



# **MA3300 Audio Monitor**

Owner's Guide





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Product: MA3300 Audio Monitor

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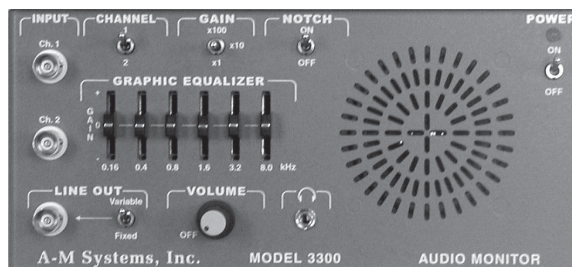
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# General Description



## Instrument Features

The *Model 3300 Audio Monitor* is a high quality audio amplifier designed to transform electrophysiological signals into sounds. This amplifier features a built-in 6-band audio equalizer that enables the user to tailor the audio performance to their personal satisfaction, a high-fidelity quality speaker, a dedicated notch filter designed to minimize noise interference generated by power lines, a headphone jack, and an BNC line out jack that enables the the Model 3300 to be used as another signal amplifier prior to subsequent processing by other instruments.

The instrument can be placed on a lab bench with its built-in metal stand, or it can be mounted in any industry standard equipment rack (with included rack-mounting hardware). In addition, the instrument is shipped with it's own desktop power supply.

It can be used in a number of research or teaching applications requiring the audio reproduction of electrophysiological signals, such as such as nerve, muscle (EMG), EEG, EKG, and ERG recordings.

**The instrument is not intended for clinical measurements using humans.**

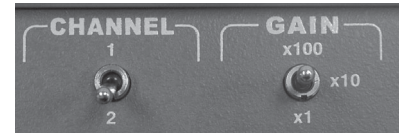
Two input signals can be passed to the *Model 3300*. A toggle switch selects which of the two signals will be amplified and processed by the 6-band equalizer. The Equalizer is a tunable filter that can increase or decrease the gain of particular frequency ranges, resulting in a pleasing sound quality produced at the speaker. The use of a set of headphones (by utilizing the mini-headphone jack) will disable the internal audio speaker. The volume control acts as a variable gain amplifier, and adjusts the volume of the speaker output. The processed signal can be passed to an oscilloscope or other instruments via the Signal Out BNC jack.

# Controls and Connectors

**INPUT:** Signals to be processed are connected to the Audio Monitor at these two BNC jacks (**Ch. 1** and **Ch. 2**).



**CHANNEL:** This toggle switch determines which of the two input signals will be processed.

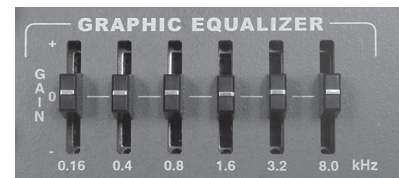


**GAIN:** This three position switch controls the level of signal gain. The switch allows the user to select from **X1**, **X10**, or **X100** gain.

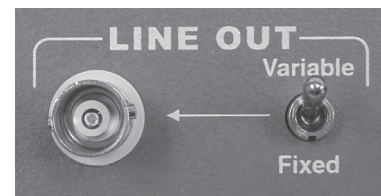
**NOTCH FILTER:** In the ON position, this filter will attenuate line noise (Either 50 or 60 Hz, depending on the country of use).



**GRAPHIC EQUALIZER:** These 6 slide potentiometers adjust the gain of a narrow range of frequencies. Each slide potentiometer can boost/increase (+) or attenuate/decrease (-) the gain around the center frequency indicated (160Hz, 400Hz, 800Hz, 1.6kHz, 3.2kHz, and 8.0kHz) by 12dB.



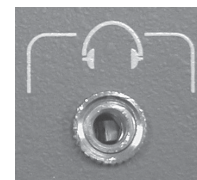
**LINE OUT:** This BNC connector provides the output signal from the amplifier channel. The toggle switch determines if this signal is *FIXED* in gain relative to the input signal (at the level determined by the **GAIN** toggle switch or includes the *VARIABLE* amplification provided by the **GRAPHIC EQUALIZER AND VOLUME** control.



**VOLUME:** This potentiometer adjusts the output volume of the speaker, and the variable amplification to the processed signal. *Warning: It is recommended to turn this knob to the off position before attaching an input signal to the Audio Monitor, in order to prevent damage to the speaker, and any nearby eardrums.*



**HEADPHONES JACK:** Insertion of a mini-headphones plug into this jack will disable the internal speaker, and power the user supplied headphones.



# Operating Instructions

## Typical Set-Up Procedure

*Turn the **VOLUME** control to the off position prior to connecting an input signal to either of the two input channels in order to prevent damage to the internal speaker or any nearby eardrums.*

Using the Channel Switch, select the desired input signal channel to be amplified. Determine the gain setting. Start with the lowest **GAIN** setting possible, and slowly increase the **VOLUME** control until a desired audio level is obtained. If you reach the maximum setting on the **VOLUME** control and the signal is still too quiet, return the **VOLUME** control to the off position and increase the **GAIN** to the next greater level.

If you would like to minimize power line generated noise, switch the **NOTCH** filter to *On*.

Adjust the **GRAPHIC EQUALIZER** slide knobs to increase or decrease the gain of certain frequency ranges in order to produce a more pleasing audio sound.

# Theory of Operation

One of two inputs may be selected using the **CHANNEL** switch. The selected input is then amplified according to the setting of the **GAIN** switch. After amplification, the signal can be filtered at the frequency of the power line by use of the **NOTCH** filter.

Particular narrow ranges of frequencies of the processed signal can then be boosted or attenuated using the **GRAPHIC EQUALIZER**. Maximum boost or attenuation is +/- 12dB, centered on the frequency indicated under each slide knob.

The output of the graphic equalizer feeds directly into the **VOLUME** control and **LINE** **OUT**put. Setting the **LINE OUT** Switch to *Variable* will produce the processed signal with the additional variable gain provided by the **VOLUME** control at the BNC jack. Setting the **LINE OUT** Switch to *Fixed* will provide the processed signal at the gain indicated by the **GAIN** switch (taken prior to the **GRAPHIC EQUALIZER**) at the BNC output jack.

The signal is then amplified using a power amplifier circuit in order to provide enough current to drive either the internal speaker or an external user-supplied set of headphones. Inserting a mini-headphones plug into the headphones jack will disable the internal speaker.

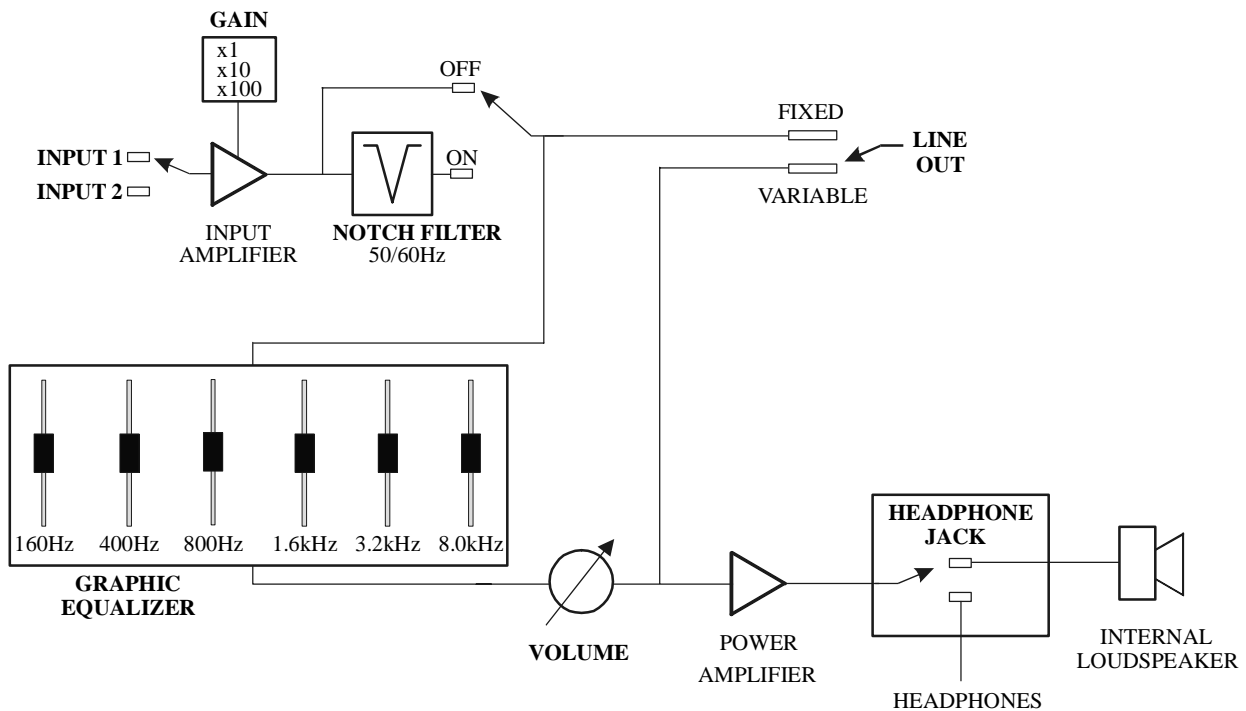


Figure 1. Main circuit block diagram

# Specifications

## Amplifier

**Gain:** 1V/V, 10V/V, 100V/V (+40dB)

**Sensitivity:** 0.01V p-p

**Input resistance:** 20M $\Omega$

### Maximum input before LINE OUT clips:

GAIN: x1 10.0V

GAIN: x10 1.0V

GAIN: x100 0.1V

### Maximum input before SPEAKER clips (*with volume control fully clockwise*):

GAIN: x1 1.0V

GAIN: x10 0.1V

GAIN: x100 0.01V

### Noise (*At Fixed Line Out*)

470 $\Omega$  source resistance (not shorted input)

22Hz-22kHz: 14 $\mu$ V p-p (57dB signal to noise)

1kHz spot frequency: 3 $\mu$ V p-p (70dB signal to noise)

2,200pF source capacitance to emulate a crystal/ceramic transducer source

Without NOTCH Filter (22Hz-22kHz): 220 $\mu$ V p-p (33dB signal to noise)

With NOTCH Filter (22Hz-22kHz): 28 $\mu$ V p-p (51dB signal to noise)

1kHz spot frequency: 1 $\mu$ V p-p (80dB signal to noise)

### Notch Filter

Gain: Unity (0dB)

Notch Frequency: 60Hz (50Hz in specific countries)

Notch Depth: -29dB

### Graphic Equalizer

Gain: Unity (0dB)

Boost/Cut Frequencies (Hz): 160, 400, 800, 1600, 3200, 8000

Nominal Boost & Cut: +/- 10dB (within 1dB)

### Power Amplifier

Power output: 2.7W continuous (rms) sine wave into 4 $\Omega$

5.4W continuous (peak) sine wave into 4 $\Omega$

Distortion (THD+N): <0.3%, 80Hz - 16kHz (at rated power)

# Specifications

## Power Amplifier (continued)

Frequency response:	100Hz - 26kHz, -3dB points (470µf output capacitor)
Amplification	x10

## Physical Dimensions

Width	8.5 inches (22 cm)
Height	4.25 inches (11 cm)
Depth	2.5 inches (7 cm)
Weight	4 lbs.



# Warranty and Service

## What does this warranty cover?

A-M Systems, Inc. warrants to the Purchaser that the Instrument, excluding cables, Headstage Probes and any other accessories shipped with the Instrument, (hereafter the "hardware") is free from defects in workmanship or material under normal use and service for the period of one (1) year. This warranty commences on the date of delivery of the hardware to the Purchaser.

## What are the obligations of A-M Systems, Inc. under this warranty?

During the warranty period, A-M Systems, Inc. agrees to repair or replace, at its sole option, without charge to the Purchaser, any defective component part of the hardware. To obtain warranty service, the Purchaser must return the hardware to A-M Systems, Inc. or an authorized A-M Systems, Inc. distributor in an adequate shipping container. Any postage, shipping and insurance charges incurred in shipping the hardware to A-M Systems, Inc. must be prepaid by the Purchaser and all risk for the hardware shall remain with purchaser until such time as A-M Systems, Inc. takes receipt of the hardware. Upon receipt, A-M Systems, Inc. will promptly repair or replace the defective unit, and then return the hardware to the Purchaser, postage, shipping, and insurance prepaid. A-M Systems, Inc. may use reconditioned or like new parts or units at its sole option, when repairing any hardware. Repaired products shall carry the same amount of outstanding warranty as from original purchase, or ninety (90) days which ever is greater. Any claim under the warranty must include a dated proof of purchase of the hardware covered by this warranty. In any event, A-M Systems, Inc. liability for defective hardware is limited to repairing or replacing the hardware.

## What is not covered by this warranty?

This warranty is contingent upon proper use and maintenance of the hardware by the Purchaser and does not cover batteries. Neglect, misuse whether intentional or otherwise, tampering with or altering the hardware, damage caused by accident, damage caused by unusual physical, electrical, chemical, or electromechanical stress, damage caused by failure of electrical power, or damage caused during transportation are not covered by this warranty. **Products may not be returned to A-M Systems, Inc. for service, whether under warranty or otherwise, which are contaminated by infectious agents, radioactive compounds or other materials constituting a health hazard to employees of A-M Systems, Inc.**

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