

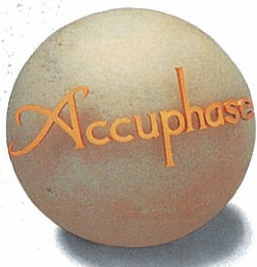
# Accuphase

STEREO POWER AMPLIFIER

# A-50

- Pure Class-A Operation Provides 50 W x 2 (into 8 Ohms) of Quality Power
- Output stage with Power MOSFETs in a 10-Parallel Push-Pull Configuration
- Hybrid IC Module Input Stage for High Performance and Outstanding Reliability
- Digital Power Meters Showing True Power Values





# Pure Class A — The Sound of Excellence. Enjoy Music through Power MOSFET Devices in the Output Stage in a 10-Parallel Even at Load Impedances as Low as One Ohm. Enjoy 50 Watts of High-Quality Power per Channel (into as Monophonic Power Amplifier Delivering a Stunning 2

The A-50 is truly a genuine class-A operation stereo power amplifier built by Accuphase, without any compromise, by pursuing its ideal for reproduced music. Thus, Accuphase incorporates its audio technologies that have been accumulated since its foundation as well as the highest grade electronic devices that are available today.

The advantage of the class-A amplification method is that power fed from the power supply is always constant, regardless of the presence of musical signals or not. This means that the amplifier exhibits high stability, while being subjected to no external interference. Thus, the amount of heat generated from the output stage becomes extremely high. In general, the power consumption of any class-A stereo power amplifier with a rated output of 50W is approximately 200W (about 350W in the case of the A-50), which is dissipated as heat. To counter this heat problem, the A-50 employs an exceptionally large heat sink for both the left and right channels to enhance the effect of heat dissipation, thereby eliminating any trouble due to the concentration of heat in the internal circuitry.

The output power per channel of the A-50 becomes as high as 400W at a 1-ohm load (actually measured value), 200W at a 2-ohm load, 100W at a 4-ohm load, or 50W at an 8-ohm load. Thus, the output power can produce an ideally linear output value despite the fluctuation of the load impedance of a speaker system. For this reason, the A-50 is capable of large output operation even when a low-impedance loudspeaker is connected. This amplifier never appears to be lacking power, having the capability to handle occasional high pulse music signals. Its clipping level is factory-set to approximately 100W at an 8-ohm load.

For its output stage, the A-50 employs power MOSFETs that have an established reputation for their contribution to excellent sound quality and performance reliability. Driving 10 pairs of these field-effect transistors in a parallel push-pull circuit configuration, the A-50 can maintain stable operation even with loads having an extremely low impedance.

The input stage of this power amplifier is a balanced differential input type in a pure complementary push-pull configuration, which is an Accuphase original. This makes it possible to provide for not only a directly connected balanced transmission, but also a direct connection even in the case of normal unbalanced signal transmission without resorting to any conversion circuit. This is done by connecting one input side of a normal unbalanced signal transmission to the ground. Thanks to this input circuit configuration, there is no difference in the quality of sound between the balanced and unbalanced inputs. Also employed in this input circuit is Accuphase's original hybrid module, with all FETs, transistors, and ICs mounted on an alumina ceramic substrate. This hybrid module technology makes it possible to secure high performance, high reliability, and extended stability without being affected by thermal changes.

The power supply unit of the A-50 consisting of a power transformer and filter capacitors is a supply source for all energy. If an amplifier has an inadequate power supply margin, it is apt to have problems, not only in the quality of sound, but also with its basic performance characteristics. Despite the A-50's output capacity of 2 x 50W/8 ohms, the power transformer used is a toroidal coil

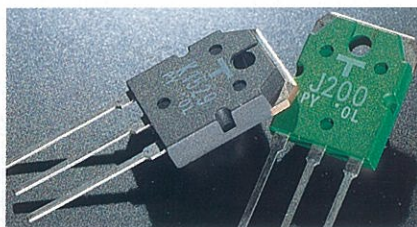
type with a power capacity as large as approximately 1,000VA and the two filter capacitors employed are very large capacitance types. Each of them has a rating of 56,000 $\mu$ F (electric charge capacitance of 3.5 coulombs). The transformer has been housed in an aluminum die-cast enclosure, which is additionally filled with a resin having an excellent vibration-suppressing coefficient of elasticity. This measure successfully isolates the power transformer completely from external electrical and mechanical interference.

The digital peak power meter of the A-50 displays a true power value. The meter first detects the current and voltages and then calculates the power value with a built-in analog multiplier. The output will be further processed by a microcomputer, which incorporates an A/D converter to indicate the true power value of the constantly changing musical signals. This digital power meter can instantaneously read the impedance of the speaker which varies complexly along with different frequencies to display the true power value. The power supply for the digital power meter has its own exclusive transformer to eliminate any adverse effect to the amplifier circuits.



## Guaranteed Linear Power of 200W/2 Ohms, 100W/4 Ohms, or 50W/8 Ohms per Channel thanks to Power Unit with Power MOSFETs in 10-Parallel Push-Pull Configuration.

Fig. 1 is a circuit diagram illustrating the amplifier output stage of the A-50. This output stage features an extravagant circuit configuration in which 10 pairs of power MOSFETs are parallel-connected for each of the N and P channels ( $Q_6, Q_8, \dots, Q_{24}$  for the N channel and  $Q_7, Q_9, \dots, Q_{25}$  for the P channel). Because the permissible power loss is 120 watts per MOSFET employed, the power burden per parallel pair of the MOSFETs becomes



only 5 watts. This means that the amplifier can use a small power range of MOSFETs, which have excellent linearity. In the pure class-A amplification operation of the A-50, a large current always flows through its circuitry, but thanks to this circuit configuration, the current becomes only 1/10 and thus tremendously raises the safety feature of the entire circuitry.

The A-50 provides huge aluminum die-cast heat sinks to cope with the heat generated by the class-A operation. All of these design considerations for ideal power amplification make it possible not only to maintain an extremely stable as 50 watts per channel into 8 ohms operation to the utmost limits, but also to guarantee an ideal power amplification as high as 100 watts per channel/4 ohms, or 200 watts per channel/2 ohms. Thus, the amplifier is capable of delivering large output power even when connected with low-impedance loudspeaker systems.

A musical signal consists of a succession of pulse waves. To prevent occasional instantaneous pulse signals from clipping in normal operation, the maximum clipping level of the A-50 is factory-set to 100W at 8 ohms.

## Modularized Balanced Differential Input Circuits

As shown in Fig. 2, the input stage of the A-50 has Accuphase's original balanced differential, pure complementary push-pull circuit. Its inverted and non-inverted signal input circuits employ FET buffers respectively with a high-input impedance and low-output impedance.

The important parts of this input stage have been made modular by developing a hybrid IC.

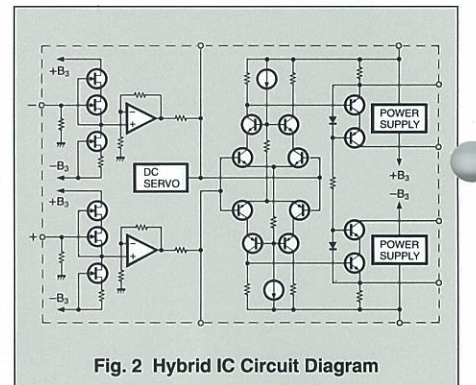


Fig. 2 Hybrid IC Circuit Diagram

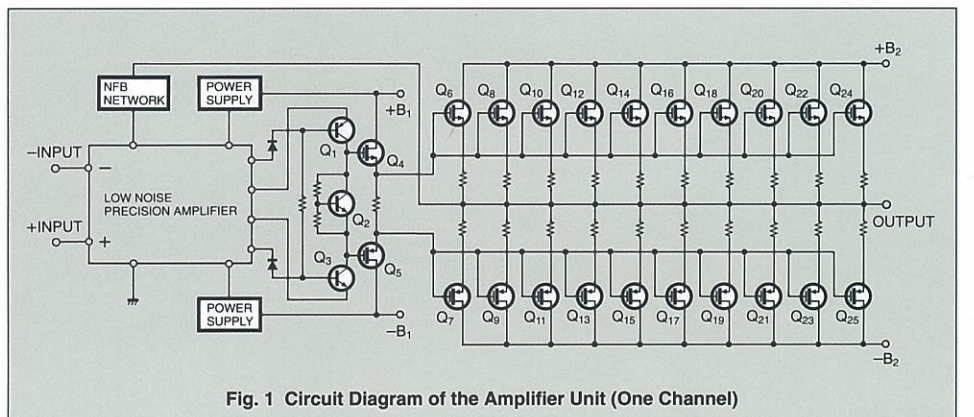


Fig. 1 Circuit Diagram of the Amplifier Unit (One Channel)

inputs. The output side generates non-inverted (+) and inverted (-) signals, which have the same voltage but opposite phase (inverted by 180 degrees), while the input side receives and mixes these two opposite-phased signals through its + and - amplifiers. The noise components of the signals generated in the cable enter both terminals with the same phase, whereby they cancel out each other and disappear when mixed in the input amplifiers.

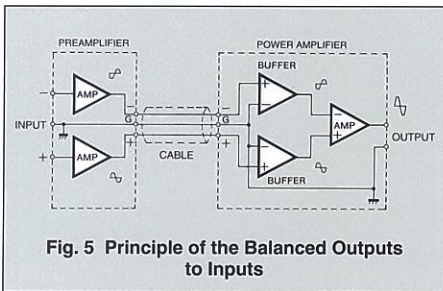


Fig. 5 Principle of the Balanced Outputs to Inputs

The longer the cable between two audio equipment units, the greater the possibility to adversely effect the sound quality due to possible external noise. Thus, a balanced connection provides a possibility for amplifiers to be completely free from such external signal disturbance and to be able to transmit signals of high quality.

As shown in Fig. 6, the A-50 has the most ideal input circuit configuration for a balanced signal transmission by feeding signals directly without any intermediary to the non-inverted (+) and inverted (-) input terminals of its differential input circuit. To achieve this, the A-50 employs two 2-ganged high-quality, precision attenuators, which control the input level of the left and right channels individually in 1dB steps with minimal gang errors. The attenuators are a very high sound quality type. Its resistor element is finished with a mirror-like surface, thus featuring a low distortion factor and an outstanding resistance to wear and tear.

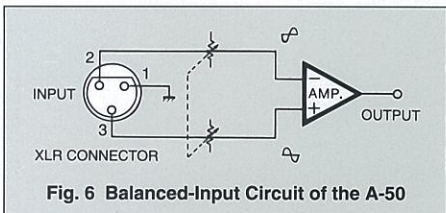
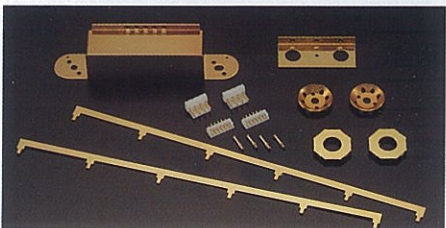


Fig. 6 Balanced-Input Circuit of the A-50

### All Signal Paths Gold-Plated

For the signal paths, through which audio signals flow, Accuphase has since long been using high purity copper. In the A-50, all such signal paths are additionally gold-plated to minimize surface resistance and to ensure smooth current flow.



Since power amplifiers must handle very large currents, the A-50 employs oxygen-free copper (OFC) for each signal path, which is additionally gold-plated. The shielded lead wires to the attenuators use a copper material with much higher purity for further improved sound quality.

### Rigid Aluminum Die-Cast Enclosure Used to Accommodate Large Power Transformer and Large-Capacity Filter Capacitors.

The power supply unit of a power amplifier is an important source of energy. Especially with a class-A power amplifier, its power supply unit becomes more important due to the constant flow of large current. Despite the output capacity of 50W per channel at 8 ohms, the power transformer used in the A-50 is a huge capacity, highly efficient toroidal type with a current capacity as large as 1,000VA. The housing of this power transformer is aluminum die-cast, which is filled with resin with a high vibration-suppressing coefficient of elasticity. This measure makes it possible to shield external interference from the power transformer and assures absolutely quiet operation.



The two filter capacitors employed are a large-capacitance electrolytic capacitor type, each of which has a rating of 56,000µF (an electric charge capacitance of 3.5 coulombs). Conventional type capacitors are normally insulated with a vinyl sleeve, but the capacitors used in the A-50 have a special soft coating of polyurethane material with high elasticity. Thus, it can effectively suppress external vibrations, while maintaining a large capacitance.



### Digital Peak Power Meter for True Power Value Indication.

The A-50 is equipped with a power meter, which displays its readings in digital format for easy

output monitoring. The power meter circuit displays a true power value by reading the actual impedance loads of the speaker systems connected. Fig. 7 shows a block diagram of this power meter. The digital power meter first detects the voltage and the current, which are then calculated by an analog multiplier to produce a power value. This value is further processed to show a digital readout by way of a microcomputer containing an A/D converter.

Because a musical signal is a succession of pulse waves, it is difficult to read the signal accurately with an analog meter. This newly employed digital power meter can, however, read instantaneously the impedance of the speaker, which varies complexly with frequency, and displays the true power output value to the speaker systems connected.

The power meter can display the peak holding time in two different modes, i.e. "1 sec" or "infinity (∞)". The digital display can be totally switched off when not required.

### Ultra-Large Speaker Terminals Allow Banana Plug Insertion.

The A-50 provides ultra-large speaker terminals that can handle very thick speaker cables. Each of these terminals is made by shaping solid bronze material, then gold plated and finally covered with a molded cap for insulation. In addition, each speaker terminal can accept a banana plug.

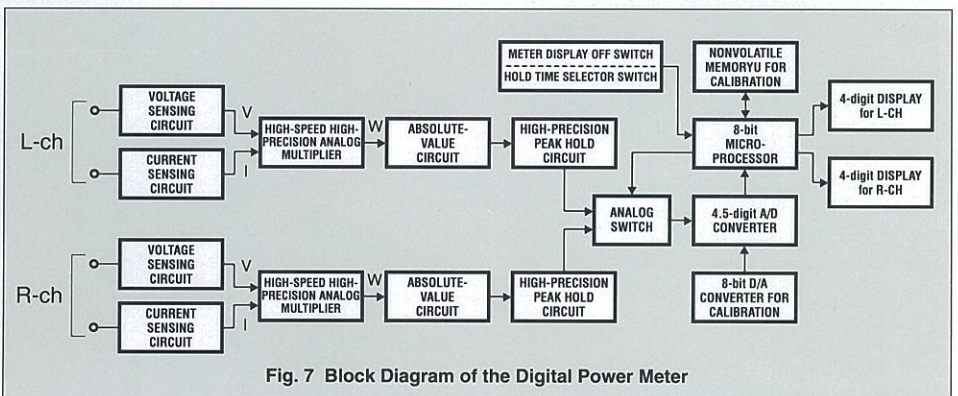
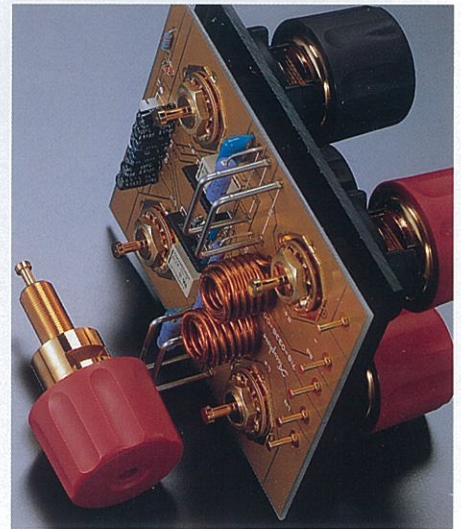
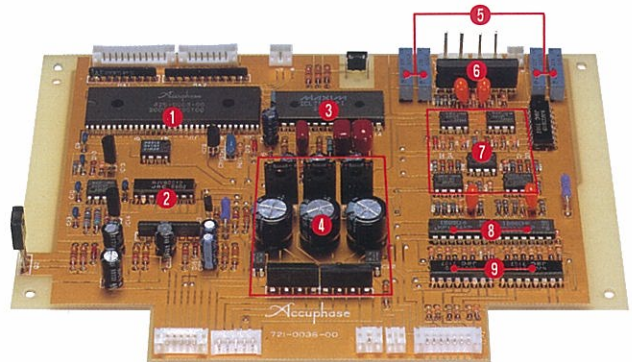


Fig. 7 Block Diagram of the Digital Power Meter

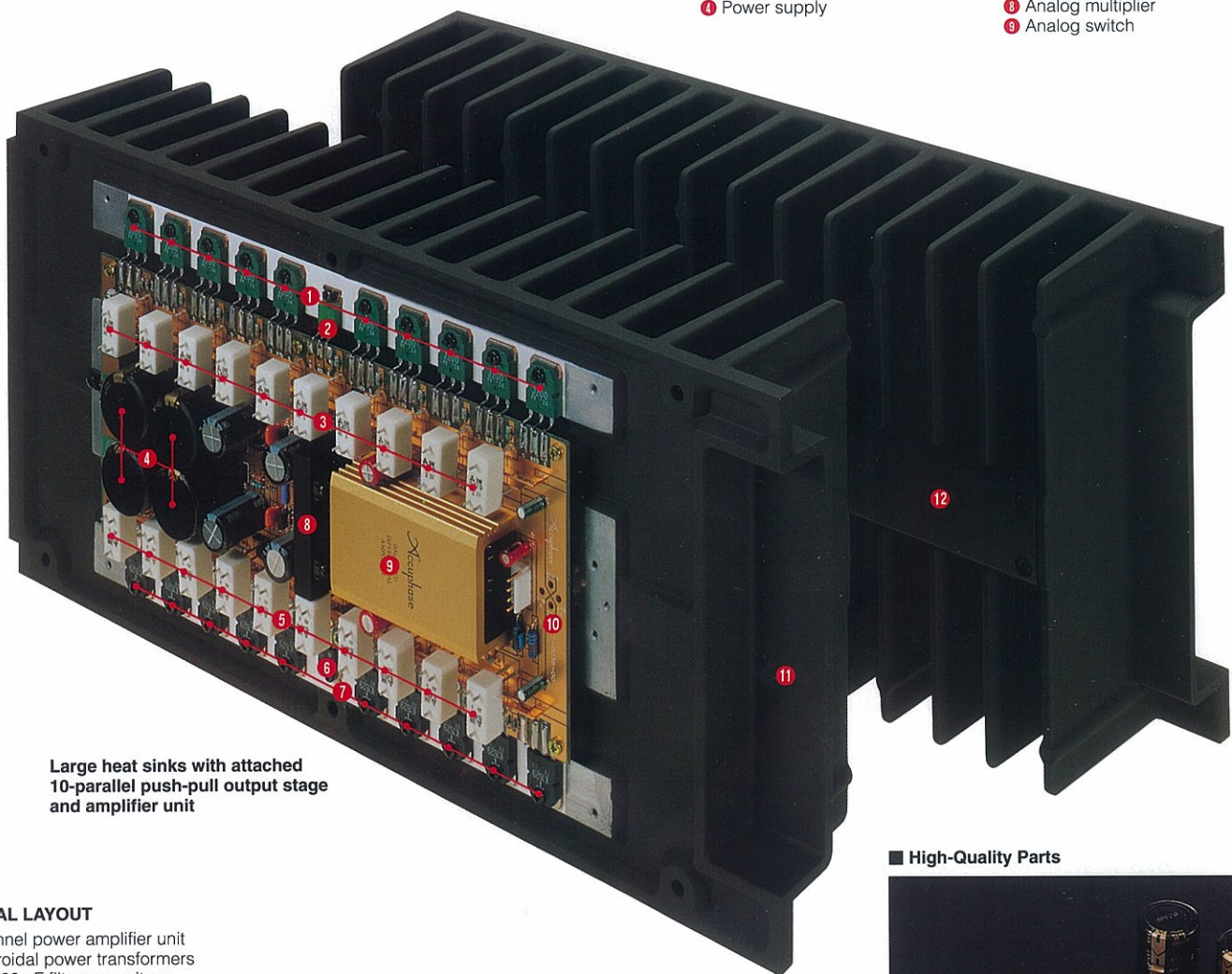
■ Power Amplifier Assembly

- 1 P-channel power MOSFETs in 10-parallel configuration
- 2 P-channel drive MOSFET
- 3 Stabilizer source resistor
- 4 Drive circuit power supplies
- 5 Stabilizer source resistors
- 6 N-channel drive MOSFET
- 7 N-channel power MOSFETs in 10-parallel configuration
- 8 Pre-drive transistor
- 9 Cover of input stage amplifier hybrid IC
- 10 Gold-plated glass epoxy PCB
- 11 Large aluminum die-cast heat sink
- 12 Resonance suppression handle



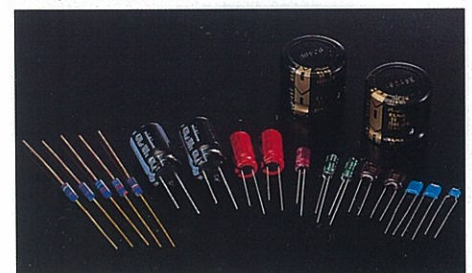
■ Digital Meter Drive Assembly

- 1 8-bit microcomputer
- 2 Offset calibration D/A converter
- 3 Hi-speed A/D converter
- 4 Power supply
- 5 Calibration potentiometer
- 6 Hold-off MOSFET array
- 7 Sample-and-hold circuitry
- 8 Analog multiplier
- 9 Analog switch



Large heat sinks with attached 10-parallel push-pull output stage and amplifier unit

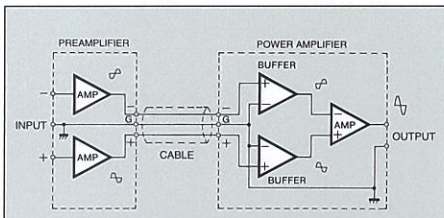
■ High-Quality Parts



■ INTERNAL LAYOUT

- 1 Left-channel power amplifier unit
- 2 Large toroidal power transformers
- 3 Two 56,000  $\mu$ F filter capacitors
- 4 PCB with meter drive and other circuits
- 5 Power meter display switch
- 6 Hold time selector switch
- 7 Right-channel power amplifier unit

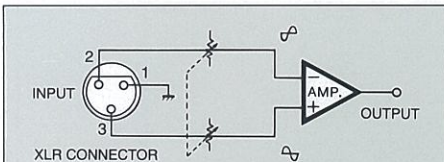
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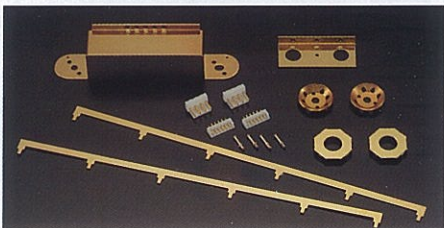
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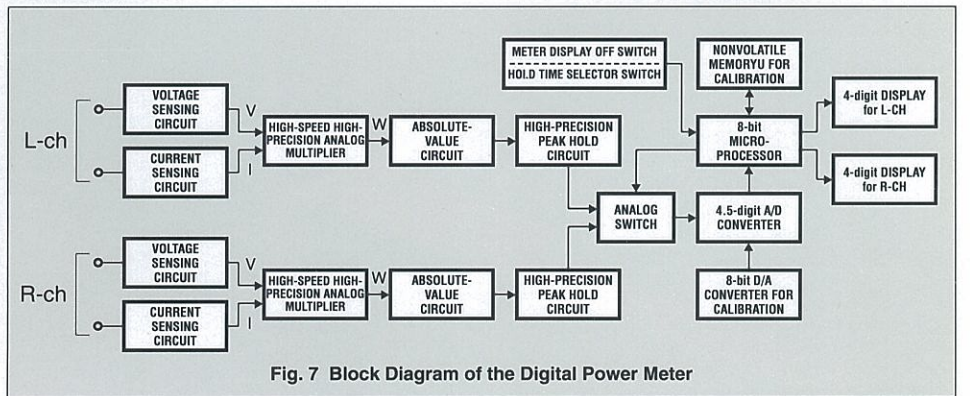
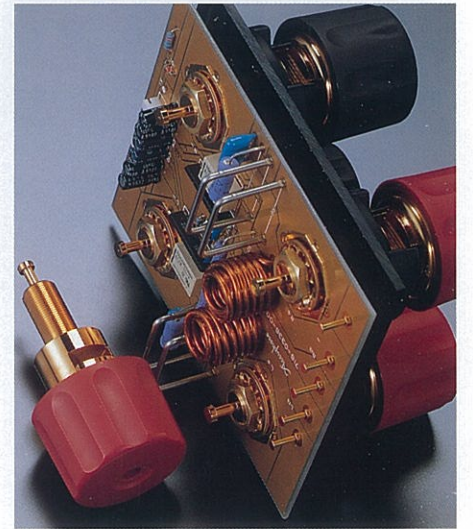
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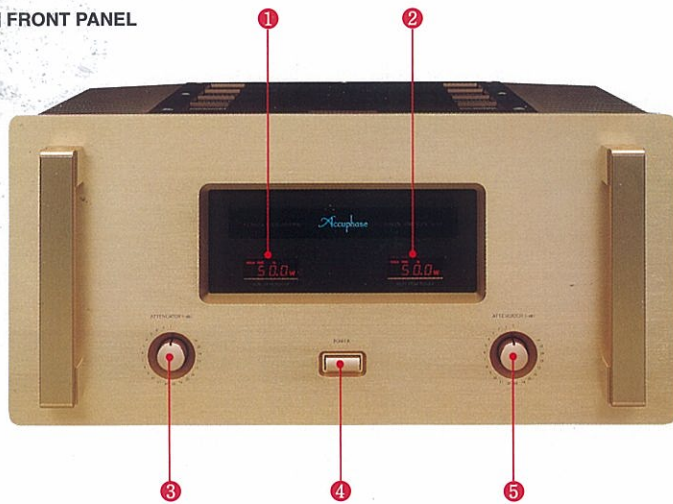
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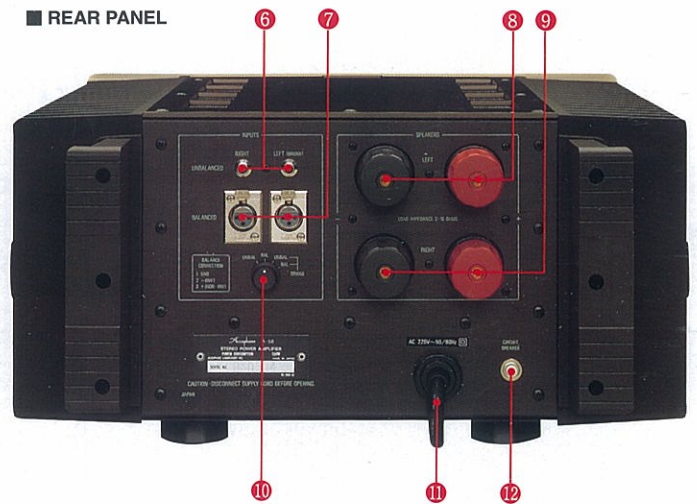


**Fig. 7 Block Diagram of the Digital Power Meter**

FRONT PANEL



REAR PANEL



- 1 Left-channel digital power meter
- 2 Right-channel digital power meter
- 3 Input level control for left channel (up to -20 dB in 1-dB steps and ∞)
- 4 Power switch
- 5 Input level control for right channel

- 6 Unbalanced input jacks
- 7 Balanced input connectors XLR-3-31 or equivalent (1): Ground (2): Inverted (-) (3): Non-inverted (+)
- 8 Left-channel speaker output terminals

- 9 Right-channel speaker output terminals
- 10 INPUTS/BRIDGE selector switch UNBALANCED, BALANCED, BRIDGE UNBALANCED, BRIDGE BALANCED
- 11 AC power cord
- 12 Circuit breaker

**GUARANTY SPECIFICATIONS** (Guaranty specifications are measured according to EIA standard RS-490.)

*enrich life through technology*

**Performance Guaranty**

All Accuphase product specifications are guaranteed as stated.

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

- Stereo mode (both channels driven)
  - 200 watts per channel into 2-ohm load
  - 100 watts per channel into 4-ohm load
  - 50 watts per channel into 8-ohm load
- Monophonic mode (bridge connection)
  - 400 watts into 4-ohm load
  - 200 watts into 8-ohm load

**Total Harmonic Distortion**

- Stereo mode (both channels driven)
  - 0.05%, with 2-ohm load
  - 0.02%, with 4- to 16-ohm load
- Monophonic mode (bridge connection)
  - 0.02%, with 4- to 16-ohm load

**Intermodulation Distortion**

0.003%

**Frequency Response**

- 20 to 20,000 Hz, +0 dB, -0.2 dB (for rated continuous average output, level control at maximum)
- 0.5 to 160,000 Hz, +0 dB, -3.0 dB (for 1 watt output, level control at maximum)
- 0.5 to 110,000 Hz, +0 dB, -3.0 dB (for 1 watt output, level control at -6 dB)

**Gain**

28.0 dB (in stereo and monophonic modes)

**Output Load Impedance**

- 2 to 16 ohms in stereo mode
- 4 to 16 ohms in monophonic mode (bridge connection)

**Damping Factor**

- 160 in stereo mode
- 140 in monophonic mode (bridge connection)

**Input Sensitivity (with 8-ohm load)**

- Stereo mode
  - 0.80 V (for rated continuous average output)
  - 0.11 V (for 1 watt output)
- Monophonic mode (bridge connection)
  - 1.59 V (for rated continuous average output)
  - 0.11 V (for 1 watt output)

**Input Impedance**

Balanced: 40 k ohms; Unbalanced: 20 k ohms

**Signal-to-Noise Ratio (A-weighted)**

110 dB (input short circuit, rated continuous average output)

**Digital Power Level Meters**

- Type: Digital meter for true power value indication
- Display range: 0.1 to 400.0 watts in stereo mode 1 to 2,000 watts in monophonic mode
- Hold time: 1 sec. and infinity (∞) selectable
- Meter display OFF switch: Provided

**Power Requirements**

100 V, 117 V, 220 V, 240 V AC, 50/60 Hz

**Power Consumption**

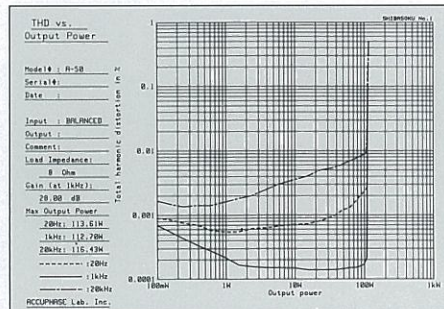
310 watts at zero signal input  
550 W in accordance with IEC-65

**Maximum Outline Dimensions**

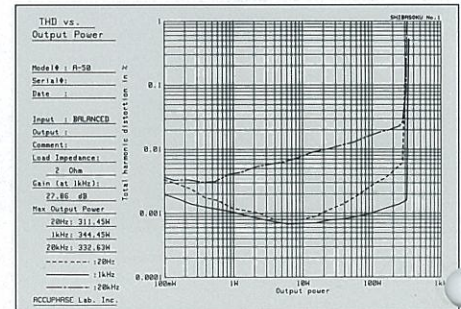
475 mm (18-23/32 inches) width,  
239 mm (9-7/16 inches) height,  
550 mm (19-11/16 inches) depth

**Weight**

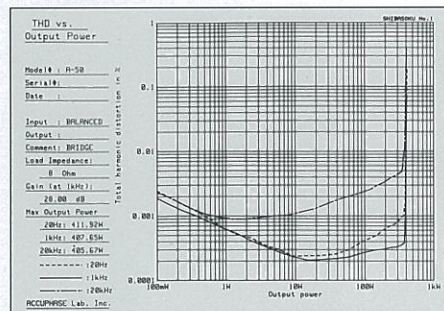
48.5 kg (106.9 lbs.) net  
53 kg (117 lbs.) in shipping carton



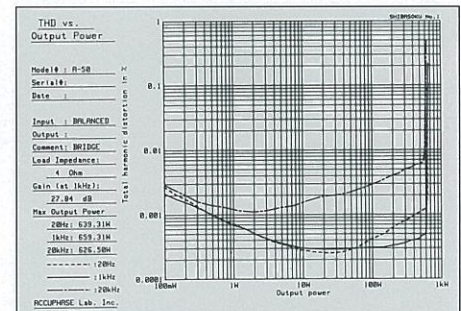
Output power vs. total harmonic distortion (at 8-ohm load, in stereo mode)



Output power vs. total harmonic distortion (at 2-ohm load, in stereo mode)



Output power vs. total harmonic distortion (at 8-ohm load, in monophonic mode)



Output power vs. total harmonic distortion (at 4-ohm load, in monophonic mode)



ACCUPHASE LABORATORY INC.