producing high power MOS FETs, and these remarkable devices have now become available, and are opening the way for further progress in audio amplification.

The following is a brief summary of some of the advantages of MOS FETs in power amplifier applications.

SUPERIOR HIGH SPEED CHARACTERISTICS ENSURE LOW DISTORTION

A harmful notching distortion caused by a phenomenon known as carrier storage effect occurs at the P-channel and N-channel circuit junction of bipolar transistors when they are used in normal push-pull formation. This distortion occurs especially in the high frequency range, and bipolar transistors must be worked in Class-A operation to eliminate it completely.

This carrier storage effect and notching distortion are not encountered with MOS FETs because of their superior high-speed switching characteristics, so the use of MOS FETs ensures very excellent, low distortion characteristics.

VOLTAGE CONTROLLED MOS FETs PERMIT SUPERIOR DRIVER STAGE DESIGN

MOS FET power transistors have a high input-impedance characteristic and are voltage controlled devices which require only low current, signal voltages fed to their input to deliver a high power output, unlike bipolar transistors that must be driven by high current, more powerful signals. This means that more ideal operating conditions can be designed for the preceding driver stage when MOS FETs are used in the final stage. Because of the low current requirements, superior low power devices can be utilized. Class-A operation can also be utilized for driver stage amplifiers more easily and improve the overall performance of the amplifier.

MOS FETs PRODUCE HIGH GAIN

The high gain attainable from only one stage of complementary push-pull Power MOS FETs is equivalent to the gain obtained with two or three bipolar transistor amplifier stages. The reduced number of stages for MOS FET amplifiers simplifies signal path circuitry and helps to create a superior power amplifier with higher stability and improved characteristics.

SUPERIOR HIGH FREQUENCY PERFORMANCE

It is advantageous to provide adequate wideband, high frequency characteristics within the NF (Negative Feedback) loop in audio amplification circuits where large amounts of negative feedback are required. This helps to prevent TIM (Transient Intermodulation Distortion) and obtain a more accurate, faithful reproduction of music. The wideband characteristics of MOS FETs make this possible, and helps to prevent TIM more effectively.

LINEARITY

Compared with Junction-type FETs, MOS FETs have a wider linear range which means that superior performance can be obtained with smaller bias currents and less heat generation, a desirable characteristic for power amplifier devices. In this respect, bipolar transistors are very excellent devices also.

BUILT-IN PROTECTION AGAINST OVERHEATING

MOS FETs have a Negative Temperature Coefficient in the high current area, a characteristic which basically differs from bipolar transistors. This helps to protect itself from damage in case of trouble. For example, if an abnormal current flow occurs resulting from some circuit breakdown, a sudden rise in pellet temperature will cause this negative temperature coefficient of the MOS FET to decrease current flow, reduce heat and protect itself from damage. A similar breakdown may cause thermal runaway with bipolar transistors which would require protective countermeasures and special operational care.

As explained above, MOS FETs have many advantages. However, if we are to mention a weak point, it is that they are costly.

Nevertheless, Accuphase has adopted MOS FETs because of thier excellent performance characteristics which, we firmly believe, is well worth the extra cost.

Although certain weak points of bipolar transistors were described in the above comparison with MOS FET devices, we must add that due to constant progress in circuit design technology, there are certain well-designed bipolar amplifiers that are equal in performance, if not superior, to some MOS FET Amplifiers.

Accuphase E-301

INTEGRATED | STEREO AMPLIFIER

GUARANTY SPECIFICATIONS

PERFORMANCE GUARANTY: All Accuphase product specifications are guaranteed as stated.

CONTINUOUS AVERAGE POWER OUTPUT: (New IHF Standard)
both channels driven, from 20 Hz to 20,000 Hz with no more than 0.02% total harmonic distortion plus N
110 watts per channel, min. RMS, at 4 ohms
110 watts per channel, min. RMS, at 8 ohms
55 watts per channel, min. RMS, at 16 ohms

TOTAL HARMONIC DISTORTION + N: (New IHF Standard)
both channels driven, from 20 Hz to 20,000 Hz at any power output from 1/4 watt to rated power
0.02% max., at 4 ohms
0.01% max., at 8 ohms
0.01% max., at 16 ohms

INTERMODULATION DISTORTION: (New IHF Standard) will not exceed 0.005% at rated power output

FREQUENCY RESPONSE: (New IHF Standard)
Main Amp Input: 20 Hz to 20,000 Hz; +0, −0.2 dB at rated power output
0.5 Hz to 300,000 Hz; +0, −3.0 dB at 1 watt power output
High Level Input: 20 Hz to 20,000 Hz; +0, −0.2 dB at rated power output
Low level Input: 20 Hz to 20,000 Hz; +0.2, −0.5 dB at rated power output

DAMPING FACTOR: (New IHF Standard)
80, 8-ohm load at 50 Hz

INPUT SENSITIVITY AND IMPEDANCE:

Input Terminal	Sensitivity Rated Output	Sensitivity New IHF Std. (1 watt output)	Impedance Ohms
Disc (Head Amp: OFF)	2.3 mV	0.22 mV	100, 47k, 82k, 150k
Disc (Head Amp: ON)	0.12 mV	0.011 mV	100
Tuner Aux, Tape Play	145 mV	13.9 mV	47k
Main Amp input	1.2V	0.12V	47k

MAXIMUM INPUT FOR DISC INPUT: (0.01% THD)
HEAD AMP OFF: 300 mV RMS at 1,000 Hz
HEAD AMP ON: 15 mV RMS at 1,000 Hz

OUTPUT LEVEL AND IMPEDANCE: Preamp, Output; 1.2V at rated input level, 200 ohms
Tape Rec. 1, 2; 145 mV at rated input level, 200 ohms

HEADPHONE JACK: For listening with low impedance (4 to 32 ohms) dynamic stereo headphones

VOLTAGE AMPLIFICATION IN DECIBELS:
Main Amp Input to Output; 27.8 dB
High-Level Input to Preamp Output; 18.4 dB
Disc (Head Amp: OFF) to Tape Rec.; 36 dB
Disc (Head Amp: ON) to Tape Rec.; 62 dB

A-WEIGHTED SIGNAL-TO-NOISE RATIO:

Input	Rated Output	New IHF Standard
Main Amp Input	120 dB	95 dB
High-Level Input	100 dB	82 dB
Disc (Head Amp: OFF)	80 dB	80 dB
Disc (Head Amp: ON)	72 dB	77 dB

TONE CONTROLS: 11-position click-stop, Bass and Treble controls, turnover frequency switches and tone ON/OFF switch.
Bass; Turnover frequency 200 Hz; ±10 dB at 50 Hz
Turnover frequency 500 Hz; ±10 dB at 100 Hz
Treble; Turnover frequency 2,000 Hz; ±10 dB at 10 kHz
Turnover frequency 7,000 Hz; ±10 dB at 50 kHz

LOUDNESS COMPENSATOR: (Volume attenuation at −30 dB)
COMP 1; +6 dB at 50 Hz
COMP 2; +10 dB at 50 Hz, +6 dB at 20 kHz

SUBSONIC FILTER: 17 Hz, cutoff 12 dB/oct

ATTENUATOR: −20 dB

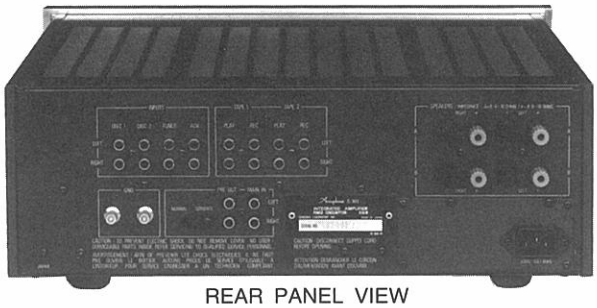
OUTPUT LOAD IMPEDANCE: 4 to 16 ohms

SEMICONDUCTOR COMPLEMENT: 81 Tr's, 13 IC's, 20 FET's, 83 Diodes

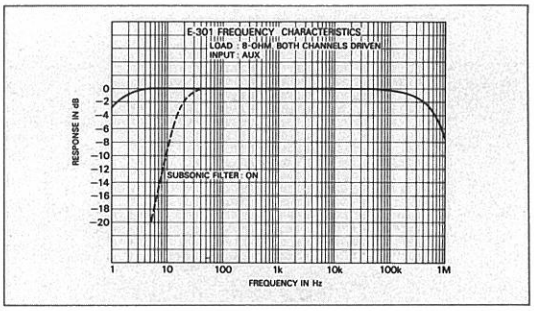
POWER REQUIREMENT: 100, 117, 220 and 240V (Voltage selector provided) 50/60 Hz
Consumption; 60 watts at zero signal output
400 watts at rated power output into 8-ohm load

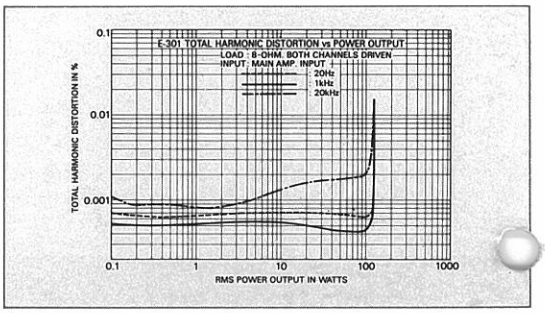
DIMENSIONS: 445 mm (17-1/2 inches) width, 160 mm (6-5/16 inches) max. height, 370 mm (14-9/16 inches) depth

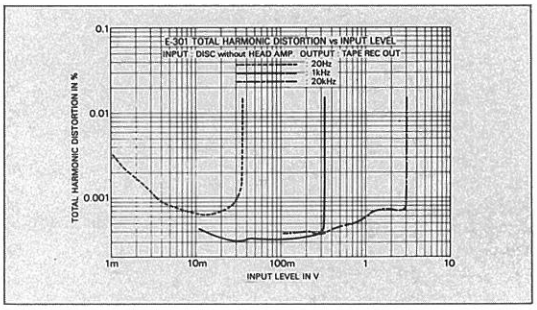
WEIGHT: 17.2 kg (37.9 lbs) net, 21.7 kg (47.8 lbs) in shipping carton

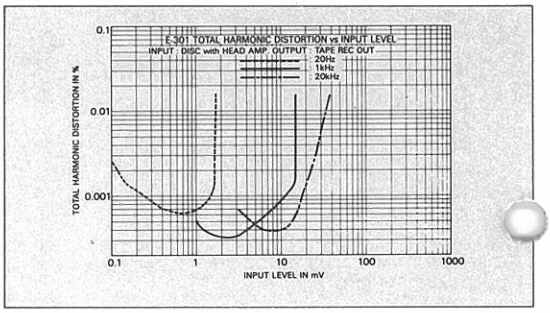


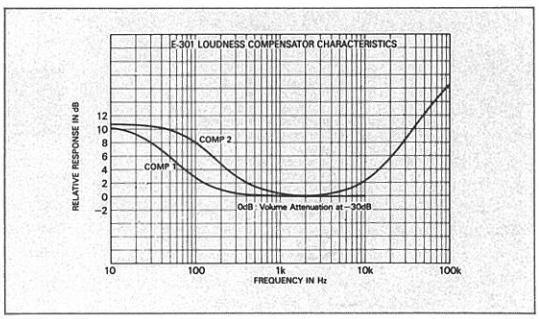
REAR PANEL VIEW











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