

Accuphase

CLASS-A STEREO POWER AMPLIFIER

A-60

- Pure Class A operation delivers quality power: 60 watts × 2 into 8 ohms
- Power MOS-FET output stage features 10-parallel push-pull configuration
- Input circuitry with MCS topology ● Current feedback design combines superb sound with total operation stability ● Bridged mode allows use as a monaural amplifier ● Massive "Super Ring" toroidal transformer rated for 1 kVA
- Dual-function power meters show digital readout or bar graph display





Aiming for the ne plus ultra – Experience the peerless sound of pure class A and MOS-FETs. Input stage with MCS topology assures impeccable performance in all aspects with minimum noise and distortion. 10-parallel push-pull power MOS-FETs operating in pure class A, and power supply with massive 1 kVA toroidal transformer deliver linear power into ultra-low impedances down to 1 ohm. 4-step gain selector further reduces residual noise.

The monophonic power amplifier M-8000 as well as the stereo power amplifiers P-7000 and P-5000 from Accuphase are highly acclaimed milestones in the history of high-class amplifiers. Featuring similar design technology as these models, the A-60 is a no-holds-barred pure class A stereo amplifier. Accuphase also has created a long and distinguished line of high-output pure class A amplifiers. The musical qualities of our A-100, A-50, and A-50V models have won the admiration of audio connoisseurs the world over. The A-60 is a worthy heir of this tradition. In the input stage, the inventive MCS principle pushes the noise floor down to amazingly low levels. Current feedback topology combines operation stability with excellent frequency response. Only minimal amounts of negative feedback are needed, which is highly beneficial in terms of sound quality. At the same time, the A-60 is designed to realize two major goals: very low output impedance (Note 1), and constant drive voltage (Note 2).

The power MOS-FETs used in the output stage are renowned for their superior sound and high reliability. Ten pairs of these devices are arranged in a parallel push-pull configuration for each channel. These superb devices are driven in a pure class A circuit configuration. Reflecting Accuphase's vast expertise and unwavering dedication to sound quality, the A-60 brings out even the most delicate nuances in the source with full authority.

Pure class A operation means that the circuit always draws the same amount of power from the power supply, regardless of the presence or absence of a music signal. It is impervious against external influences and has high stability. The output stage produces considerable amounts of thermal energy, but because the MOS-FET devices used in the A-60 have negative thermal characteristics, there is no danger of thermal "runaway" as exists with bipolar transistors. In addition, extra-large heat sinks on both sides of the amplifier help to prevent internal heat buildup.

Another attractive feature of the A-60 is the sophisticated power meters with digital readout and bar graph indication. A dedicated DSP performs arithmetic operations that allow the meters to always show the true power levels of the constantly changing music signal.

Note 1 Low amplifier output impedance

The load of a power amplifier, namely the loudspeaker generates a counterelectromotive force that can flow back into the amplifier via the NF loop. This phenomenon is influenced by fluctuations in speaker impedance, and interferes with the drive performance of the amplifier. The output impedance of a power amplifier should therefore be made as low as possible by using output devices with high current capability. This absorbs the counterelectromotive force generated by the voice coil and prevents the occurrence of intermodulation distortion.

Note 2 The constant drive voltage principle

Even in the presence of a load with wildly fluctuating impedance, the ideal power amplifier should deliver a constant voltage signal to the load. Figure 2 shows the results of actual output voltage/output current measurements at different load impedances for the A-60. It can be clearly seen that output voltage is almost constant at various loads, which means that current increases in a linear fashion. Actual measurements of clipping power have yielded the following figures, which impressively demonstrate the more than ample performance of the A-60: 1 ohm: 513 watts, 2 ohms: 343 watts, 4 ohms: 202 watts, 8 ohms: 110 watts.

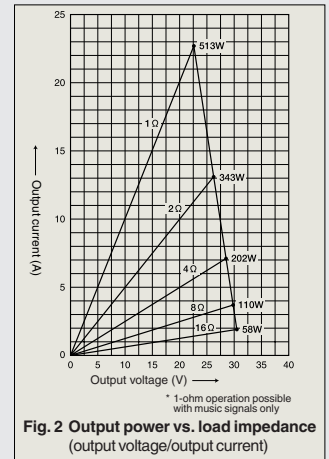
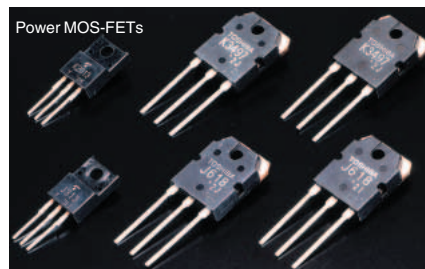


Fig. 2 Output power vs. load impedance (output voltage/output current)

Power MOS-FET output stage with 10-parallel push-pull power units delivers 480 watts into 1 ohm, 240 watts into 2 ohms, 120 watts into 4 ohms, or 60 watts into 8 ohms with outstanding linearity

* 1-ohm loads to be driven with music signals only

The output stage (Figure 1) uses power MOS-FETs. 10 pairs of these devices are arranged in a parallel



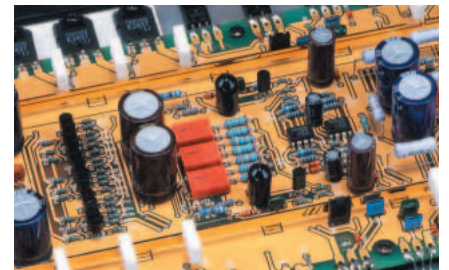
push-pull configuration for each channel. The result is stable operation with ideal power linearity even down to ultra-low impedances. The maximum power dissipation of one MOS-FET is 130 watts, but the actual power load per pair is only 6 watts, so that each device is driven only in its low-power range

where linearity is excellent.

A music signal consists of a continuous succession of pulse waveforms. To prevent clipping on occasional momentary high-level pulses, the maximum clipping level of the A-60 is set to 100 watts per channel into 8 ohms.

MCS topology in input stage reduces residual noise and drastically improves S/N ratio

The input stage which has an important role to play features Accuphase's innovative MCS (Multiple Circuit



Summing) design. Three separate unit amplifiers for the input signal are connected in parallel, which minimizes noise and distortion and greatly improves other performance parameters as well. This manifests itself in further improved sound quality.

Gain control also switches NFB for reduced noise floor

The gain control of the A-60 has four positions: MAX, -3 dB, -6 dB, -12 dB. Reducing the gain also results

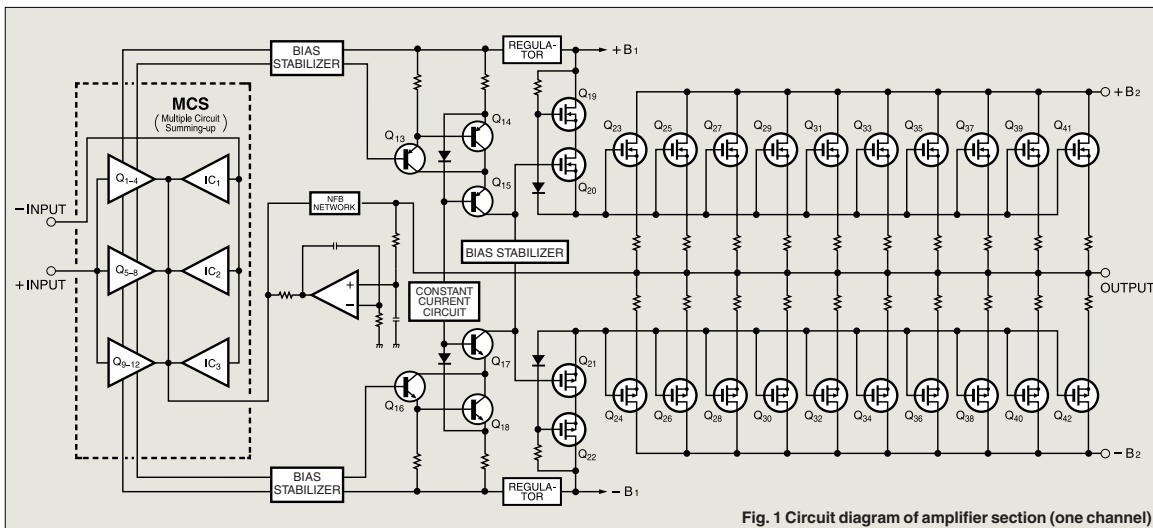
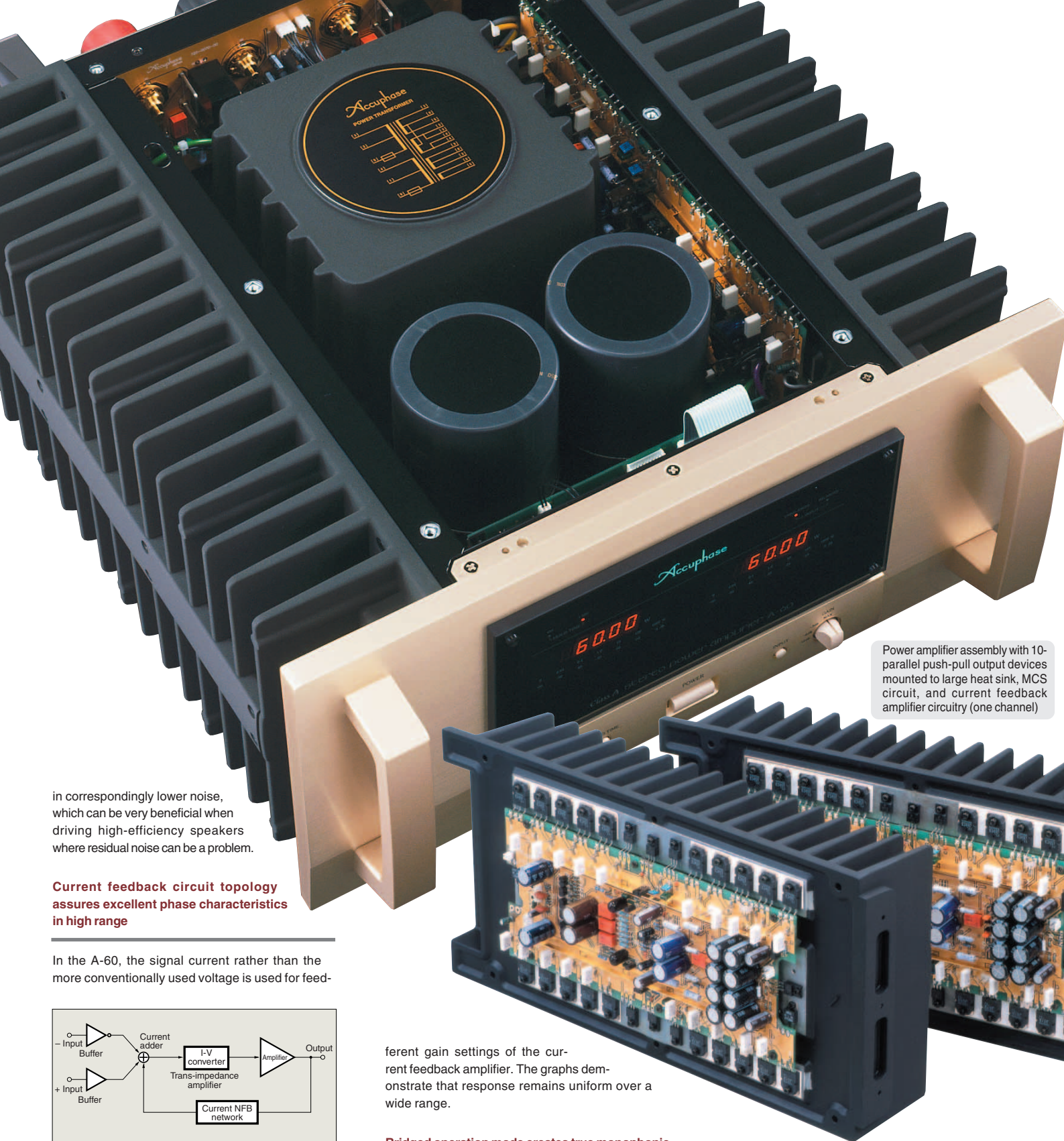


Fig. 1 Circuit diagram of amplifier section (one channel)



Power amplifier assembly with 10-parallel push-pull output devices mounted to large heat sink, MCS circuit, and current feedback amplifier circuitry (one channel)

in correspondingly lower noise, which can be very beneficial when driving high-efficiency speakers where residual noise can be a problem.

Current feedback circuit topology assures excellent phase characteristics in high range

In the A-60, the signal current rather than the more conventionally used voltage is used for feed-

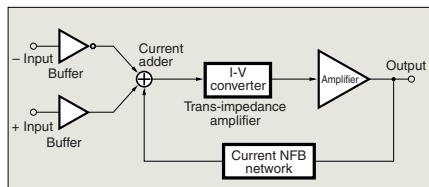


Fig. 3 Principle of current feedback amplifier

back. Since the impedance at the current feedback point (current adder in Figure 3) is very low, there is almost no phase shift. Phase compensation therefore can be kept at a minimum. A minimal amount of NFB results in maximum improvement of circuit parameters. The result is excellent transient response and superb sonic transparency, coupled with utterly natural energy balance. Figure 4 shows frequency response for dif-

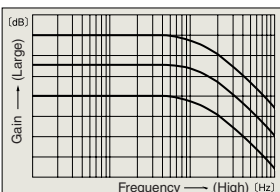


Fig. 4 Frequency response with current feedback (Response remains uniform also when gain changes)

ferent gain settings of the current feedback amplifier. The graphs demonstrate that response remains uniform over a wide range.

Bridged operation mode creates true monophonic amplifier with 960 watts into 2 ohms, 480 watts into 4 ohms or 240 watts into 8 ohms

* 2-ohm loads to be driven with music signals only

Bridged connection turns the A-60 into a monophonic amplifier with four times more power than during stereo operation. The result is an extremely capable performer with almost unlimited reserves.

Robust power supply with large "Super Ring" toroidal transformer and 82,000 µF filtering capacity

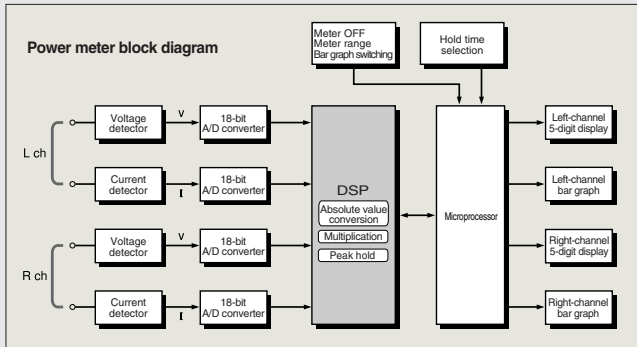
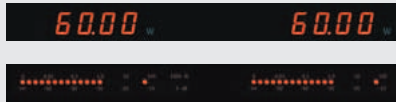
The power supply section is a critical aspect of any power amplifier. The A-60 features a large toroidal power transformer with a rating of about 1 kVA. The transformer is housed in a non-resonant

aluminum enclosure filled with damping material that has excellent heat transfer characteristics. Toroidal transformers which use heavy-gauge copper wiring on a ring-shaped core have important advantages for audio applications, such as very low impedance, small size, and high conversion efficiency.

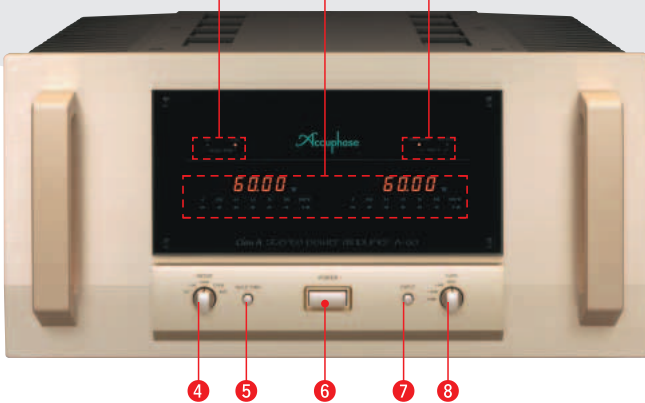


Power meters switchable for digital readout and bar graph indication

The power meters of the A-60 have a dual function. They can show a digital readout of true output power (5 digits), or operate as a bar graph indicator with 25 LED points. The meter selector has positions for meter OFF, different watt ranges, and bar graph operation.



Front panel



Rear panel

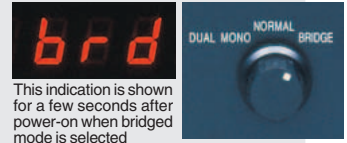


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|--|---|
| 1 Hold time indicator | 9 Left/right channel speaker output terminals |
| 2 Left/right channel power meters (digital readout/bar graph switchable) | 10 Unbalanced inputs |
| 3 Input type indicator | 11 Balanced inputs |
| 4 Meter switch (OFF, range selection, bar graph) | ① Ground |
| 5 Hold time selector (1 second/∞) | ② Inverted (-) |
| 6 Power switch | ③ Non-inverted (+) |
| 7 Input selector | 12 Mode selector |
| 8 Gain selector (MAX, -3 dB, -6 dB, -12 dB) | DUAL MONO NORMAL BRIDGE |
| | 13 AC circuit breaker* |
| | 14 AC power connector* |

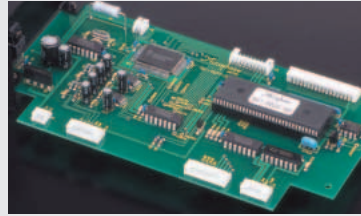
Remarks

- * This product is available in versions for 120/230 V AC. Make sure that the voltage shown on the rear panel matches the AC line voltage in your area.
- * The shape of the AC inlet and plug of the supplied power cord, and the circuit breaker current rating depend on the voltage rating and destination country.

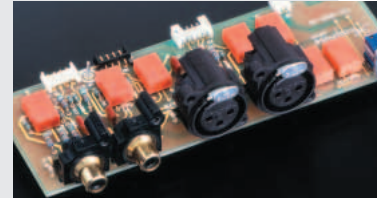
- Oversize speaker terminals compatible with Y lugs and banana plugs
- Balanced connection eliminates induced noise
- Input type selector button (balanced/unbalanced) on front panel
- PCB copper foil and all major signal path components are gold-plated
- Meter hold time can be switched to 1 second or infinite
- Selector allows switching to Dual Mono, Stereo, or Bridged operation



This indication is shown for a few seconds after power-on when bridged mode is selected



Assembly with meter circuitry and protection circuitry



Unbalanced and balanced input connectors



Large speaker terminals



Gold-plated parts

GUARANTEED SPECIFICATIONS

[Guaranteed specifications are measured according to EIA standard RS-490.]

- **Continuous Average Output Power (20 - 20,000 Hz)**

Stereo operation	480 watts per channel into 1 ohm (*)
(both channels driven)	240 watts per channel into 2 ohms
	120 watts per channel into 4 ohms
	60 watts per channel into 8 ohms
Monophonic operation (bridged connection)	960 watts into 2 ohms (*)
	480 watts into 4 ohms
	240 watts into 8 ohms

Note: Load ratings marked (*) apply only to operation with music signals.
- **Total Harmonic Distortion**

Stereo operation (both channels driven)	0.07%, with 2-ohm load
	0.05%, with 4 to 16-ohm load
Monophonic operation (bridged connection)	0.03%, with 4 to 16 ohms load
- **Intermodulation Distortion** 0.003%
- **Frequency Response**

At rated output:	20 - 20,000 Hz +0, -0.2 dB
At 1 watt output:	0.5 - 160,000 Hz +0, -3.0 dB
- **Gain** 28.0 dB (GAIN selector: MAX, stereo/monophonic operation)
- **Gain Switching** Max (28 dB), -3 dB (25 dB), -6 dB (22 dB), -12 dB (16 dB)
- **Output Load Impedance**

Stereo operation:	2 to 16 ohms
Monophonic operation:	4 to 16 ohms

* With music signals only, 1-ohm loads are permissible for stereo operation and 2-ohm loads for monophonic operation.
- **Damping Factor** 100
- **Input Sensitivity (with 8 ohm load)**

Stereo operation	0.87 V for rated output (60 W)
	0.11 V for 1 watt output
Monophonic operation	1.74 V for rated output (240 W)
	0.11 V for 1 watt output
- **Input Impedance** 40 kilohms (balanced), 20 kilohms (unbalanced)
- **Signal-to-Noise Ratio (A-weighted)** 112 dB at rated output, input shorted
- **Output Level Meters (digital and bar graph)**

Digital meters:	5-digit indication, with range selection for 10W/100W/1000W
Bar graph meters:	25-point indication
Hold time:	1 second/∞ (switchable)

* Display can be switched off. * Same indication for left/right in monophonic mode
- **Power Requirements** AC 120 V / 230 V, 50 / 60 Hz (Voltage as indicated on rear panel)
- **Power Consumption**

300 watts idle
550 watts in accordance with IEC-65
- **Maximum dimensions**

Width	465 mm (18-5/16")
Height	238 mm (9-3/8")
Depth	545 mm (21-7/16")
- **Mass**

45.1 kg (99.4 lbs.) net
54.0 kg (119.0 lbs.) in shipping carton

■ Supplied accessories: • AC power cord