

# **HD-31**

**HIGH DEFINITION™  
GRAPHIC EQUALIZER**

**OWNER'S MANUAL**

## INTRODUCTION

Congratulations on your purchase of another fine ART product. The HD-31 one third octave equalizer represents the next generation in professional audio equalization. This is a product of more than ten years of research and development and it features the absolute best in electronic components. Modern automated assembly and computerized testing procedures allow for the production of an equalizer that is astonishingly rugged and reliable and also have audio performance characteristics better than any current digital specifications.

The internal assembly is a work of art. Virtually all components in the audio chain are PC board mounted and are soldered collectively at exact controlled temperatures. The board interconnects are high quality, no-fail ribbon connectors. Even the slider knobs have been ergonomically designed for speed of use!

The most innovative feature of the equalizer is the amazing accuracy of the filter networks. There is practically no center-point drift regardless of the adjacent filter settings. Constant Q circuitry ensures consistent filter bandwidth. The HD-31 allows you to equalize with a new level of precision and may be the most transparent and accurate equalizer available.

## INSTALLATION

The ART HD series Equalizers may be used in a variety of setups including: mixing consoles, fixed installations, in the effects loop of an amplifier, and in the tape loop of a home receiver. Self contained in an all steel two high 19" rack mount case, these equalizers are designed for continuous professional use. Mounting location is not critical, but for greater reliability we recommend that you not place the unit on top of power amps, tube equipment, or other sources of heat.

### **Power Requirements**

The equalizer is designed to operate on 105 to 120 volts AC, 50 to 60 HZ. Units manufactured for use outside the United States have been modified to comply with the required electrical specifications. The rear panel sticker indicates the input power requirements of the equalizer. The center connection of the power cord provides chassis grounding to the AC mains line.

### **Connections**

All audio connections to the equalizer are made at the rear of the unit via professional ¼" phone jacks, XLR connectors (pin 3 Hot) or hard wired directly to a terminal strip. When the unit is bypassed or power is disconnected, an internal relay connects the inputs directly to the outputs thus enabling the signal to pass directly through the unit.

Both the input and output have an active balanced configuration. The balanced input impedance is 10K ohms and the output impedance is 100 ohms. When using stereo plugs (TRS) the tip is hot. The equalizer may be used in an unbalanced mode by using standard ¼ inch phone plugs (TS).

## OPERATION

Refer to the front panel for controls and their location.

### **Power Switch**

The power switch located in the bottom right section of the front panel turns the equalizers power on or off. When the switch is pushed in, power is applied to the circuitry and is indicated by the LED to the left of the switch being lit. A short power on delay and muting circuitry protect your system from harmful thumps which may occur during instant power-ups.

### **Active Switch**

To engage the equalizer press in the switch found in the upper right section of the front panel labeled Active. When the switch is in, the Active LED above the switch will light indicating that the equalizer circuitry is active. When the LED is not lit it indicates that equalizer is in the Bypass mode.

The equalizer does not have to be in the Active mode for the signal present LED to operate.

### **Gain Select Switch**

The gain select switch is located to the left of the Active switch. You may select two ranges of gain that the frequency sliders control. Plus and minus 7.5 dB and 15 dB are the two gain ranges that may be chosen. When the switch is pushed in, the plus or minus 15 dB range is active. With the switch out, the 7.5 dB range is selected. Use the 7.5 dB range when critical frequency tailoring is needed. This switch does not affect the gain of the output level control.

### **Lo Cut Filter Switches**

Two low cut filters at 20 Hz and 40 Hz frequency points with an 18dB/octave slope are provided with the equalizer. When the 20 Hz switch is pushed in, a high pass filter cutting all frequencies below 20 Hz is engaged. Pushing in the 40 Hz switch engages the 40 Hz low cut filter. If both filters are engaged at the same time a "brick wall" low cut filter results. These subsonic filters are useful in the elimination of annoying problems such as stage rumble, mic handling noise and other low frequency vibrations.

### **High Cut Filter Switches**

Two high cut filters with 16 KHz and 20 KHz frequency points and an 18dB/octave slope are available with the equalizer. When the 20 KHz switch is pushed in, the low pass filter cuts all frequencies above 20 KHz. If you choose to use the 16 KHz filter, all frequencies above this frequency will be cut. Using both high cut filters together will provide a “brick wall” rolloff. These ultrasonic filters may be used to eliminate harmful high frequencies that may emanate from poorly designed equipment and be passed into the input of another. They may be used to protect your high end transducers in your PA at extremely loud volumes, to protect your system from RF Interference or to simply roll off the high end characteristics of a room.

### **Signal Present/Clip LED**

The LED located near the top right of the front panel indicates whether or not signal is present at the input of the equalizer. When the input signal reaches approximately -32 dBm the LED will light green dimly. As the signal strength increases so does the intensity of the LED. At approximately +17 dBm, the LED will change its color to red indicating that you have approximately 6 dB of headroom left before clipping occurs. The LED indicates signal presence regardless of the equalizer circuitry being engaged or not.

### **Level Control Slider**

The slider at the far right of the front panel labeled Level controls the final output level of the equalizer circuitry. The output level may be adjusted over a range of plus or minus 15 dB. This level control does not operate as just an output pad but optimizes internal operating levels for the best possible performance. When the slider control is in the center detent position, the output level is unity. If individual frequency bands are set for other than unity, their additive gains will result in the overall output level of the equalizer.

### **Frequency Control Sliders**

A frequency level control is provided for each designated frequency. The gain of the frequency band may be adjusted over a plus or minus 15 dB range of boost or cut. If the gain select switch is set in the 7.5 dB position, the gain of the frequency band may be adjusted over a plus or minus 7.5 dB range of boost or cut. This and the 60 millimeter travel of the slider enable critical adjustment to be made to the frequency band. When the slider is in the center detent position unity gain is achieved.

# APPLICATIONS

## **The Audio Spectrum, a Reference**

In general, what we hear extends over a range of frequencies from 20 Hertz (Hz) to 20 Kilohertz (KHz). This equates to roughly ten and one third octaves, an octave being a factor of two. The most perceived range lies between 300Hz to 3KHz, the region where most voice information occurs. The audio spectrum may be divided into seven frequency ranges. We will define these ranges in the following text.

### **Low Bass: 20Hz to 40Hz**

This is the lowest of normally audible octaves. Below these frequencies, sounds are more felt than heard. These subaudible frequencies are produced by earthquakes, building vibrations, elephants and huge organ pipes. Low bass information include the fundamental frequencies of the lowest keys on organs, synthesizers and pianos. Mechanical rumble also falls within the range below 40Hz. This and the fact that few speaker systems can reproduce these frequencies accurately is why 40Hz was chosen as one of the frequencies for the cutoff switch. These low bands on the equalizer may be useful for tailoring the low frequency response of some speakers and microphones.

### **Bass: 40Hz to 160Hz**

These two octaves are normally perceived as the bass frequencies. Instruments such as the electric and string bass, tuba, bass drum and the lower notes of keyboard instruments fall within this range. The bottom end of most music is reflected here.

### **Mid Bass: 160Hz to 315Hz**

In this octave, the transition between bass and midrange occurs. Low frequency crossover points in speaker systems are usually selected in this range. Modification of voice and drum fundamentals as well as the character of the upper bass and lower brass instruments can be achieved by manipulating the levels of these frequencies.

### **Mids: 315Hz to 2.5KHz**

The fundamental frequencies of voice and musical instruments occurs within these three octaves. The upper harmonics of bass instruments also falls within this range. The intelligibility of speech falls within this range of frequencies. Just as a point of reference, these three octaves are about the same bandwidth as a telephone.

### Upper Mids 2.5KHz to 5KHz

In this octave, what we perceive as presence, definition and attack are subject to control. Boosting these bands adds crispness while cutting them eliminates vocal sibilants such as hiss. Your ear is most sensitive in this frequency range.

### Highs: 5KHz to 10KHz

Brilliance, vocal fricatives and intensity of the sound are adjusted in this frequency range. The snap of percussive instruments especially cymbals and the harmonic overtones of guitar are intensified in this octave.

### Upper Highs: 10KHz to 20KHz

The upper limits of hearing fall within this octave. Since only the upper harmonics of some instruments are in this range, you may often cut these bands to reduce hiss without affecting the overall sound quality. Brightness of cymbals and synthesizer harmonics may also be controlled.

## SPECIFICATIONS HD-31

### INPUT

Impedance ..... 10K ohm (balanced)  
Maximum Input Level ..... +24 dBm

### OUTPUT

Impedance ..... 100 ohm (balanced)  
Maximum Input Level:  
Balanced 600 ohm ..... +23 dBm  
Balanced no load ..... +27 dBm  
Unbalanced ..... +23 dBm  
Dynamic Range ..... 118 dB  
Signal/Noise Ratio (R.E. +20 dBm) ..... 115 dB  
Equivalent Input Noise ..... -95 dBm  
THD ..... < .005% 20-20 KHz, +15 dBm

### FREQUENCY RESPONSE

..... 10-50 KHz +0. -5 dB  
..... 02-153 KHz -3 dB

### FILTERS

Frequency Centers ..... 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160,  
200, 250, 315, 400, 500, 630, 800, 1K, 1.25K, 1.6K,  
2K, 2.5K, 3.15K, 4K, 5K, 6.3K, 8K, 10K, 12.5K, 16K, 20K  
Boost/Cut ..... +/- 15 dB or 7.5 dB  
Level Control ..... +/- 15 dB  
High Pass ..... 20 Hz and 40 Hz (18dB/octave)  
Low Pass ..... 16 KHz and 20 KHz (18dB/octave)

### CONNECTIONS

1/4 inch Stereo (TRS) [Balanced] (Tip Hot, (+)), (Ring (-))  
Terminal Strip  
XLR (Pin 3 Hot, (+)), (Pin 2 (-))

### POWER REQUIREMENTS

Domestic: 105-125 Volts AC, 50-60Hz, 135ma @116 VAC, 15.7 Watts  
Domestic: 105-125 Volts AC, 50-60Hz, 135ma @116 VAC, 15.7 Watts  
Foreign: 210-250 Volts AC, 50-60Hz, 67.5ma @232 VAC, 15.7 Watts

### INDICATORS

Power ..... Red (ON)  
ACTIVE ..... Red (ON)  
Signal Present/Clip ..... Green/Red (Red = Clipping)  
Signal Present Level ..... -32 dBm  
Signal Clip Level ..... +17 dBm

### DIMENSIONS

Width ..... 19 inches (482mm)  
Depth ..... 6.25 inches (159mm)  
Height ..... 3.5 inches (889mm)  
Weight ..... 8 lbs. 10 oz. (4kg)

ART retains a policy of constant product improvement. Specifications are subject to change without notice.

Precision handcrafted in the United States of America.



## SERVICE & WARRANTY INFORMATION

The following information is provided for the unlikely event your unit requires service.

- 1) Be sure the unit is the cause of the problem. Check to make sure the unit has power supplied, all cables are connected correctly and the cables themselves are in working condition.
- 2) If you find the unit to be at fault, write down a description of the problem including how and when the problem occurs.
- 3) Pack the unit in it's original carton or a reasonable substitute. The packing box is not recommended for a shipping carton. If possible put the packaged unit in another box for shipping. NOTE: The front panel is subject to damage in shipping if the unit is poorly packaged.
- 4) Include with your unit: a return shipping address (We cannot ship to a P.O. Box), a copy of your purchase receipt, a daytime phone number in case we need to contact you and the description of the problem.

5) Ship the unit to:

APPLIED RESEARCH & TECHNOLOGY, INC.

215 TREMONT STREET

ROCHESTER, NY 14608

ATTN: REPAIR DEPARTMENT

OUR NEW AREA CODE IS 585

- 6) If you have questions regarding repairs, or if you think your unit may (or may not) need to be repaired feel free to contact our customer service department at (716) 436-2720.

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Warranty service for this unit will be provided by Applied Research & Technology, Inc. in accordance with the following warrant statement.

Applied Research & Technology, Inc. warrants to the original purchaser that this product and the components thereof, will be free from defects in workmanship and materials for a period of one year from the date of purchase.

Applied Research & Technology, Inc. (ART) will, without charge, repair or replace, at its option, defective product or component parts upon prepaid delivery to an authorized service center or the factory service department, accompanied by proof of purchase date in the form of a valid sales receipt.

**EXCLUSIONS:** This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. This warranty is void if the serial number is altered, defaced, or removed.

ART shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may also have other rights which vary from state to state.