TO: [redacted]

NEW REVISED

Electro-Voice®
a MARK IV company

Models APL/APH
Low/High Pass Crossover/Equalizer Modules

SPECIFICATIONS

Channel Configuration:
One input, one band-pass output

Relative Phase:
Output is in phase with input

Frequency Response:
±0.5 dB in passband

Noise Output:
−88 dBu

Total Harmonic and Intermodulation Distortion:
0.02% typical

Output Configuration:
Unbalanced

Maximum Output Level:
+18 dBu

Output Protection:
Safe for short circuit or ±25 volts dc

Output Internal Impedance:
47 ohms

Input Configuration:
Balanced or unbalanced, user selectable

Input Impedance,
Bridging:
15,000 ohms unbalanced
Balanced:
30,000 ohms

Input Common-Mode Rejection:
55 dB, typical 60-1,000 Hz

Overall Gain:
0 dB

Bandpass Frequency Range:
(determined by module)

Filter Type:
Third-order Butterworth (18 dB per octave)

Low-Frequency Equalization for "Step-Down" Operation of TL Bass Speaker Systems:
Second-order under-damped filter with switchable plus-6-dB peak boost frequencies of 29, 32, 35, 45, and 60 Hz, plus "flat" with a high-pass f_3 of 30 Hz

Plug-In Module Horn/Driver Equalization, Supplied:
"Flat" module
Available Modules:
EQA, EQB, modules for EV horns
EB series for low frequency extension

Transient Performance:
Not limited by slew rate or power bandwidth over 20-20,000 Hz under any normal operating condition

Power Requirements:
±15 volt dc, 25 mA

Mounting:
Male octal connector with centering post

Octal Connector Pin Assignment:
Pin 1 = input (−)
Pin 2 = circuit common
Pin 3 = +15 volts dc
Pin 4 = chassis ground
Pin 5 = −15 volts dc
Pin 6 = input (+)
Pin 7 = no connection
Pin 8 = passband output

Overall Dimensions:
4.07 cm (1.6 in.) high
4.07 cm (1.6 in.) wide
5.08 cm (2.0 in.) deep

Net Weight:
45 g (1.6 oz)

DESCRIPTION

The EV APL/APH filters are single-channel, high-performance devices intended as accessories to the AP2600, AP2600SA, and 7300 amplifiers. The filters are available in a variety of frequencies, as listed at the end of this section. Response shape is third-order Butterworth (18-dB-per-octave slope).

Each APL module incorporates a 16-pin DIP socket that accepts the optional EB or HP plug-in modules that modify the standard third-order Butterworth response. The EB modules provide "step down" low-frequency response extension for various Electro-Voice TL series vented low-frequency speaker systems. Each APL low-pass module is shipped with an HP16/32 "flat" DIP module, which provides a 12-dB-per-octave rolloff for infrasonic speaker protection below 16 or 32 Hz, depending on module orientation.

Each APH module incorporates a 16-pin DIP socket which accepts the optional EQ series plug-in modules. These modules provide high-frequency equalization to compensate for the power-response rolloff inherent in all compression drivers and the effect of horn directivity on on-axis frequency response. The various EQ series modules are tailored to specific Electro-Voice DH compression drivers and HP/HR constant-directivity horns. Each APH high-pass module is shipped with an EQF "flat" DIP module, which provides an unmodified Butterworth response.

Model#	Description
APL-125	low-pass module, 125 Hz
APL-500	low-pass module, 500 Hz
APL-800	low-pass module, 800 Hz
APL-1250	low-pass module, 1,250 Hz
APH-125	high-pass module, 125 Hz
APH-315	high-pass module, 315 Hz
APH-500	high-pass module, 500 Hz
APH-800	high-pass module, 800 Hz
APH-1250	high-pass module, 1,250 Hz

A BMK blank module is available for the construction of custom filters. Write to Electro-Voice for additional information on specific EB, HP, and EQ modules currently available.

INSTALLATION

The filter is placed in series with the input to the power amplifier. To install an APL or APH, remove the two jumper pins in the octal socket associated with the channel in which the filter is to be inserted. Align the key and insert the module fully into the socket.

NOTE: One horn/driver equalization (or flat) module must be installed in the socket for the filter to be operative. See section for instructions.

WARRANTY (Limited)

Electro-Voice Accessories are guaranteed for one year from date of original purchase against malfunction due to defects in workmanship and materials. If such malfunction occurs, unit will be repaired or replaced (at our option) without charge for materials or labor if delivered prepaid to the proper Electro-Voice service facility. Unit will be returned prepaid. Warranty does not extend to finish, appearance items or malfunction due to abuse or operation under other than specified conditions, nor does it extend to incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you. Repair by other than Electro-Voice or its authorized warranty service agencies will void this guarantee. A list of authorized service centers is available from Electro-Voice, Inc., 600 Cecil Street, Buchanan, MI 49107 (AC/616-695-6831); Electro-Voice, Inc., 3810 148th Avenue N.E., Redmond, WA 98052 (AC/206-881-9555); Electro-Voice, Inc., 10500 W. Reno, Oklahoma City, OK 73128 (AC/405-324-5311) and/or Electro-Voice West, 8234 Doe Avenue, Visalia, CA 93291 (AC/209-651-7777). This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Service and repair address for this product: Electro-Voice, Inc., 10500 W. Reno, Oklahoma City, OK 73128.

Specifications subject to change without notice.

ELECTRO-VOICE, INC., 600 Cecil Street, Buchanan, Michigan 49107
MANUFACTURING PLANTS AT ■ BUCHANAN, MI ■ NEWPORT, TN ■ SEVIERVILLE, TN ■ REDMOND, WA ■ GANANOQUE, ONT.

a MARK IV company
Part Number 531094-804

OPERATING INSTRUCTIONS

ELECTRICAL

The **15594A** obtains its power from the powered octal accessory socket on the rear of the **9444A** or any other Anniversary Series power amplifier product. The circuitry is designed to operate with a bipolar (±) 15 volt DC supply and draws approximately 25 ma DC of current.

Note: The **944A** internal bipolar supply is independently fused for its own protection.

INSTALLATION

Remove (and save) the two "U" jumpers from the octal socket into which the **15594A's** octal plug will be inserted. Install the module's male octal plug into the female socket making sure that the key on the guidepost aligns with the grove in the female socket.

SIGNAL CONNECTIONS

Schematically the module will be inserted between the input connectors and the balanced input stage of the power amplifier. Though this may appear to eliminate the advantages of the balanced input stage of the power amplifier, the module's input stage is also electronically balanced and offers more than 60 dB (typically 80 dB) of common-mode signal rejection. For a review of typical input connections to the amplifier, refer to the **9444A** Power Amplifier Operating Instructions (Part No. 42-02-025946.

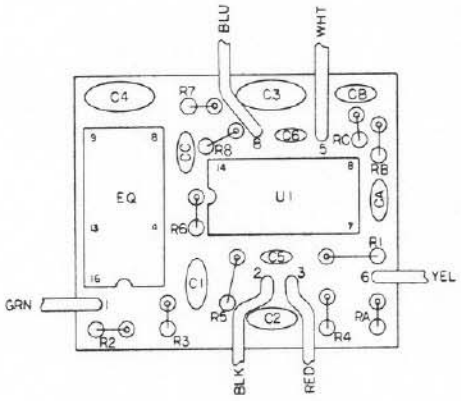
DISASSEMBLY OF CASE

The snap-a-part case makes disassembly quick and convenient. Apply pressure to one locking tab near the base of the module with a medium-size flat blade screwdriver until the base is free. If necessary, repeat the process for the remaining tab.

Note: A "flat" submodule assembly (Part No. 17-02-124712) is installed in the **15594A** by the factory and must remain in the circuit for the circuit to work unless replaced with a custom submodule assembly.

Installation of a Submodule Assembly

1. Remove the housing from the octal plug base to expose the circuit board.



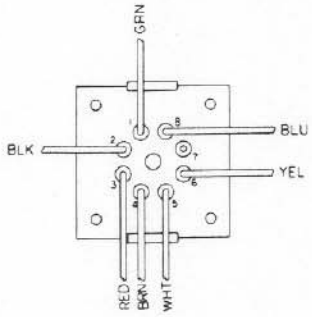


Figure 1. Component Layout of 15594A

2. Remove (and save) the FLAT submodule assembly from the socket at rear end of the circuit board (away from end with octal plug.) Note the position of the flatted corner of the submodule. This represents pin number 1 of the submodule.

3. Install the submodule assembly into the socket provided. Orient the submodule assembly such that pin 1 (the flatted corner) mates with pin 1 of the socket. Refer to Figure 1.

Note: The standard "flat" submodule assembly offers a choice of low end response down to either 16 Hz or 32 Hz with a roll-off rate of 12 dB/oct. Normally the factory orientates the submodule such that the low end corner frequency is 16 Hz (pin 1 of submodule to pin 1 of socket). The corner frequency may be changed to 32 Hz by simply rotating the submodule by 180° and re-installing it into the socket (pin 1 of submodule to pin 9 of socket).

LOW FREQUENCY EQUALIZER

A special 2nd order underdamped filter has been incorporated into the **15594A** to provide the low frequency contouring necessary for "step-down" operation of bass speaker systems and high pass filtering of subsonic signals.

Custom Low Frequency Equalization Submodules

The **9600A** Blank Submodule Assembly is available to construct custom equalization modules. The resistor designations in the following instructions refer to the designations used in the schematic. Refer to Figure 2.

I. Calculating a New Low End Corner Frequency While Maintaining Maximally Flat Response Throughout the Passband

The low end corner frequency at which the 12 dB/oct roll-off begins may be changed by calculating new values for resistors RE1 and RE2 from the following equations:

$$RE2 = \frac{(1.06 \times 10^{13})}{(4.7 \times 10^{6})(f3) - (2.25 \times 10^{6})} \text{ ohms}$$

$$RE1 = \frac{(4.7 \times 10^{6})\,RE2)}{2(RE2) + (9.4 \times 10^{5})} \text{ ohms}$$

where f3 is the new low end corner frequency.

II. Extending the Low Frequency Response

The low end response of the **15594A** may be extended to approximately 5 Hz by omitting RE1 and replacing RE2 with a 1 MΩ, ¼ W, 5% resistor.

III. Producing a Peak in the Low Frequency Response for Step-Down Operation

The proper selection of resistors RE1 and RE2 will produce a 6 dB boost in the low frequency response at frequency fpk. The values for the resistors may be calculated from the following equations:

$$RE2 = \frac{(3.11 \times 10^{13})}{(4.7 \times 10^{6})\,(fpk) - (6.61 \times 10^{6})} \text{ ohms}$$

$$RE1 = (4.43 \times 10^{5})/(fpk) \quad \text{ohms}$$

where fpk is the frequency where the maximum boost occurs.

CHANGING CROSSOVER FREQUENCY

A third-order Butterworth low pass filter performs the crossover function. Although the crossover frequency is fixed in the module, it can be changed by substituting new values for resistors, RA, RB, and RC.

Standard Crossover Frequency Component Values

Table I shows the resistor values required for the standard available crossover frequencies. The designations in Table I refer to the component designations used in the schematic. See Figure 2.

Table I. Frequency Determining Resistor Values for Standard Crossover Frequencies

Model No.	Crossover Frequency	RA	RB	RC
15594A-125	125 Hz	124 kΩ	887 kΩ	162 kΩ
15594A-500	500 Hz	32.4 kΩ	232 kΩ	41.2 kΩ
15594A-800	800 Hz	20.5 kΩ	147 kΩ	26.1 kΩ
15594A-1250	1250 Hz	13.0 kΩ	93.1 kΩ	16.9 kΩ

Custom Crossover Frequency Component Values

If other crossover frequencies are desired, the values for the three resistors may be calculated from the following equations:

$RA = (16.39 \times 10^{6})/(f3 + 6)$ ohms

$RB = (116.97 \times 10^{6})/(f3 + 6)$ ohms

$RC = (21.03 \times 10^{6})/(f3 + 6)$ ohms

where f3 = the desired crossover frequency in Hz.

SERVICE INFORMATION

Modifications to ALTEC LANSING products except for those described herein are not recommended. Such modifications shall be at the sole expense of the person(s) or company responsible, and any damage to persons or property resulting therefrom shall not be covered under warranty or otherwise.

Parts Ordering

To order replacement parts, look up the ordering number from the parts list and call (405) 324-5311, Telex 160369, FAX (405) 324-8981, or write:

ALTEC LANSING Replacement Parts Service
P.O. Box 26105
Oklahoma City, OK 73126-0105 U.S.A.

Factory Service

If factory service is required, ship the module prepaid to:

ALTEC LANSING Customer Service/Repair
10500 W. Reno
Oklahoma City, OK 73128 U.S.A.

Enclose a written note describing the problem along with any other helpful information such as where used, how used, etc.

Technical Assistance

For applications assistance or other technical information, call (405) 324-5311, Telex 160369, FAX (405) 324-8981, or write:

ALTEC LANSING Technical Assistance
P.O. Box 26105
Oklahoma City, OK 73126-0105 U.S.A.

PARTS LIST

Parts Common to All 15594A Modules

Reference Designator	Ordering Number	Name and Description
R1, 2	47-03-124484	Res., 15 kΩ, ¼ W, 1%
R3, 4, 5, 6	47-03-124615	Res., 30.1 kΩ, ¼ W, 1%
R7	47-01-107373	Res., 10 MΩ, ¼ W, 5%
R8	47-01-102046	Res., 47 Ω, ¼ W, 5%
C1, 2	15-06-124441	Cap., 25 pf, 1 kV
C3, 4	15-06-124637	Cap., .1 µf, 100 V, 5%
C5, 6	15-02-122891	Cap., .1 µf, 50 V, 20%
CA, B	15-06-124588	Cap., .01 µf, 100 V, 5%
CC	15-06-124587	Cap., .001, 100 V, 5%
U1	17-01-124461	IC, TL074CN
	14-01-026154	Housing
	14-04-026153	Base with Octal Plug
	17-02-124712	Submodule Assembly, FLAT

15594A-125

Reference Designator	Ordering Number	Name and Description
RA	47-03-123013	Res., 124 kΩ, ¼ W, 1%
RB	47-03-124633	Res., 887 kΩ, ¼ W, 1%
RC	47-03-124632	Res., 162 kΩ, ¼ W, 1%

15594A-500

Reference Designator	Ordering Number	Name and Description
RA	47-03-124631	Res., 32.4 kΩ, ¼ W, 1%
RB	47-03-124630	Res., 232 kΩ, ¼ W, 1%
RC	47-03-124629	Res., 41.2 kΩ, ¼ W, 1%

15594A-800

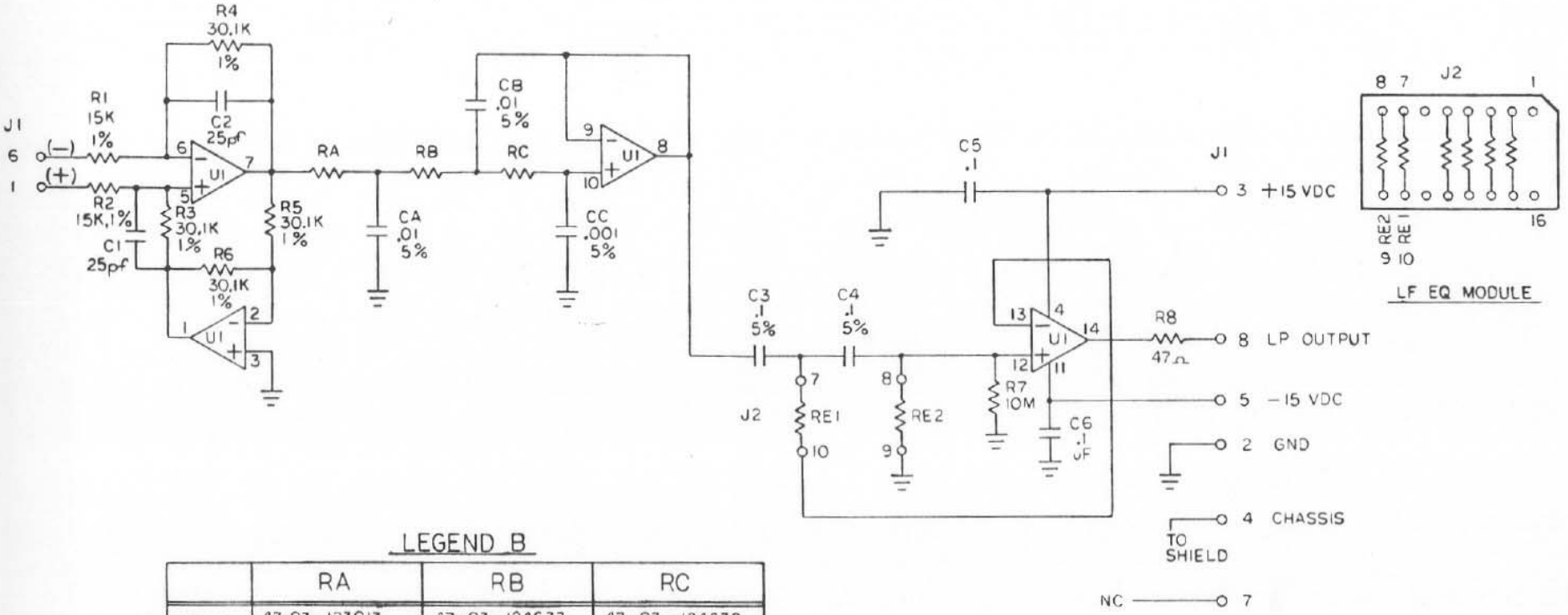
Reference Designator	Ordering Number	Name and Description
RA	47-03-124628	Res., 20.5 kΩ, ¼ W, 1%
RB	47-03-124627	Res., 147 kΩ, ¼ W, 1%
RC	47-03-119029	Res., 26.1 kΩ, ¼ W, 1%

15594A-1250

Reference Designator	Ordering Number	Name and Description
RA	47-03-123010	Res., 13.0 kΩ, ¼ W, 1%
RB	47-03-124626	Res., 93.1 kΩ, ¼ W, 1%
RC	47-03-124625	Res., 16.9 kΩ, ¼ W, 1%

LEGEND A

U1 = TL074CN
J1 = OCTAL SOCKET
J2 = 16 PIN



LEGEND B

	RA	RB	RC
125 Hz	47-03-123013 124KHM; 1%; .25W	47-03-124633 887KHM; 1%; .25W	47-03-124632 162KHM; 1%; .25W
500 Hz	47-03-124631 32.4KHM; 1%; .25W	47-03-124630 232KHM; 1%; .25W	47-03-124629 41.2KHM; 1%; .25W
800 Hz	47-03-124628 20.5KHM; 1%; .25W	47-03-124627 147KHM; 1%; .25W	47-03-119029 26.1KHM; 1%; .25W
1250 Hz	47-03-123010 13.0KHM; 1%; .25W	47-03-124626 93.1KHM; 1%; .25W	47-03-124625 16.9KHM; 1%; .25W

Figure 2. Schematic of 15594A