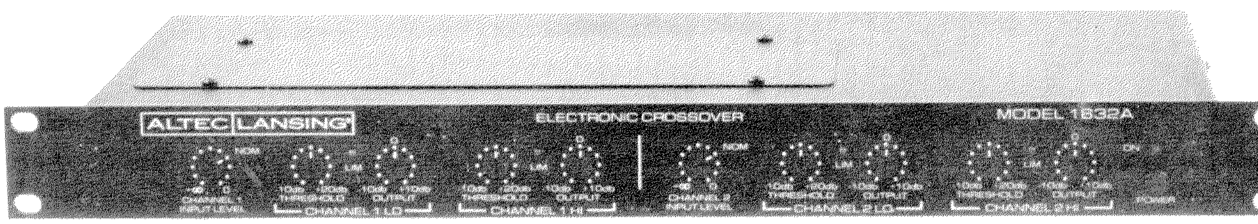
1632A ELECTRONIC CROSSOVER



DESCRIPTION

The ALTEC LANSING **1632A** Electronic Crossover is a dual channel two-way crossover switchable to a single channel three-way crossover. Combination woofer/enclosure equalization options are included on each low pass output along with combination horn/driver equalization options on each of the **1632A**'s high pass outputs. Also featured are selectable 30/60 Hz high pass input filters. Hard limiters on each output allow speaker protection in all but the most rugged of applications.

The crossover sections provide 24 switch selectable crossover frequencies ranging from 50 Hz to 10 kHz. Crossover frequencies are located on the ISO one-third octave centers. The Linkwitz-Riley fourth order filter response provides stop band attenuation of 24 dB/octave (80 dB/decade). Simple equations are provided to calculate other frequencies for custom applications.

Each low pass output is provided with a "flat" woofer/enclosure combination equalization submodule. This submodule provides a maximally flat frequency response. Other responses, including low frequency peaking and "step down", are available by custom building submodules whose components are easily calculated from simple equations provided to optimize a loudspeaker system.

Each of the high pass outputs is provided with a "flat" horn/driver combination equalization submodule. Optional submodules in the **9600A**-series are available to properly equalize almost any ALTEC LANSING horn and compression driver combination for a flat power response.

Speaker protection is provided by hard limiters on each output of the **1632A**. Each limiter features a front panel threshold control ranging from -10 dBu to +20 dBu with LED threshold indicators on each output. They also include switch selectable and user-optional response times to be used to aid in protecting low-frequency woofers as well as high-frequency compression drivers. The *feed-foward* design of each limiter eliminates the possibility of oscillation, and it allows exact response times to be program-dependent to preserve a more natural sound.

Other features include front panel input level controls for each input channel, ±10 dB gain controls for each output channel, barrier strip termination on each input and output, and electronically balanced input and output circuitry. The universal power transformer permits 100, 120, 200, 220, 240 Vac 50/60 Hz operation. An optional plug-in input and output line transformer, **15560A**, is available for isolation should it be deemed necessary.

SPECIFICATIONS

Type:	Dual-channel two-way electronic crossover or single-channel three-way electronic crossover
Input Type:	Electronically balanced
Input Impedance:	>15 kΩ unbalanced >30 kΩ balanced
Maximum Input Level:	+18 dBu (Ref. 0 dBu=0.775 Vrms)
CMRR:	>60 dB
Output Type:	Electronically balanced
Output Impedance:	<50 Ω unbalanced <100 Ω balanced
Maximum Output Level:	+24 dBm
Minimum Load Impedance:	600 Ω
Frequency Response: (Ref. 1 kHz)	30 Hz - 20 kHz +0, -3 dB
Total Harmonic Distortion:	<0.03% 0 dBu output at 1 kHz
Intermodulation Distortion (SMPTE):	< 0.1% at 0 dBu output
Noise Floor:	<-80 dBm A-weighted
Channel Crosstalk:	>60 dB
Input Filter:	30/60 Hz user-selectable high pass (24 dB/octave)
Crossover Frequency Range:	50 Hz to 10 kHz, switch selectable on the ISO one-third octave centers
Crossover Filter Type:	Fourth-order Linkwitz-Riley
Slope:	24 dB/octave (80 dB/decade)
Limiter Threshold Range:	-10 dBu to +20 dBu
Response Times:	Switch selectable from Ch.1 LF output: Slow (<500 Hz) to Medium (full range) All other outputs: Medium to Fast (>500 hz)

Controls:	Ten recessed screwdriver-slotted controls include: Two input level controls Four limiter threshold controls Four output gain controls AC power switch
Connections	
Input:	Barrier strip
Output:	Barrier strip
AC Power:	IEC power cord receptacle
Power Requirements:	100, 120, 200, 220, 240 Vac 50/60 Hz user selectable. Supplied wired and fused for 120 Vac with a power consumption of 14 watts. A detachable line cord with 120 volt grounding plug is supplied.
Operating Temperature:	Up to 60°C (140°F)
Dimensions:	1.75" (4.45cm) H x 19.0" (48.3cm) W x 9.75" (24.8cm) D
Shipping Weight:	11 lbs. (5 kg)
Net Weight:	8 lbs. (3.7 kg)
Enclosure:	Rack mount chassis 18 GA steel main chassis 18 GA steel top/back cover 3/16 inch aluminum front panel
Color:	Black
Support Documentation:	Equations to calculate new crossover frequency Equations to modify LF EQ curve Guidelines to modify HF EQ curve
Included Accessories:	Three "flat" horn/driver EQ submodules' Two "flat" low frequency submodule assemblies
Optional Accessories:	**10401** perforated steel security cover **15560A** plug-in line transformer

Optional Horn/Driver Equalization Submodule Accessories (16-pin DIP plug)

9600A: Blank submodule assembly for custom equalization

9601A
9602A
9603A
9604A
9605A
9606A
9607A
9608A
9609A
9610A

See chart to select 9600-series submodule for a particular horn/driver combination.

LARGE FORMAT HORNS AND DRIVERS

HORN \ DRIVER	288-L	290-L	291-L	299-L	906-A
MR42B	**9603A**	**9602A**	**9603A**	**9603A**	**9603A**
MR64B	**9601A**	**9602A**	**9601A**	**9601A**	**9601A**
MR94B	**9601A**	**9602A**	**9601A**	**9601A**	**9601A**
MRII-542	**9605A**	**9602A**	**9606A**	**9606A**	**9607A**
MRII-564	**9607A**	**9602A**	**9608A**	**9607A**	**9607A**
MRII-594A	**9605A**	**9604A**	**9604A**	**9605A**	**9605A**
MRII-5124	**9610A**	**9602A**	**9604A**	**9609A**	**9609A**

SMALL FORMAT HORNS AND DRIVERS

MR994A/909-A: **9609A**

ALTEC LANSING continually strives to improve products and performance. Therefore, specifications are subject to change without notice.

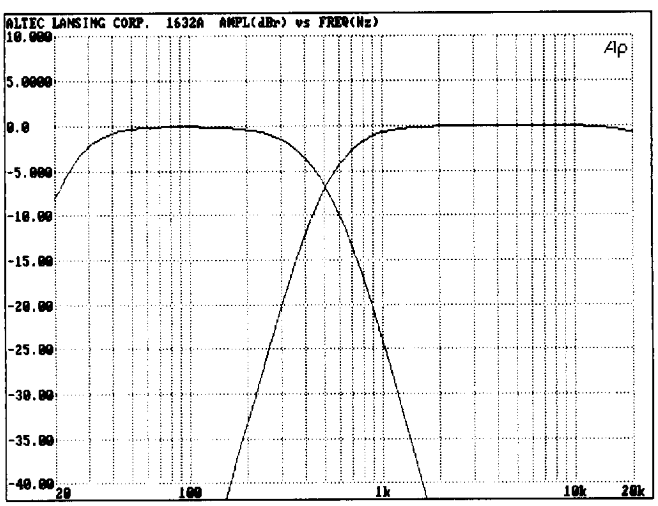


Figure 1. Typical two-way crossover curve.

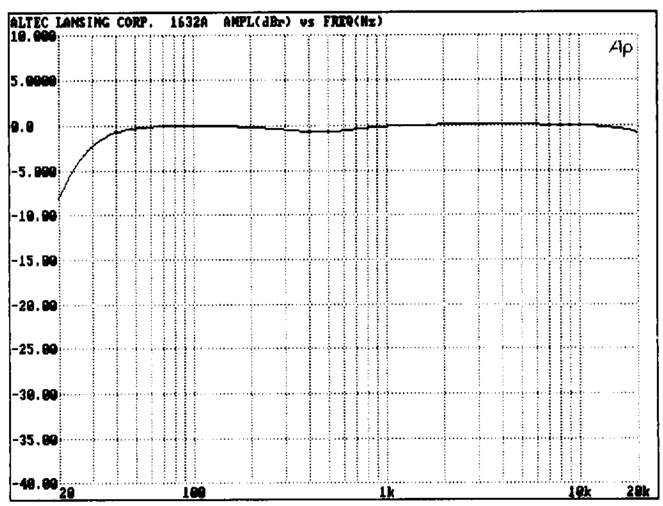


Figure 2. Summed high pass and low pass amplitude response

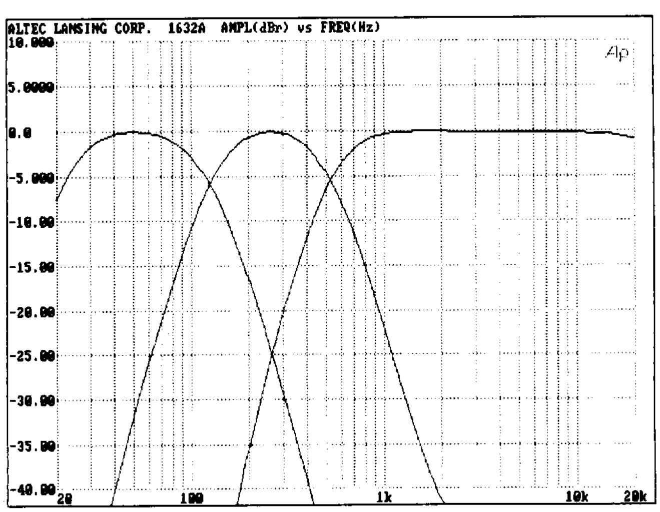


Figure 3. Typical three-way crossover curve.

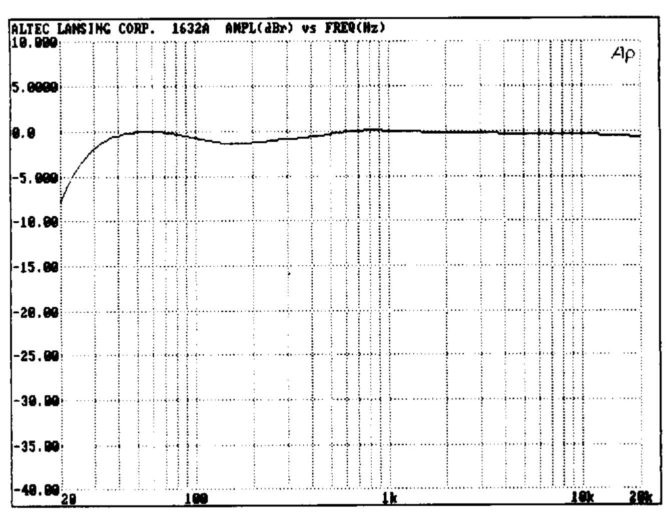
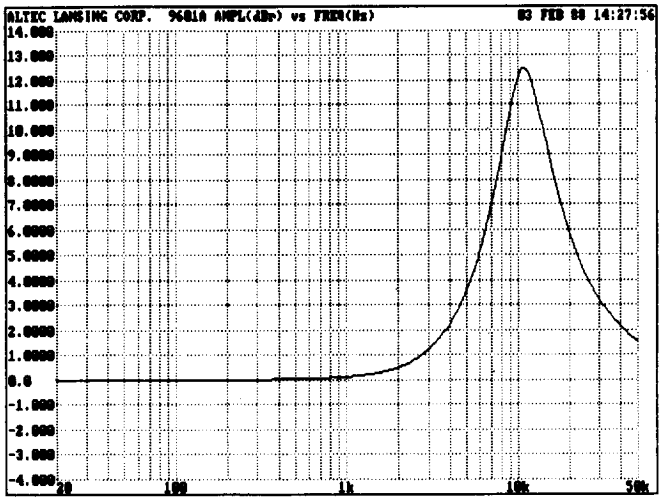
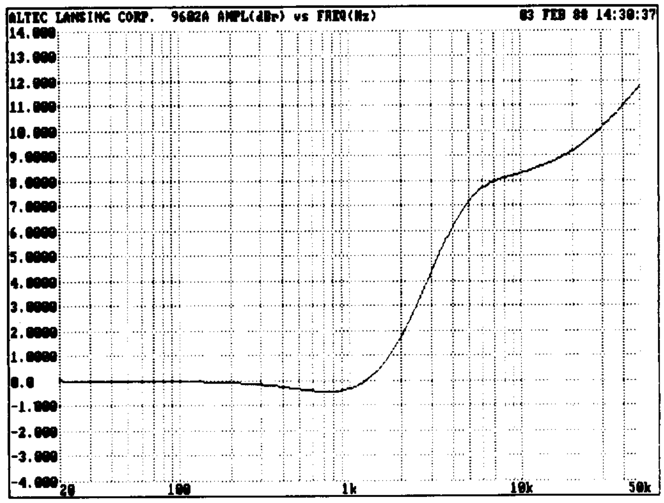
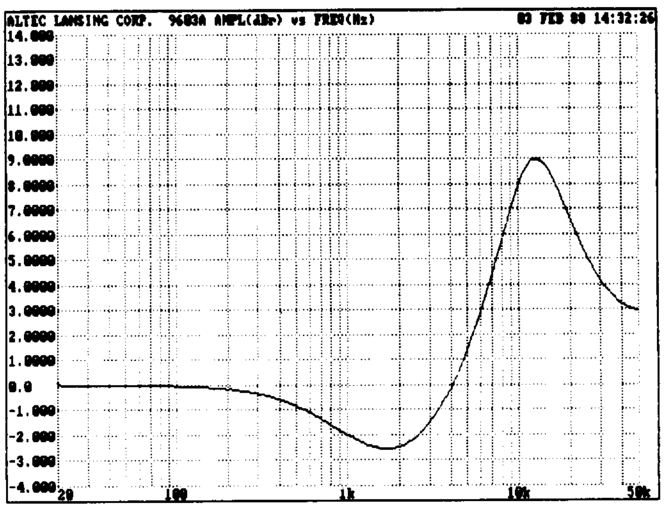


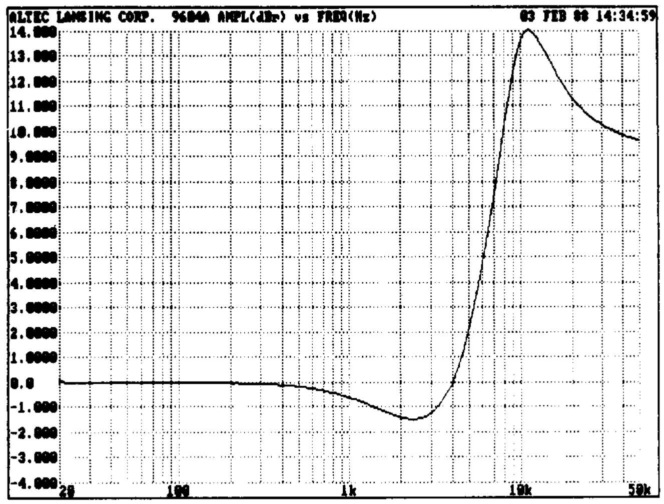
Figure 4. Summed high pass, low pass, and mid band amplitude response.

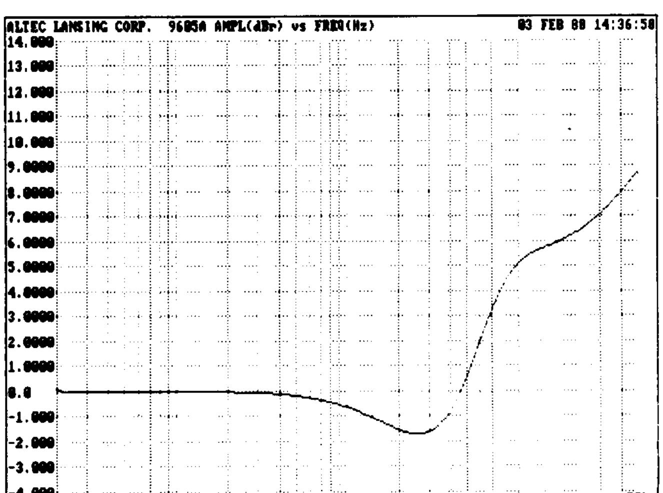
EQUALIZATION CURVES FOR THE 9600A SERIES SUBMODULES

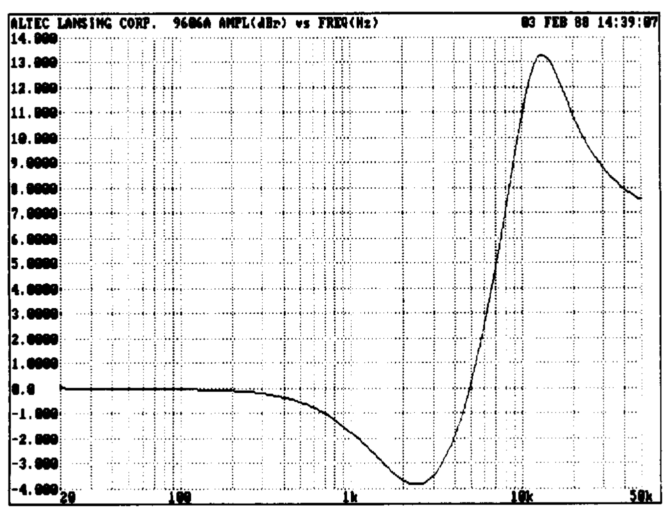


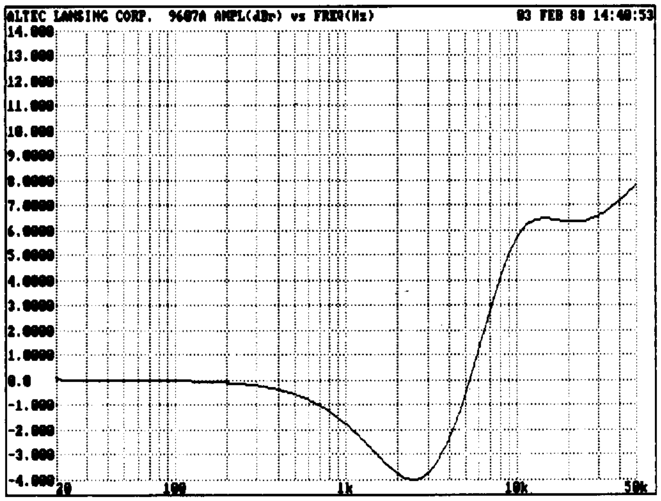








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-4.000
20
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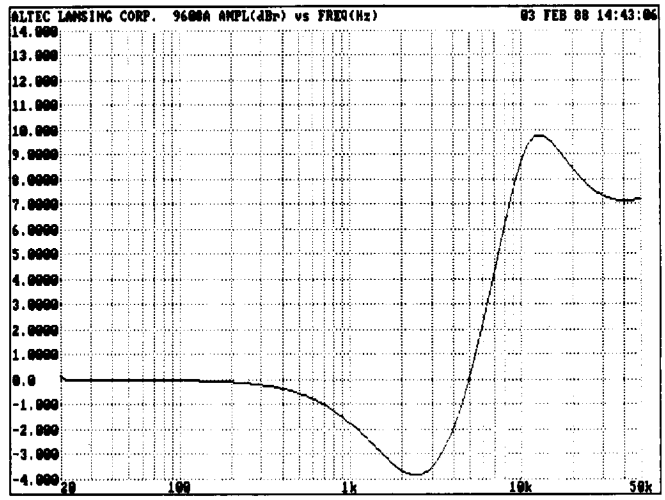
1k
10k
50k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-4.000
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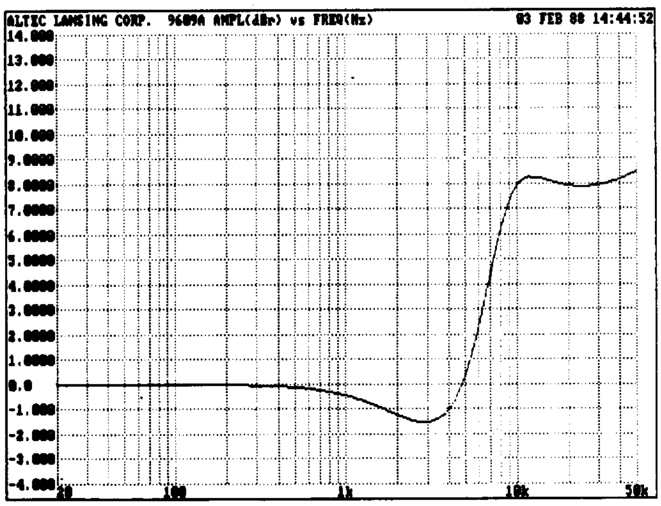
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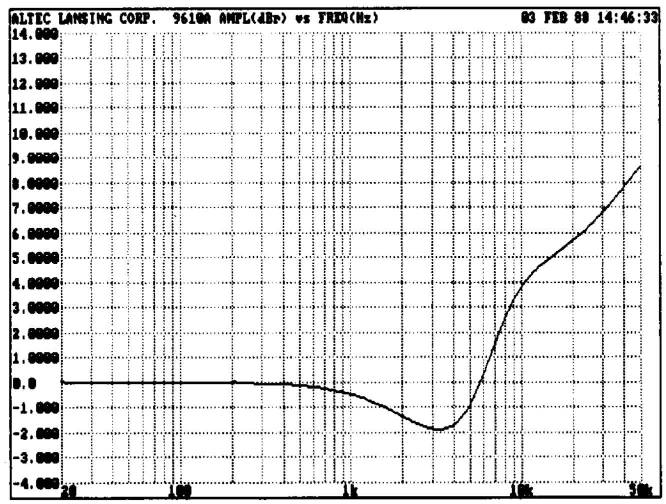
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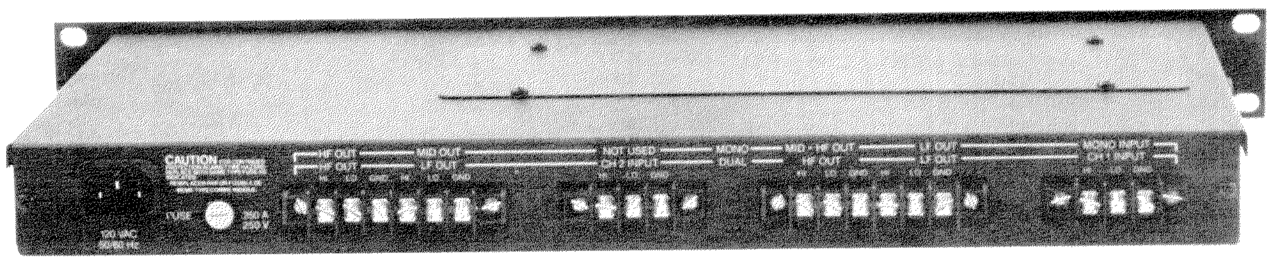
5.0000
4.0000
3.0000
2.0000
1.0000
0.0
-1.000
-2.000
-3.000
-4.000
20
100
1k
10k
50k



ARCHITECT'S AND ENGINEER'S SPECIFICATIONS

The electronic crossover shall be a dual-channel two-way crossover switchable to a one-channel three-way crossover. The crossover sections shall provide 24 switch selectable frequencies within the range of 50 Hz to 10 kHz. Crossover frequencies shall be chosen to conform to ISO one-third octave centers. The crossover shall include additional circuitry and female DIP sockets for the acceptance of optional plug-in equalizer submodule assemblies in all outputs. In the low frequency outputs, this circuitry, in combination with the submodule assemblies shall equalize specific woofer/enclosure combinations for low frequency peaking or "step down" operation. For the high frequency outputs, this circuitry, in combination with the submodule assemblies, shall equalize specific horn/driver combinations for a flat power response. This circuitry shall be compatible with ALTEC LANSING's **9600A**-series of horn/driver equalization submodules. Three "flat" horn/driver submodules and two "flat" low frequency submodules shall be included accessories. A limiter shall be included on each output. Each limiter shall have a threshold control ranging from -10 dBu to +20 dBu and switch selectable response times. An LED threshold indicator shall be included on each output. The limiters shall exhibit the feedforward design concept to eliminate the possibility of oscillation. Each input shall include a user-selectable 30/60 Hz high pass filter with the slope of 24 dB/octave.

An input level control shall be included on each input along with a gain control on each output.

The electronic crossover shall meet or exceed the following criteria: electronically balanced inputs and outputs; input impedance: 15 kohms unbalanced and 30 kohms balanced; maximum input level: +18 dBu; CMRR: >60dB; output impedance: 50 ohms unbalanced and 100 ohms balanced; maximum output level: +24 dBm; minimum load impedance: 600 ohms; frequency response: 30 Hz to 20 kHz +0, -3 dB; THD: <0.03% 0 dBu output at 1 kHz; IMD (SMPTE): <0.1% 0 dBu output; noise floor: < -80 dBm A-weighted; and channel crosstalk: >60dB. Input and output connections shall be made via barrier strips and the ac power via IEC power cord receptacle. A universal power transformer shall permit use with 100, 120, 200, 220, 240 Vac 50/60 Hz lines. Power consumption shall be 14 watts at 120 Vac. A standard IEC power cord shall be included. The electronic crossover shall be enclosed in a black 18 GA steel rack mount chassis with a 3/16 inch aluminum front panel. The unit shall conform to the following dimensions: 1.75" H x 19.0" W x 9.75" D, with a weight of 8 lbs.

The electronic crossover shall be the ALTEC LANSING **1632A**.

ALTEC LANSING®

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OPERATING INSTRUCTIONS

FOR THE 1632A ELECTRONIC CROSSOVER

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OPERATING INSTRUCTIONS
FOR THE 1632A ELECTRONIC CROSSOVER

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OPERATING INSTRUCTIONS

1.0 ELECTRICAL

1.1 120 Vac, 50/60 Hz Power Connections

The **1632A** is provided with the primary of the power transformer strapped for 120 Vac operation from the factory. Refer to Table I for exact strapping details.

NOTE: *Verify that the line voltage is in accordance with the selected voltage rating BEFORE connecting the* **1632A** *to the ac line.*

1.2 100, 200, 220, 240 Vac, 50/60 Hz Power Connections

The **1632A** may be powered from line voltages other than 120 Volts by re-strapping the primary of the power transformer. Use the following procedures to change the factory strapping to the desired line voltage.

1. Disconnect the **1632A** from the ac power source.
2. Remove the seven screws securing the top/back cover. There is 1 screw on each side, 3 screws on the rear, and the 2 middle screws inset into the front panel. Refer to Figure 1 for the exact screw location.
3. Locate the six voltage select solder cups near the power transformer. See Figure 2 for location.
4. Referring to Table I, unsolder the jumper wires from the solder cups and resolder them in accordance with the pin designations that correspond to the desire operating voltage.

Table I. Primary Power Conversion Chart

PRIMARY VOLTAGE	CONNECT PINS
100 V	1-5, 2-4
120 V	1-6, 3-4
200 V	2-5
220 V	2-6
240 V	3-6

5. Install the top/back cover with the seven screws previously removed.

Table II. Fuse Selection Chart

AC Line Voltage	AC Line Fuse
100 V	1/4 A/250V
120 V	1/4 A/250V
200 V	1/8 A/250V
220 V	1/8 A/250V
240 V	1/8 A/250V

6. Install the proper fuse value from Table II.

NOTE: *Use of fuses other than those listed in Table II will void the warranty.*

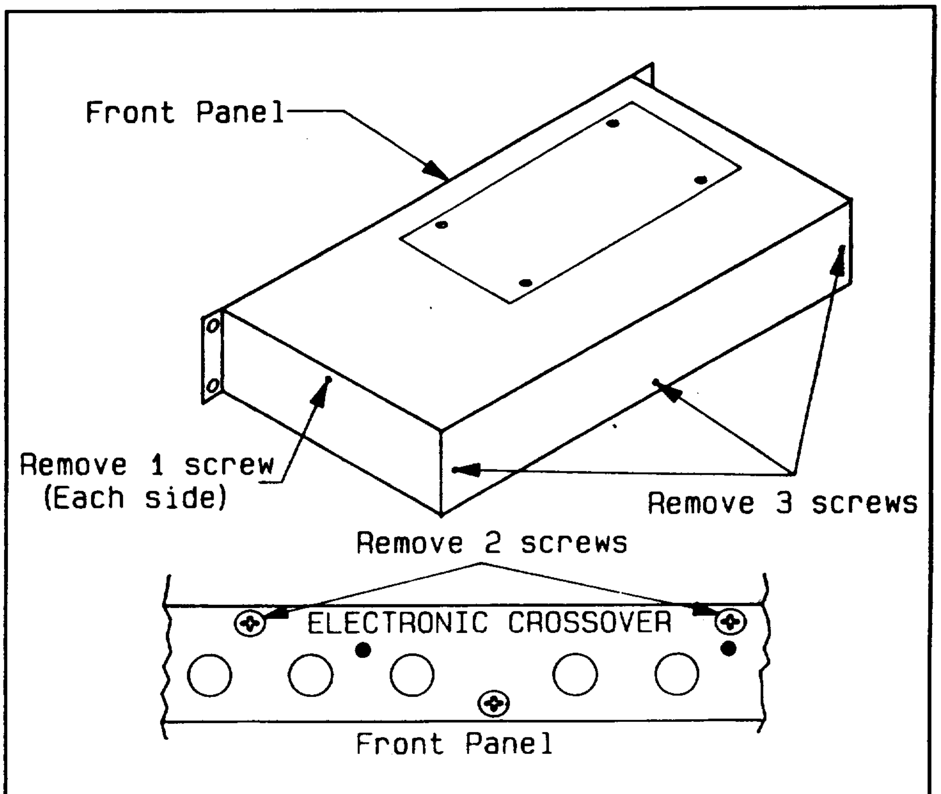


Figure 1. Top/back cover removal.

2.0 INSTALLATION

2.1 Rack Mounting

The **1632A** may be installed in a standard 19-inch equipment rack. It requires 1.75 inches of vertical space and mounting is accomplished by using the appropriate four screws supplied.

2.2 Ventilation

The **1632A** should not be used in areas where the ambient temperature exceeds 60°C (140°F).

3.0 SIGNAL CONNECTIONS

3.1 Input Connections

The inputs to the **1632A** are electronically balanced. For balanced input lines, connect the noninverting (+) side of the line to the "HI" input terminal. Then connect the inverting (-) side to the "LO" input terminal and the shield to the "GND" terminal. For unbalanced input lines, connect the noninverting (+) side to the "HI" input terminal, the inverting (-) side to the "LO" input terminal and then strap the "LO" terminal to "GND". Refer to Figure 3 for typical input connections.

When the **1632A** is used in the single channel three-way mode (see **Mode Selection** below), the input should be made to the Channel 1 input connector.

3.2 Output Connections

The outputs of the **1632A** are also electronically balanced. For balanced output lines, connect the noninverting (+) side of the line to the "HI" output terminal. Then connect the inverting (-) side to the "LO" output terminal and the shield to the "GND" terminal. For unbalanced output lines, connect the noninverting (+) side to the "HI" output terminal. Then connect the inverting (-) side to the "GND" terminal. Unbalanced loads connected as described above will experience a 6 dB loss in output signal. This loss may be made up by using the Output gain control or by installing the optional **15560A** line transformer described below. Refer to Figure 4 for typical output connection details.

CAUTION: ***The 1632A's electronically balanced outputs are ground referenced.* DO NOT connect the "LO" side to ground for unbalanced operation. *This may cause overheating and ultimate failure of the output stage. If your system requires unbalanced operation, connect only between the "HI" output terminal and the "GND" terminal.***

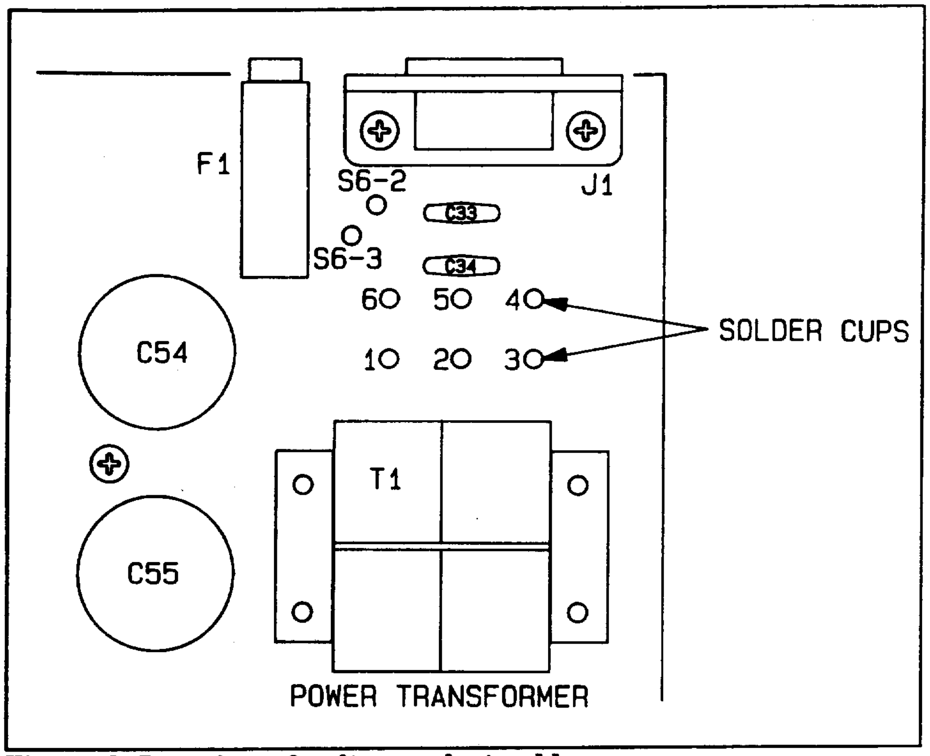


Figure 2. Location of voltage select solder cups.

4.0 INSTALLING OPTIONAL 15560A LINE TRANSFORMER

The Model **15560A** line transformer is available to provide isolation for the input and the output, if necessary. The circuit board is drilled to accept the **15560A**. Use the following procedures to install the **15560A** line transformer.

1. Turn off power to the **1632A** and remove (and save) the seven screws securing the top/back cover. See Figure 1.
2. Locate the transformer mounting areas near the rear of the circuit board. See Figure 5 for exact locations.
3. Cut and remove the two jumpers for each transformer installed. These jumpers are indicated in Figure 5.
4. Insert the transformer into the pin receptacles inside the desired mounting area. (The orientation of the pin receptacles is keyed so that the transformer can be inserted only one way.)
5. Replace the top/back cover with the seven screws previously removed.

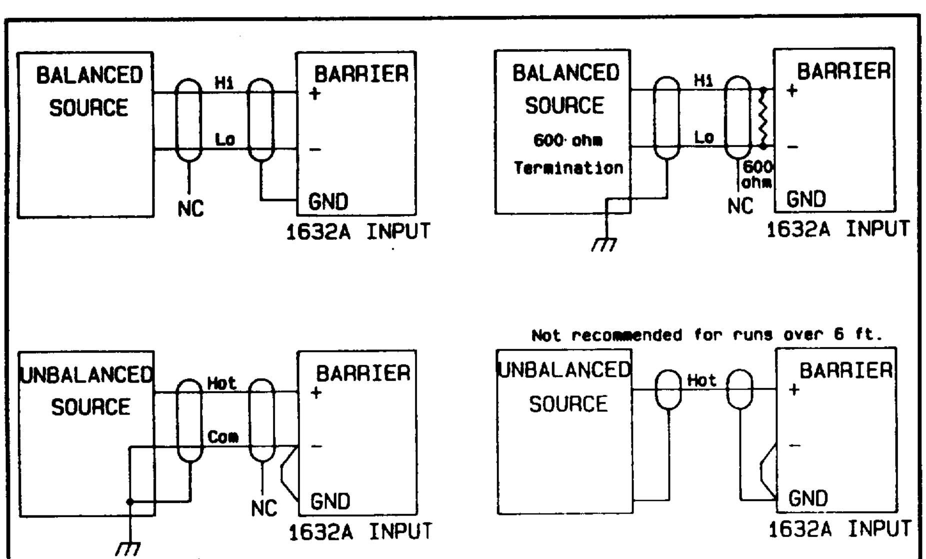


Figure 3. Typical input connections.

5.0 OPERATION

5.1 Mode Selection

The **1632A** may be used in one of two modes: a dual channel two-way crossover or a single channel three-way crossover. A mode switch is provided to select the desired mode of operation. This switch is located

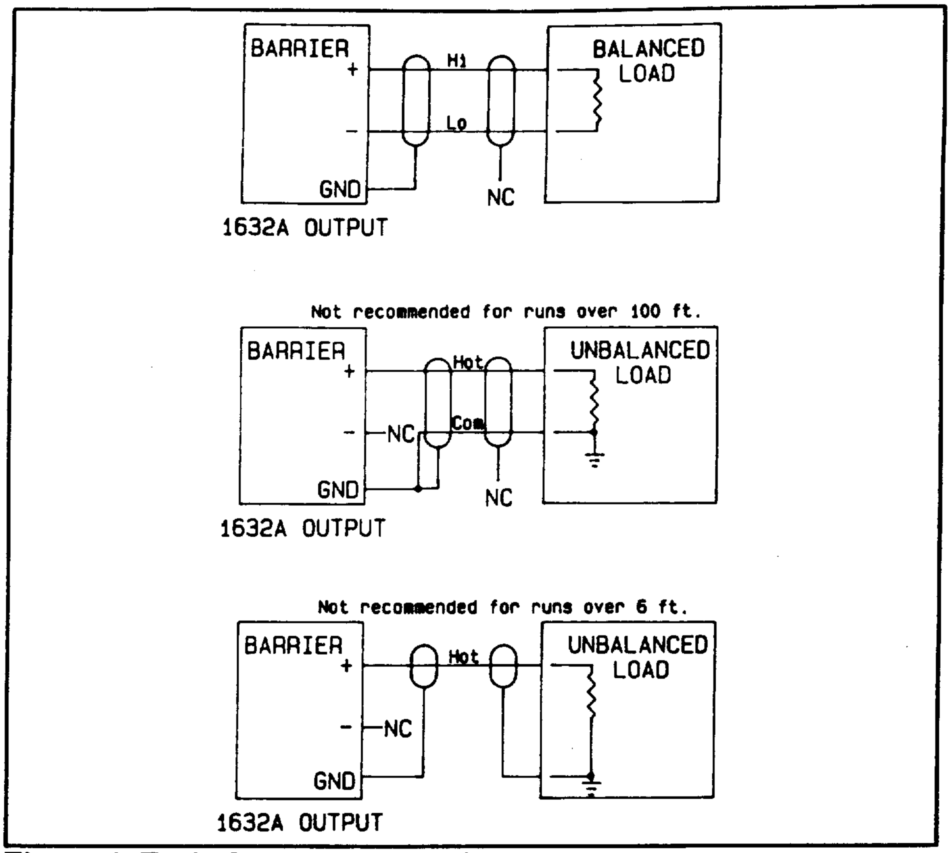


Figure 4. Typical output connections.

inside the unit. It is accessible by removing the panel on the top/back cover. See Figure 6. For exact mode switch location see Figure 7. Figure 8 shows the **1632A** in the dual channel mode used in a typical bi-amplified system. Figure 9 shows the **1632A** in the single channel mode used in a typical tri-amplified system.

5.2 Input Filter

A 30 Hz 24 dB/octave input filter is included on each channel. This filter may be changed to 60 Hz by clipping out four jumpers on each channel, or may be changed to other frequencies. Follow these procedures:

1. Turn off power to the **1632A** and remove the seven screws securing the top/back cover. See Figure 1.
2. To change to 60 Hz, locate the four appropriate jumpers. See Figure 5. Channel 1 jumpers are labeled J10, J11, J12, and J13. Channel 2 jumpers are labeled J210, J211, J212, and J213. With a pair of side cutters cut each jumper and remove it from the circuit board.
3. To change to other frequecies, change the value of each capacitor (C19, 20, 21, 22 on Channel 1 and C219, 220, 221, 222 on Channel 2) inversely proportional to the frequency change.
4. Replace the top/back cover.

5.3 Crossover Frequency Selection

5.3.1 Switchable Frequency Selection

Each channel contains a crossover for use in the dual channel two-way mode as shown in the bi-amplified system in Figure 8. When used in the single channel three-way mode

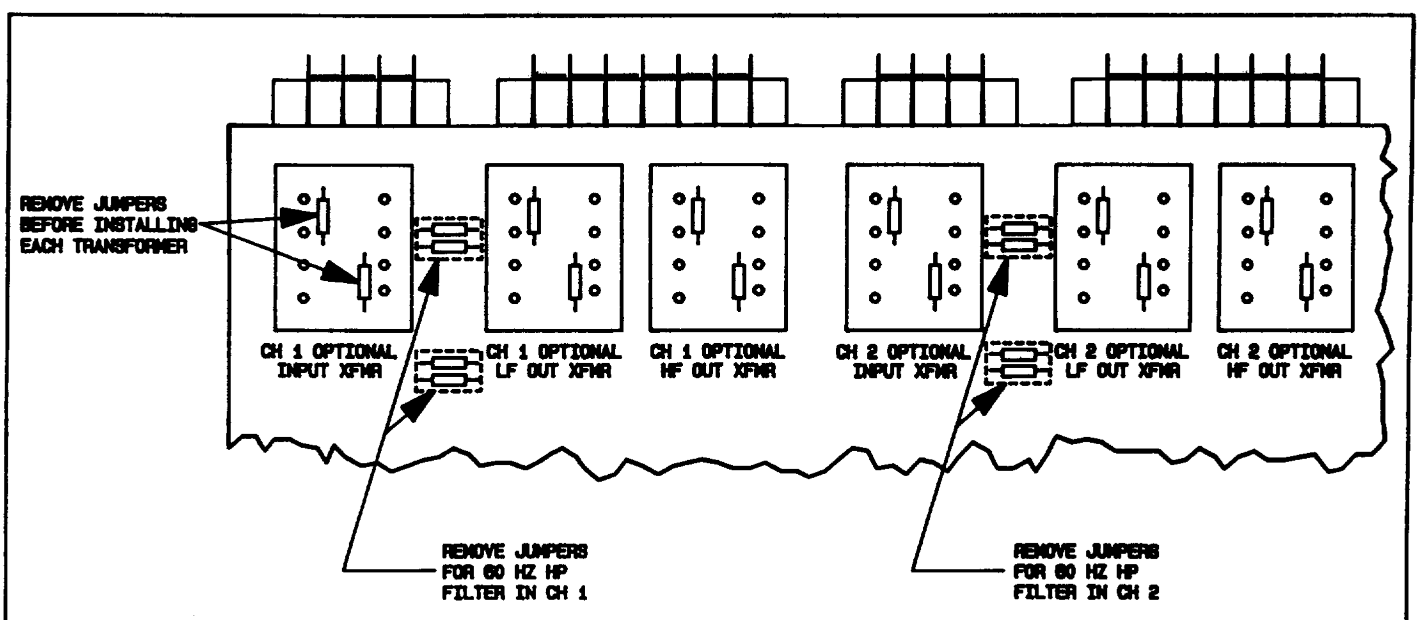


Figure 5. Location of optional line transformers and input filter jumpers.

the crossover in Channel 1 is used to select the lower crossover frequency. The crossover in Channel 2 is used to select the higher crossover frequency. See Figure 11 for the 1632A's block diagram.

CAUTION: ***Do not change the crossover frequency setting while the 1632A is powered.***

To select the desired crossover frequency, follow these procedures:

1. Turn off power to the **1632A** and remove (and save) the four screws that secure the access panel. See Figure 6 for details.

2. Locate the five DIP switch blocks for EACH crossover. There is one "C" switch block and four "R" switch blocks for EACH crossover. The "C" block in Channel 1 is labeled S5 and the "R" blocks are labeled S1, S2, S3, and S4. The "C" block in Channel 2 is labeled S25 and "R" blocks are labeled S21, S22, S23, and S24. Refer to Figure 7 for details.

3. See Table III for the list of crossover frequencies and associated switch positions.

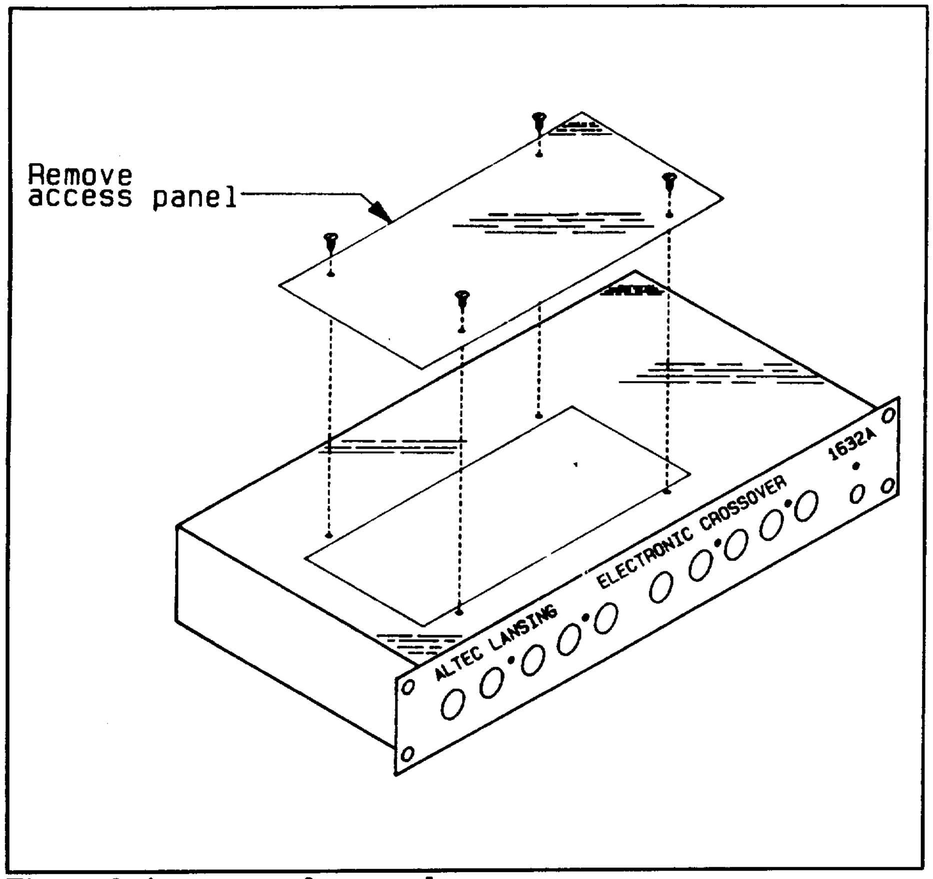


Figure 6. Access panel removal.

4. Move each switch in the "C" block to the position ("On" or "Off") that corresponds to the desired crossover frequency.

5. For each "R" block, move each of the eight switches to the position that corresponds to the desired crossover frequency.

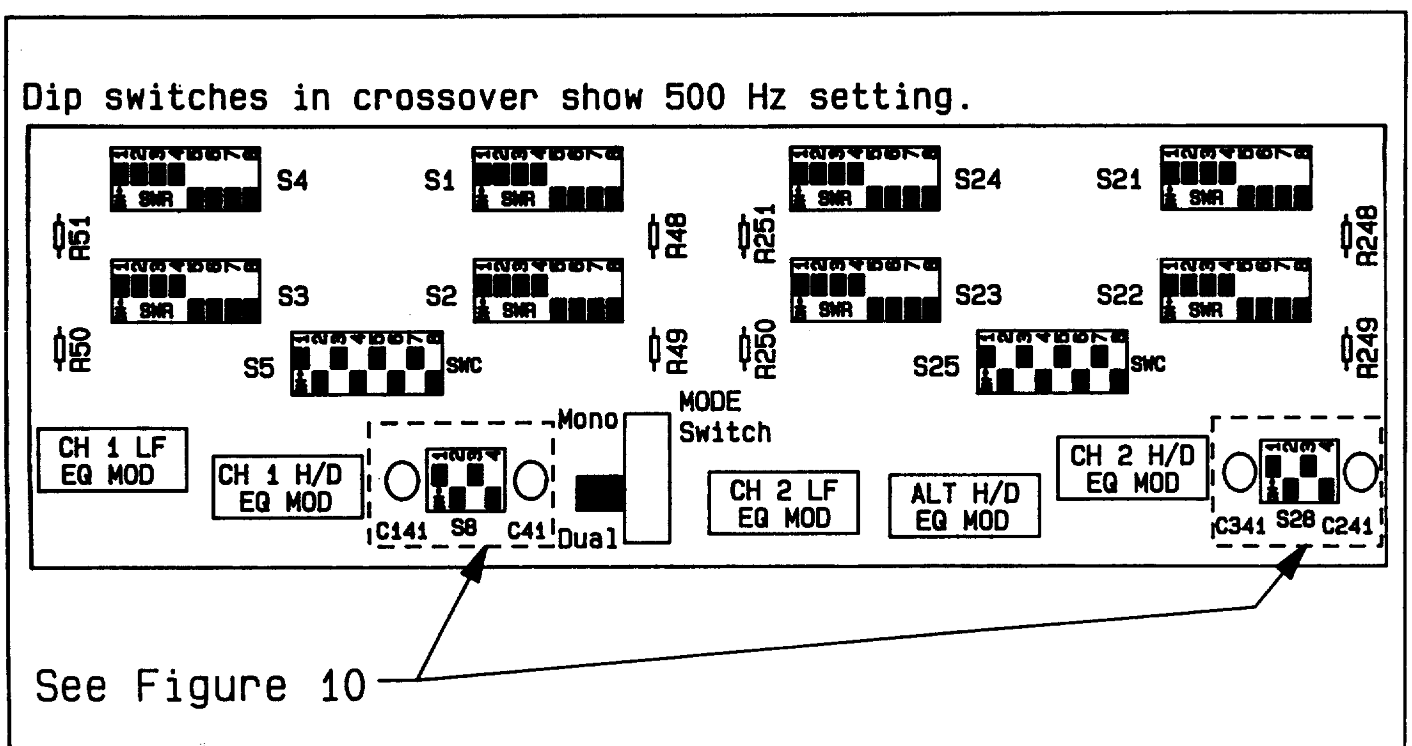


Figure 7. Location of pertinent components with access panel removed.

Table III. Crossover Frequency Switch Settings

CAUTION: Speaker damage may occur if switches are improperly set or changed while the 1632A is on.

FREQ.	SWITCH C	SWITCH R (on)	FREQ.	SWITCH C	SWITCH R (on)
50	all on	1	800	all on	12345
63	1357 on	1	1k	1357 on	12345
80	all off	1	1.25k	all off	12345
100	all on	12	1.6k	all on	123456
125	1357 on	12	2k	1357 on	123456
160	all off	12	2.5k	all off	123456
200	all on	123	3.15k	all on	1234567
250	1357 on	123	4k	1357 on	1234567
315	all off	123	5k	all off	1234567
400	all on	1234	6.3k	all on	12345678
500	1357 on	1234	8k	1357 on	12345678
630	all off	1234	10k	all off	12345678

6. Replace the access panel.

NOTE: *An example of a 500 Hz crossover setting is in Figure 7.*

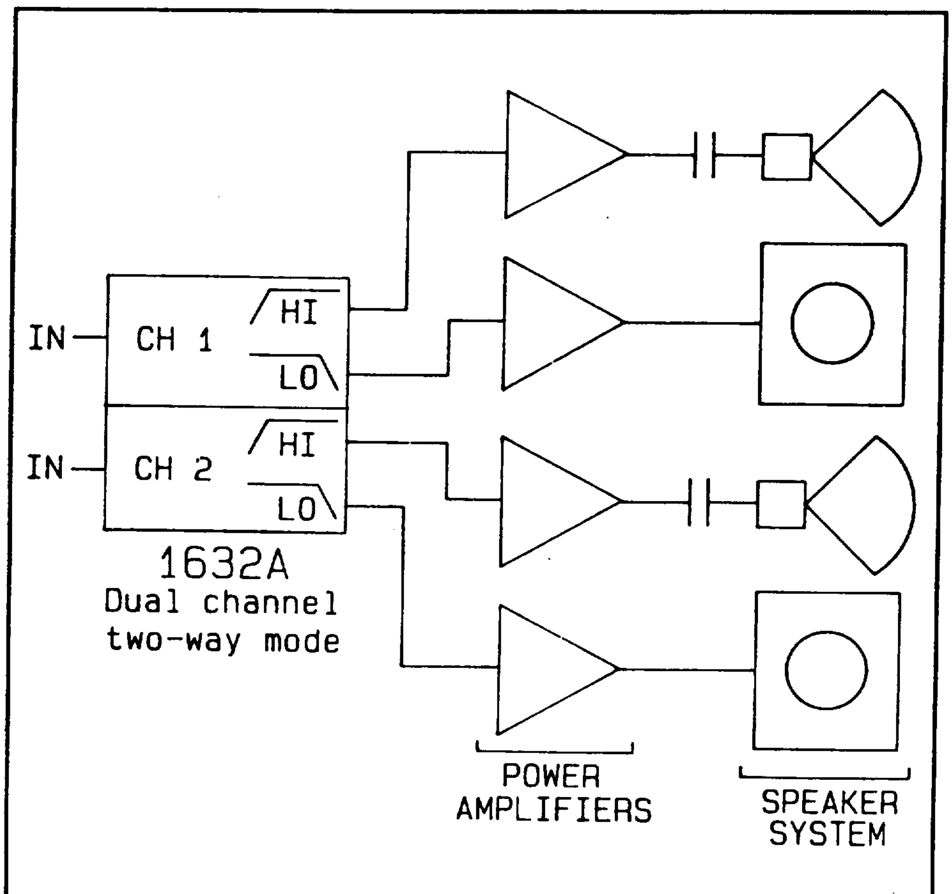


Figure 8. Typical bi-amplified sound system.

5.3.2 Optional Fixed Frequency Modification

Provisions have been designed into the 1632A that allow the user to bypass the selector switches and permanently set the crossover frequency to one fixed value. This may be useful in the unlikely event that one of the 24 switch selectable crossover frequencies will not suit a particular application or the user may simply wish to permanently set the unit to one of the ISO one-third octave centers already provided. In either case, the unit's crossover frequency will be fixed at one set value. None of the switching blocks will be used and all 40 switches in each channel must be set to the "Off" position.

This modification is performed by adding four resistors to each crossover circuit. The resistor locations are designated by R48, R49, R50, R51 in Channel 1 and R248, R249, R250, and R251 in Channel 2. These are shown in Figure 7 and designated as "User Option" in the schematic diagram of Figure 13.

NOTE: *By performing this modification, the user forfeits the ability to switch select that channel's crossover frequency. Resistors R48-R51 in Channel 1 and R248-R251 in Channel 2 MUST be removed in order to return that channel to the switch selectable state.*

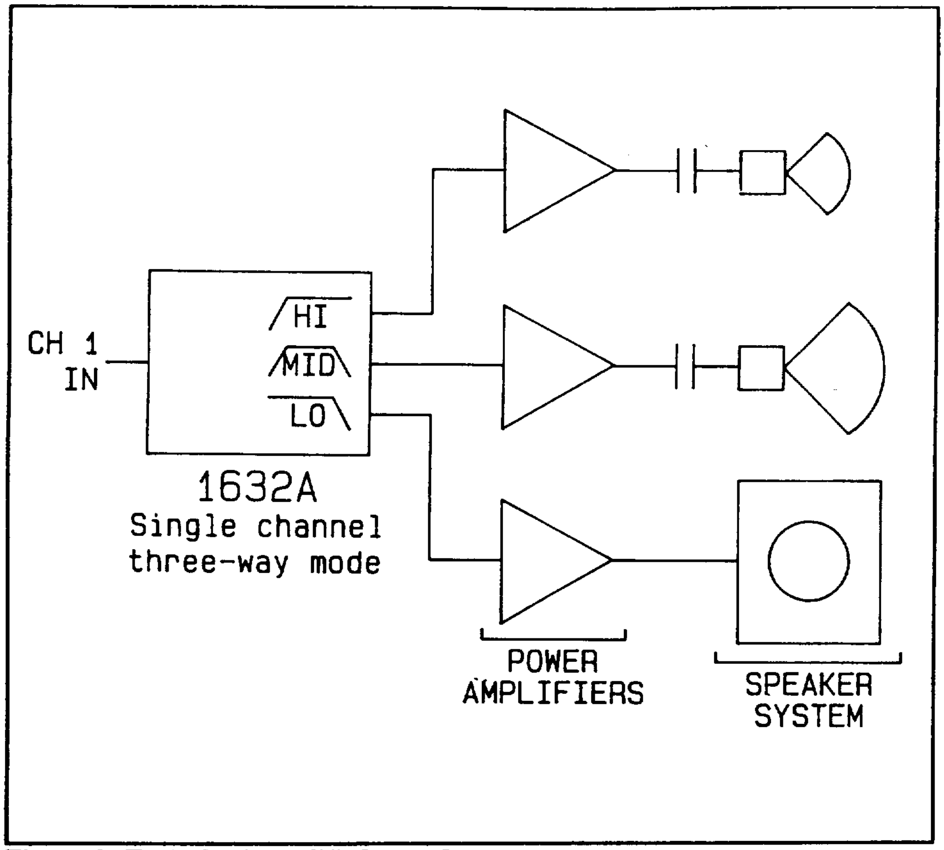


Figure 9. Typical tri-amplified sound system.

To obtain the resistor value for R48-R51 (R248-R251), use the following equation:

$R = (1.6 \times 10^7) / f_c$

where R = R48(R248) = R49(R249) = R50(R250) = R51(R251) and f_c is the desired crossover frequency in Hertz. Choose the nearest standard value.

NOTE: ***Metal film 1% resistors are highly recommended for this modification.***

To implement this modification, follow these procedures:

1. Turn off power to the **1632A** and remove the access panel from the top/back cover. See Figure 6.
2. Find the resistor locations R48-R51 and/or R248-R251. Refer to Figure 7.
3. At each location, two lead sockets are provided for easy installation of the user option resistors. To install, cut the resistor leads to about ¼ inch long, bend them at right angles, and insert them straight into the sockets.
4. Verify that all 40 switches on EACH channel are in the "Off" position.
5. Replace the access panel.

5.4 Equalization Submodules

5.4.1 Low Frequency EQ Submodule

A special second-order underdamped filter has been incorporated into each of the low frequency outputs of the **1632A** to provide the low frequency contouring necessary for "step-down" operation of bass speaker systems and/or high pass filtering of subsonic signals. See Figure 7 for exact locations. To provide a flat frequency response, a 1 MΩ resistor for RE2 is factory installed in each of the low pass outputs. Blank submodule assemblies are available for customized low frequency equalization. The resistor designations in the following calculations refer to the designations used in the schematic. Refer to Figure 13.

5.4.1.1 Low End Corner Frequency Calculation

To build a customized low frequency high pass filter in a **9600A** blank submodule calculate values for resistors RE1 and RE2 from the following equations:

$$RE2 = (1.06\times10^{13}) / [(4.7\times10^6)(f_{-3}) - (2.25\times10^6)]$$

$$RE1 = [(4.7\times10^6)(RE2)] / [2(RE2) + (9.4 \times 10^6)]$$

ohms, where f_{-3} is the new low end corner frequency.

Table IV. Component Values for 9600A-Series Submodules

MODEL #	RE1	RE2	RE4	RE5	RE6
9601A	17.4k	20.0k	53.6k	40.2k	1.82k
9602A	78.7k	78.7k	511k	40.2k	17.4k
9603A	78.7k	78.7k	200k	28.0k	1.82k
9604A	53.6k	28.0k	53.6k	40.2k	3.01k
9605A	53.6k	28.0k	511k	40.2k	3.01k
9606A	78.7k	40.2k	53.6k	28.0k	1.82k
9607A	78.7k	40.2k	511k	28.0k	1.82k
9608A	78.7k	40.2k	200k	28.0k	1.82k
9609A	53.6k	20.0k	200k	40.2k	3.01k
9610A	53.6k	20.0k	511k	40.2k	3.01k

5.4.1.2 Low Frequency Response Peak for Step-Down Operation

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

$$RE2 = (3.11 \times 10^{13}) / [(4.7 \times 10^{6})(f_{pk}) - (6.61 \times 10^{6})]$$

$$RE1 = (4.43 \times 10^{5}) / f_{pk}$$

ohms, where f_{pk} is the frequency where the maximum boost occurs.

5.4.2 Horn/Driver EQ Submodule

A special equalizer has been incorporated into each of the high frequency outputs to provide compensation for the high frequency roll off that occurs naturally when high performance compression drivers are mated with constant directivity horns. This phenomenon occurs because the efficiency of all compression drivers decreases at high frequencies (above 2.5 kHz), and becomes perceptible when a driver is placed on a constant directivity horn which spreads the output over a uniform coverage angle.

The **9600A**-series plug-in submodules properly equalize a particular horn/driver combination to produce a flat power response. **Refer to the Specifications in the front of this booklet for a list of the submodules and the corresponding horn/driver combinations that they equalize.**

NOTE: *An alternate "flat" horn/driver submodule is installed and switched into the signal path of the mid-frequency output when the* **1632A** *is switched in the single channel mode. The low frequency submodule is thus switched out in the single channel mode. See Figure 11 for further details.*

Note a "flat" submodule (Part No. 21-01-026734) is installed in each high frequency output by the factory and must remain installed for the circuit to properly operate unless it is replaced with one of the **9600A**-series submodules.

5.4.2.1 Standard Equalization Submodules

For those who want to build their own submodules, Table IV lists the component values used in each of the submodules. The designations in Table IV refer to the component designations used in the schematic. See Figure 13.

5.4.2.2 Custom Equalization Submodules

In some installations, custom equalization will be necessary. The guidelines below should help in achieving the equalization required. Do not be afraid to experiment.

5.4.2.2.1 Producing a Notch in the Frequency Response

Resistors RE1 and RE2 may be used to place a notch in the response at a given depth and frequency. As a starting point, refer to the response curves for the **9600A**-series submodules at the front of this booklet and choose the most appropriate values for RE1 and RE2 from Table IV.

Increasing the values RE1 and RE2 by the same ratio will lower the notch frequency while maintaining approximately the same notch depth. Conversely, decreasing them will raise the notch frequency.

Increasing the value of RE1 and simultaneously decreasing the value of RE2 such that their product is the same will deepen the notch depth at a given frequency. In the same manner, the notch depth may be made shallower be decreasing RE1 and increasing RE2.

5.4.2.2.2 Producing a Top-end Boost

Resistors RE4, RE5, and RE6 determine the amount of high frequency boost and the frequency at which the boost occurs.

Increasing the values of RE5 and RE6 in the same proportion will lower the frequency at which the top-end boost occurs. Conversely, decreasing them will raise the frequency.

NOTE: *A 10:1 ratio of RE5 to RE6 corresponds to about 10 kHz.*

Decreasing the value of RE4 will increase the amount of high frequency boost at the frequency set by RE5 and RE6. Likewise, increasing RE4 will flatten the response.

NOTE: *There may be interaction between the notch and top-end boost adjustments. This is particularly true if the notch frequency is near or coincident with any boost frequency.*

5.4.3 Installation of Submodules

To install the equalization submodules into the **1632A**, follow these procedures:

1. Turn off power to the **1632A** and remove the access panel from the top/back cover. See Figure 6.
2. Find the appropriate equalization submodule location. Refer to Figure 7.

NOTE: *At the low frequency EQ submodule location, a submodule will not be factory inserted in the socket. This results in a flat frequency response for the low frequency outputs.*

---

3. If replacing the low frequency EQ submodule simply install the custom submodule assembly into the socket orienting it such that pin 1 (the flattened corner) mates with pin 1 of the socket. If replacing the high frequency horn/driver EQ submodule, remove the submodule presently installed and then insert the other submodule orienting such that pin 1 (the flattened corner) mates with pin 1 of the socket.
4. Replace the access panel.

5.5 Hard Limiter

Each output channel of the **1632A** incorporates a limiter circuit whose compression ratio is virtually ∞:1. These limiters are useful for speaker protection.

5.5.1 Threshold Controls

Each front panel threshold control sets a reference level for its respective channel above which the input signal will be limited to that level. Input signals that fall below this level will pass through to the output unlimited but will still be affected by the Output gain control.

5.5.2 Response Time Selection

Each limiter circuit contains switch selectable response times. The selection of response times in the low frequency output of Channel 1 is an option between **Slow** and **Medium**. In the other three outputs the option is **Medium** or **Fast**. User-option response times are provided for in each channel and bypasses the selector switches. This is useful in the event that the user needs a response time other than those provided.

The **Fast** setting gives about 3 ms attack and decay times. This response setting is most useful for limiting high frequency signals, such as high frequency output of a crossover in a bi-amped or tri-amped system. However, low frequency distortion may be heard on full-range material, due to the excessively quick response times.

For normal full-range limiting, the **Medium** response time setting gives about 40 ms attack and decay times. This setting is still fairly quick but will not track individual cycles of bass notes, thus avoiding low frequency distortion.

In the **Slow** response time setting the attack and decay times are about ½ second. In this case, there will be a noticeable lag in time before the limiter responds to peaks. This is very annoying on full-range material, but will give long-term overload protection for large speakers such as sub-woofers, which can absorb momentary overloads. Also this setting will not cause limiting to occur on each individual low frequency cycle.

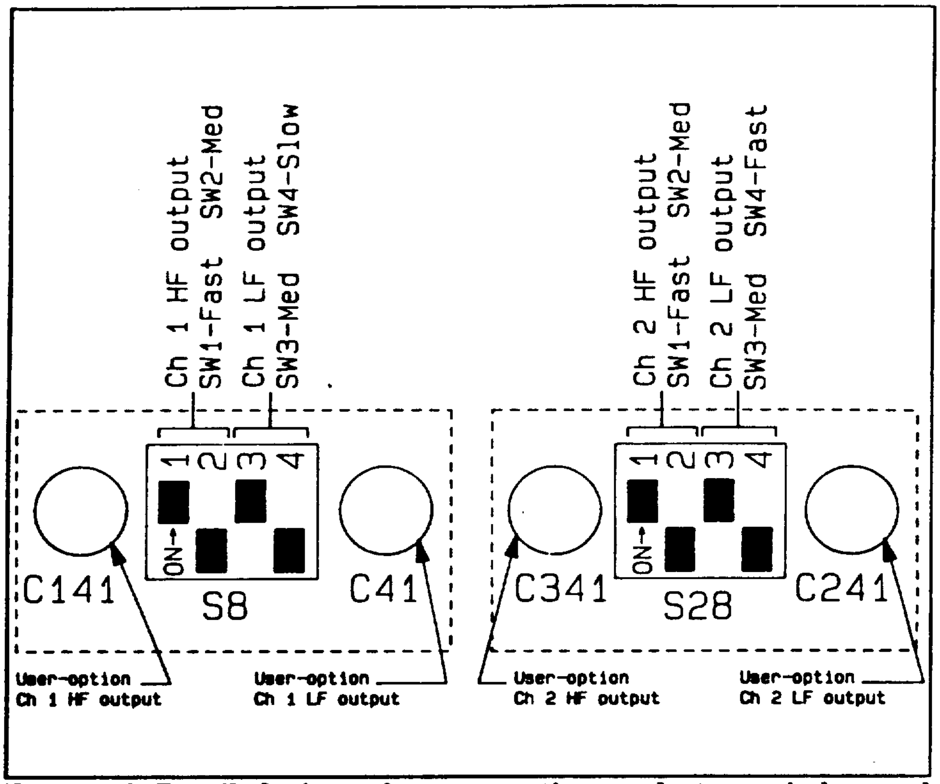


Figure 10. Detailed view of response times selector switches and user-option capacitors.

To select these response times follow these procedures:

1. Turn off power to the **1632A** and remove the access panel from the top/back panel. See Figure 6.

2. Referring to Figure 10, select the desired response setting for the following:

   Channel 1 low frequency output: S8 switches 3 and 4 refer to **Medium** and **Slow** response times, respectively.

   Channel 1 high frequency output: S8 switches 1 and 2 refer to **Fast** and **Medium** response times, respectively.

   Channel 2 low frequency output: S28 switches 3 and 4 refer to **Medium** and **Fast** response times, respectively.

   Channel 2 high frequency output: S28 switches 1 and 2 refer the **Fast** and **Medium** response times, respectively.

NOTE: *Ensure that two switches are "ON" for each switch block S8 and S28.*

3. To use the user-option alternative, refer to Figure 10. Increasing the value of the capacitor will increase the response time. Conversely, decreasing the value of the capacitor will decrease the response time. Each of C41, C141, C241 and C341 locations are supplied with lead sockets. Cut the capacitor leads to about ¼ inch and insert them straight into the sockets. Be **sure to turn off ALL response time switches in S8 and S28.**

   C41 selects the response time for the LF output of Ch 1.

   C141 selects the response time for the HF output of Ch 1.

C241 selects the response time for the LF output of Ch 2.

C341 selects the response time for the HF output of Ch 2.

4. Replace the access panel.

5.5.3 Typical Response Settings

For most high frequency compression drivers the **Fast** response setting should be used to provide the fastest limiting response to signal level peaks. For full-range PA speakers and most sub-woofer applications, the **Medium** response setting should be used to prevent low frequency distortion that could occur when using the **Fast** response setting in this application. The **Slow** response setting is to be used only for sub-woofers where no limiting of individual peaks is tolerated, but protection against prolonged overload, such as feedback, is needed. However the best way to determine the proper response time setting is to experiment with them.

5.6 Output Gain Controls

These front panel controls provide ±10 dB of gain to each output channel. The fixed gain that is added or subtracted by the Output gain control is not affected by the Threshold level control setting. However, the gain change brought about when the input signal exceeds the Threshold level setting is in addition to that caused by the Output gain control.

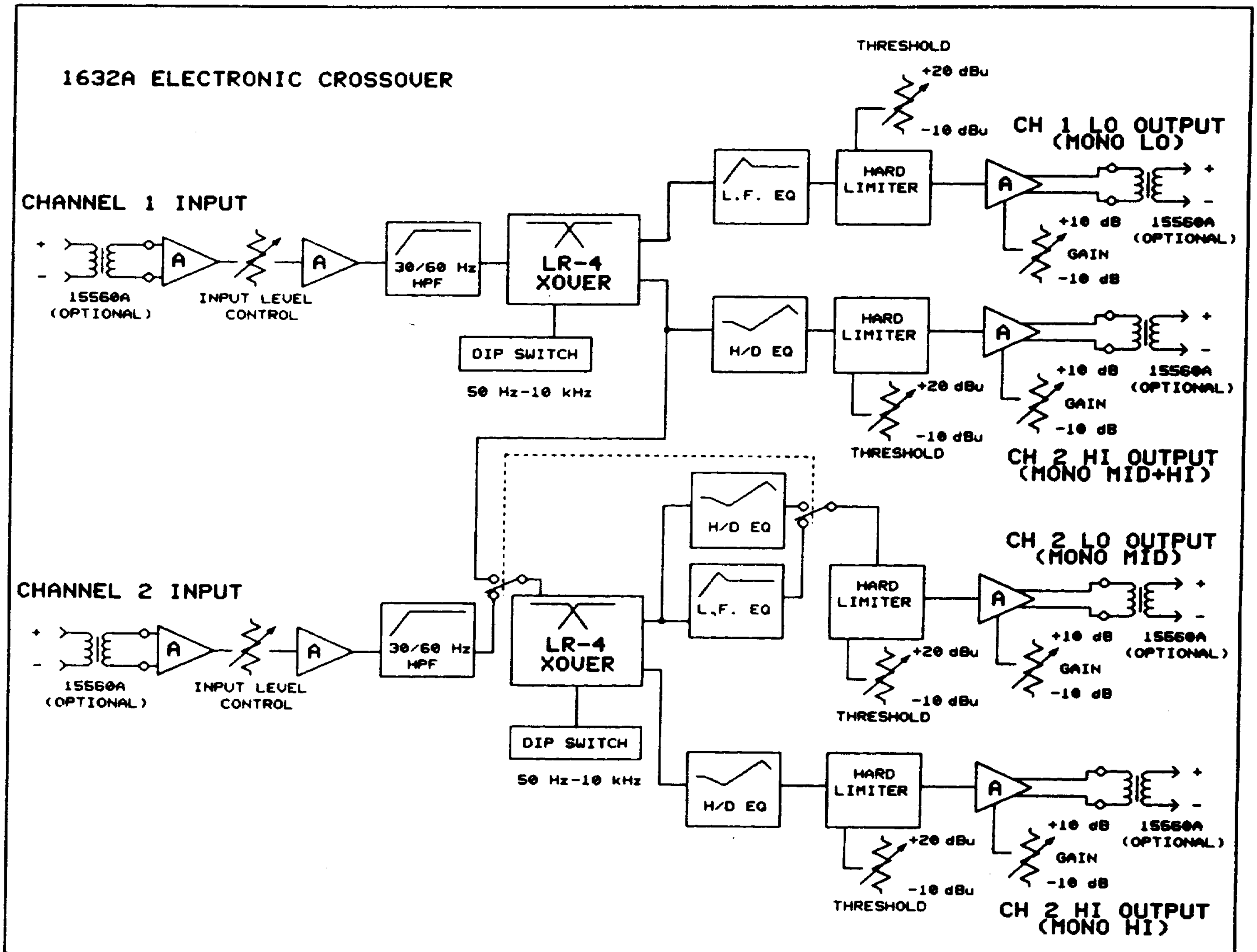


Figure 11. Block diagram of the 1632A.

ALTEC
LANSING

1632A

ELECTRONIC CROSSOVER

SERVICE INSTRUCTIONS

CAUTION

No user serviceable parts inside. Harzardous voltages and currents may be encountered within the chassis. The servicing information contained within this document is for use only by ALTEC LANSING Corp. authorized warranty stations and qualified service personnel. To avoid electric shock, DO NOT perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

6.0 SERVICE INFORMATION

CAUTION: *No user serviceable parts inside. Hazardous voltages and currents may be encountered within the chassis. The servicing information contained within this document is for use only by ALTEC LANSING Corp. authorized warranty stations and qualified service personnel. To avoid electric shock DO NOT perform any servicing other than that contained in the Operation Instructions unless you are qualified to do so. Otherwise, refer all servicing to qualified service personnel.*

NOTE: *Modifications to ALTEC LANSING products are not recommended. Such modifications shall be at the sole expense of the person(s) or company responsible, and any damage resulting there from shall not be covered under warranty or otherwise.*

6.1 Threshold Zero Adjustment Procedure

This adjustment procedure requires an sine wave generator.

1. Turn off power to the 1632A and remove the seven screws securing the top/back cover. See Figure 1.
2. Set the Threshold control to 0dBu and the Output gain control to 0 dB.
3. Apply an input sine wave signal of 0 dBu (0.775 Vrms) to the desired input. Assure that the frequency is enough above of below the crossover frequency of that channel so that the signal will not be affected by the crossover circuit. (The output signal level should equal the input signal level on the desired output.)
4. Locate the proper threshold zero adjust trimmer. Refer to Figure 12.
5. Adjust the trimmer so that the corresponding front panel LED just begins to light.
6. Proceed to the next desired output channel.
7. Replace the top/back cover.

6.2 Parts Ordering

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

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

6.3 Factory Service

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

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

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

6.4 Technical Assistance

For applications assistance or other technical information, call (405) 324-5311, Telex 16069, or write:

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

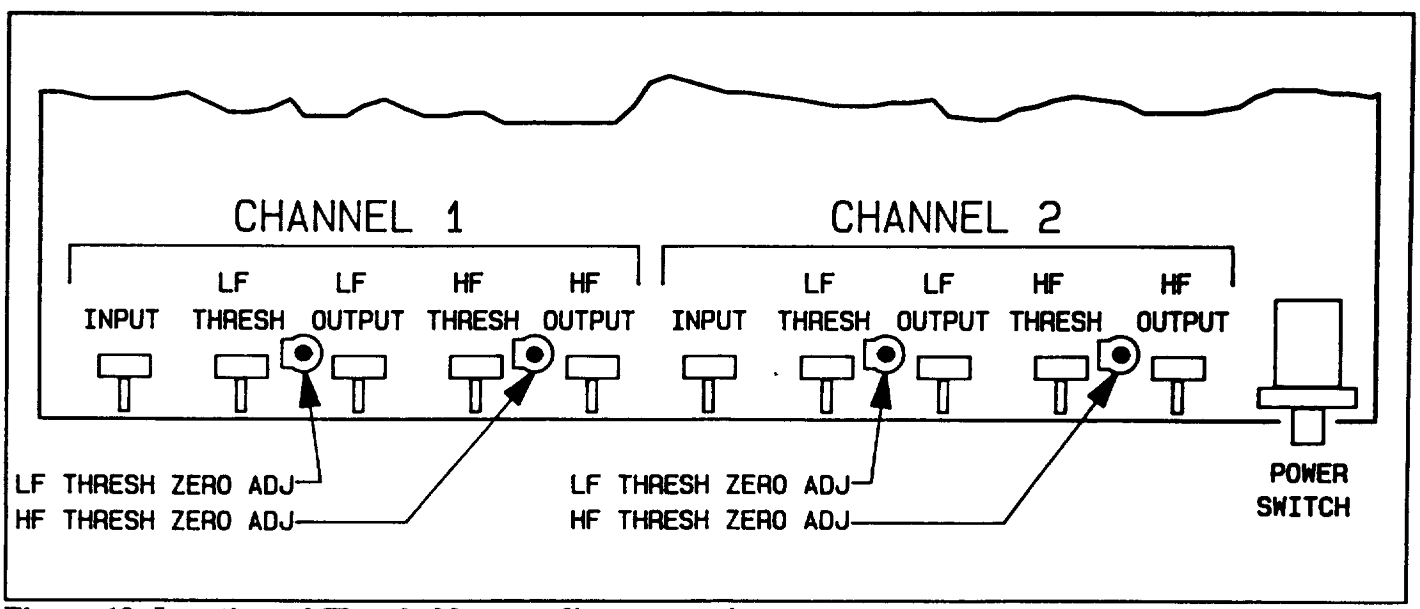


Figure 12. Location of Threshold zero adjustment trimmers.

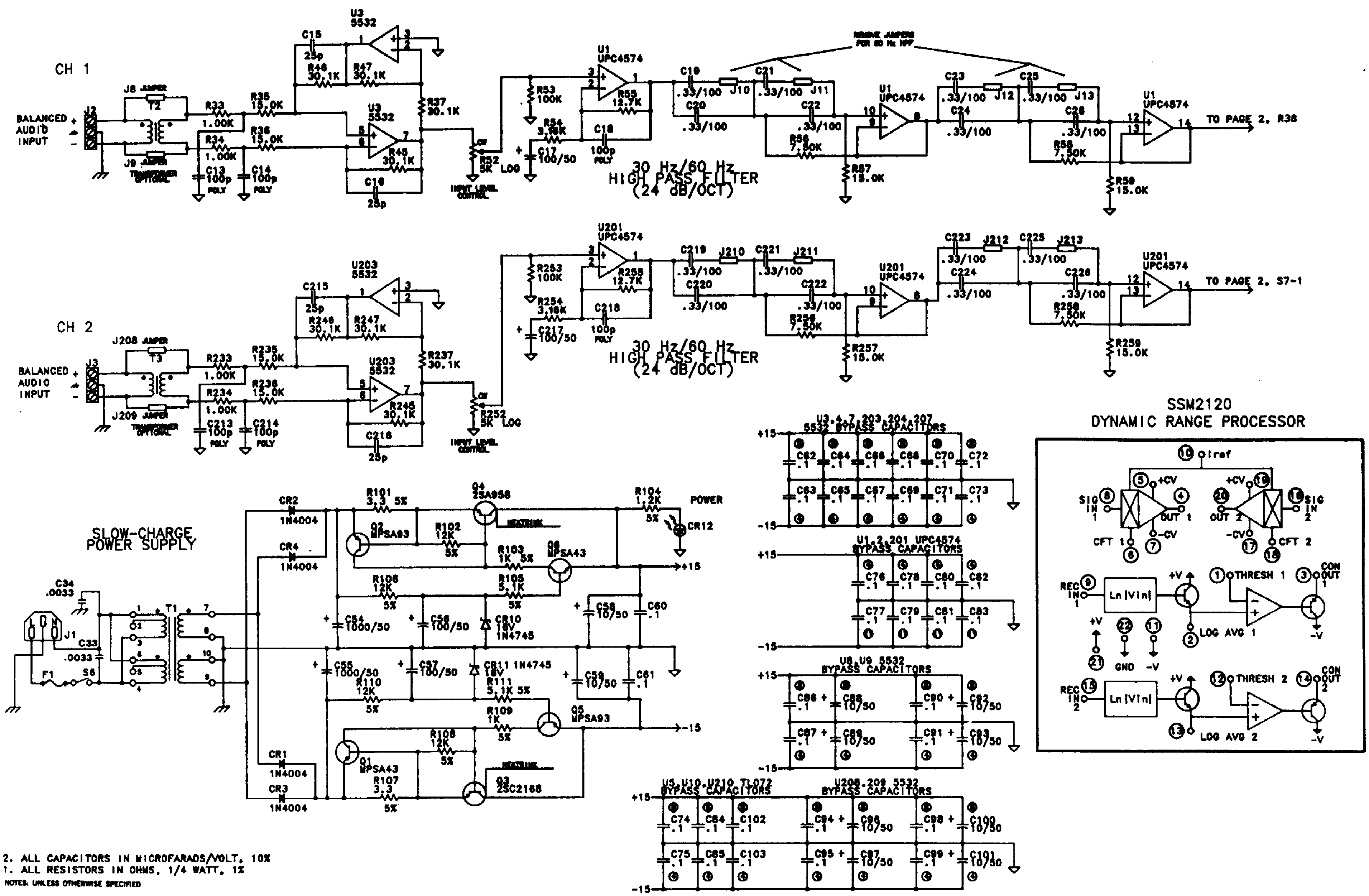
PARTS LIST
CIRCUIT BOARD ASSEMBLY (27-01-027294)

Reference Designator	Part Number	Description
C1,6,9,12,201,206, 206,209,212	15-06-124692	Cap., .0027 µF, poly
C2,5,8,11,202, 205,208,211	15-06-124691	Cap., .0033 µF, poly
C3,4,7,10,203, 204,207,210	15-06-124588	Cap., .01 µF, poly
C13,14,18,46,48,146, 148,213,214,218, 246,248,346,348	15-06-124440	Cap., 100 pF, poly
C15,16,49,149,215, 216,249,349	15-06-124441	Cap., 25 pF, poly
C17,50,51,56,57,217	15-01-124503	Cap., 100 µF, 50 V
C19,20,21,22,23,24, 25,26,219,220,221, 222,223,224,225,226	15-06-122843	Cap., .33 µF, poly
C27,28,227,228	15-06-124637	Cap., .1 µF, poly
C29,30,31,229,230, 231,233,234,235	15-06-124587	Cap., .001 µF, poly
C32,232,236	15-06-124611	Cap., .0047 µF, poly
C33,34	15-02-122768	Cap., .0033 µF, disk
C37,45,47,58,59,88, 89,92,93,96,97,100, 101,137,145,147,237, 245,247,337,345,347	15-01-124502	Cap., 10 µF, 50 V
C38,138,238,338	15-01-124507	Cap., 1 µF, 50 V
C39,139,143,239,243, 339,343	15-01-124506	Cap., 4.7 µF, 50 V
C40,140,240,340	15-02-100304	Cap., .001 µF, 100 V, disk
C42,142,242,342	15-01-124859	Cap., 47 µF, 50 V
C43	15-01-124858	Cap., 470 µF, 50 V
C44,52,53,60,61,62, 63,64,65,66,67,68, 69,70,71,72,73,74, 75,76,77,78,79,80, 81,82,83,84,85,86, 87,90,91,94,95,98, 99,144,244,344	15-02-124437	Cap., .1 µF, 50 V, disk
C54,55	15-01-124505	Cap., 1000 µF, 50 V
CR1,2,3,4	48-02-042787	Rect., 1N4004
CR5,6,105,106,205, 206,305,306	48-01-122601	Diode, signal, 1N4448
CR7,12,107,207,307	39-01-124540	LED, red
CR8,9	48-01-122988	Diode, zener, 5.1 V, .5 W
CR10,11	48-01-124954	Diode, zener, 16 V, 1 W
F1		
J8,9,10,11,12,13,14, 15,114,115,208,209, 210,211,212,213, 214,215,314,315	21-01-110310	Jumper
Q1,6	48-03-120233	Transistor, MPSA43, NPN, 200 V
Q2,5	48-03-120234	Transistor, MPSA93, PNP, 200 V
Q3	48-03-124474	Transistor, power, NPN
Q4	48-03-124475	Transistor, power, PNP
R1,9,17,25,201,209, 217,225	47-03-124670	Res., 3.09 kΩ, 1%, ¼ W
R2,10,18,26,202,210, 218,226	47-03-124673	Res., 6.19 kΩ, 1%, ¼ W
R3,11,19,27,203,211, 219,227	47-03-124698	Res., 12.4 kΩ, 1%, ¼ W
R4,12,20,28,204,212, 220,228	47-03-124681	Res., 24.9 kΩ, 1%, ¼ W
R5,13,21,29,205,213, 221,229	47-03-124695	Res., 49.9 kΩ, 1%, ¼ W
R6,14,22,30,53,206, 214,222,230,253	47-03-119305	Res., 100 kΩ, 1%, ¼ W

PARTS LIST con't

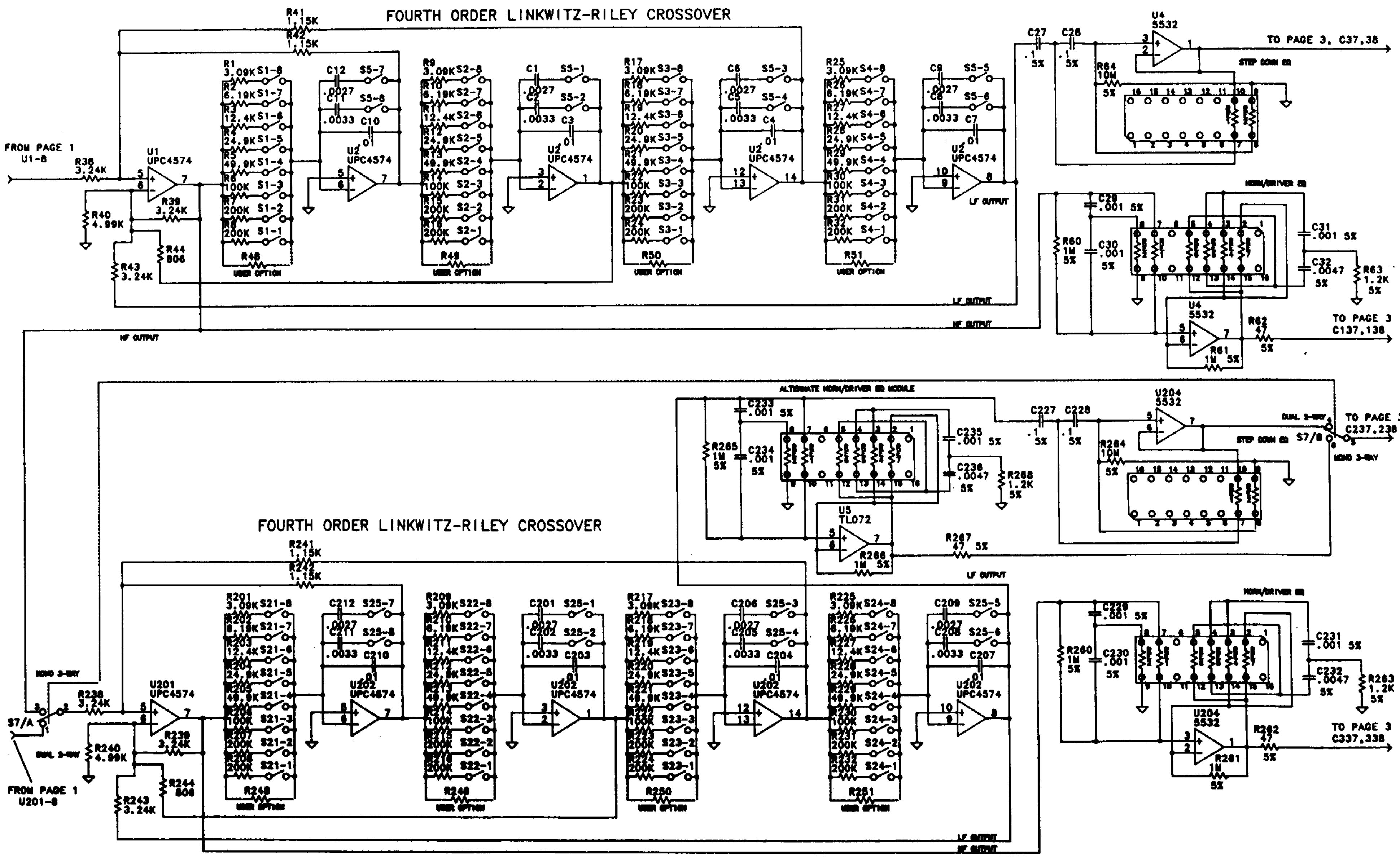
CIRCUIT BOARD ASSEMBLY (27-01-027294)

Reference Designator	Part Number	Description
R7,8,15,16,23,24,31, 32,207,208,215,216, 223,224,231,232	47-03-123011	Res., 200 kΩ, 1%, ¼ W
R33,34,81,181,233, 234,281,381	47-03-121532	Res., 1.00 kΩ, 1%, ¼ W
R35,36,57,59,70,73, 170,173,235,236, 257,259,270,273, 370,373	47-03-124484	Res., 15.0 kΩ, 1%, ¼ W
R37,45,46,47,69,88, 169,188,237,245, 246,247,269,288, 369,388	47-03-124615	Res., 30.1 kΩ, 1%, ¼ W
R38,39,43,74,174, 238,239,243,274,374	47-03-124697	Res., 3.24 kΩ, 1%, ¼ W
R40,240	47-03-124696	Res., 4.99 kΩ, 1%, ¼ W
R41,42,241,242	47-03-124699	Res., 1.15 kΩ, 1%, ¼ W
R44,244	47-03-124694	Res., 806 Ω, 1%, ¼ W
R52,252	47-06-124963	Pot., 5 kΩ, audio taper
R54,254	47-03-121329	Res., 3.16 kΩ, 1%, ¼ W
R55,255	47-03-124679	Res., 12.7 kΩ, 1%, ¼ W
R56,58,256,258	47-03-124805	Res., 7.50 kΩ, 1%, ¼ W
R60,61,85,90,92,185, 190,192,260,261, 265,266,285,290, 292,385,390,392	47-03-108491	Res., 1.00 MΩ, 1%, ¼ W
R62,72,94,97,98,99, 172,194,197,198, 199,262,267,272, 294,297, 298,299, 372,394,397,398,399	47-01-102046	Res., 47 Ω, 5%, ¼ W
R63,104,263,268,503, 513,523,533	47-01-102080	Res., 1.2 kΩ, 5%, ¼ W
R64,264,502,512,522, 532	47-01-107373	Res., 10 MΩ, 5%, ¼ W
R71,171,271,371	47-01-102112	Res., 27 kΩ, 5%, ¼ W
R75,77,175,177,275, 277,375,377	47-03-124837	Res., 39.2 kΩ, 1%, ¼ W
R78,178,278,378	47-06-122135	Pot., 50 kΩ, 30%, trim
R79,179,279,379	47-03-121457	Res., 110 kΩ, 1%, ¼ W
R80,180,280,380	47-06-124523	Pot., 10 kΩ, linear taper
R82,83,182,183,282, 283,382,383	47-03-124953	Res., 200 kΩ, 1%, ¼ W
R84,284	47-01-102131	Res., 150 kΩ, 5%, ¼ W
R86,87,103,109	47-01-102078	Res., 1 kΩ, 5%, ¼ W
R88,188,288,388	47-03-124686	Res., 9.53 kΩ, 1%, ¼ W
R89,93,189,193,289, 293,389,393	47-03-124684	Res., 4.64 kΩ, 1%, ¼ W
R91,191,291,391	47-06-124964	Pot., 10 kΩ, lin. tap., detent
R95,96,195,196,295, 296,395,396	47-03-109437	Res., 10.0 kΩ, 1%, ¼ W
R101,107	47-01-124952	Res., 3.3 Ω, 5%, ¼ W
R102,106,108,110	47-01-102104	Res., 12 kΩ, 5%, ¼ W
R105,111	47-01-102095	Res., 5.1 kΩ, 5%, ¼ W
R501,504,511,514, 521,524,531,534	47-01-102102	Res., 10 kΩ, 5%, ¼ W
R505,515,525,535	47-01-113206	Res., 5.6 kΩ, 5%, ¼ W
S1,2,3,4,21,22,23, 24,25	51-02-121529	Switch, DIP, 8 pos.
S6	51-02-124478	Switch, PB, power, DPDT
S7	51-02-124826	Switch, bridge
S8,28	51-02-122316	Switch, DIP, 4 pos.
T1	56-08-025906	Transformer, power
U1,2,201,202	17-01-124583	IC, UPC4574, quad op-amp
U3,4,7,8,9,203,204, 207,208,209	17-01-122833	IC, 5532, dual op-amp
U5,10,210	17-01-124688	IC, TL072, dual op-amp
U6,206	17-01-124798	IC, SSM2120, dyn. sig. proc.



2. ALL CAPACITORS IN MICROFARADS/VOLT, 10%
1. ALL RESISTORS IN OHMS, 1/4 WATT, 1%
NOTES: UNLESS OTHERWISE SPECIFIED

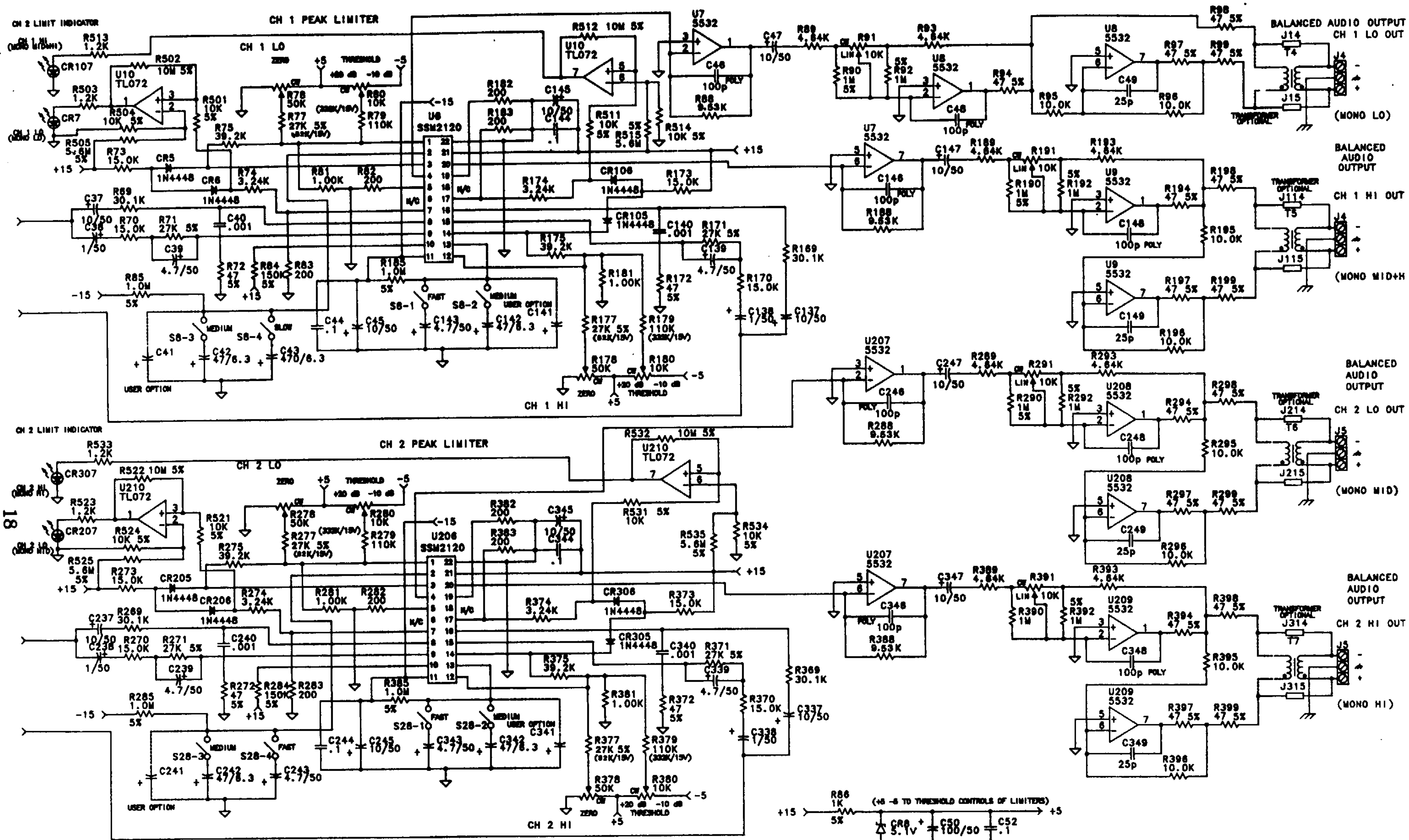
Figure 13a. Schematic of the 1632A.



2. ALL CAPACITORS IN MICROFARADS/VOLT, 10%
1. ALL RESISTORS IN OHMS, 1/4 WATT, 1%

NOTES: UNLESS OTHERWISE SPECIFIED

Figure 13b. Schematic of the 1632A.



2. ALL CAPACITORS IN MICROFARADS/VOLT, 10%
1. ALL RESISTORS IN OHMS, 1/4 WATT, 1%

Figure 13c. Schematic of the 1632A.