Accuphase

PRECISION STEREO PREAMPLIFIER

C-290V

● Current feedback circuit topology assures great sound and stable operation ● Printed circuit boards using Teflon base ● Fully modular construction with separate units for all amplifier stages ● Four-gang volume control with CP resistor elements ● Amorphous-core power transformers ● Logic-controlled relays for short signal paths ● Optional analog record playback capability ● Exquisite persimmons wood cabinet

A new chapter in analog excellence — The ultimate analog preamplifier with current feedback design. Teflon-base printed circuit boards assure optimum performance and reliability. High-quality four-gang volume control uses CP elements. Fully dual-mono construction with separate amorphous-core power transformers for left and right channels. Optional phono equalizer unit allows top-quality analog disc reproduction.

The C-290V is based on balanced signal transmission technology originally introduced with the C-290. It also makes use of the current feedback principle developed by Accuphase and highly praised throughout the audio world for its superb performance and sound quality. All circuit aspects were further refined and brought to an even higher level of perfection. All circuit parts and components were individually selected on the basis of their sonic properties. The result is an analog preamplifier that stands at the very pinnacle of its field.

In its standard configuration, the C-290V is a pure line-level amplifier, but by installing the optional phono equalizer unit AD-290V, it allows top-grade analog disc reproduction as well. The balanced output stage employs complementary bridged feedback which allows total isolation from the ground line. The printed circuit boards which play a very important role in the sound of a preamplifier are made from a Teflon material (glass fluorocarbon resin) with low dielectric constant and low loss. Gold-plating of all signal traces further improves reliability and signal purity for optimum sound.

The four modules which house the line input and balanced output circuitry use specially thick aluminum with high rigidity. The modules are arranged on a motherboard firmly mounted to a hard aluminum chassis for electrical isolation and mechanical vibration suppression. Complete dual-mono construction with separate power transformers and filtering capacitors reliably prevents any unwanted interaction between the two stereo channels.

The core of the power transformers is made of an amorphous alloy core with outstanding frequency characteristics. The volume control which is another important aspect is a four-gang type which uses CP (conductive plastic) resistor elements for exceptionally clean sound. Hermetically sealed, logic-controlled relays at strategic locations make it possible to keep signal paths extremely short. Every single part and every choice of material serves one overriding goal: to reproduce music with the true splendor of a live performance.

Current feedback topology prevents phase shifts

The amplifying circuits in the C-290V use the current feedback method for negative feedback. The operating principle is shown in Figure 2. At the input point of the feedback loop, the impedance is kept low and current detection is performed. A trans-impedance amplifier then converts the current into a voltage to be used as the feedback signal. Since the impedance at the current feedback point (current adder in Figure 2) 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 3 shows frequency response for different gain settings of the current feedback amplifier. The graphs demonstrate that response remains uniform over a wide range.

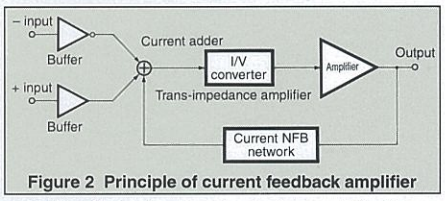


Figure 2 Principle of current feedback amplifier

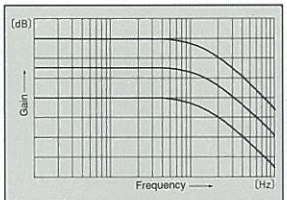


Figure 3 Frequency response with current feedback (response remains uniform also when gain changes)

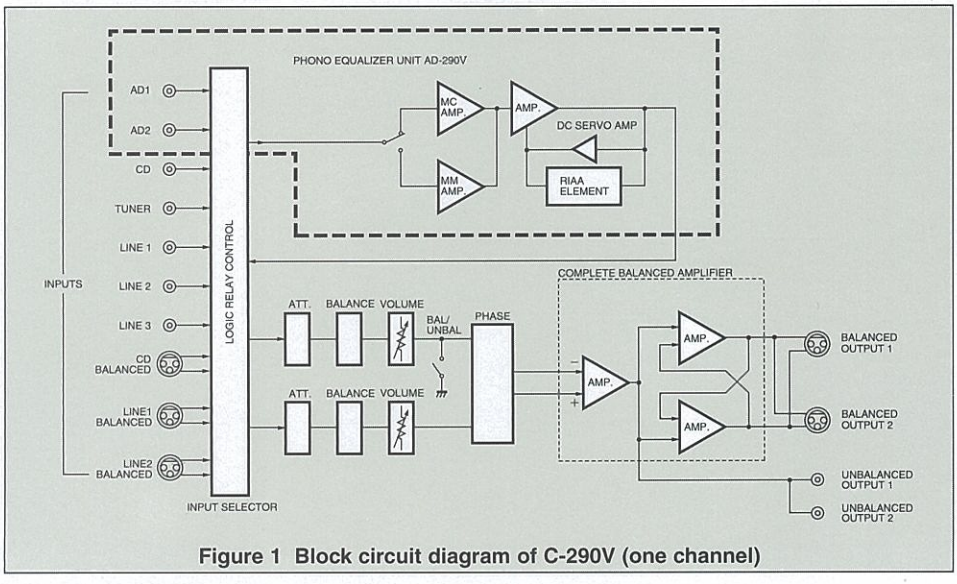


Figure 1 Block circuit diagram of C-290V (one channel)

Balanced output stage with bridged feedback

In balanced signal transmission, two identical signals are transmitted simultaneously with inverted phase and combined at the receiving end, thereby canceling out common-mode noise and interference. This principle is one of the requirements for truly high-quality sound.

The principle of balanced sound transmission is shown in Figure 4. The outputs of the two amplifiers AMP2 and AMP3 are connected to form a cross-feedback loop, which sends the symmetrical (+) and (–) signals with low impedance to the next stage. The signals are isolated from the ground line, resulting in an ideal balanced circuit. Even if one side of the output is grounded, both amplifiers continue to operate, and the output voltage does not change.

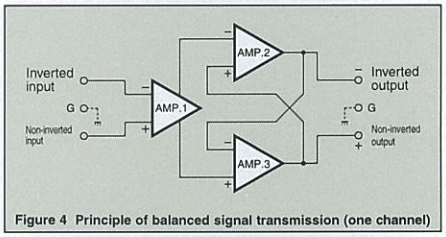


Figure 4 Principle of balanced signal transmission (one channel)

Discrete line amplifier designed for sound quality

The line amplifier is a pure complementary push-pull circuit. It is built from discrete components and employs the superior current feedback principle. Phase compensation can be kept to a minimum, resulting in realistic ambience.

Printed circuit boards made from Teflon material (glass fluorocarbon resin) with low dielectric constant and low loss

The printed circuit boards consist of a glass fluorocarbon resin material which has a stable, low dielectric constant as well as superior heat resistance and high-frequency characteristics. It is therefore found mainly in demanding applications such as SHF band satellite transmissions and high-precision measuring instruments. Since printed circuit boards inevitably act to a certain extent as a dielectric, it is vital to choose a material that provides all the required physical properties while having a low dielectric constant. The glass fluorocarbon resin fulfills all of these requirements, and gold-plated copper traces further contribute to sonic purity.

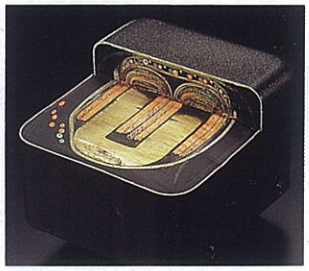
*Teflon is a registered trademark of DuPont USA.

Complete mono construction with separate amorphous-core transformers for left and right channels

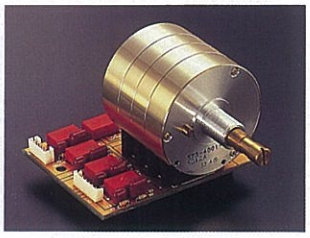
The power supply of the C-290V employs a dual-mono approach with separate power transformers and filtering capacitors for the two stereo channels. Each unit amplifier is equipped with a wide-range low-impedance voltage regulator to eliminate possible interference between stages.

The power supply circuitry not only serves as energy source, but its load current also has considerable bearing on sound quality. The power

transformers which play a particularly important role possess an amorphous alloy core which assures high operation stability even at high frequencies. Amorphous alloys are produced by rapidly cooling liquid metal, which results in a non-crystalline structure. This provides important advantages in magnetic as well as mechanical properties, ideal for audio applications.



Four-gang volume control with CP resistor elements

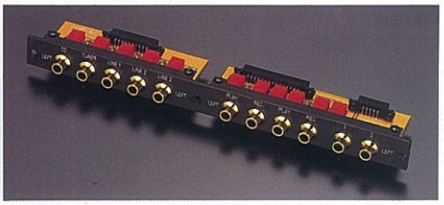


The volume control uses CP (conductive plastic) resistor elements which are produced by a printing process followed by a forming stage under high pressure at high temperature. This creates a mirror-like surface with minimum contact resistance and negligible distortion.

The 8 mm thick brass shaft is supported by bearings made of a precision machined aluminum block, and each of the four resistor elements is housed in a precision machined aluminum case acting as a highly efficient shield. The control uses continuous adjustment which is the most favorable principle in terms of sound quality.

The tracking error is kept to an amazing 0.5 dB at -60 dB.

Logic-controlled relays for signal switching assure high sound quality and long-term reliability



The use of logic-controlled relays at strategic locations makes it possible to keep signal paths extremely short. The relays used in the C-290V are high-performance hermetically sealed types as used in professional communication applications. The contacts are twin crossbar types plated with gold and silver palladium alloy, for minimum contact resistance and outstanding long-term reliability.

Vibration-free design with unit amplifiers in aluminum enclosures fastened to 8-mm hardened aluminum chassis

The C-290V has four unit amplifiers, two each for the line input and line output in each channel. Each unit is powered by its own local voltage regulator circuitry, and is housed in a strong aluminum enclosure, to prevent interference between units.

Twelve inputs and six outputs with alphanumeric display

To accommodate today's enormous variety of program sources, the C-290V offers nine RCA type input pairs, plus three balanced inputs. An alphanumeric display on the front panel shows at a glance which input is selected. Six outputs further add to the versatility of the unit.

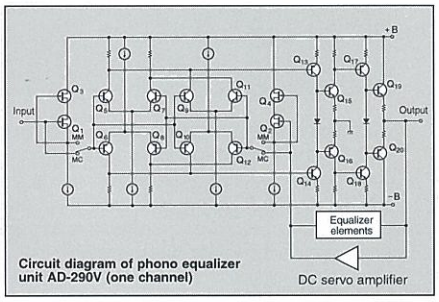
Balance control with alphanumeric display

The pushbutton balance control uses 1-dB step attenuators and allows settings from 0 dB to -6 dB and ∞. The adjustment values are shown on the front panel.

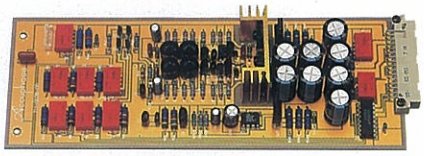
Dedicated phono equalizer unit AD-290V

Audiophiles with a collection of analog records will welcome the capability of the C-290V to reproduce analog discs with sonic quality of the highest caliber. The separately available phono equalizer unit AD-290V is designed for simple installation in a dedicated rear-panel slot.

The unit uses printed circuit boards made from Teflon material (glass fluorocarbon resin) and is housed in a sturdy aluminum case for complete protection against any external interference. Complementary push-pull circuitry is employed throughout, with dedicated input stages for MM and MC cartridges. The MM input uses FET devices with high S/N ratio, whereas the MC input employs a differential configuration of extremely low-noise devices, ideal for providing the low impedance required by moving-coil cartridges with their low output levels. MC input impedance can be switched in three stages (10/30/100 ohms). MM input impedance is fixed to 47 kilohms. To match the output of the cartridge, MC gain can be set to 62 or 68 dB, and MM to 30 or 36 dB. All of these functions can be controlled at the front panel of the C-290V.

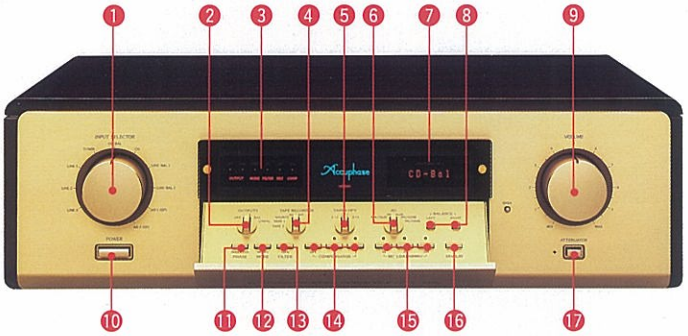


Circuit diagram of phono equalizer unit AD-290V (one channel)

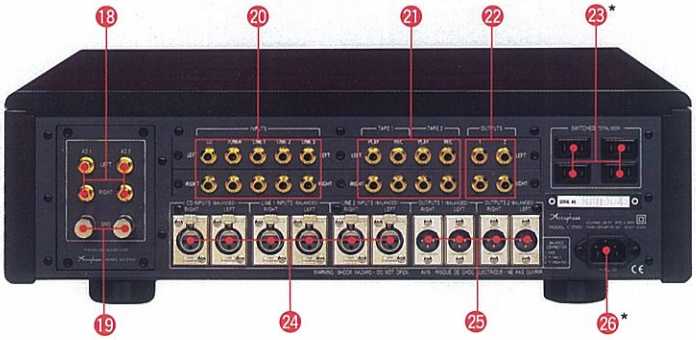


* The phono equalizer unit AD-290 designed for the model C-290 can also be used.

■ Front Panel



■ Rear Panel (with optional AD-290V)



❶ Input Selector
LINE-1 LINE 2 LINE-3 TUNER CD-BAL CD
LINE-BAL 1 LINE-BAL 2 AD 1 (OP) AD 2 (OP)
❷ Output Selector OFF ALL BAL UNBAL
❸ Function LED indicators
❹ Tape Monitor/Rec On/Off Selector
TAPE 1 TAPE 2 SOURCE REC OFF
❺ Tape Copy Selector 1 → 2 OFF 2 → 1
❻ Analog Disc Equalizer Gain Selector
MM/30 dB, MM/36 dB MC/62 dB, MC/68 dB
❼ Input/Balance Display
❽ Balance Control LEFT RIGHT
❾ Volume Control
❿ Power Switch
⓫ Output Phase Button
⓬ Mode Button
⓭ Subsonic Filter Button
⓮ Loudness Compensator Buttons OFF 1 2
⓯ MC Cartridge Load Impedance Selector
10 ohms 30 ohms 100 ohms
⓰ Display Mode Buttom INPUT BALANCE
⓱ Attenuator Button
⓲ AD (Analog Disc) Input Jacks (2 sets)
⓳ AD Ground Terminal
⓴ Line Input Jacks
CD TUNER LINE 1 LINE 2 LINE 3
㉑ Tape Recorder Input/Output Jacks
㉒ Unbalanced Output jacks
㉓ AC Outlets (Switched)*
㉔ CD/LINE Balanced Input Connectors
① GND ② Inverted [–] ③ Non-inverted [+]
㉕ Balanced Output Connectors (2 sets)
① GND ② Inverted [–] ③ Non-inverted [+]
㉖ AC Input Connector
[for supplied power cord]*

Remarks

* *The shape of the AC inlet, plug of the supplied power cord, and AC outlet depends on the voltage rating and destination country.*

* *This switched AC outlet may not be supplied depending on the safety standards or regulations applicable in the particular country to where the unit is destined.*

C-290V Guaranteed Specifications

[Guaranteed specifications are measured according to EIA standard RS-490.
AD denotes Analog Disc input.]
[Specifications are measured with phono equalizer unit AD-290V installed.]

Frequency Response
BALANCED /UNBALANCED INPUT: 3 to 300,000 Hz +0, –3.0 dB
20 to 20,000 Hz +0, –0.2 dB
AD INPUT [MM/36 dB, MC]: 20 to 20,000 Hz ±0.2 dB
AD INPUT [MM/30 dB, MC]: 20 to 20,000 Hz ±0.3 dB

Total Harmonic Distortion 0.005% (for all inputs)

Input Sensitivity, Input Impedance

Input	Sensitivity		Input impedance
	Rated output	0.5 V output	
AD:MM/30 dB INPUT	8.0 mV	2.0 mV	47k Ω
AD:MM/36 dB INPUT	4.0 mV	1.0 mV	47k Ω
AD:MC/62 dB INPUT	0.2 mV	0.05 mV	10/30/100 Ω switchable
AD:MC/68 dB INPUT	0.1 mV	0.025 mV	10/30/100 Ω switchable
BALANCED/UNBALANCED	252 mV	63 mV	40k Ω/20k Ω

Rated Output Level and Impedance
BALANCED/UNBALANCED OUTPUT: 2.0 V, 50 Ω
TAPE-REC (with AD input): 252 mV, 200 Ω

S/N Ratio

Input terminal	Input shorted (A weighting) S/N ratio at rated output	S/N ratio (EIA)
AD:MM/30 dB INPUT	94 dB	86 dB
AD:MM/36 dB INPUT	90 dB	86 dB
AD:MC/62 dB INPUT	80 dB	85 dB
AD:MC/68 dB INPUT	75 dB	85 dB
BALANCED/UNBARANCED	111 dB	95 dB

Maximum Output Level (THD 0.005%, 20 - 20,000 Hz)
BALANCED/UNBALANCED OUTPUT: 8.0 V
TAPE REC (with AD input): 9.5 V

Maximum AD Input Level (1 kHz, THD 0.005%)
MM [30/36 dB] INPUT: 300/150 mV
MC [62/68 dB] INPUT: 7.5/3.75 mV

Minimum Load Impedance
BALANCED/UNBALANCED OUTPUT: 600 Ω
TAPE REC: 10 k Ω

Gain

BALANCED/UNBALANCED INPUT	→	BALANCED/UNBALANCED OUTPUT:	18 dB
UNBALANCED INPUT	→	REC OUTPUT:	0 dB
AD [MM 30/36 dB] INPUT	→	BALANCED/UNBALANCED OUTPUT:	48/54 dB
AD [MM 30/36 dB] INPUT	→	REC OUTPUT:	30/36 dB
AD [MC 62/68 dB] INPUT	→	BALANCED/UNBALANCED OUTPUT:	80/86 dB
AD [MC 62/68 dB] INPUT	→	REC OUTPUT:	62/68 dB

Loudness Compensator Characteristics (volume setting -30 dB)
1: +3 dB (100 Hz)
2: +8 dB (100 Hz), +6 dB (20 kHz)

Subsonic Filter Characteristics
Cutoff frequency 10 Hz, -18 dB/octave

Attenuator Characteristics -20 dB

Power Requirements
100 V, 120 V, 220 V, 230V, 240 V
(Voltage as indicated on rear panel) AC 50/60 Hz

Power Consumption 24 watts

Dimensions
Width 496 mm (19-1/2")
Height 160 mm (6-5/16")
Depth 405 mm (15-15/16")
(with AD-290V installed: 414 mm (16-5/16"))

Weight
23.8 kg (52.4 lbs) net
24.8 kg (54.7 lbs) (with AD-290V) net
30.0 kg (66.1 lbs) in sipping carton
31.0 kg (68.3 lbs) (with AD-290V) in sipping carton

● Specifications and design subject to change without notice for improvements.

Accuphase
ACCUPHASE LABORATORY INC.

PRINTED IN JAPAN L9810Y 850-0158-00 (AD1)