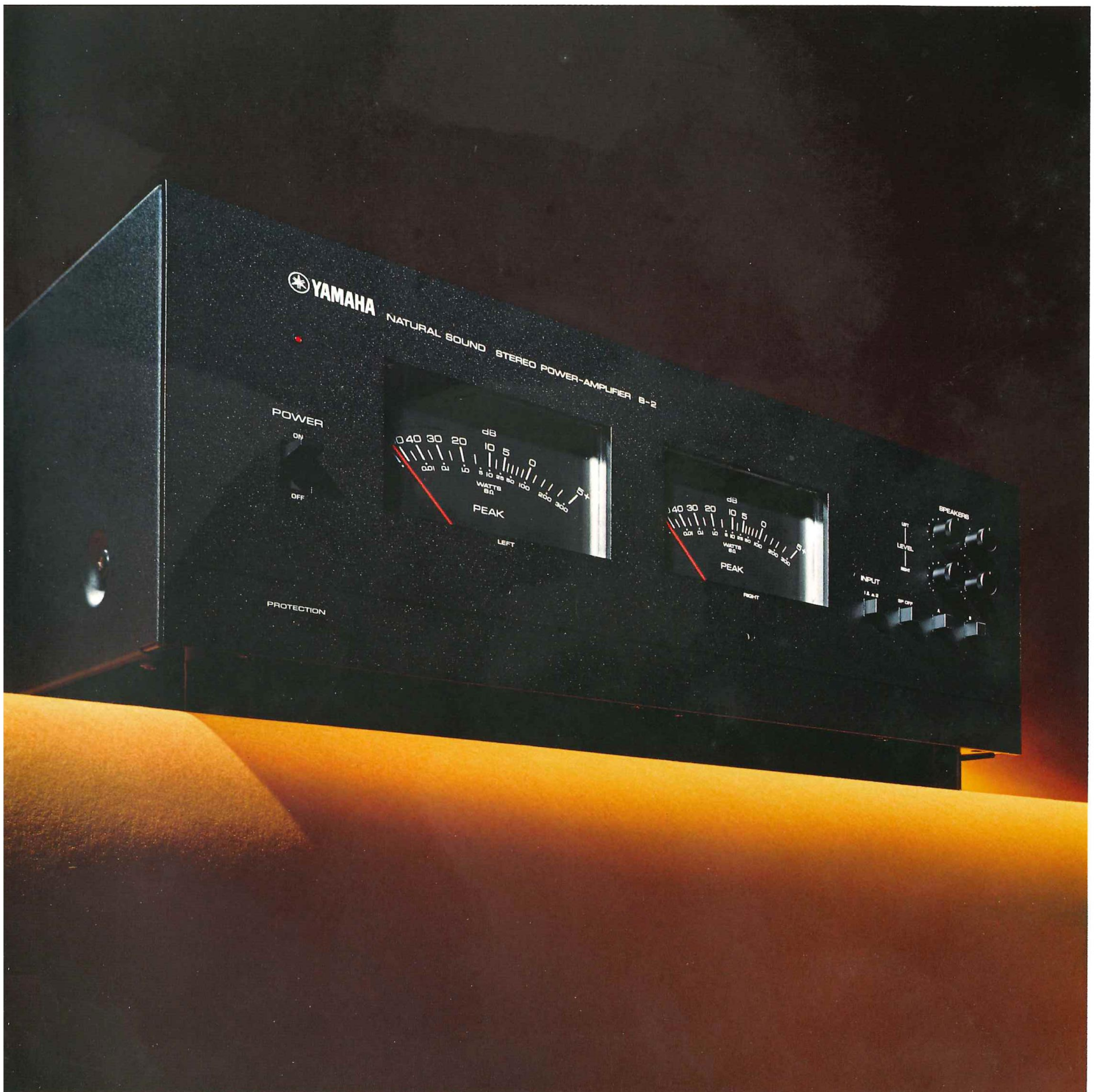


# YAMAHA B-2

High power low distortion stereo power amplifier. Matched symmetrical pairs of Yamaha vertical FETs. True DC amp performance. Fully complementary output-capacitorless circuitry. Symmetrical push-pull driver stage. Wide range (-50 to +5 dB) peak meters. 100 watts/channel, both channels driven into 8 ohms, 20 Hz to 20,000 Hz, with 0.08% total harmonic distortion.



# THE B-2 POWER AMPLIFIER

A Major Advance in  
Technology and Audio  
Quality

The same unique Yamaha blend of advanced technology and audio-musical know-how that led to the now famous all-FET B-1 basic amplifier is behind the second generation B-2 DC power amplifier. At a price within the reach of a much wider circle of enthusiasts, it features superb performance characteristics, particularly in the high signal-to-noise ratio and low distortion. Fully complementary FETs specially developed for the B-2 are used in matched pairs in symmetrical configurations with all-new circuitry (patents applied for) boasting response flat to DC (0 Hz). There is delicacy and accuracy in the nuances of musical reproduction which virtually put the B-2 in a class of its own, because distortion is low not only at maximum rated output, but right down to fractions of a watt. Combine this with tremendous reserves of power, and dynamic transient response, and you have an amplifier in the true Yamaha tradition: setting standards to judge the current state of the art. Convenience features include highly sensitive wide range peak level meters, switchable to read external component levels, twin inputs and speaker outputs with front-panel selection and individual level controls, plus push-button speaker muting.

The B-2 is joy to hear  
and to use.

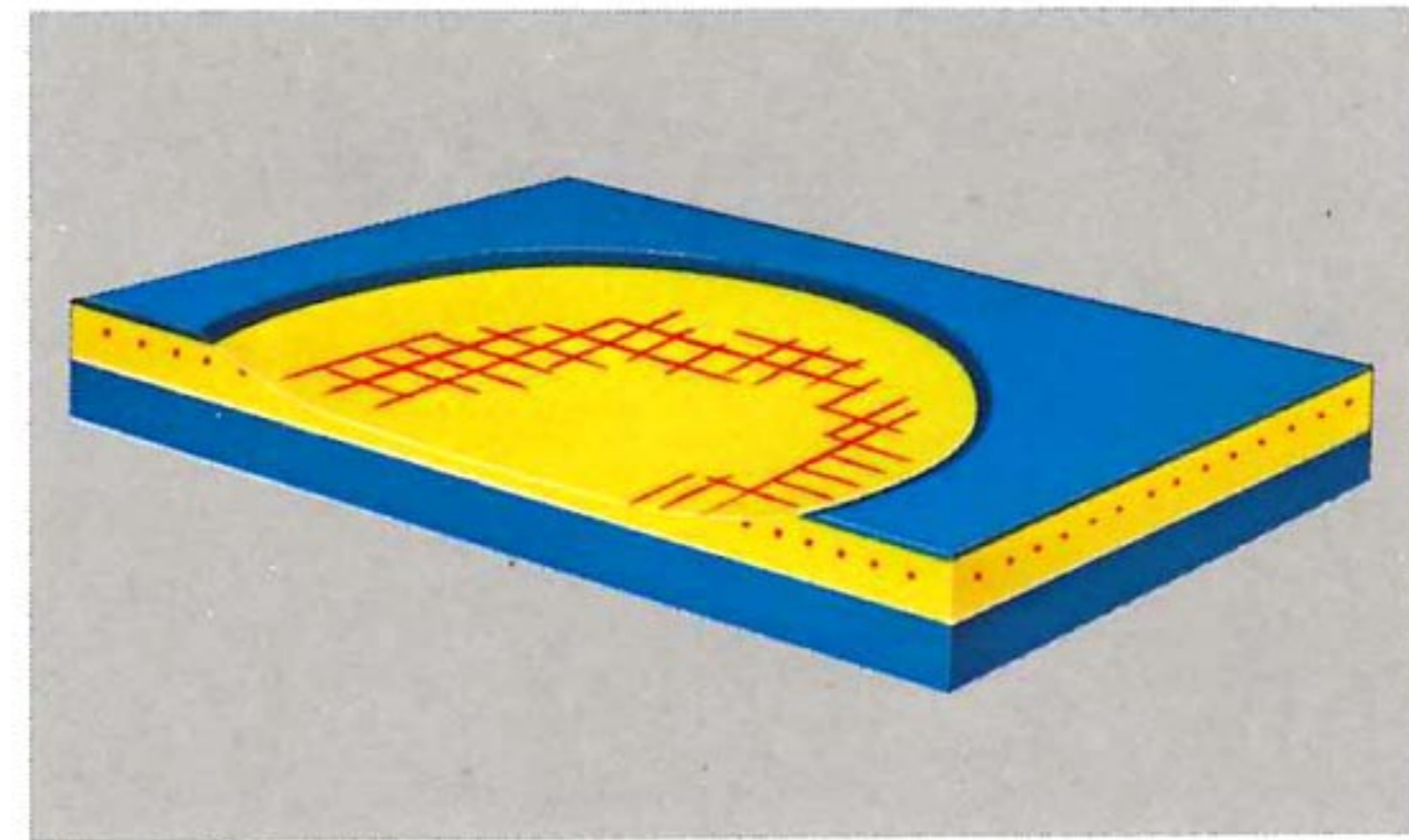


# FULLY COMPLEMENTARY PAIRED VERTICAL FETS

## A New Yamaha Contribution to Audio Engineering

The B-2 began with an impossible ideal: a DC amplifier in which vertical FETs and bi-polar transistors would give response flat to DC (0 Hz), in a completely symmetrical fully complementary configuration. Impossible because the perfectly matched pairs of FETs did not exist. But now Yamaha has achieved this breakthrough, at the same time dramatically improving signal-to-noise ratio and slew rate, as well as reducing distortion.

## YAMAHA VERTICAL FET MESH CONFIGURATION

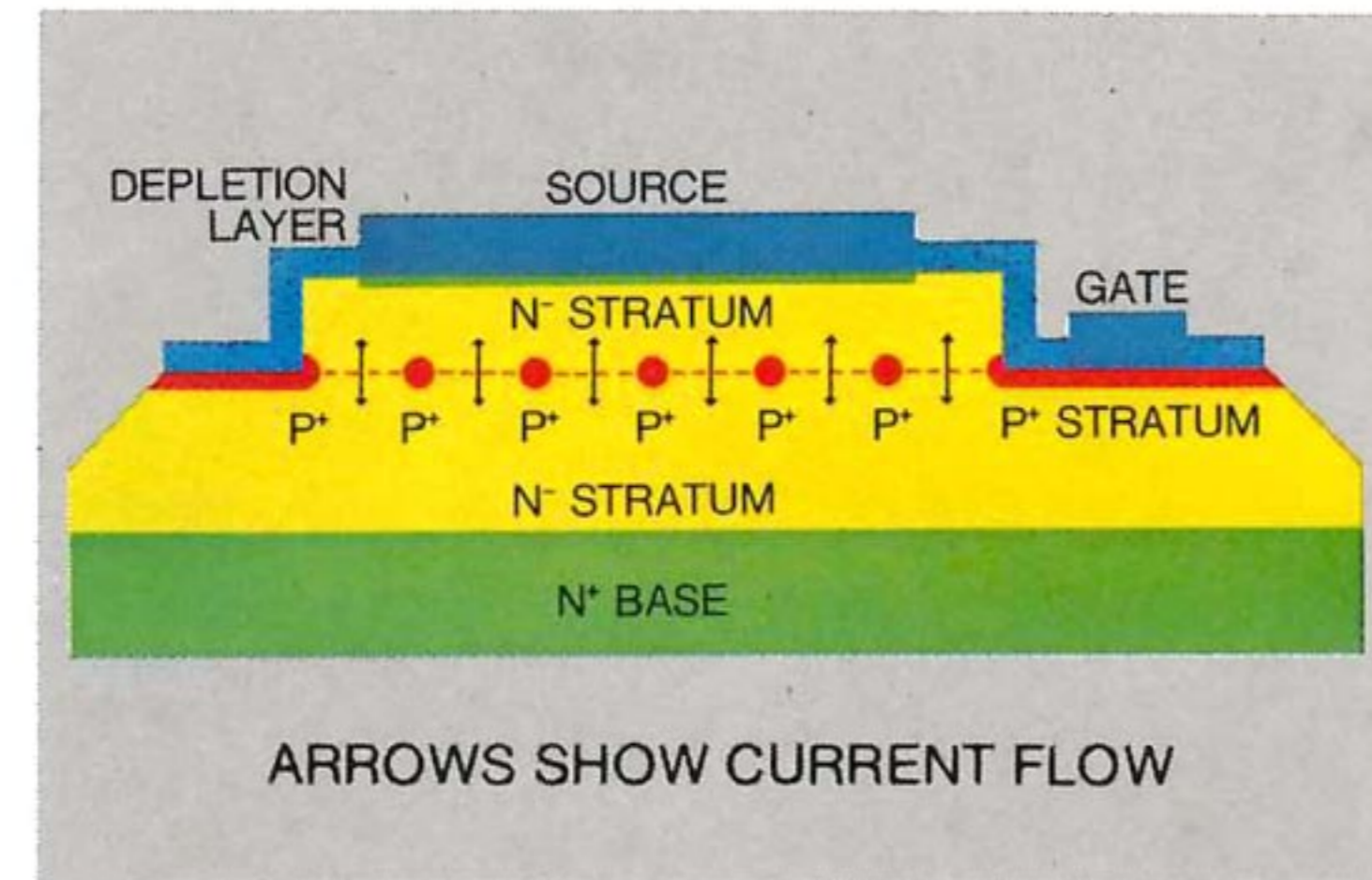


## Tailor-Made FETs for Sophisticated Circuits

Circuit design came first with the B-2: each circuit was designed for the required performance standards in every category where an audio amplifier must excel. Then came the development of semiconductor devices (FETs) which could satisfy the severe demands of these circuits. Yamaha investigated chip size, impurity levels,

gate mesh structure, and then established rigorous production controls to make accurate P-ch and N-ch pairing possible. Finally, FETs are precisely paired according to their actual performance characteristics, to form the super-pairs used in the B-2.

## YAMAHA VERTICAL FET CONSTRUCTION

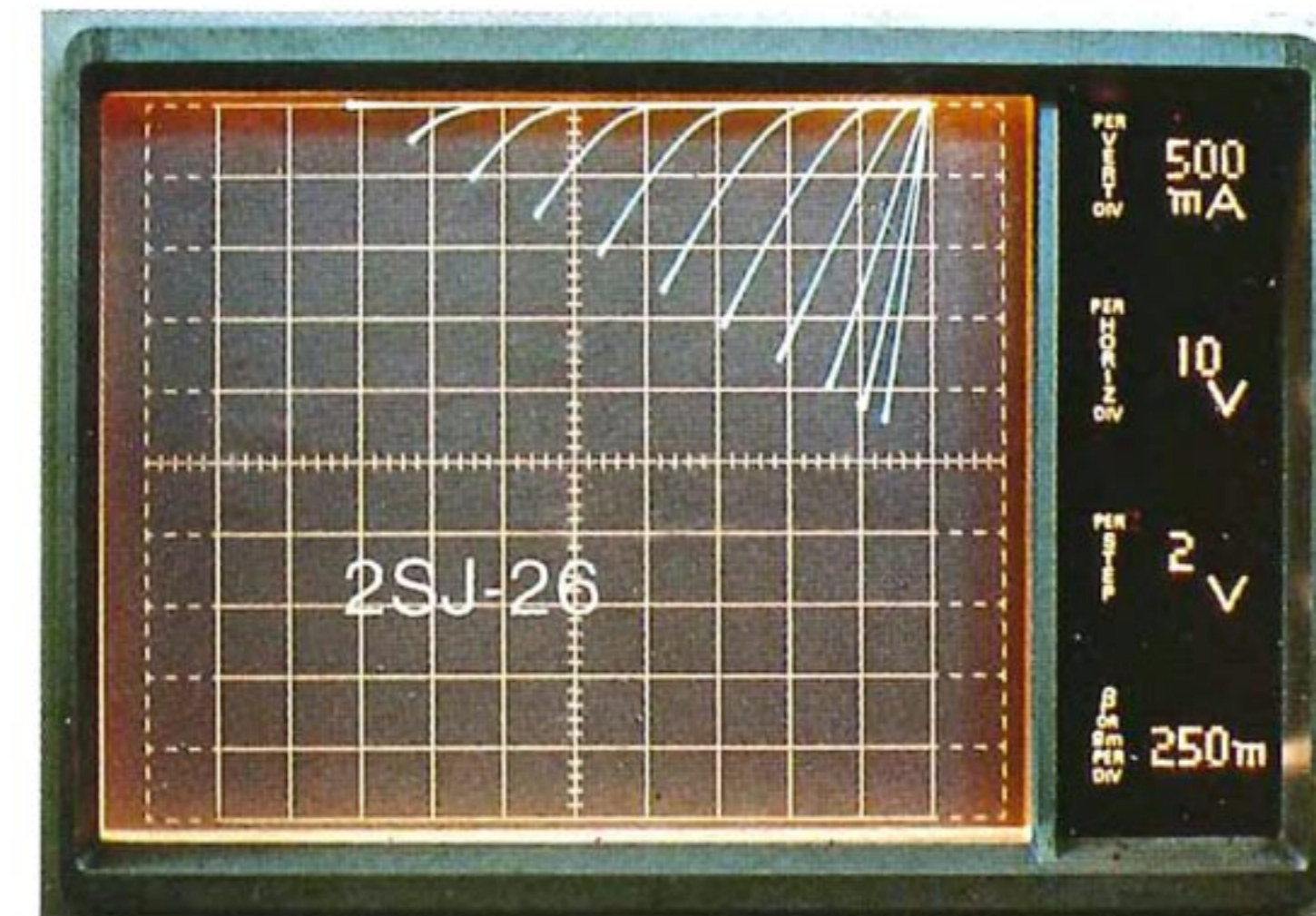
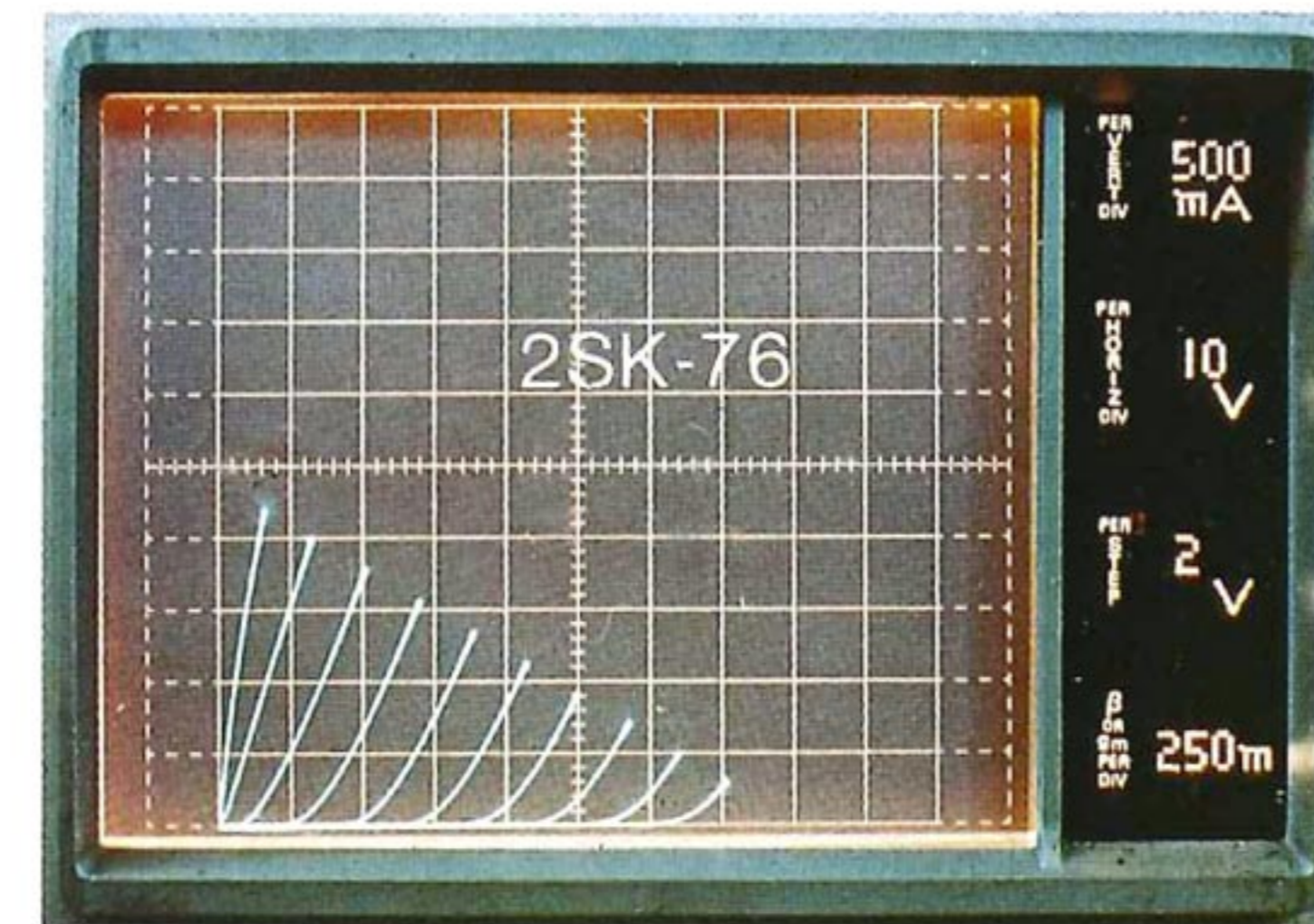


## Setting New Standards in Vertical FET Performance

As well as having all the advantages of conventional FETs, such as low input impedance and high switching speed, Yamaha FETs form complementary pairs. Smaller than the 2SK-77 FETs used in the B-1 basic amplifier, the 2SK-76 (N-ch) and 2SJ-26 (P-ch) FETs each have excellent complementary characteristics, good linearity over a wide operating range, high voltage gain, and high operating voltages. These unique vertical FETs, and the sophisticated circuits for which they were developed, are behind the B-2's superb performance.



OUTPUT CHARACTERISTICS OF THE 2SK-76 (N-ch) AND 2SJ-26 (P-ch) FETs

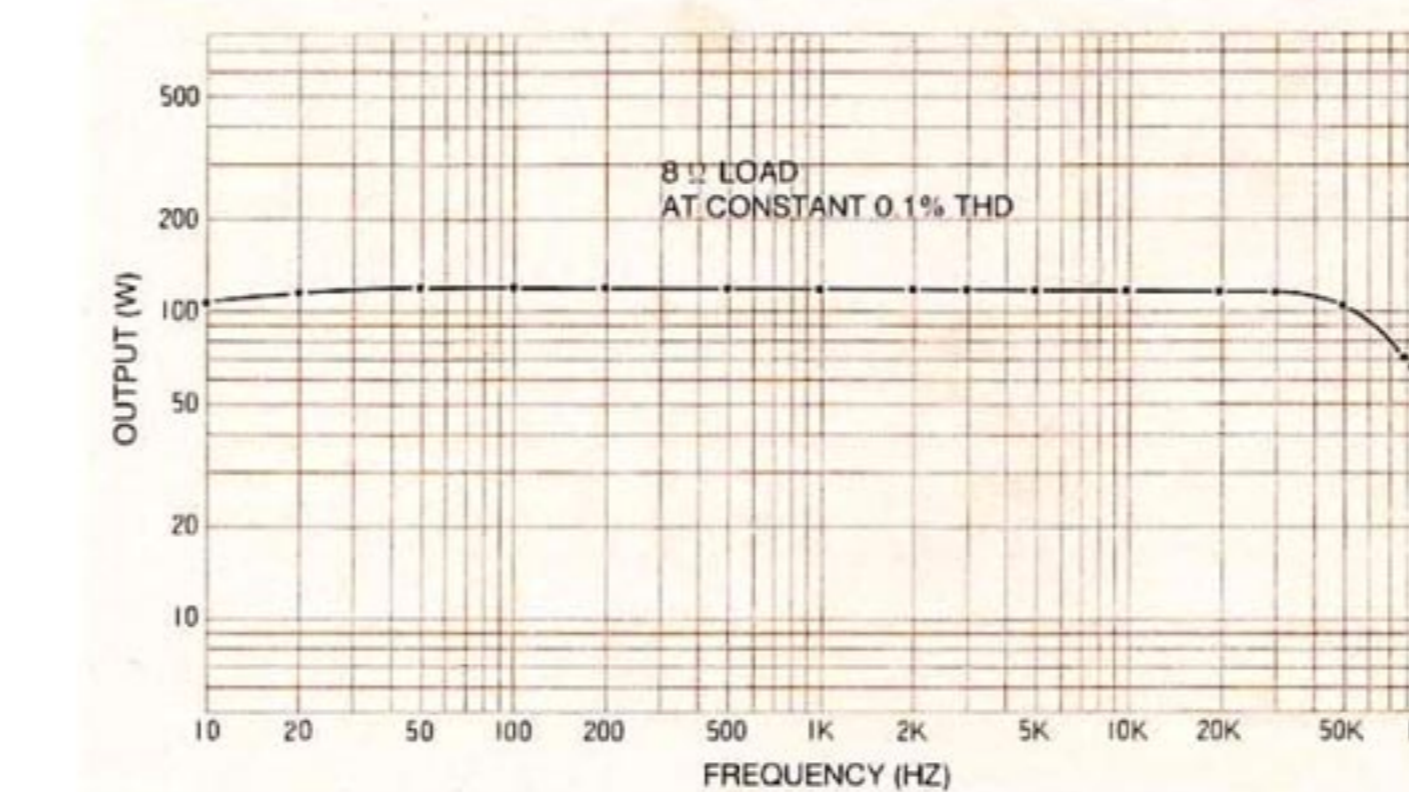


# PERFORMANCE DETAILS THAT MAKE AN AUDIBLE DIFFERENCE

## Flat to Zero Hertz (DC)

To achieve the audio enthusiast's dream, a DC amplifier with response flat to 0 Hz, capacitors have been eliminated not only from input, output, and inter-stage coupling, but also from the NFB loop and bootstrap circuits, in fact every location where they could affect low frequency response. With the DC amplifier, true bass response and full waveform fidelity become possible for the first time. Only Yamaha's precisely matched FET super-pairs made this possible. And center-balance potential drift is held within 10 mV not only for temperatures from 0 to 50°C (32 to 122°F), but also after first switching on, fully protecting speakers in normal operation.

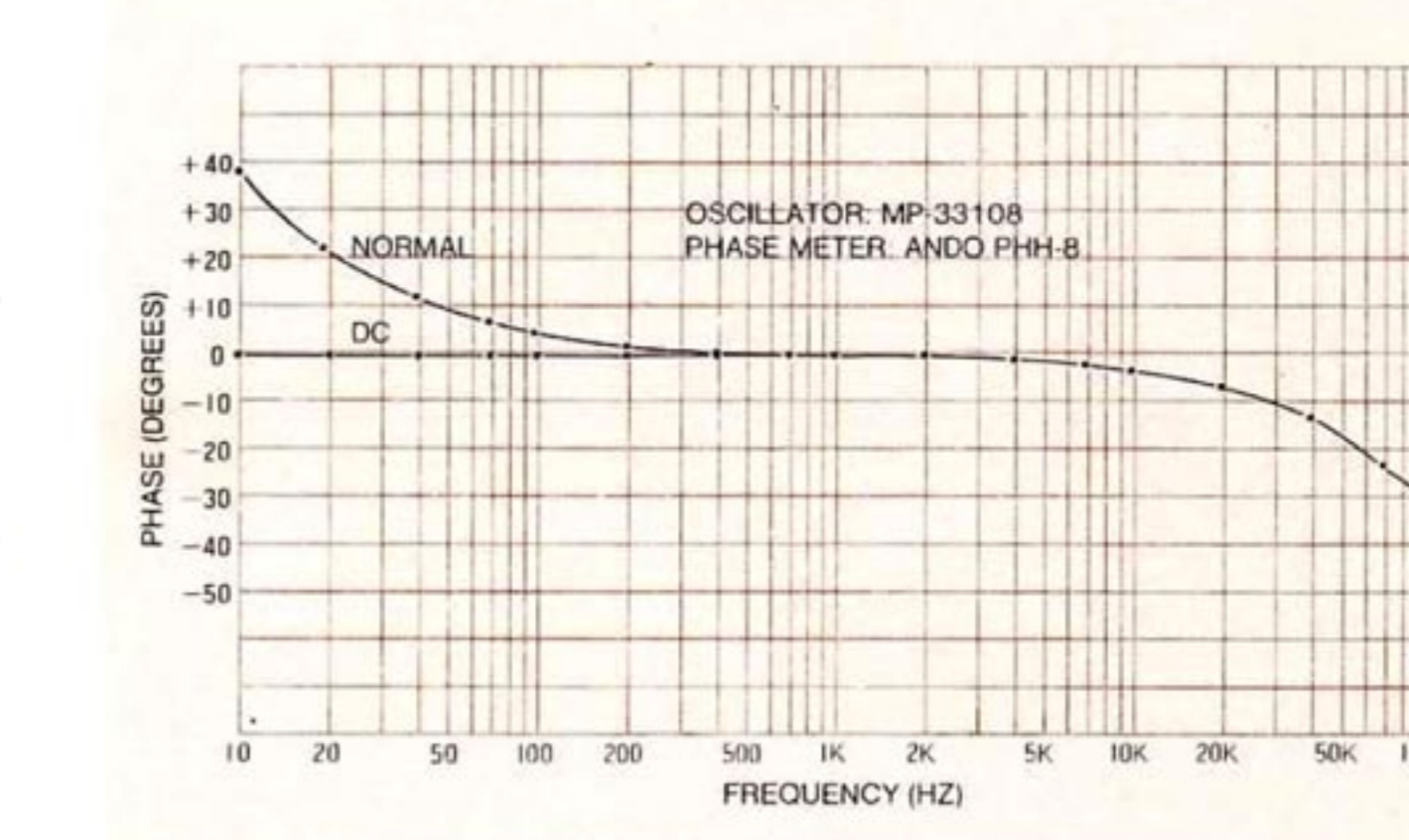
## POWER BANDWIDTH



## Linear Phase Response

The B-2's phase shift of no more than 30° from DC to 100 kHz (in DC mode) means that sudden peaks of sound are never attenuated nor lose their dynamic impact. The waveforms of the program source, however complex, are reproduced with their original crispness and punch.

## PHASE CHARACTERISTICS



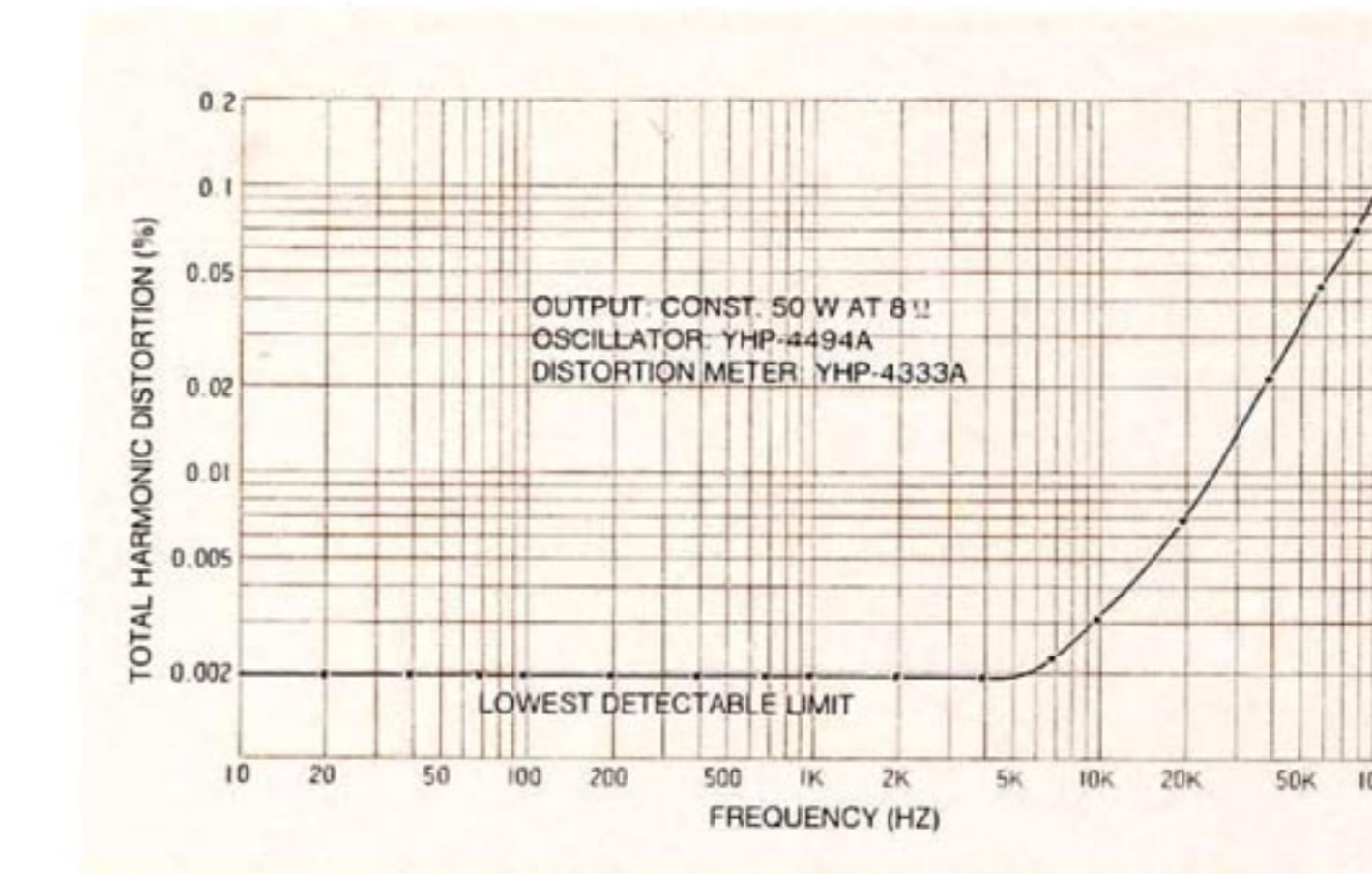
## The Sound of Silence

With a full 115 dB signal-to-noise ratio, hiss noise should never intrude to spoil normal listening: you probably won't be able to hear it even if you turn the volume to maximum.

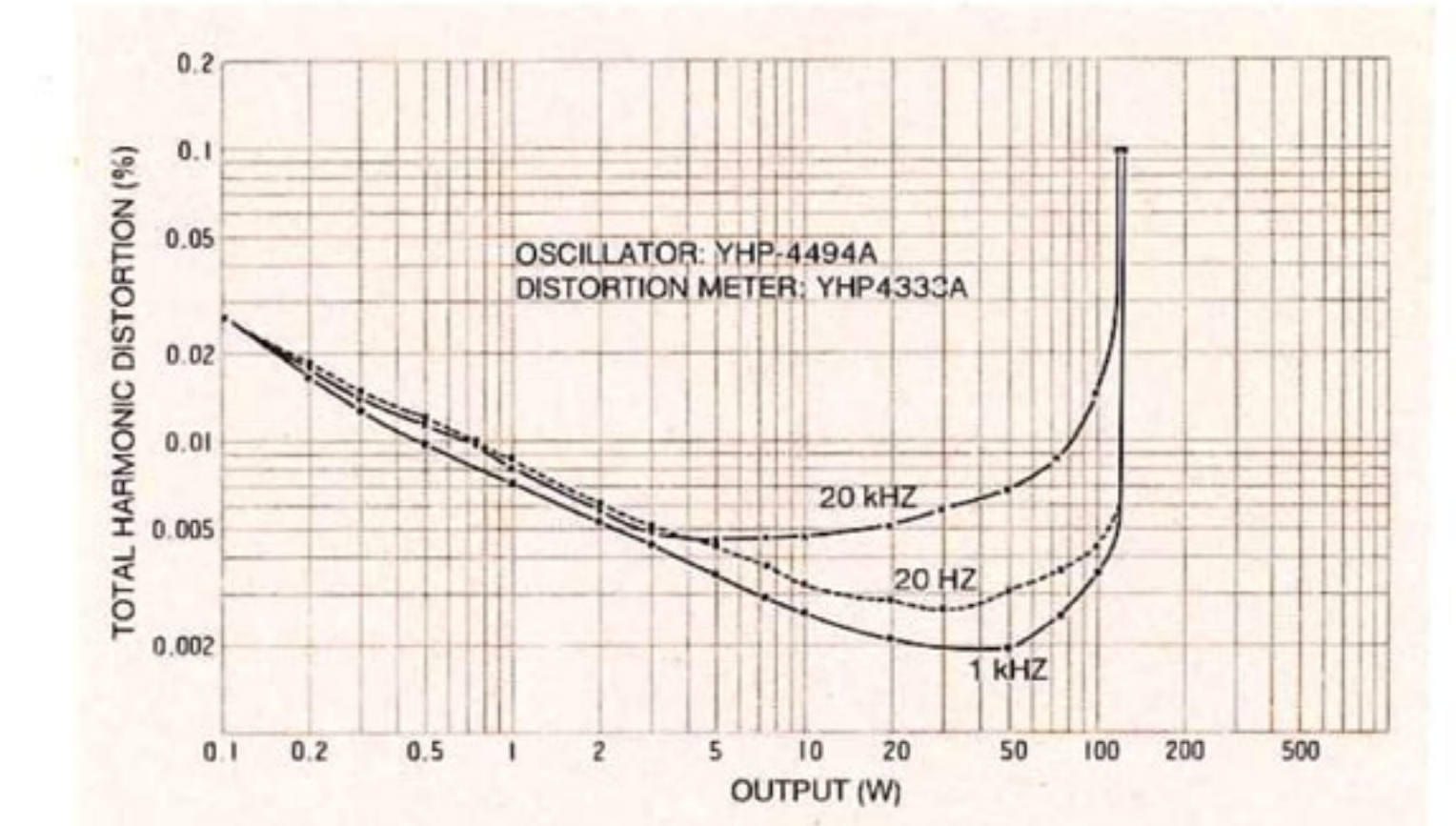
## Distortion at the Limit of Inaudibility

One glance at the graphs will show you how low the distortion is; one audition will tell you the difference it makes in audio quality.

## FREQUENCY RESPONSE vs TOTAL HARMONIC DISTORTION



## OUTPUT vs TOTAL HARMONIC DISTORTION



## Independent Balanced (±) Power Lines for Left- and Right-Hand Channels

Cross-channel separation is dramatically improved by completely independent transformer-supplied power lines for L and R channels. Four huge 18,000 μF electrolytic capacitors smooth the power supplies for the balanced (±) complementary circuit configurations, ensuring ample reserves of power for peak volumes.

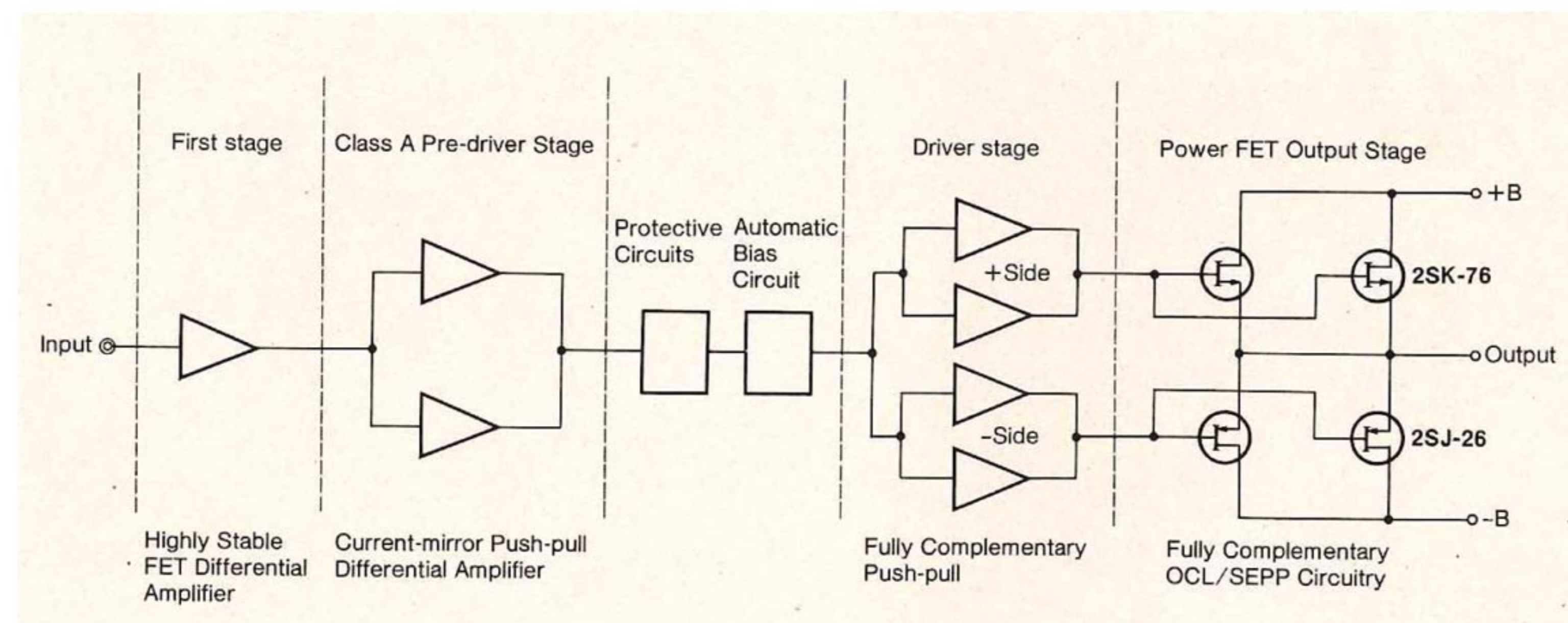
## Safe, Reliable, and Fully Protected

Automatic bias circuit, FET protection, speaker protection, thermally protected transformers, and specially chosen components including gold-plated sliding contacts, are just some of the ways in which Yamaha ensures long and trouble-free enjoyment of the best the B-2 can give.

# FULLY SYMMETRICAL PUSH-PULL DRIVE CIRCUITRY

From the ultra-stable differential FET amplifier first stage, with cascode-bootstrap circuit, through the pre-driver stage with current-mirror class A differential push-pull amplification, and the fully complementary symmetrical push-pull driver stage, to the output stage using super-pair FETs in a fully complementary configuration with parallel push-pull OCL circuitry, every stage in the B-2 combines functionality and elegant simplicity. The result is no more than 0.08% total harmonic distortion at 100 watts of continuous rms power, both channels driven into 8 Ohms. At 10 watts (nearer to normal listening levels) the corresponding figure is an amazing 0.008%! And

## SYMMETRICAL PUSH-PULL DRIVE CIRCUIT BLOCK DIAGRAM



since FET distortion is mostly in the less objectionable even-order harmon-

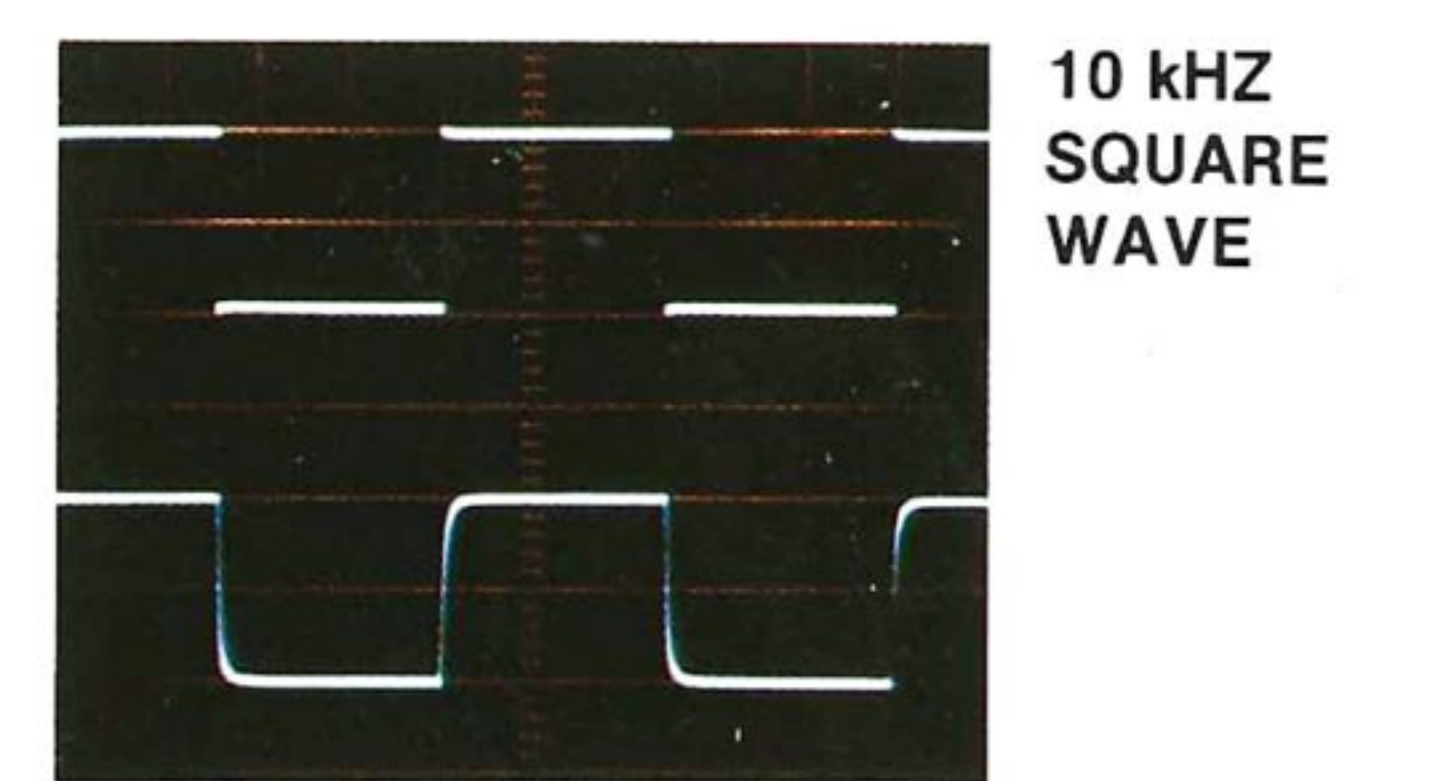
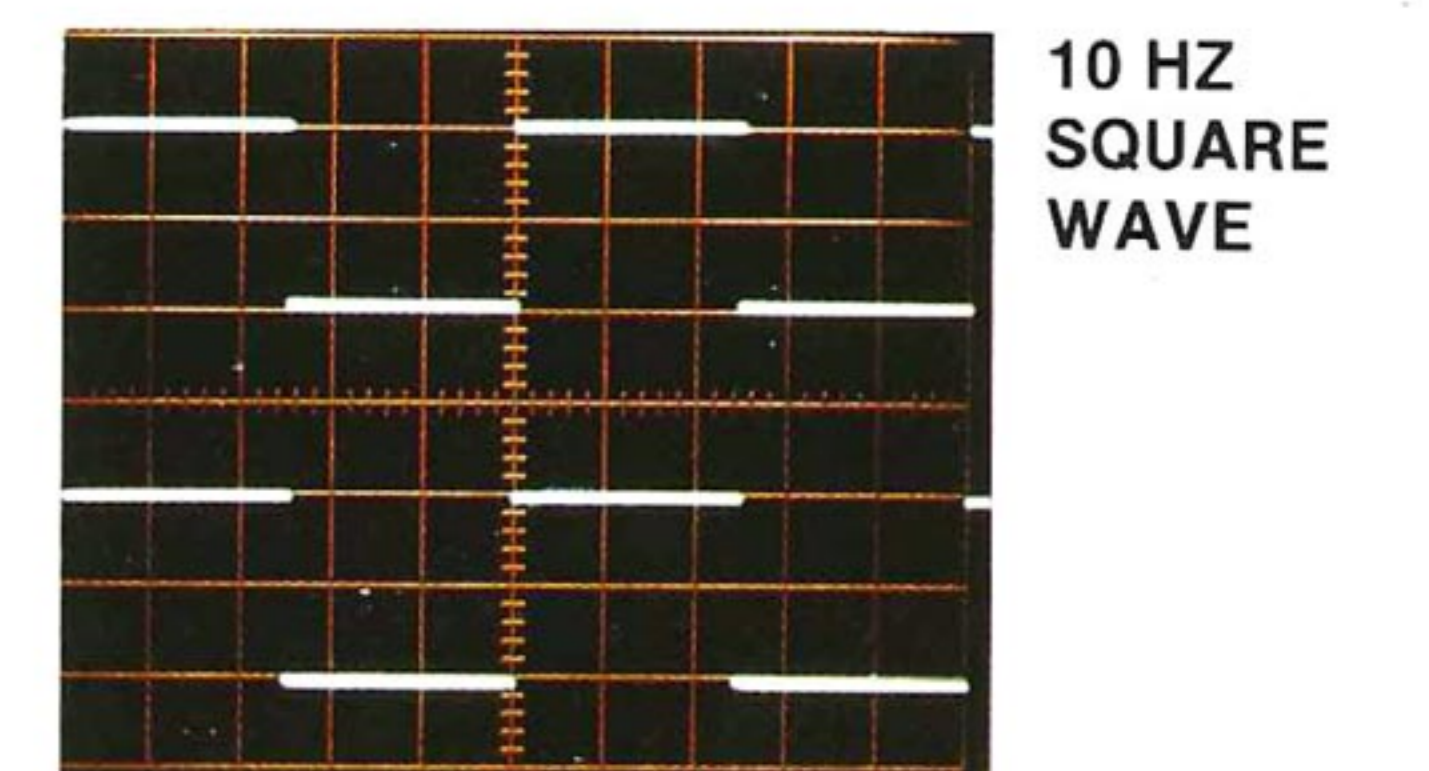
ics, the B-2 sounds even purer and sweeter than you would expect.

## High Stability, High S/N, Low Distortion First Stage

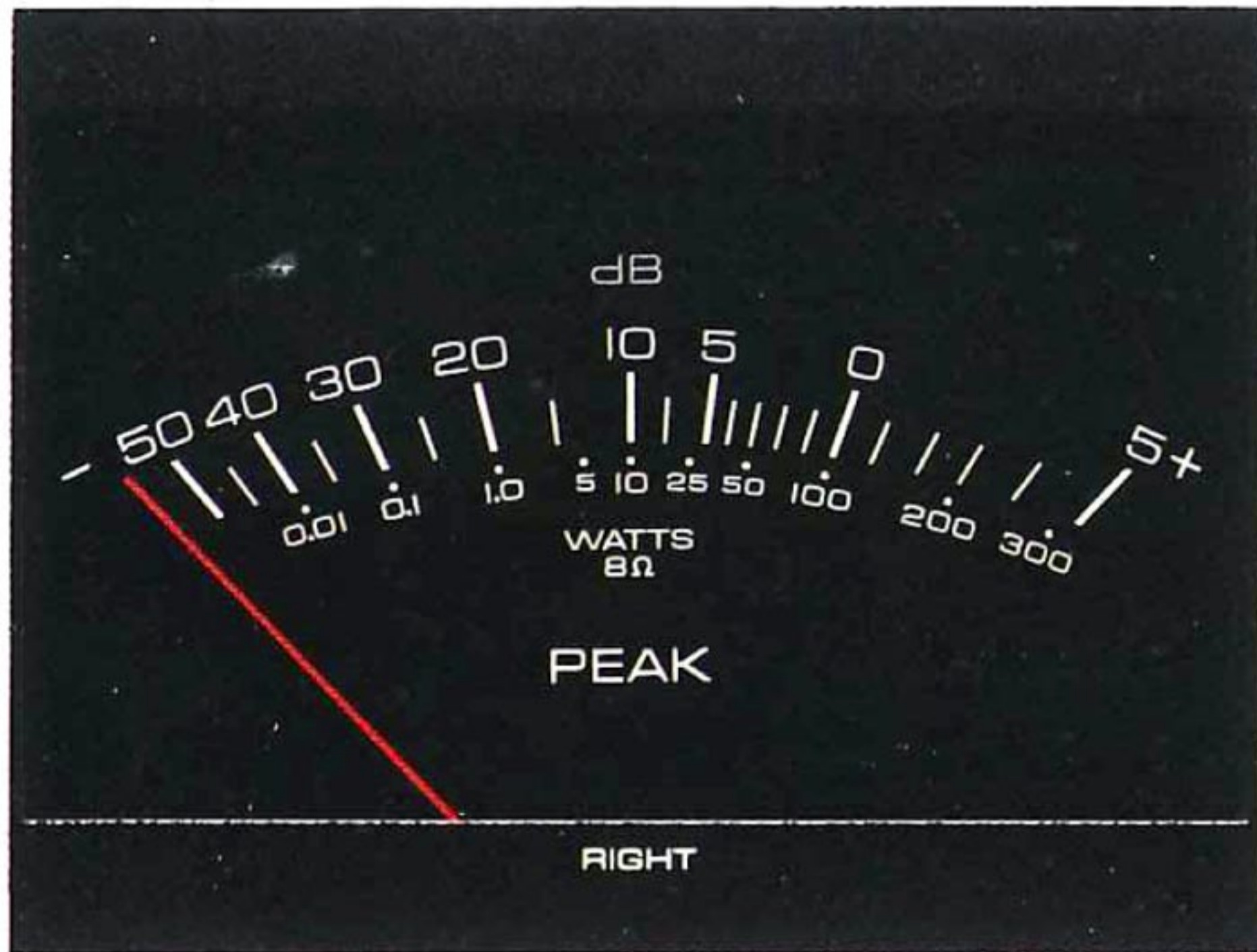
With a DC amplifier, drift in the center-balance potential can cause potentially damaging DC flow through the speakers. The rigorously matched super low noise FET differential amplifier pair are thermally coupled for negligible drift (within 10mV) in the B-2. Also cascode-bootstrap circuitry ensures that distortion is held to a minimum despite rises in signal source impedance, which can accompany reductions in volume.

## Symmetrical Push-Pull Drive

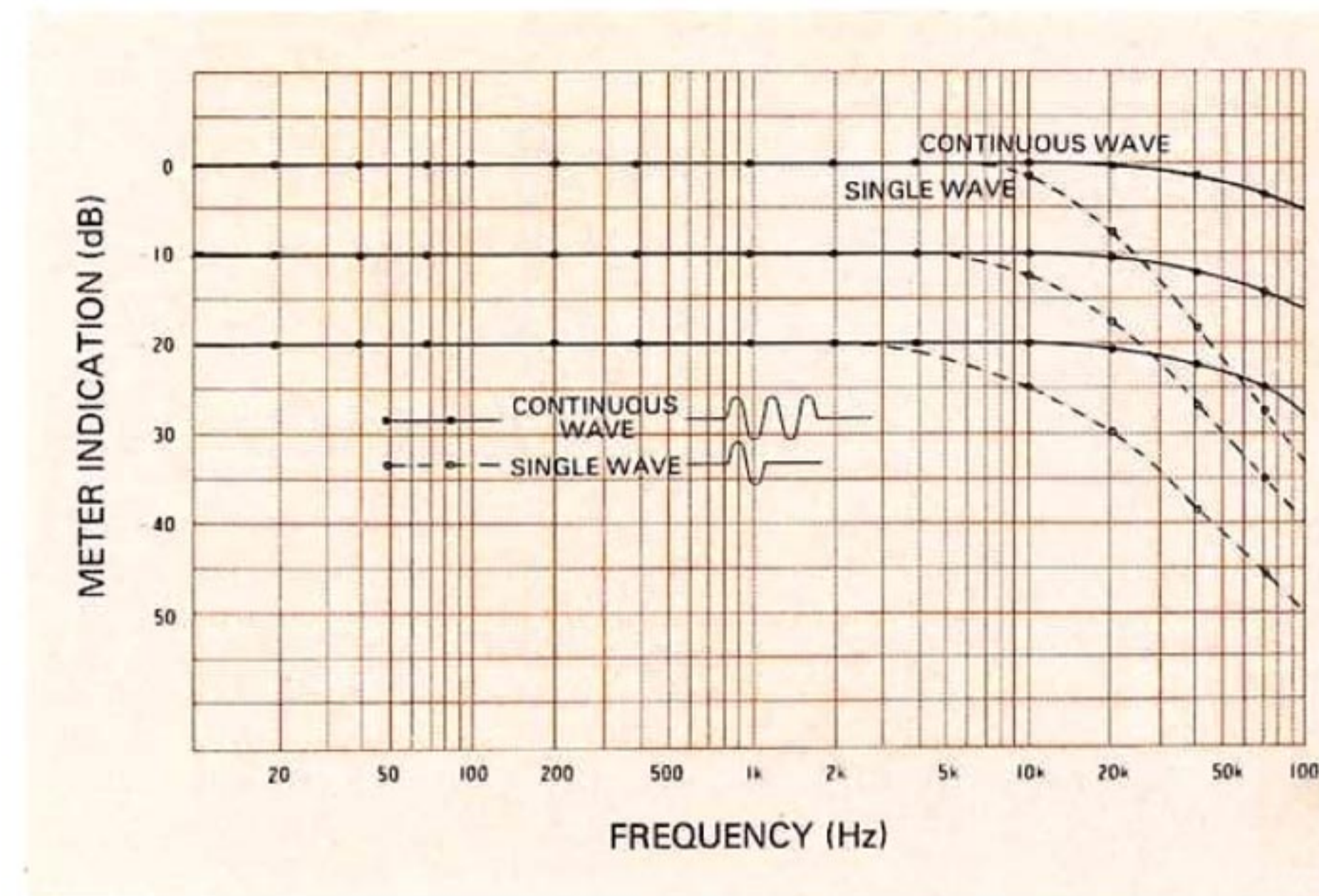
By using P-ch and N-ch FETs in a fully complementary push-pull drive configuration, low drive impedance and high input impedance (with correspondingly low current requirements) are achieved. Low current demand means that high performance low power transistors can be used: in the B-2 the same 1-watt transistors are used in the drive stage as in the pre-drive stage! This greatly extends the high frequency response and boosts slew rate.



# UNUSUAL ATTENTION TO DETAIL FOR FULLEST FLEXIBILITY



PEAK LEVEL METER RESPONSE



## Front Panel Selection of Two Speaker Systems

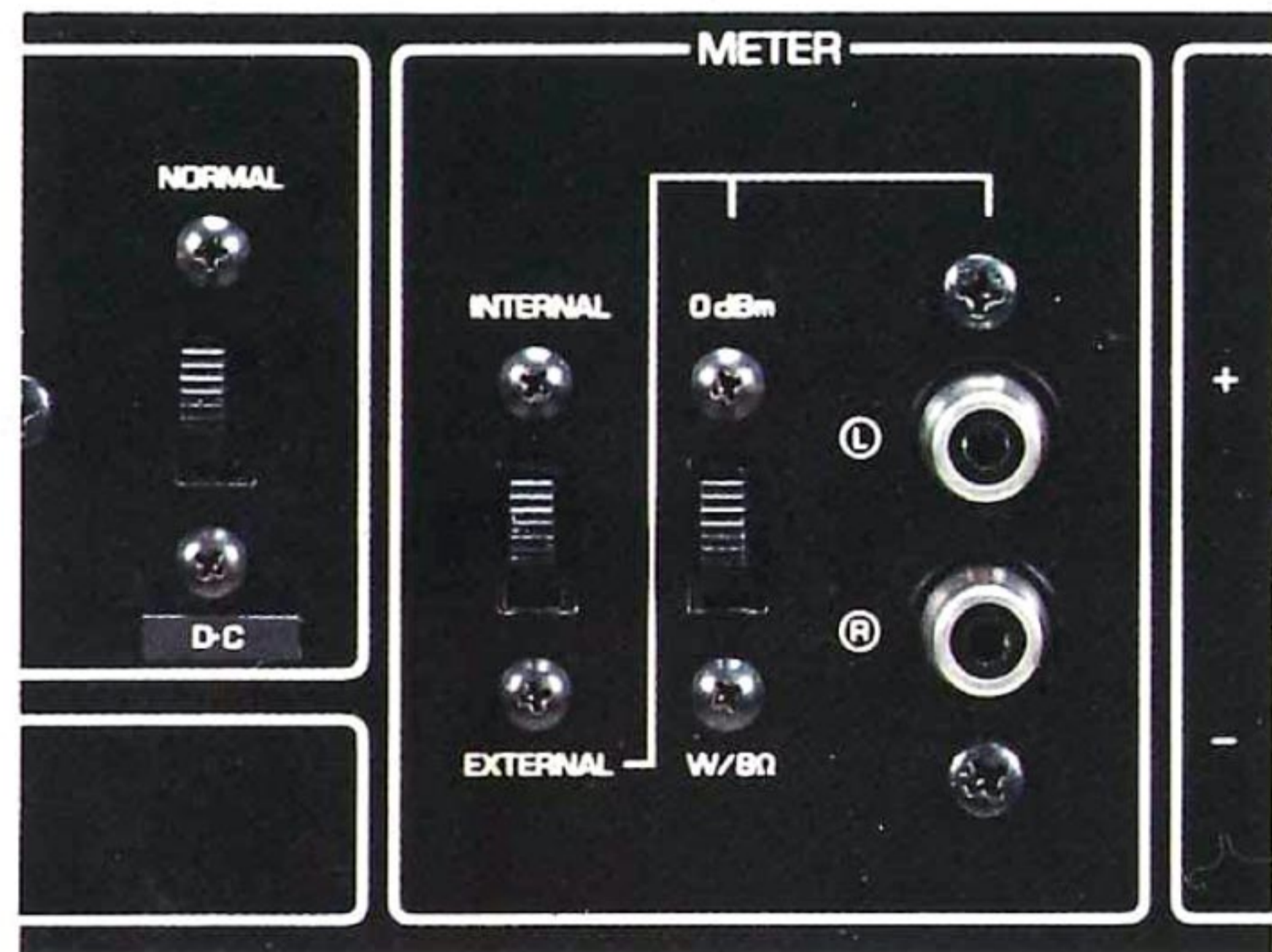
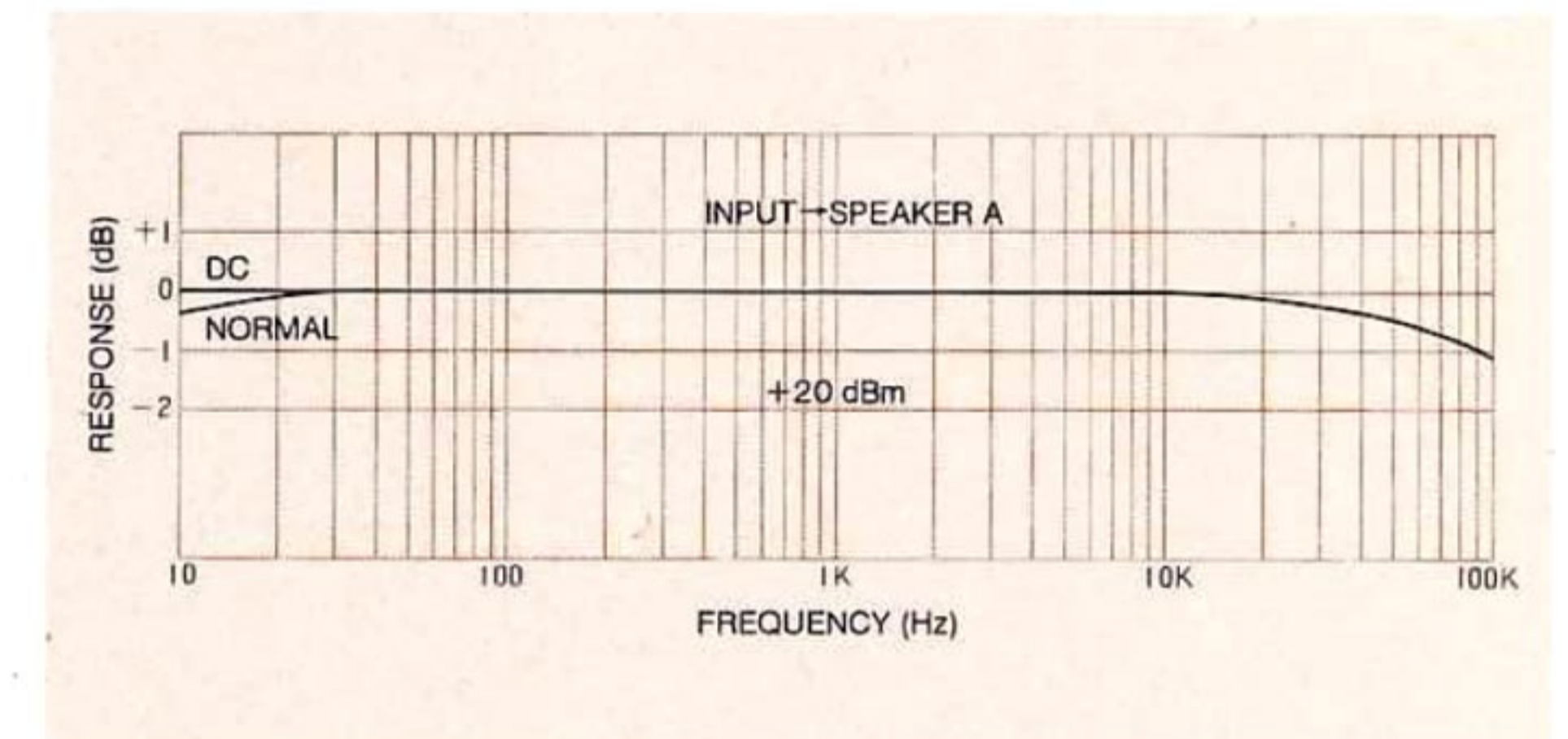
## Individual Speaker Level Setting Adjustment

Use these controls to obtain similar sound levels from speakers of different efficiencies. There is virtually no performance deterioration.

## Speaker-Off Switch

Set levels in safety — and silence — with the help of this switch.

## B-2 OVERALL FREQUENCY RESPONSE



## External Component Peak Level Monitoring

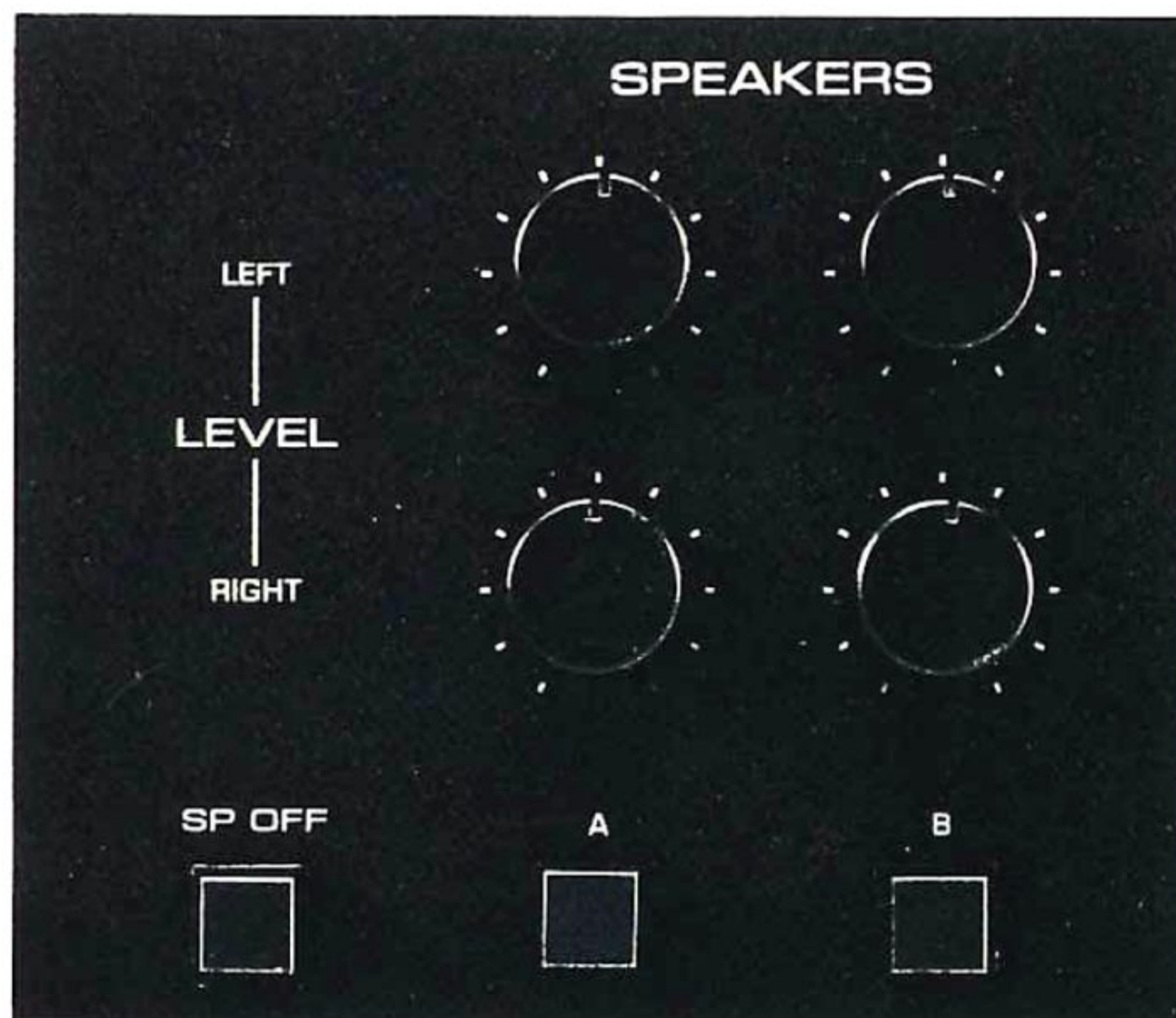
The meters can be switched to read output levels from power or preamplifiers.

## Front Panel Selection of Two Inputs

With one input shorted, this offers On-Off switching.

## Wide Range Peak Output Level Meters

Specially developed for the C-I control amplifier and UC-I control unit, these sophisticated meters respond quick enough to show a single 10 kHz sine-wave cycle, displaying it long enough for accurate monitoring of the real output power level. Peak power levels are accurately displayed from -50 dB to +5 dB (0.001 — 300 watts with 8 ohm speakers), within  $\pm 1$  dB from -20 to +5 dB, and still within  $\pm 3$  dB at -50 dB.

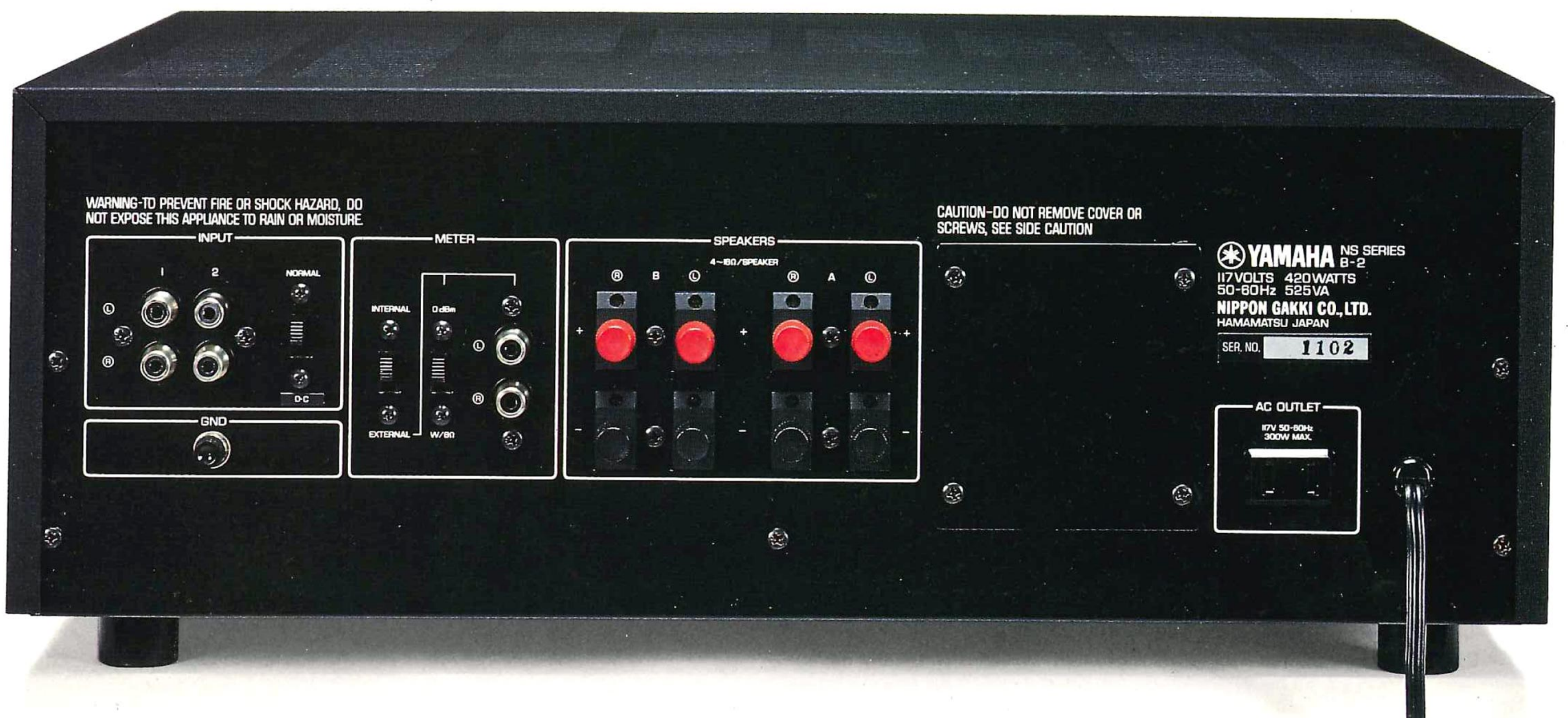


## DC or Normal Operation by Rear Panel Switch

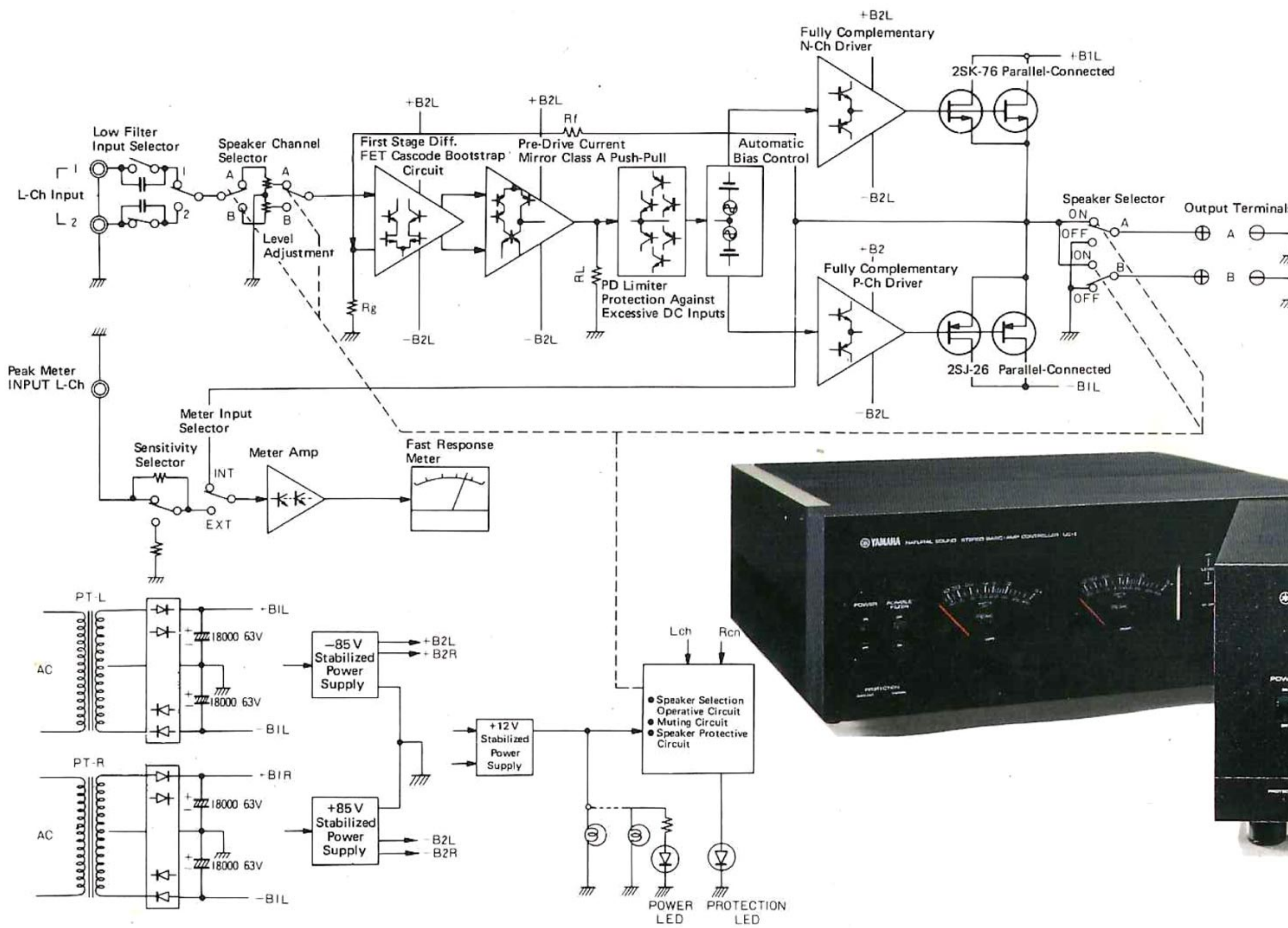
The B-2 will perform as a DC amplifier unless this switch is set to the Normal position, which gives added protection to speakers from the harmful effects that sub-sonic rumble, etc., can have with the DC setting.

## Protection Indicator LED

Positive indication that the B-2 protective circuits are operating.



## BLOCK DIAGRAM



**FRONT: B-2  
REAR: B-1 WITH COMPANION  
UC-I CONTROL UNIT**



## SPECIFICATIONS

<b>Power Amplifier Section</b>		<b>Signal-to-Noise Ratio (IHF-A)</b>	115 dB (with 4.7 kΩ input short)
<b>Continuous rms power</b>	140 + 140 Watts (4 ohms)	<b>Residual noise</b>	0.25 mV
(both channels driven, at rated distortion, from 20 Hz to 20 kHz)	100 + 100 Watts (8 ohms)	<b>Peak Meter Section</b>	
<b>Total harmonic distortion (THD)</b>	0.08% or less at rated output (8 ohms)	<b>Meter range</b>	-50 to +5 dB (0 dB = 8 Ω / 100 W or 0 dB = 0 dBm)
	0.01% or less at 50 Watts output (8 ohms)	<b>Accuracy</b>	+5 to -20 dB ±1.0 dB -20 to -40 dB ±2.0 dB -40 to -50 dB ±3.0 dB
	0.008% or less at 10 Watts output (8 ohms)	<b>Frequency response</b>	20 Hz to 20 kHz ±1.0 dB
<b>Intermodulation distortion</b>	0.03% or less at 50 Watts output (4 & 8 ohms)	<b>Rise/decay time</b>	100 μsec / 1 sec
(70 Hz: 7 kHz = 4:1 SMPTE)		<b>Input terminals</b>	RCA pin jacks for external measurements
<b>Power bandwidth</b>	5 Hz to 100 kHz	<b>Indicator switch</b>	Internal/External on rear panel
(-3 dB, 0.5% THD, 8 ohms)		<b>Input sensitivity/impedance</b>	
<b>Frequency response</b>	DC to 100 kHz +0, -1 dB (DC setting)	Internal	0 dB = 8 Ω / 100 Watts
(1 Watt output, 8 ohms)	10 Hz to 100 kHz +0, -1 dB (Normal setting)	External	0 dB = 8 Ω / 100 Watts / 100 kΩ 0 dB = 0 dBm / 43 kΩ
<b>Phase deviation</b>	+0 to -30° from DC to 100 kHz (10 Watts output)	<b>General</b>	
<b>Input sensitivity/impedance</b>	775 mV / 25 kΩ	Semiconductors	8 Vertical FETs, 4 Horizontal FETs, 95 Bi-polar Transistors, 2 ICs, and 66 Diodes (including LEDs)
<b>Input terminals</b>	1 or 2 (selected by front panel switch) Normal/DC (selected by rear panel switch)	Power supplies (U.S. & Canada)	120 V AC, 60 Hz
<b>Output terminals</b>	A or B speakers	(other areas)	220/240 V AC, 50/60 Hz
<b>Damping factor at 8 ohms</b>	20 Hz; 70 1 kHz; 70 20 kHz; 50	Power consumption	420 W (U.S.), 950 W (other areas)
		Dimensions (W x H x D)	436 mm (17 1/8") x 370 mm (14 5/8") x 151 mm (6")
		Weight	26 kg (57 lbs. 3 oz.)

Specifications subject to change without notice

For details please contact:

SINCE 1887  **YAMAHA**  
 NIPPON GAKKI CO., LTD., HAMAMATSU, JAPAN  
 □ YAMAHA INTERNATIONAL CORPORATION  
 P.O. Box 6600, Buena Park, Calif. 90620 U.S.A.  
 □ YAMAHA AUDIO  
 1330 Portage Ave., Winnipeg, Man. R3G 0V6 Canada  
 □ YAMAHA EUROPA G.m.b.H.  
 2084 Rellingen b. Hamburg, Siemensstr. 22-34  
 West Germany