EQUALIZER MODEL 9901

OPERATING GUIDE

1.0 INTRODUCTION

The APHEX EQUALIZER MODEL 9901 is a three band fully parametric equalizer with superb flexibility and performance. It was designed with the knowledge that each user of a parametric equalizer has a different opinion as to what sounds "good". Extensive listening tests did, however, reveal a number of operating and circuit features which made important contributions to functionality and sound. The most important operational features were included given the amount of space available on the front panel of the MODEL 9901.

The "sound" of any equalizer is the result of the equalizer topology and how well that topology is realized by an electronic circuit. Change in sound quality, beyond the amplitude change caused by the equalizer, is generally caused by phase shift in one or more parts of the spectrum and audio degradation introduced by the circuit. The MODEL 9901 uses a unique topology to achieve minimum phase shift and a pristine audio path to maintain audio quality.

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Your EQUALIZER was carefully packed at the factory, and the container was designed to protect the unit from rough handling. Nevertheless, we recommend careful examination of the shipping carton and its contents for any sign of physical damage which could have occurred in transit. If damage is evident, do not destroy the container or packing material. Immediately notify the carrier of a possible claim for damage. Shipping claims must be made by the consignee.

1.1 Limited Warranty

Aphex Systems, Ltd. warrants to the original owner that the EQUALIZER will be free from defects in parts and labor for a period of one (1) year from the date of purchase.

THE ABOVE WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESSED, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY WARRANTY ARISING OUT OF ANY PROPOSAL, SPECIFICATION, OR SAMPLE. APHEX SYSTEMS SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. APHEX SYSTEMS NEITHER ASSUMES NOR AUTHORIZES ANY PERSON TO ASSUME FOR IT ANY OTHER LIABILITY

1.2 Service Information

If it becomes necessary to return a unit for repair, **contact Aphex for a return authorization number**, repack it in the original carton and packing material, and insure the shipment. If a warranty repair, enclose a copy of proof of purchase and send package to:

APHEX SYSTEMS, LTD.
11068 Randall Street
Sun Valley, CA 91352
PH: (818) 767-2929 FAX: (818) 767-2641

WARNING: TO REDUCE THE RISKS OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

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APHEX SYSTEMS

2.0 PRINCIPLES OF EQUALIZATION

Equalization is a change in the amplitude of a part of the spectrum of a signal. The highest amount of change is the **BOOST** when there is an increase in amplitude and **CUT** when there is a decrease.

The three main types of equalization characteristics are **PEAKING, SHELVING** and **HIGH and LOW CUT FILTERING.**

2.1 PEAKING

A peaking circuit has a bell shape characteristic. A shelving circuit changes amplitude up to a certain frequency, and from that frequency to one or the other end of the spectrum the response is flat.

In a peaking circuit, the frequency with the highest amount of boost or cut is the **CENTER FREQUENCY**, sometimes called the resonant frequency.

The**"Q"** is the bandwidth of a peaking circuit. It is defined as the result of the center frequency divided by the difference between the frequencies where the amplitude is .707 times (-3dB) the voltage of the center frequency. The higher the "Q", the narrower the bandwidth. The lower the "Q", the wider the bandwidth.

2.2 LOW CUT and HIGH CUT Filters

LOW CUT and **HIGH CUT** filters (also known as high pass and low pass filters) reduce the frequency response of the signal at a certain rate expressed in "dB per octave". The frequency at which the signal is attenuated 3dB is called the **CORNER FREQUENCY.**

A shelving equalizer's **CORNER FREQUENCY** is also defined by the 3dB down point.

There are circuits which boost higher frequencies according to a specific curve. This is called pre-emphasis and is not usually generated by an equalizer but rather by a dedicated, calibrated filter circuit.

Various frequency response curves and characteristics are generated when the same or different equalization circuits are used in combination either in parallel or serially.

2.3 Types of Equalizers

A **PARAMETRIC EQUALIZER** is an equalizer in which some of the parameters of BOOST/CUT, PEAKING/SHELVING, "Q", AND CENTER FREQUENCY are adjustable. It typically has three or more bands.

A **GRAPHIC EQUALIZER** is an equalizer in which only the amount of BOOST or CUT is adjustable. The number of bands it has is expressed as a fraction of an octave (e.g. one-third octave) indicating that there are three bands of equalization per octave.

Graphic equalizers typically employ higher "Q"s so that changing the amplitude in a band will have little or no effect in adjacent bands.

Generally speaking, the higher the "Q" and amount of amplitude change, the greater the amount of phase shift. Since the amount of shift affects the sound, a parametric equalizer is used for "musical" applications and graphic equalizers are used to correct for room resonances or to reduce noise in a narrow band.

3.0 EQUALIZER INSTALLATION

3.1. Physical Considerations

The 9901 EQUALIZER is designed to fit into one slot of an Aphex 9000 frame and dbx® 900 series frames. The thumbscrews (#6-32) secure the module to the frame.

3.2 Electrical Considerations

3.2.1 Power

The 9901 is powered by +/-15V. The power is bussed to the unit on the backplane of both the Aphex and the dbx® racks. The +/-24V which appears on the dbx® rack will not affect the 9901 in any way.

NOTE: The 9901 consumes 107mA worst case. Compute the total power consumption of all modules in the rack to determine if sufficient power is available from the power supply.

On the Aphex rack model 9000R the audio ground and chassis ground come out the the power screw terminal connector separately (see figure 1). The terminal ⏚ marked may be jumpered to the terminal ⏚ marked to electrically connect the audio and chassis grounds together.

3.2.2 Edge Connector Pin-out (see schematics)

Pin #	Description
1	No connection
2	No connection
3	Ground (Chassis)
4	Ground (Audio)
5	+15V
6	-15V
7	no connection
8	no connection
9	no connection
10	no connection
11	Ground
12	Input +
13	Input -
14	Output +
15	Output -

3.2.3 Rear Panel Connections (screw terminals on rear of racks)

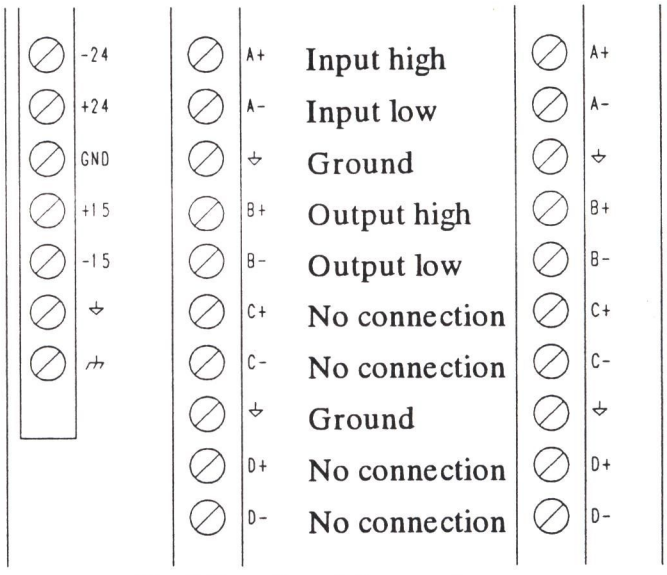


Fig: 1 Rear Panel Connections

3.2.4 Audio Input and Output Connections

The 9901 may be driven balanced or unbalanced. If balanced, "high" should be connected to A+, "low" connected to A- and shield connected to Ground. If unbalanced, connect "high" to A+, "low" to A- and connect a jumper from A- to Ground.

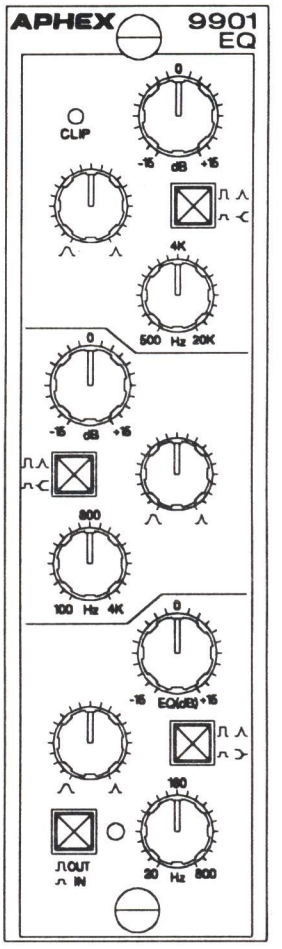
The output can drive either balanced or unbalanced loads. Connect B+ for output "high" and B- for output "low". Do not connect shield. If driving a known unbalanced load, connect a jumper between B- and Ground.

3.2.5 Impedances

The EQUALIZER features a high input impedance (22kΩ balanced), allowing it to be easily driven by any other piece of audio equipment, including consumer gear. However, a piece of equipment designed to work into a 600Ω load may show unusually low output meter readings, even though the unit is driving the EQUALIZER properly. Or the unit may considerably overdrive the EQUALIZER's input, while still indicating 0VU.

In either case, installing a 600Ω resistor across each EQUALIZER input to lower the input impedance to 600Ω.

4.0 FRONT PANEL



4.1 CLIP L.E.D.

Lights when any stage- input, the three bands or the output- is less than 1dB under clipping.

4.2 HIGH FREQUENCY BOOST/CUT POTENTIOMETER

Adjusts the amplitude of the high frequency band +/-15dB. Center detent is 0dB, full CW is +15dB, full CCW is -15dB.

4.3 HIGH FREQUENCY PEAK/SHELF SWITCH

Switches the response of the high frequency band from a peaking response in the OUT position to a high frequency shelving response in the IN position.

4.4 HIGH FREQUENCY "Q" POTENTIOMETER

Adjusts the "Q" of the high frequency band when in peaking response from 1 (broad) at full CCW to 10 (narrow) at full CW. This has no effect when the high frequency band is in shelving response.

4.5 HIGH FREQUENCY CENTER FREQUENCY POTENTIOMETER

Adjusts the center frequency of the high band in the peaking mode from 500Hz at full CCW to 20kHz at full CW. When the high band is switched to shelving response and the gain is at either full boost or cut, the setting indicates the approximate corner frequency.

4.6 MIDDLE FREQUENCY BOOST/CUT POTENTIOMETER

Adjusts the amplitude of the middle frequency band +/-15dB. Center detent is 0dB, full CW is +15dB, full CCW is -15dB.

4.7 MIDDLE FREQUENCY PEAK/SHELF SWITCH

Switches the response of the middle frequency band from a peaking response in the OUT position to a high frequency shelving response in the IN position.

4.8 MIDDLE FREQUENCY "Q" POTENTIOMETER

Adjusts the "Q" of the middle frequency band when in peaking response from 1 (broad) at full CCW to 10 (narrow) at full CW. This has no effect when the middle frequency band is in shelving response.

4.9 MIDDLE FREQUENCY CENTER FREQUENCY POTENTIOMETER

Adjusts the center frequency of the middle band in the peaking mode from 100Hz at full CCW to 4kHz at full CW. When the middle band is switched to shelving response and the gain is at either full boost or cut the setting indicates the approximate corner frequency.

4.10 LOW FREQUENCY BOOST/CUT POTENTIOMETER

Adjusts the amplitude of the low frequency band +/-15dB. Center detent is 0dB, full CW is +15dB, full CCW is -15dB.

4.11 LOW FREQUENCY PEAK/SHELF SWITCH

Switches the response of the low frequency band from a peaking response in the OUT position to a low frequency shelving response in the IN position.

4.12 LOW FREQUENCY "Q" POTENTIOMETER

Adjusts the "Q" of the low frequency band when in peaking response from 1 (broad) at full CCW to 10 (narrow) at full CW. This has no effect when the low frequency band is in shelving response.

4.12 LOW FREQUENCY CENTER FREQUENCY POTENTIOMETER

Adjusts the center frequency of the low band in the peaking mode from 20Hz at full CCW to 800Hz at full CW. When the low band is switched to shelving response and the gain is at either full boost or cut the setting indicates the approximate corner frequency.

4.13 IN/OUT SWITCH

Switches the filters into the circuit in the IN position and out of the circuit in the OUT position.

4.14 IN/OUT L.E.D.

Lights when the IN/OUT switch is in the IN position.

5.0 SAMPLE CURVES

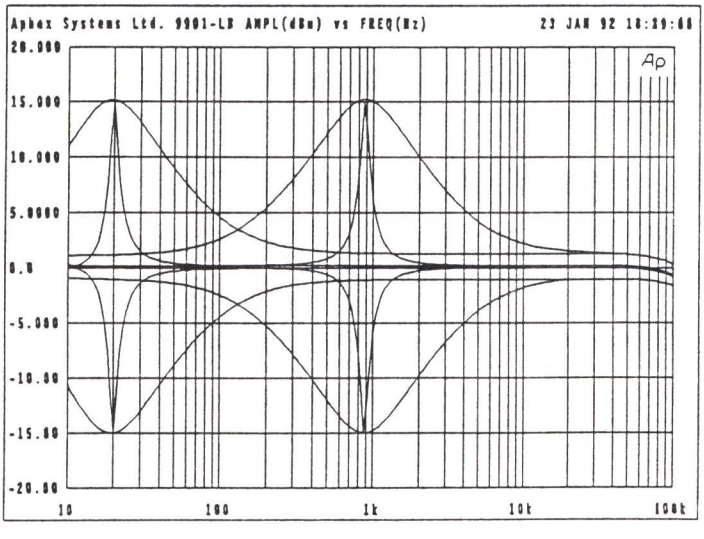


Fig: 5-1 Low Band: Peaking, Q min/max; Frequency min/max; EQ min/max

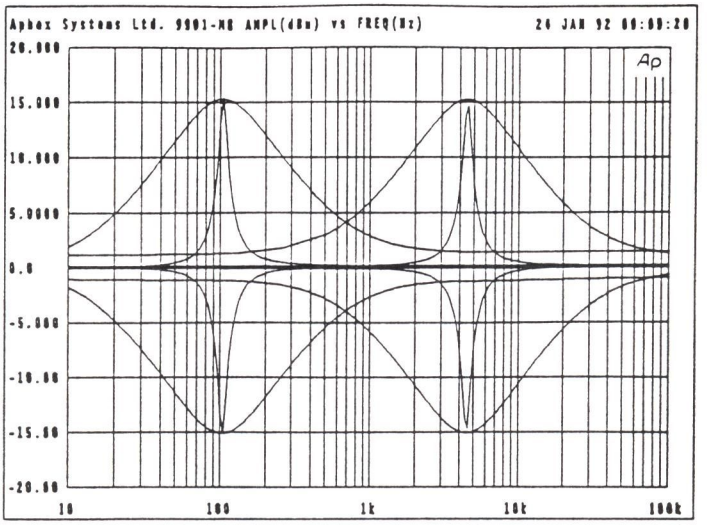


Fig: 5-2 Mid Band: Peaking, Q min/max; Frequency min/max; EQ min/max

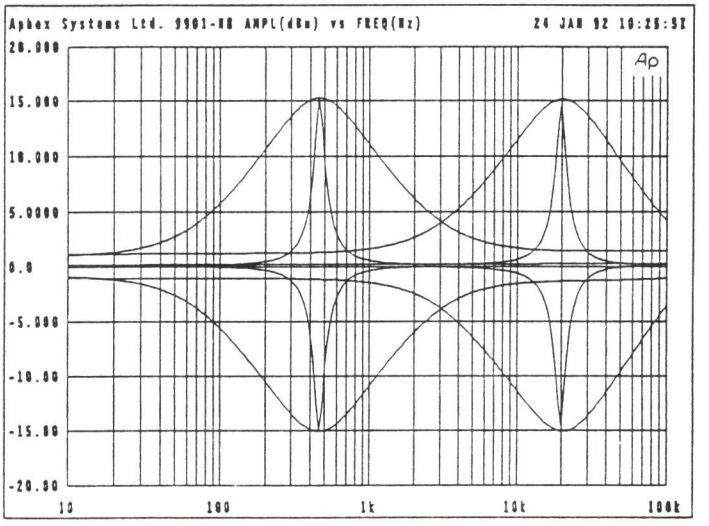


Fig: 5-3 Hi Band: Peaking, Q min/max; Frequency Min/max; EQ min/max

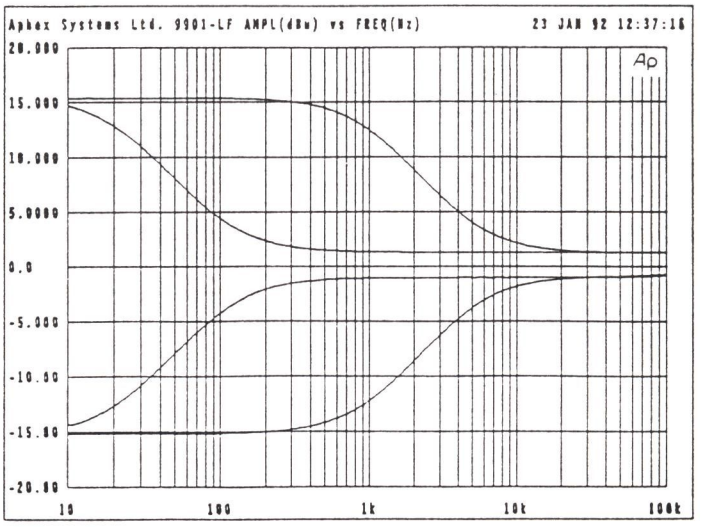


Fig: 5-4 Low Band: shelving, Frequency min/max; EQ min/max

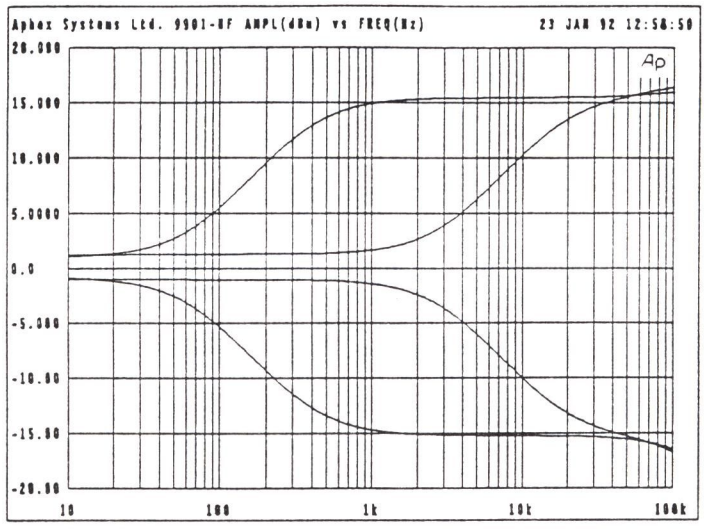


Fig: 5-5 Hi Band: Shelving; Frequency min/max; EQ min/max

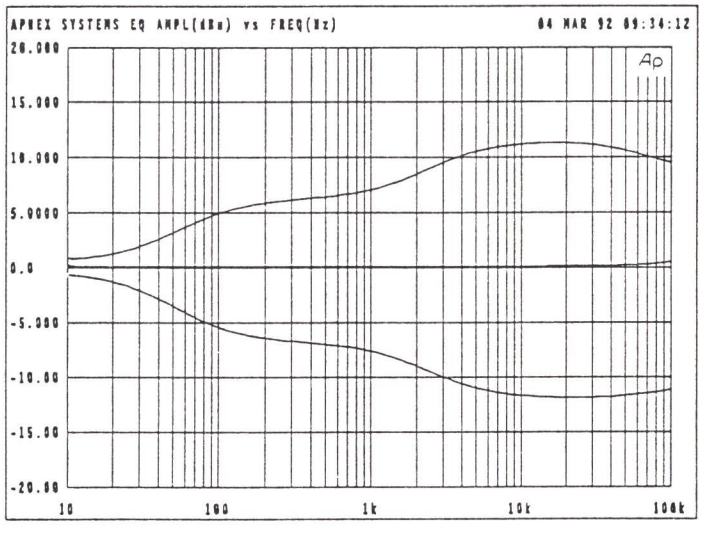


Fig: 5-6 Mid Frequency Shelving; EQ Boost/Cut combined with High Frequency EQ Boost/Cut

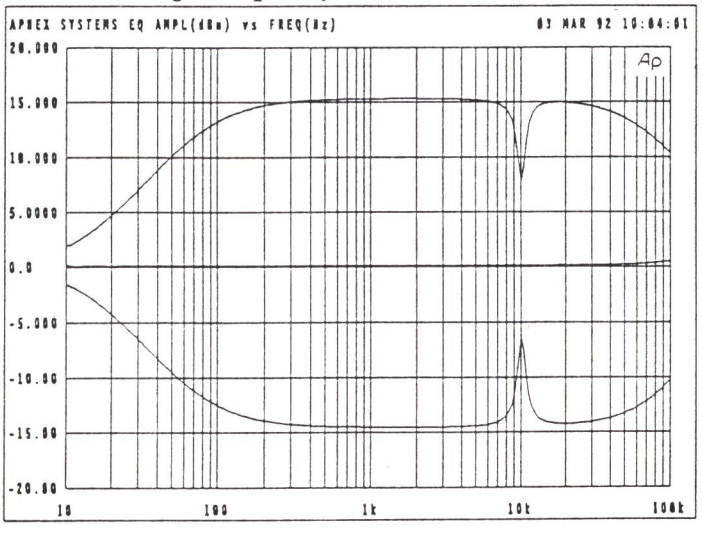


Fig: 5-7 Mid Frequency Shelving; EQ Boost/Cut combined with High Frequency Peak; EQ Cut/Boost

6.0 SPECIFICATIONS

INPUT

Type:	Transformerless, RF-filtered, true instrumentation
Impedance:	22kΩ balanced, 11kΩ unbalanced
Maximum Input Level:	+27dBu
CMRR:	Greater than 60dB @ 20Hz to 10kHz

OUTPUT

Type:	Transformerless, RF-filtered, true-instrumentation
Output Impedance:	65Ω
Maximum Output Level :	+27dBu
Dynamic Range:	101dB
Bandwidth:	10 Hz to 100kHz; +/- 0.5dB
Signal/Noise (ref +4dBu):	-78dBu
THD (max output level):	0.003%
IMD (SMPTE) @ max output level:	0.004%

CONTROLS

EQ Control (all bands):	+/- 15dB
Q Control (all bands):	1 to 10

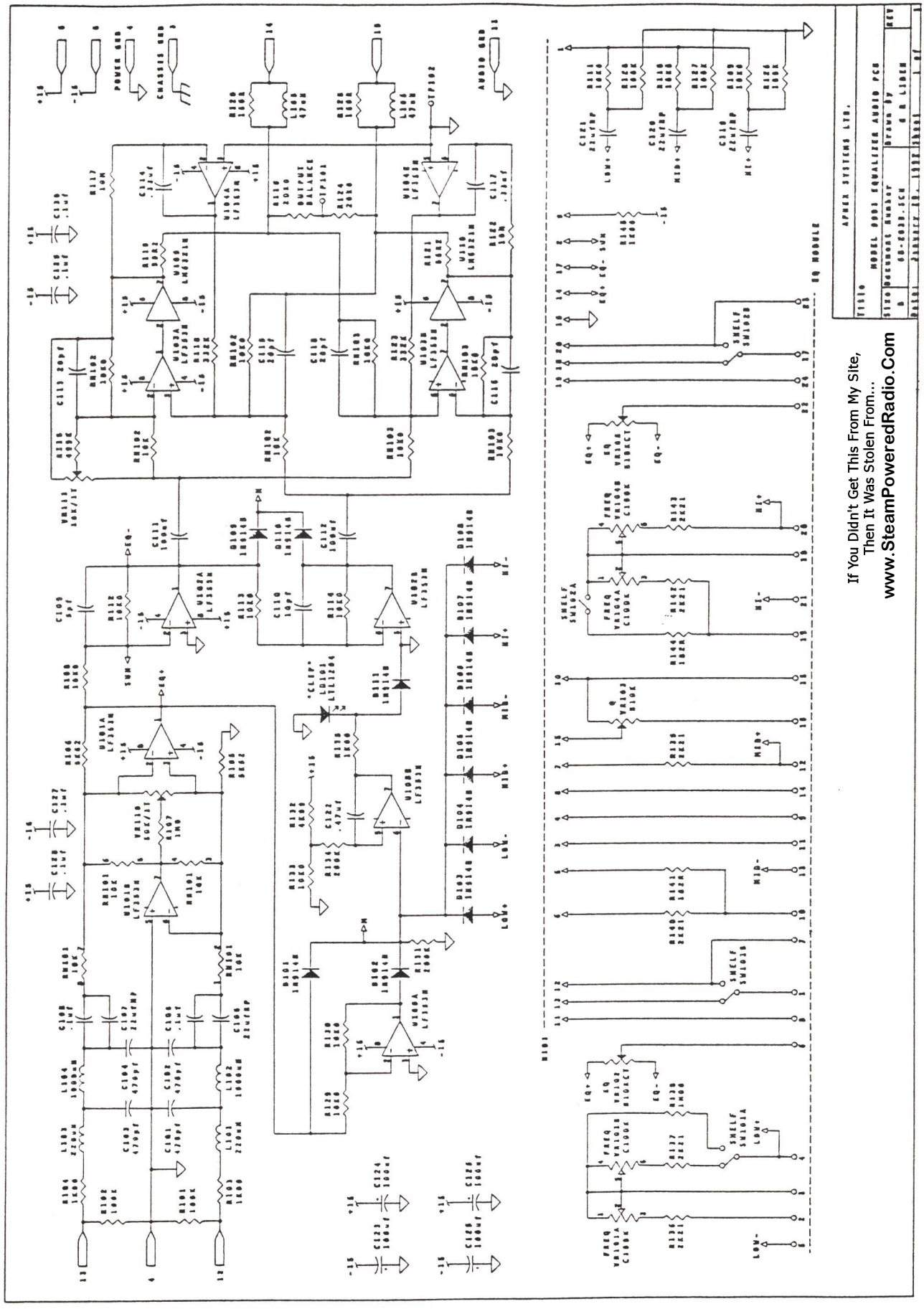
Frequency Controls

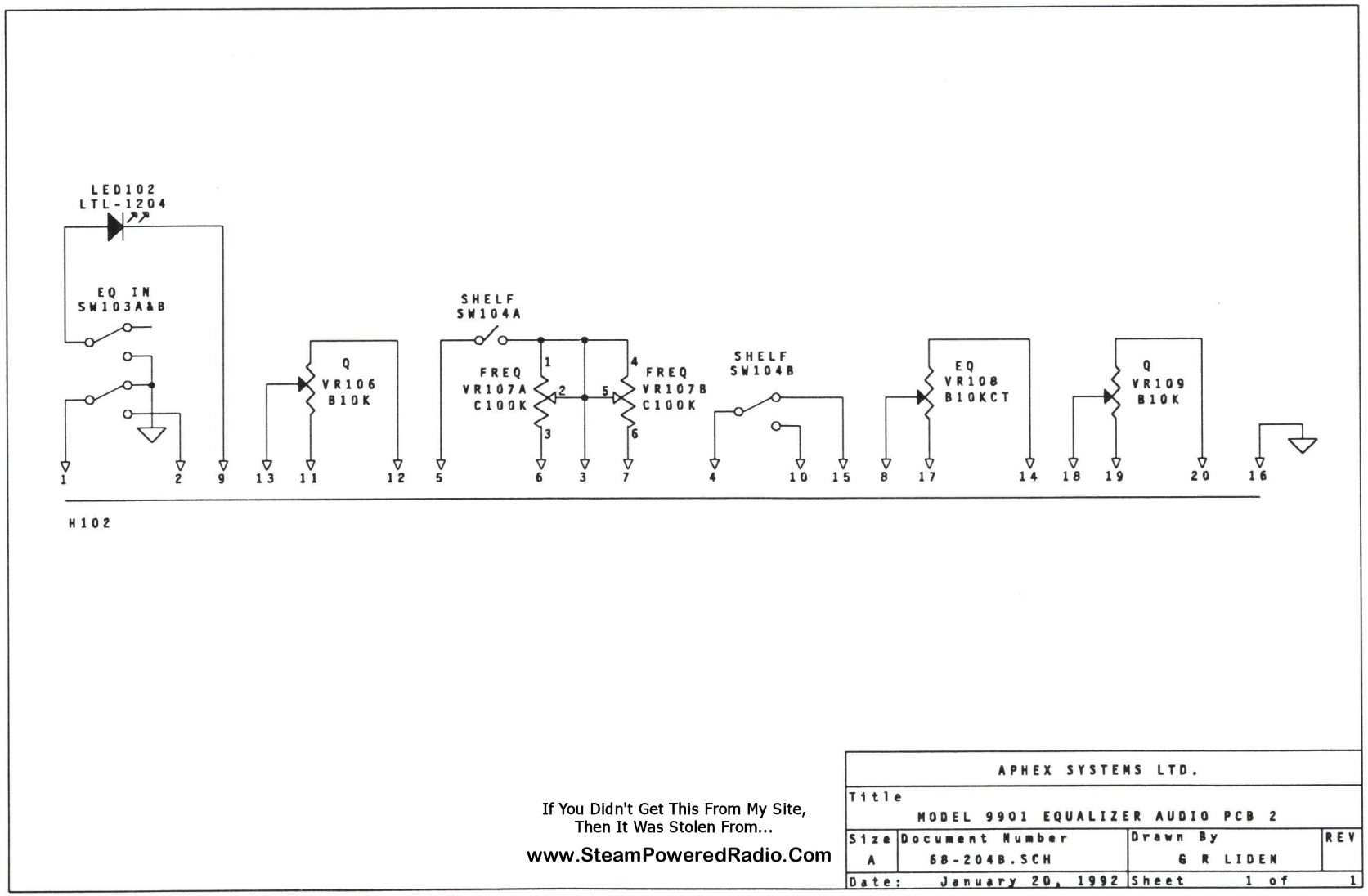
Low:	20 to 800Hz
Mid:	100 to 4kHz
High:	500 to 20kHz

OTHER SPECIFICATIONS

Power Requirements:	+/-15 Volts DC
Power Consumptions (max):	107mA
Dimensions:	Board: 4.5" H x 9.5" D; Front Panel: 5.25" H x 1.5W
Shipping Weight:	2lbs
Net Weight:	1lbs

7.0 SCHEMATICS





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