

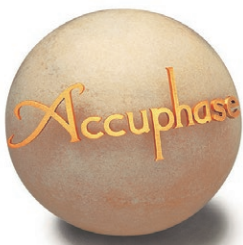
# Accuphase

INTEGRATED STEREO AMPLIFIER

## E-4000

- AAVA volume control
- Power amplification stage configured as instrumentation amplifier
- Four-fold parallel push-pull configuration of power transistors driven in Class AB
- High power output of 180 watts into 8 ohms / 260 watts into 4 ohms
- High damping factor of 800
- Strong power supply with massive high-efficiency toroidal transformer and high-voltage, large filtering capacitors
- Protection circuitry using MOS-FET switches





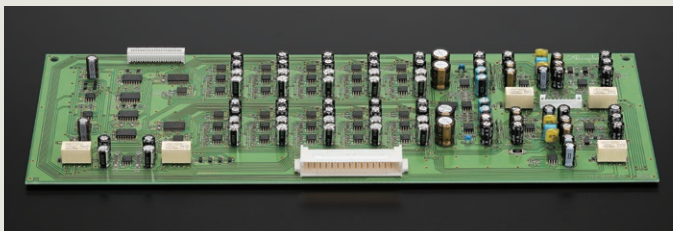
# An integrated amplifier crafted from separate amplifier technologies

The E-4000 integrated amplifier has emerged from separate amplifier technologies. The preamplifier section features AAVA using ANCC to allow for volume adjustments that maintain high levels of vibrancy. The power amp section employs balanced transmission utilizing the instrumentation amplifier principle to drive noise suppression to its limit. The E-4000 is equipped with a four-fold parallel push-pull configuration of power transistors driven in Class AB in the output stage to extract every last ounce of potential from the speakers and create soundscapes filled with subtlety.

## Innovation – At the leading edge of technology

### ■ AAVA volume control circuit

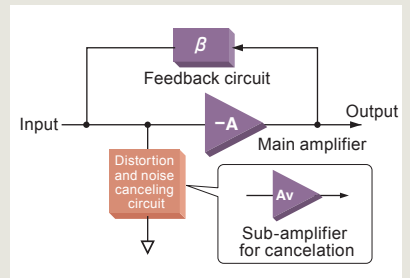
Conventional preamplifiers use variable resistors to adjust volume, which causes contacts to deteriorate and create grit as well as increase noise at normal volume levels. AAVA, however, produces multiple, widely varying signals from the input signal and controls volume by changing the combination of those signals. This achieves minimum noise levels at all volume levels without any grit.



AAVA volume control board

### ■ Drastic reduction of distortion and noise ANCC: Accuphase Noise and distortion Cancelling Circuit

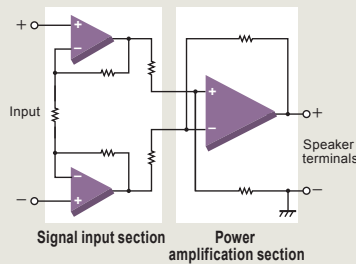
The E-4000 uses ANCC topology for the I-V converter amplifier. This innovative topology adds a sub-amplifier for effectively canceling noise in the main amplifier circuit. The use of low-noise technology in the sub-amplifier (noise density: 1.5 nV /  $\sqrt{\text{Hz}}$ ) further enhances the benefits of ANCC. By incorporating ANCC in the I-V converter amplifier and the balanced amplifier of the AAVA section, a further drastic reduction in noise is achieved, especially at low to medium volume level positions.



Block diagram of ANCC

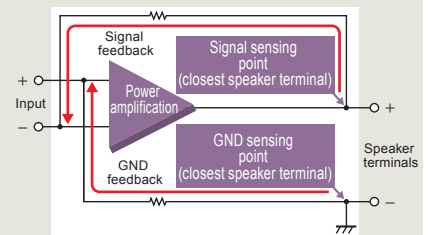
### ■ Instrumentation amplifier

With balanced circuits in the signal input section, the amplification stage is comprised entirely of an instrumentation amplifier principle that equalizes input impedance on the + and – sides, for excellent external noise suppression, and providing optimal circuitry for this high-end audio amplifier.



### ■ Balanced remote sensing

Balanced remote sensing improves damping factor by feeding back the GND at the same time as the signal is output from the speaker terminals.



## Sound quality – Simply aiming for the best

### ■ Robust power amplification stage

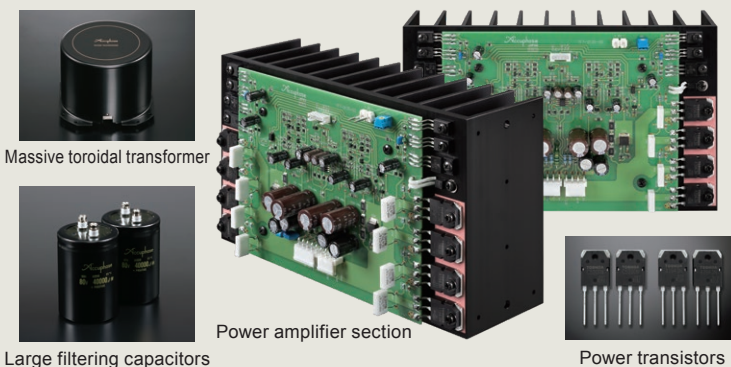
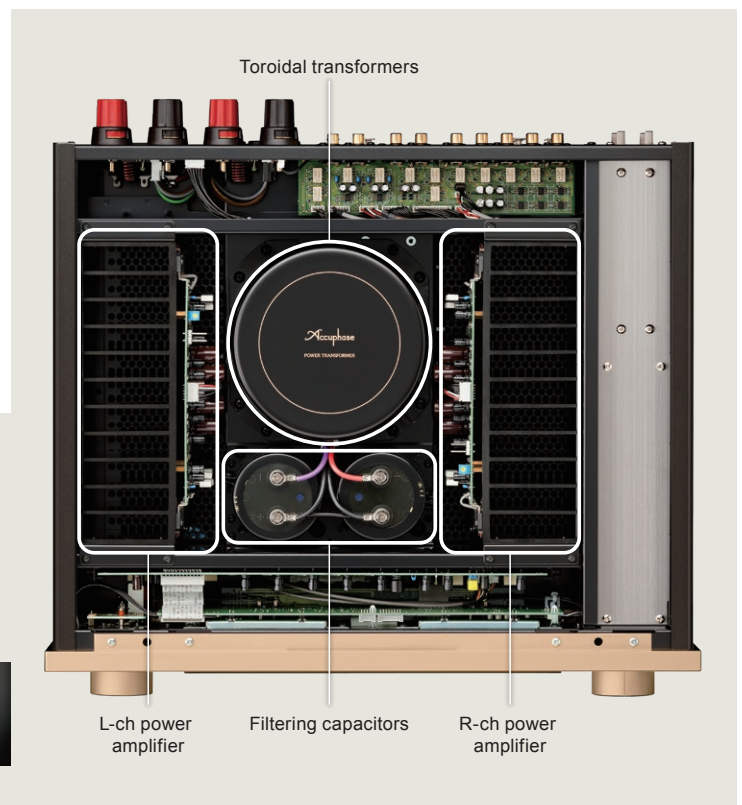
The power amplification stage on both the left and right sides is equipped with a large heat sink and employs four-fold parallel push-pull power transistors driven in Class AB to provide rated, high-power output of 180 watts into 8 ohms and 260 watts into 4 ohms.

### ■ High damping factor brings out the full potential of the loudspeakers

The damping factor represents the amplifier's ability to drive the speakers. A damping factor of 800 (guaranteed) extracts the maximum potential from the loudspeakers.

### ■ Power supply circuitry designed for optimum stability

A strong power supply featuring a massive toroidal transformer and two high-voltage, large filtering capacitors (40,000  $\mu\text{F}/80\text{ V}$ ) offers a stable power supply at all times.



Massive toroidal transformer

Large filtering capacitors

Power amplifier section

Power transistors

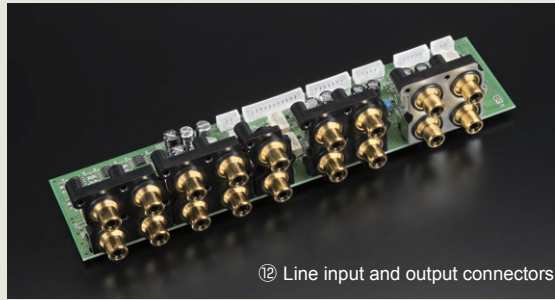
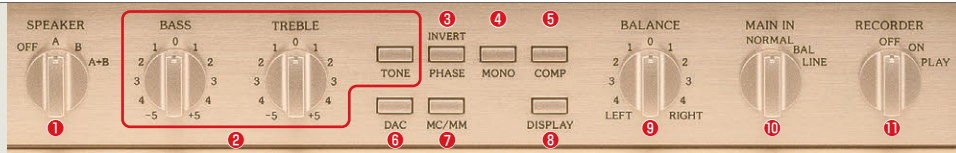
L-ch power amplifier

Filtering capacitors

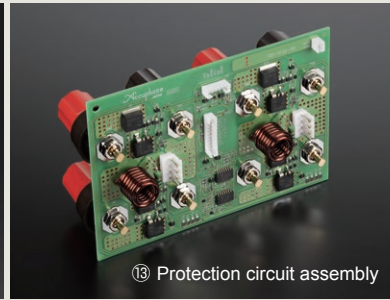
R-ch power amplifier

## Advanced Features

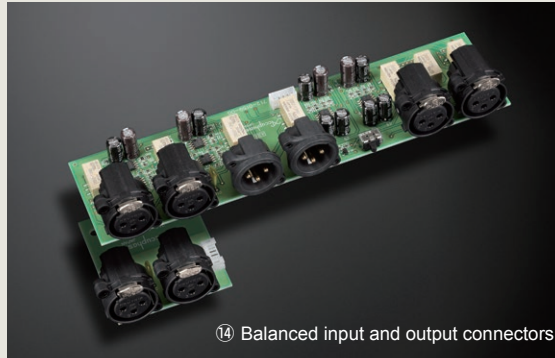
- AAVA volume control circuit
- Highly reliable logic-control signal switching relays
- Power amplification stage configured as instrumentation amplifier
- Current feedback amplification circuit topology assures excellent phase characteristics in high range
- Preamp output connectors (LINE / BALANCED)
- Dedicated, high-quality headphone amplifier
- Volume attenuator that can instantly reduce sound as low as -20 dB
- Speaker output selector .....①
- Tone controls using summing active filters .....②
- Individual phase setting for each input .....③
- Stereo signal can be switched to monophonic operation...④
- Loudness compensator to adjust audible sonic balance...⑤
- DAC input selector (when DAC-60 / DAC-50 / DAC-40 is installed).....⑥
- MC/MM selector (when AD-50 / AD-30 / AD-20 is installed)...⑦
- Display mode selector .....⑧
- Left/right balance control through AAVA .....⑨
- Input selector for power amplifier section (LINE / BALANCED) ...⑩
- Recorder selector .....⑪
- Five sets of LINE input connectors .....⑫
- Speaker output protection circuit guards against short-circuiting .....⑬
- Two sets of balanced line inputs .....⑭
- Two sets of large speaker terminals .....⑮
- Volume display .....⑯
- Sampling frequency display .....⑰ (when DAC-60 / DAC-50 / DAC-40 is installed)
- Highly reliable MOS-FET switches .....⑱
- High-carbon cast iron insulators for superior vibration damping.....⑲



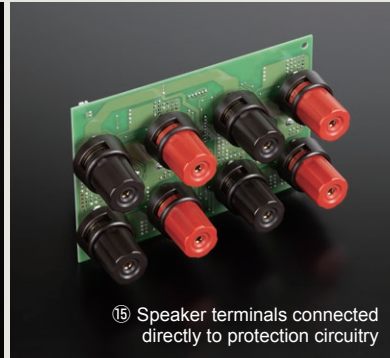
⑫ Line input and output connectors



⑬ Protection circuit assembly



⑭ Balanced input and output connectors



⑮ Speaker terminals connected directly to protection circuitry



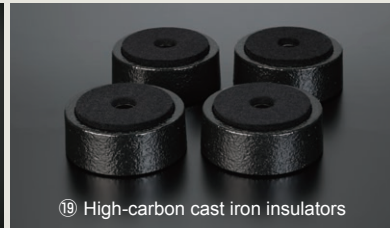
⑯ Volume display



⑰ Sampling frequency display



⑱ MOS-FET switches



⑲ High-carbon cast iron insulators



A highly-sensitive, large analog power meter capable of displaying output levels to -50 dB



Includes CD player operation

Supplied Remote Commander RC-250

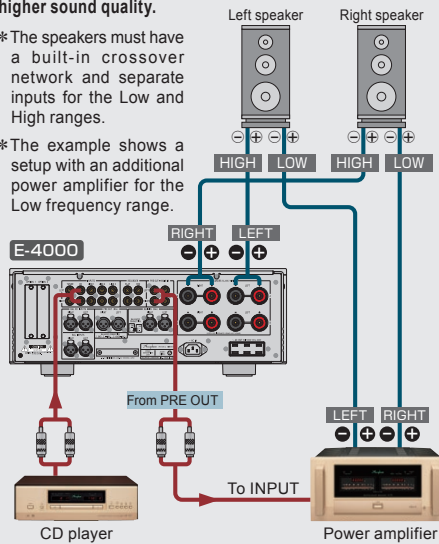


## Bi-amping for Further Enhanced Sound

In a bi-amped setup, the speaker units for the Low frequency range and the High frequency range are driven by separate amplifiers with equal gain, enabling playback with even higher sound quality.

\*The speakers must have a built-in crossover network and separate inputs for the Low and High ranges.

\*The example shows a setup with an additional power amplifier for the Low frequency range.



## Option Boards



Option board installation example

The rear panel expansion slots allow use of three types of option boards (DAC-60, AD-50, LINE-10). Up to two boards can be installed, according to requirements.

The following option boards can also be used:

Digital Input Board	DAC-50 / DAC-40 / DAC-30 / DAC-20 / DAC-10
Analog Record Input Board	AD-30 / AD-20 / AD-10 / AD-9
Line Input Board	LINE-9

### Analog Record Input Board AD-50



Features a high-performance phono equalizer for playback of analog records.

- Supports MC and MM cartridges
- Load impedance selection (MC only)
- Subsonic filter

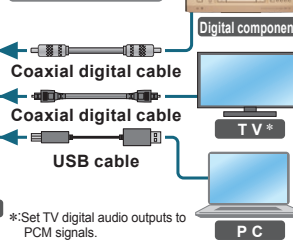
Cartridge	MC	MM
	Gain	66 dB
Input Impedance	30 ohms	47 kilohms
	100 ohms	300 ohms

AD-50

### Digital Input Board DAC-60



Connection example



High-performance DAC with two ES9016K2M chips from ESS Technology driven in parallel.

Input	Signal	Sampling frequencies	Number of bits
USB	DSD	2.8 MHz	1-bit
		5.6 MHz	
		11.2 MHz [ASIO only]	
OPTICAL	PCM	32 to 384 kHz	32-bit
		32 to 96 kHz	24-bit
COAXIAL	PCM	32 to 192 kHz	24-bit

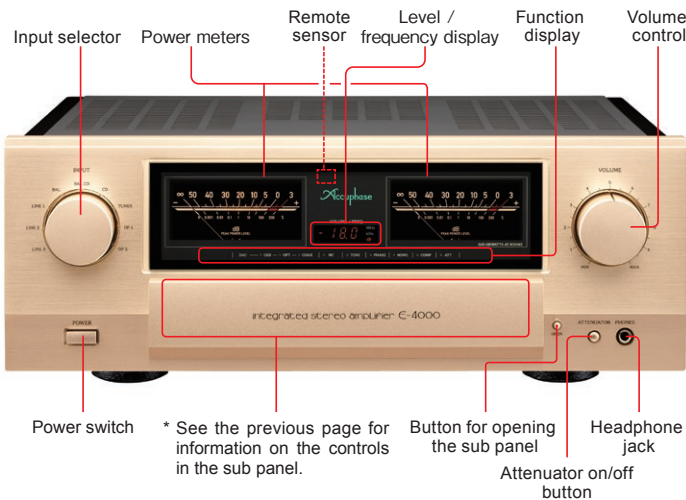
\*:Set TV digital audio outputs to PCM signals.

### Line input board LINE-10



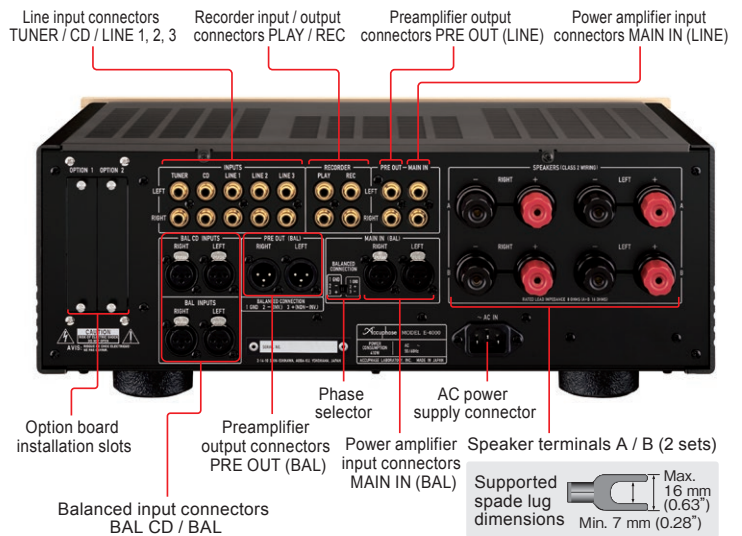
Provides an additional set of unbalanced line level inputs.

## Front Panel



- Input selector
- Power meters
- Remote sensor
- Level / frequency display
- Function display
- Volume control
- Power switch
- \* See the previous page for information on the controls in the sub panel.
- Button for opening the sub panel
- Headphone jack
- Attenuator on/off button

## Rear Panel



- Line input connectors TUNER / CD / LINE 1, 2, 3
- Recorder input / output connectors PLAY / REC
- Preamplifier output connectors PRE OUT (LINE)
- Power amplifier input connectors MAIN IN (LINE)
- Option board installation slots
- Balanced input connectors BAL CD / BAL
- Preamplifier output connectors PRE OUT (BAL)
- Power amplifier input connectors MAIN IN (BAL)
- Phase selector
- AC power supply connector
- Speaker terminals A / B (2 sets)
- Supported spade lug dimensions: Max. 16 mm (0.63"), Min. 7 mm (0.28")

## E-4000 Guaranteed Specifications

Rated Output (20 to 20,000 Hz, 0.05%)	Both channels driven	4-ohm load *	260 W / ch
		8-ohm load	180 W / ch
Total Harmonic Distortion (20 to 20,000 Hz)	Both channels driven	4 to 16-ohm load	0.05%
		Intermodulation Distortion 0.01%	
Frequency Response	At rated output	INPUT (BALANCED / LINE) 20 to 20,000 Hz (0, -0.5 dB)	
	At 1 W output	MAIN IN (BALANCED / LINE) 20 to 20,000 Hz (0, -0.2 dB)	
Damping Factor	800		
	Input Sensitivity	At rated output	INPUT (BALANCED / LINE) 190 mV
EIA (at 1 W output)		MAIN IN (BALANCED / LINE) 1.51 V	
		INPUT (BALANCED / LINE) 14.2 mV	
		MAIN IN (BALANCED / LINE) 113 mV	
Input Impedance	INPUT (BALANCED)		40 kilohms
	INPUT (LINE)		20 kilohms
	MAIN IN (BALANCED)		40 kilohms
	MAIN IN (LINE)		20 kilohms
Max. Input Voltage	INPUT (BALANCED / LINE)		5.0 V
Output Voltage	At rated output	PRE OUTPUT (BALANCED / LINE)	1.51 V
Output Impedance	At rated output PRE OUTPUT (BALANCED / LINE)		50 ohms
Gain	INPUT (BALANCED / LINE) → PRE OUTPUT (BALANCED / LINE)		18 dB
	MAIN IN (BALANCED / LINE) → SPEAKER OUTPUT		28 dB

\*: Limited to music signals

Tone Controls	Turnover frequency and adjustment range	Bass: 300 Hz	±10 dB
		Treble: 3 kHz	±10 dB
Loudness Compensator	+6 dB (100 Hz)		
Attenuator	-20 dB		
S/N Ratio	At rated output (INPUT BALANCED)	INPUT (BALANCED)	102 dB
		INPUT (LINE)	109 dB
	EIA	MAIN IN (BALANCED / LINE)	125 dB
		MAIN IN (BALANCED / LINE)	101 dB
Power Meters	Logarithmic type peak level display of output in dB or %		
Stereo Headphones	Compatible impedance		8 ohms or higher
Power Requirements	120 V, 220 V, 230 V AC (voltage as indicated on rear panel)		
Power Consumption	50 / 60 Hz		
	Idle	54 W	
	In accordance with IEC 62368-1	248 W	
Maximum dimensions	Stand-by 0.3 W		
	Width 465 mm (18.3") × Height 181 mm (7.1") × Depth 428 mm (16.9")		
Mass	Net	24.4 kg (53.8 lbs)	
	In shipping carton	31 kg (69 lbs)	

### Supplied accessories

- AC power cord
- Remote Commander RC-250

### Remarks

- ★ This product is available in versions for 120/220/230 V AC. Make sure that the voltage shown on the rear panel matches the AC line voltage in your area.
- ★ The 230 V version has an Eco Mode that switches power off after 120 minutes of inactivity.
- ★ The shape of the plug of the supplied AC power cord depends on the voltage rating and destination country.



# INTEGRATED STEREO AMPLIFIER E-4000



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The E-4000 is a succession model of E-480, the 12th generation Accuphase Class-AB high-power integrated stereo amplifier.

The Preamplifier section provides a low-noise AAVA volume control with a fully refined circuit configuration and layout.

The Power amplifier section adopted the bipolar transistors in a four-fold parallel push-pull arrangement and made a significant achievement for the driving ability of loudspeakers.

The E-4000 extracts the full potential of any loudspeaker to reproduce sound overflowing with energy and vividness.

# Differences in front view



E-480



Gold-plated ring

Gold-plated ring

Large power meter

E-4000

Machining with end mills

Accuphase Laboratory, Inc.

The front face design has changed from the E-480, with the large power meters in the big glass window surrounded by precise cutting work and the gold-plated rings set at the bottom of the input selector and the volume knob.

## Internal View



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E-4000 has a mono-block construction.

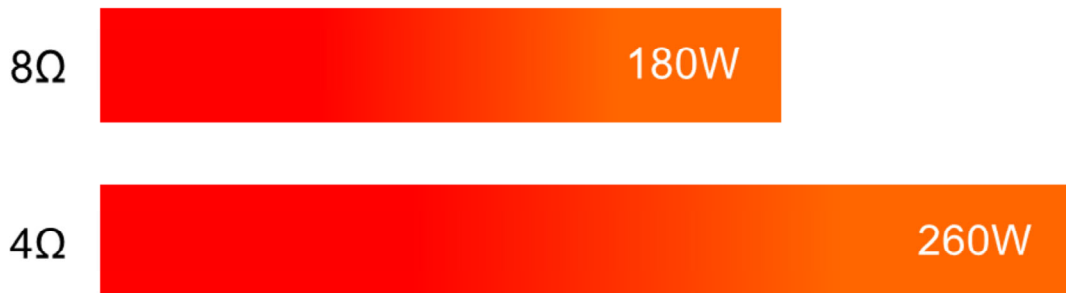
A strong power supply with a massive, specially-made, high-efficiency toroidal transformer and 40000µF filtering capacitors are installed in the unit's center.

In addition, the two power amplifier modules are kept separate for the left and right channels.

The AAVA module is set at the front of the unit to avoid noise interference.

# Output power

- Class-AB 180W / channel into 8Ω load



Continuous average output power

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The E-4000 has the second highest output power in Accuphase integrated amplifiers, and the rated continuous average output power is 180W/8Ω.

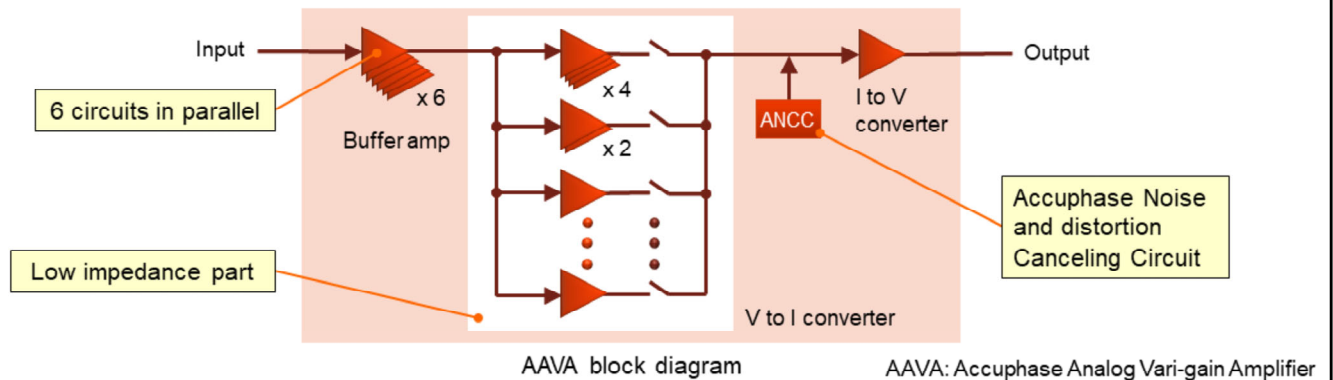
The E-4000 perfectly drives any loudspeakers, even low-efficiency ones.

\*Rated continuous average output power is equal to the E-480



# Improvement of AAVA

- 20% lower noise than the E-480 ( @9 o'clock volume position )
- Utilizing ANCC
- 6 buffer amps paralleled
- Making the V to I Converter low impedance



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AAVA (Accuphase Analog Vari-gain Amplifier) is a volume control principle that eliminates all variable resistors from the signal path.

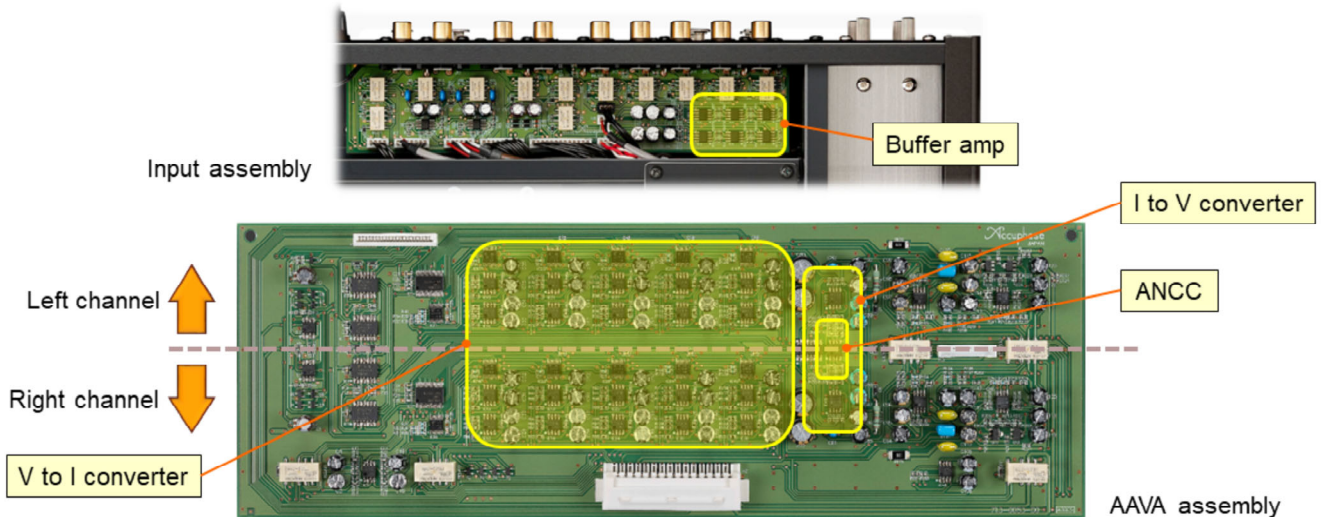
This AAVA volume control is Accuphase's unique technology.

The E-4000's AAVA module contains six paralleled buffer amplifiers and the lower-impedance V to I converter and utilizes the ANCC, so the E-4000 achieved 20% lower noise than the E-480.

\*E-480's AAVA module has no ANCC and five circuits paralleled in the buffer amplifier.

# AAVA implementations

- Placing buffer amps close to input jacks



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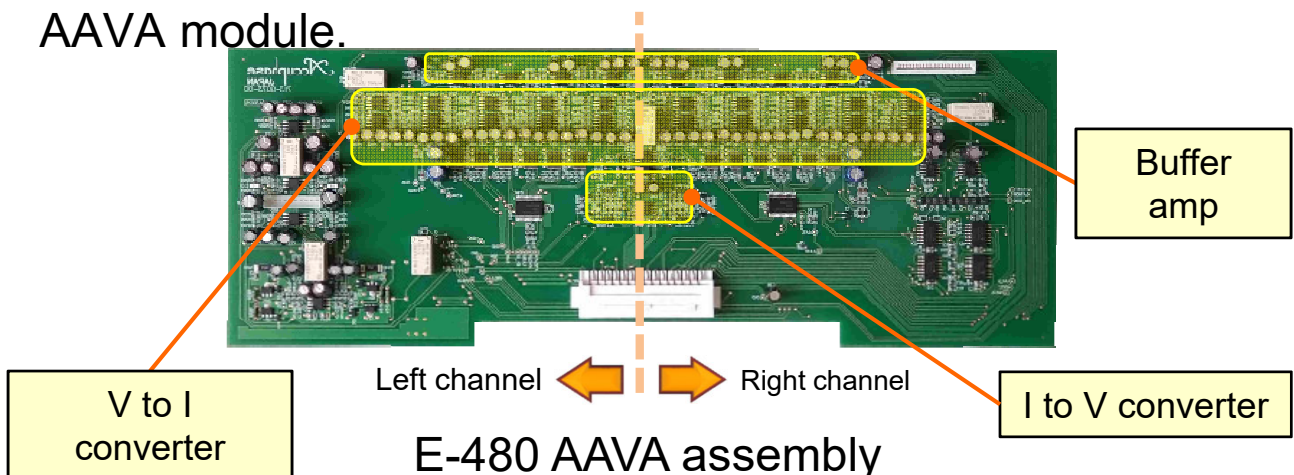
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For the E-4000, Accuphase thoroughly reviewed the AAVA implementations.

Placing the buffer amplifiers close to the input jacks, the E-4000 succeeds in reducing the noise induced between the input jack and AAVA.

Thanks to this, the E-4000 achieves excellent performance in the induction noise rejection, comparable to the balanced AAVA module adopted for the high-grade pre-amplifiers.

\*In the E-480, buffer amplifiers are arranged inside the AAVA module.



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## Super high damping factor

- 33% higher than the former model E-480 and has the same value as Class-A stereo power amp A-48



Guaranteed damping factor

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The E-4000 achieves a guaranteed damping factor of 800.

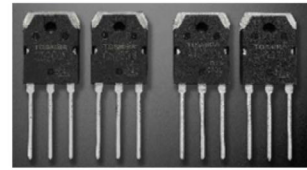
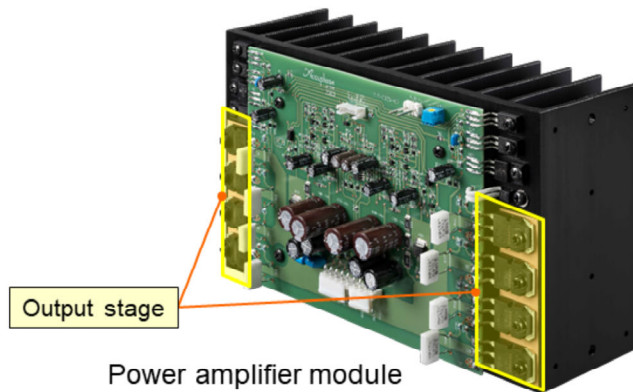
It is 33% higher than the former model E-480 and has the same value as Class-A stereo power amplifier A-48.

\*Damping-Factor, DF: An index of speaker driving ability. A higher Damping-Factor amplifier has higher speaker driving ability.

$DF = 8 \text{ ohm} / \text{Output-impedance}$

# Technology for high damping factor

- Very low output impedance power amp engine
  - Bipolar transistor 4 parallel push-pull output stage
  - Same circuit configuration as Class-AB stereo power amp P-7500



The bipolar transistor in the output stage  
Absolute maximum ratings: 230V/15A

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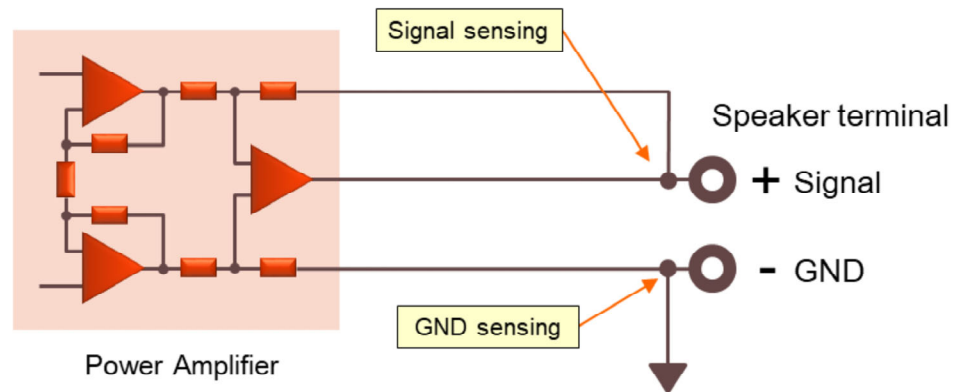
The Circuit configuration of the power amplifier engine is as same as the flagship Class-AB stereo power amplifier P-7500.

The output impedance is lower by four-fold parallel push-pull output stage arrangements of bipolar transistors.

\*E-480 has three-fold parallel push-pull output stage arrangements of MOS-FET. Absolute maximum ratings of E-480's MOS-FET: 200V/12A

# Technology for high damping factor

- Balanced Remote-sensing
  - Feedback from speaker terminal proximity
  - Signal-line and GND-line sensing



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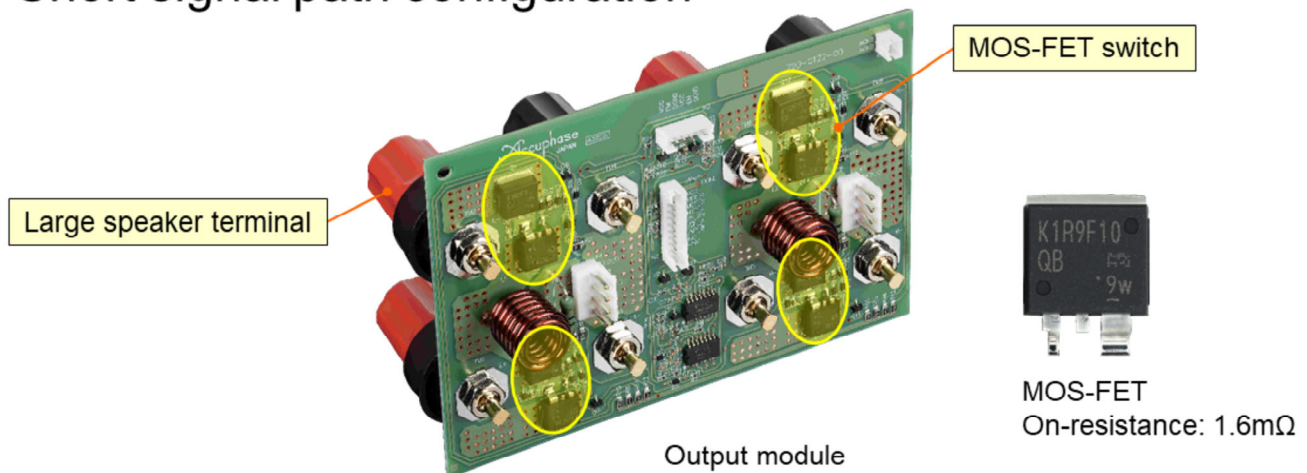
Remote sensing is the technique to lower the amplifier's output impedance by the negative feedback with signal sensing from nearby the speaker terminals.

Balanced Remote-sensing is the technique to lower the output impedance by both the signal sensing and the GND senses.

Not only the Damping Factor but also Total Harmonic Distortion and Intermodulation Distortion are all improved by the Balanced Remote-sensing.

# Technology for high damping factor

- Speaker protection equipped with the MOS-FET switch circuit
- Short signal path configuration



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Mechanical relays are the typical components for speaker protection, but the contact resistance of mechanical relays is higher than people think.

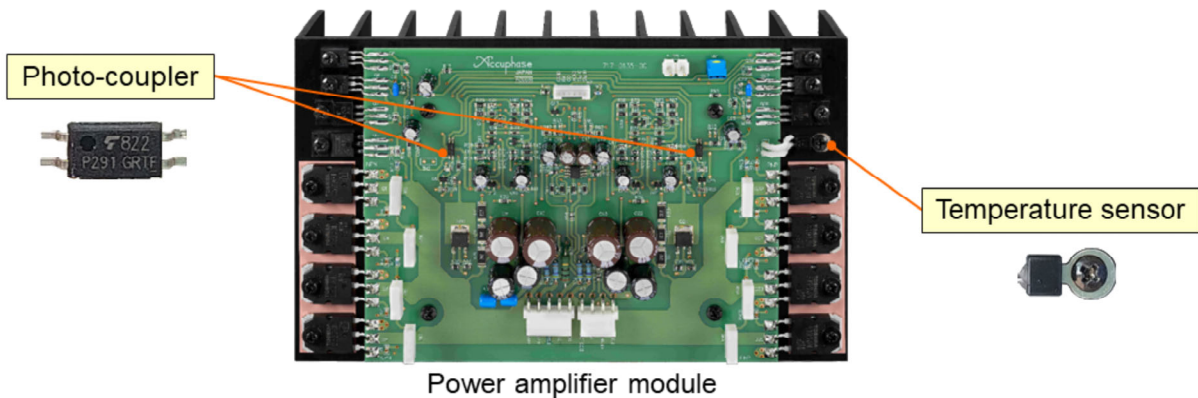
Therefore, Accuphase has chosen the MOS-FET switch instead of conventional mechanical relays for speaker protection.

Thanks to this MOS-FET switch, the damping factor, reliability, and sound quality are all improved. E-4000 adopted a new MOS-FET with a very low on-resistance of 1.6mΩ (E-480 used 2.0mΩ on-resistance MOS-FET). E-4000 employs carefully-selected very low-impedance components such as the large speaker terminals.

Making signal paths thick and short also helps attain low impedance.

# Pursuing further product safety and reliability

- Power amplifier
  - Newly-developed protection circuit using Photo-couplers
  - Temperature sensors are installed on the heatsink



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The newly designed output protection circuit can detect any short-circuiting of the speaker terminals with due consideration for product safety.

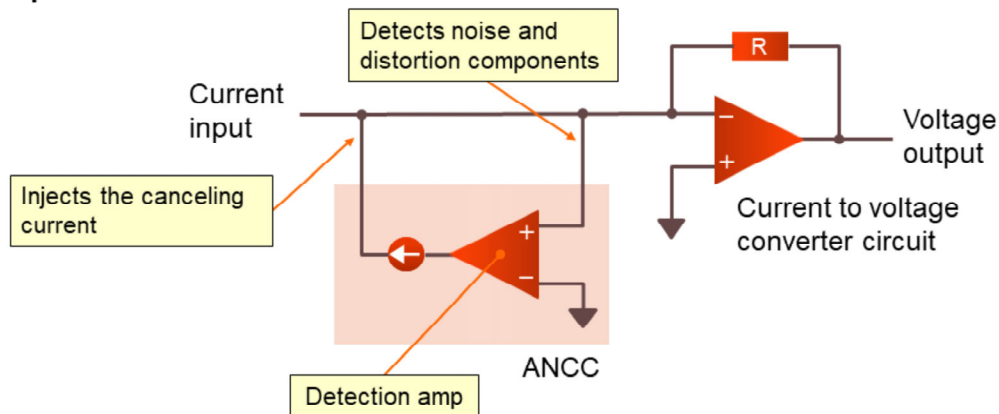
Temperature sensors that detect the heatsink temperature are installed on the heatsink. Thanks to this, the unit accurately ascertains the high-temperature alarm in the power amplifier section.

Thanks to the photo-coupler, the detected short-circuiting information is completely isolated from the music signal to minimize the negative effects on the sound quality.

\*When these protection circuits are activated, the unit completely interrupts speaker output and makes the power meters flash to indicate the abnormal condition.

## Appendix "ANCC"

- ANCC: Accuphase Noise and distortion Canceling Circuit
  - To detect and cancel the noise and distortion at the input stage of the amplifier



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ANCC: "Accuphase Noise and distortion Canceling Circuit" is installed in AAVA's current-to-voltage converter.

Canceling noise and distortion are realized by detecting the components of noise and distortion at the input stage of an I-V converter circuit and by injecting the canceling current, which contains the reversed polarity of those components.

ANCC is a highly effective technology at any volume position.