

EQ27

CONSTANT Q EQUALIZER

OPERATING INSTRUCTIONS and trouble-shooting guide

LECTROSONICS, INC.
Rio Rancho, NM

INTRODUCTION

The EQ27 Constant Q Equalizer Module is designed to provide full frequency 1/3 octave system equalization capabilities in a compact, low-cost module. Each of the 27 ISO standard frequency bands yields precise, variable attenuation of up to 15dB. Since the EQ27 is implemented as an attenuation only equalizer, system overload capabilities are not compromised by injudicious boosting of frequency bands. In addition to the 27 bands of equalization, a bypass switch is provided for comparison of the equalized and unequalized sound.

The EQ27 occupies two standard widths in a Modular Audio Processor mainframe. All controls are recessed, and are covered by a supplied panel to prevent accidental misadjustment.

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GENERAL TECHNICAL DESCRIPTION

The architecture of the EQ27 is an attenuation only implementation of a constant Q type equalizer. Constant Q topologies differ from non-constant Q topologies in two critical ways.

First, the bandwidth (or Q) of each 1/3 octave filter stays substantially constant, regardless of the amount of attenuation. In contrast, non-constant Q filter topologies (the dominant topology in most equalizers) exhibit substantial broadening of the filter bandwidth as the attenuation (or boost in cut/boost type equalizers) is reduced. In general, the only setting for which the bandwidth of a non-constant Q equalizer equals 1/3 octave is full attenuation (or full boost).

Second, there is substantially more interaction between frequency bands in a non-constant Q equalizer than in a constant Q equalizer. This is the result of both the broadening bandwidth of the non-constant Q type filter, as well as an intrinsic band to band interaction inherent in the non-constant Q design. It is not uncommon for frequency bands up to an octave or more away from one another to have significant interaction in a non-constant Q design.

The practical advantage of the constant Q type of equalizer is that system equalization is much more direct. Since there is minimum interaction between frequency bands, much of the tuning and retuning required by non-constant Q equalizers (to account for adjacent band interaction) is eliminated.

The input circuit for the EQ27 is an RF filtered electronically balanced differential amplifier.

The EQ/BYPASS switch simply connects or bypasses the equalizer section depending on the switch setting.

The equalizer circuit is composed of 27 1/3 octave active RC bandpass filters. High precision resistors and capacitors are used throughout to insure exact center frequencies. The bandpass filters are arranged in parallel in the feedback loop of a low noise op-amp. The 27 adjustment pots determine how much the gain in each 1/3 octave frequency band gain of the equalizer will be reduced.

The output circuit is an electronically balanced and floating type, which is RF filtered.

INSTALLATION

The EQ27 module is installed from the rear of the Modular Audio Processor mainframe. The printed circuit board fits into one of the ten sets of card guides provided in the mainframe. The module is then slid forward in the mainframe until the female edge connector on the board is firmly seated on the male pins of the main bus board. Care should be taken when inserting the edge connector onto the pins to be sure there is correct alignment. Four #4 machine screws are provided to fasten the rear panel to the top and bottom rear rails of the Modular Audio Processor mainframe. In addition, four #4 countersink machine screws are provided to secure the cover panel, also provided, on the front of the Modular Audio Processor mainframe after system adjustment is complete.

FRONT PANEL DESCRIPTION

EQ/BYPASS SWITCH - Sets the operational mode of the equalizer. The EQ position is equalizer in, and the BYPASS position is equalizer out.

dB CUT (1/3 OCTAVE EQ CONTROLS) - Set the amount of attenuation desired in the selected frequency range. Fully clockwise is 15dB of attenuation, and fully counterclockwise is no attenuation (0dB).

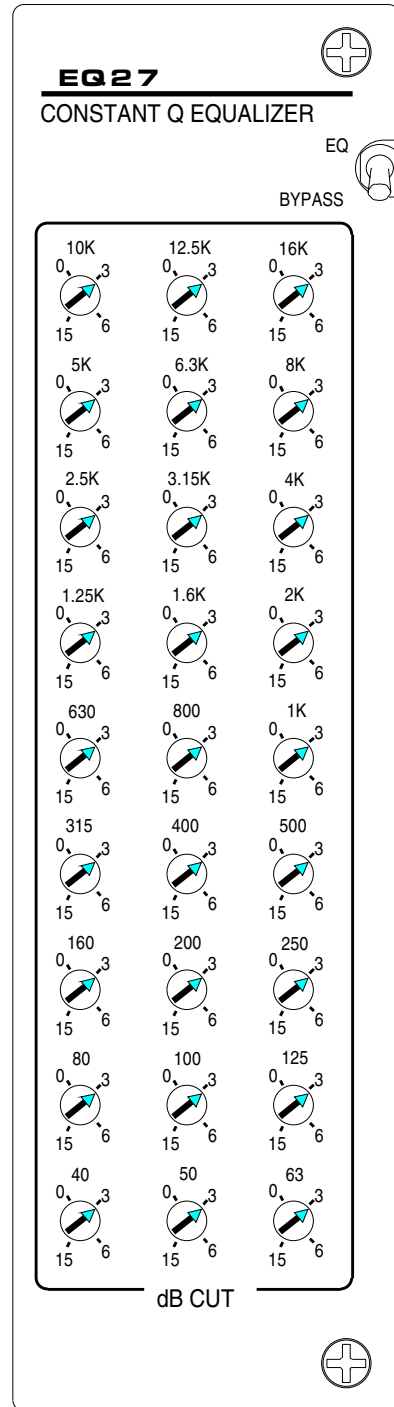


Figure 1 - EQ27 Front Panel

REAR PANEL DESCRIPTION

INPUT - Provides a balanced, RF filtered, XLR type line level input to the EQ27.

OUTPUT - Provides a balanced and floating, RF filtered, XLR type line level output from the EQ27.

THRU - Provides an output which is directly parallel to the input. This output may be used for daisy-chaining the unequalized signal.

OPERATING INSTRUCTIONS

The following instructions assume a properly set up automatic or standard system.

1) Using a pink noise generator as input to the EQ27 and a 1/3 octave analyzer, adjust the 27 band equalizer for the desired sound system response. For a voice only reinforcement system, frequencies below around 200Hz should be gradually attenuated, as well as frequencies above about 2KHz. Adjust the high frequency roll-off to about 3dB/octave as a start.

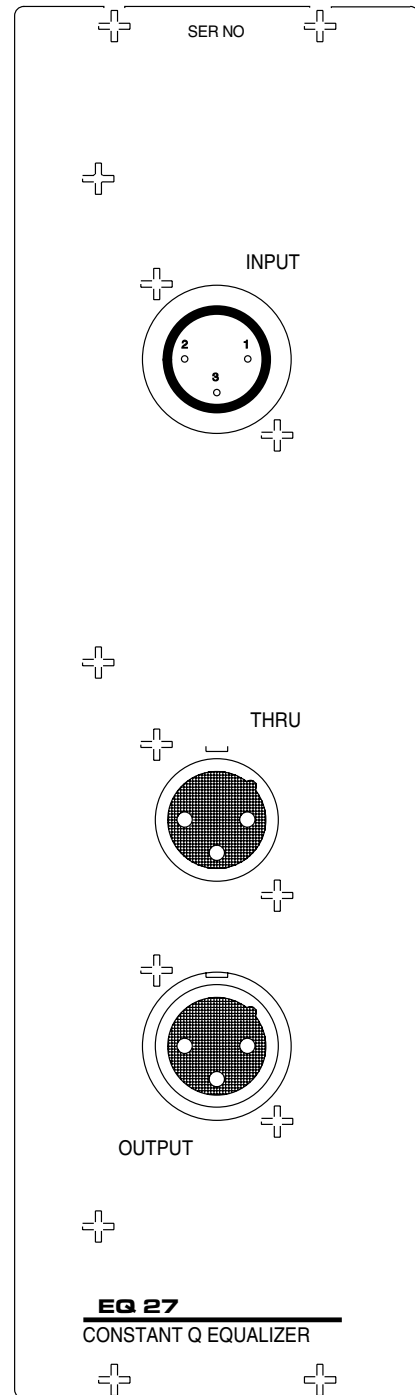


Figure 2 - EQ27 Rear Panel

SPECIFICATIONS

Equalizer Section:	
Filter Type:	Second order bandpass active filter, 1/3 octave
Center Frequencies:	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
Maximum Attenuation:	15dB
THD @ +4dBu:	Less than .02% (All controls flat)
IMD @ +4dBu (60/7KHz):	Less than .02% (All controls flat)
Noise, 20-20KHz:	-90dBu
Input Impedance:	20K balanced, 10K unbalanced
Output Impedance:	100 ohms balanced, 50 ohms unbalanced
Maximum Input Level:	+20dBu
Maximum Output Level:	+20dBu
Input/Output Connectors:	3 Pin XLR
Maximum Power Consumption:	100mA at +/-15 Volts

SERVICE AND REPAIR

If your system malfunctions, you should attempt to correct or isolate the trouble before concluding that the equipment needs repair. Make sure you have followed the setup procedure and operating instructions. Check out the inter-connecting cords and then go through the TROUBLE SHOOTING section in the manual

We strongly recommend that you **do not** try to repair the equipment yourself and **do not** have the local repair shop attempt anything other than the simplest repair. If the repair is more complicated than a broken wire or loose connection, send the unit to the factory for repair and service. Don't attempt to adjust any controls inside the units. Once set at the factory, the various controls and trimmers do not drift with age or vibration and never require readjustment. **There are no adjustments inside that will make a malfunctioning unit start working.**

LECTROSONICS service department is equipped and staffed to quickly repair your equipment. In-warranty repairs are made at no charge in accordance with the terms of the warranty. Out of warranty repairs are charged at a modest flat rate plus parts and shipping. Since it takes almost as much time and effort to determine what is wrong as it does to make the repair, there is a charge for an exact quotation. We will be happy to quote approximate charges by phone for out of warranty repairs.

RETURNING UNITS FOR REPAIR

You will save yourself time and trouble if you will follow the steps below:

- A. DO NOT return equipment to the factory for repair without first contacting us by letter or by phone. We need to know the nature of the problem, the model number and the serial number of the equipment. We also need a phone number where you can be reached 8 am to 4 pm (Mountain Standard Time).
- B. After receiving your request, we will issue you a return authorization number (R.A.). This number will help speed your repair through our receiving and repair departments. The return authorization number must be clearly shown on the outside of the shipping container.
- C. Pack the equipment carefully and ship to us, shipping costs prepaid. If necessary, we can provide you with the proper packing materials. UPS is usually the best way to ship the units. Heavy units should be "double-boxed" for safe transport.
- D. We also strongly recommend that you insure the equipment, since we cannot be responsible for loss of or damage to equipment that you ship. Of course, we insure the equipment when we ship it back to you.

Mailing address:
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LIMITED ONE YEAR WARRANTY

The equipment is warranted for one year from date of purchase against defects in materials or workmanship provided it was purchased from an authorized dealer. This warranty does not cover equipment which has been abused or damaged by careless handling or shipping. This warranty does not apply to used or demonstrator equipment.

Should any defect develop, we will, at our option, repair or replace any defective parts without charge for either parts or labor. If we cannot correct the defect in your equipment, we will replace it at no charge with a similar new item. We will pay for the cost of returning your merchandise to you.

This warranty applies only to items returned to us, shipping costs prepaid, within one year from the date of purchase.

This warranty gives you specific legal rights. You may have additional legal rights which vary from state to state.

LECTROSONICS, INC.

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