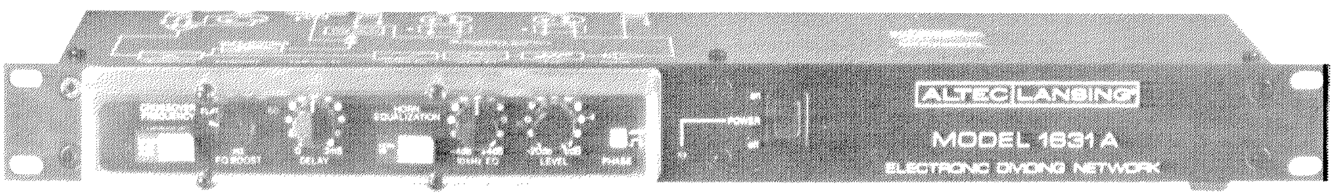
1631A ELECTRONIC DIVIDING NETWORK



DESCRIPTION

The Altec 1631A Electronic Dividing Network is a single-channel active crossover designed to provide a user selectable crossover frequency from 100 Hz to 8000 Hz. The unit may be used as a two-way frequency dividing network for biamplified systems, or in pairs for triamplified applications. Operating at line level (+16 dBm maximum) with zero insertion loss, the 1631A has both 15,000 ohm unbalanced input and 30,000 ohm balanced input configurations. Unbalanced High-Frequency and Low-Frequency outputs will accept a minimum load of 600 ohm and deliver a maximum level of +20 dBm.

The frequency and characteristics of the filters are determined by a plug-in module. This allows the user complete freedom in choosing the frequency, order and characteristic of the high-pass and low-pass sections. Each section may be controlled independently, allowing for crossover frequency overlap or spread, or even different slopes for each section. Modules for 500 Hz and 800 Hz maximally flat third-order Butterworth filters are supplied with the unit.

Several types of equalization are available. A continuously variable control provides up to 4 dB of boost or cut at 10 kHz. A selector switch allows 6 dB peak boost at five frequencies commonly used for Thiele B-6 aligned low-frequency speaker systems.

A plug-in module may be configured to provide custom equalization to compensate for the falling high-frequency response of various combinations of horns and drivers. Additional controls include a low-frequency delay adjustment and high-pass output level and polarity adjustments.

SPECIFICATIONS

Type: Single channel, two-way electronic dividing network with user selectable crossover frequency.

Input Configuration: Single balanced or unbalanced input. Accepts signal input from any high- or low-impedance, active or passive, balanced or unbalanced source.

Input Impedance: 15,000 ohms unbalanced or 30,000 ohm balanced.

Input Common-Mode Rejection: 55 dB typical 60 Hz to 1000 Hz.

Output Configuration: One unbalanced high-pass output, one unbalanced low-pass output.

Output Impedance: Internal 47 ohm source impedance. 600 ohm minimum load.

Maximum Output Level: + 20 dBm (+ 18 dBV)

Output Protection: Safe for short circuit or +/-25VDC

Overall Gain: 0 dB with controls set flat.

Frequency Response: +/- 0.5 dB 30 Hz to 20 kHz with high-pass and low-pass outputs combined.

Distortion: Total harmonic and intermodulation distortion typically 0.02%, 0.1% maximum at 20 kHz, +20 dBm output with controls set flat.

Noise Output: - 88 dBm (- 90 dBV) maximum, 20 Hz to 20 kHz bandwidth.

High/Low Channel Crosstalk: 60 dB typical.

Crossover Frequency Range: 100 Hz to 8000 Hz. Set by miniature plug-in module. 500 Hz and 800 Hz modules supplied. An empty module is also provided for custom construction by the user.

Filter Type: 18 dB per octave, third-order Butterworth for normally supplied modules. Possible custom module constructions by user include first-, second-, and third-order Butterworth, Bessel, or Chebyshev configurations, chosen independently for high-pass and low-pass channels.

Signal Delay: Continuously variable from 0 msec (actually 25 usec) to 2 msec for low-pass output.

Relative Phase:

Low-Pass Output: Output in phase with input with delay control at minimum.

High-Pass Output: Switchable, 0 or 180 degrees, output relative to input.

Equalization:

High-Frequency: Continuously variable, +/- 4 dB at 10 kHz, Q = 3

Low-Frequency: Second-order underdamped filter with 6 dB peak boost switchable for frequencies of 29, 32, 35, 45 or 60 Hz. Also a "flat" position provides a high-pass filter with a 12 dB per octave rolloff, 3 dB down at 30 Hz for subpassband speaker protection. These peak boost filters provide the equalization required for Thiele B-6 aligned low-frequency speaker/enclosure combinations.

Horn/Driver: Miniature plug-in modules provide custom equalization to compensate for the falling high-frequency response of various combinations of horns and drivers. A module with flat response is provided.

Transient Performance: Not limited by slew rate or power bandwidth of 20 Hz to 20 kHz under normal operating conditions.

Controls:
1 rotary low-frequency equalization selector.
1 continuously variable low frequency delay adjustment.
1 high-frequency gain control.
1 high-frequency equalization control.
1 push button high-frequency polarity (180 degree phase) reversal switch.
1 rocker power switch.

Indicators: 1 power-on indicator.

Connections:

Input:
1 stereo 1/4" phone jack (tip, ring, sleeve) for balanced or unbalanced input.
1 XLR-3 type female for balanced or unbalanced input.

Output:
1 mono 1/4" phone jack (tip, sleeve) for unbalanced low-frequency output.
1 XLR-3 type male for unbalanced low-frequency output.
1 mono 1/4" phone jack (tip), sleeve) for unbalanced high-frequency output.
1 XLR-3 type male for unbalanced high-frequency output.

Special: 1 RCA phono jack for common bass connection.

Power Requirements: 100, 120, 220, 240 VAC 50/60 Hz. user selectable. Supplied wired and fused for 120 VAC with a power consumption of 15 watts. A detachable IEC line cord with 120 volt grounding plug is supplied.

Power Protection: Universal fuse holder accepts 1/16 amp., 250 volt 1/4" x 1-1/4" MDL type slo-blo fuse for 100 or 120 VAC. A replacement fuse-post cap is available to allow use of 5mm x 20mm slo-blo fuses for 220/240 volt operation.

Mounting: Standard 19" rack space, 1-3/4" high (1 standard rack unit), requires 8-1/2" behind panel including connectors.

Dimensions: 1/73" (4.4 cm) H x 19.0" (48.3 cm) W x 4.875" (12.4 cm) D

Weight: 4.74 pounds (2.15 kg)

Color: Black

Accessories: Removeable transparent plastic security cover is supplied with the unit.

ARCHITECT'S AND ENGINEER'S SPECIFICATIONS

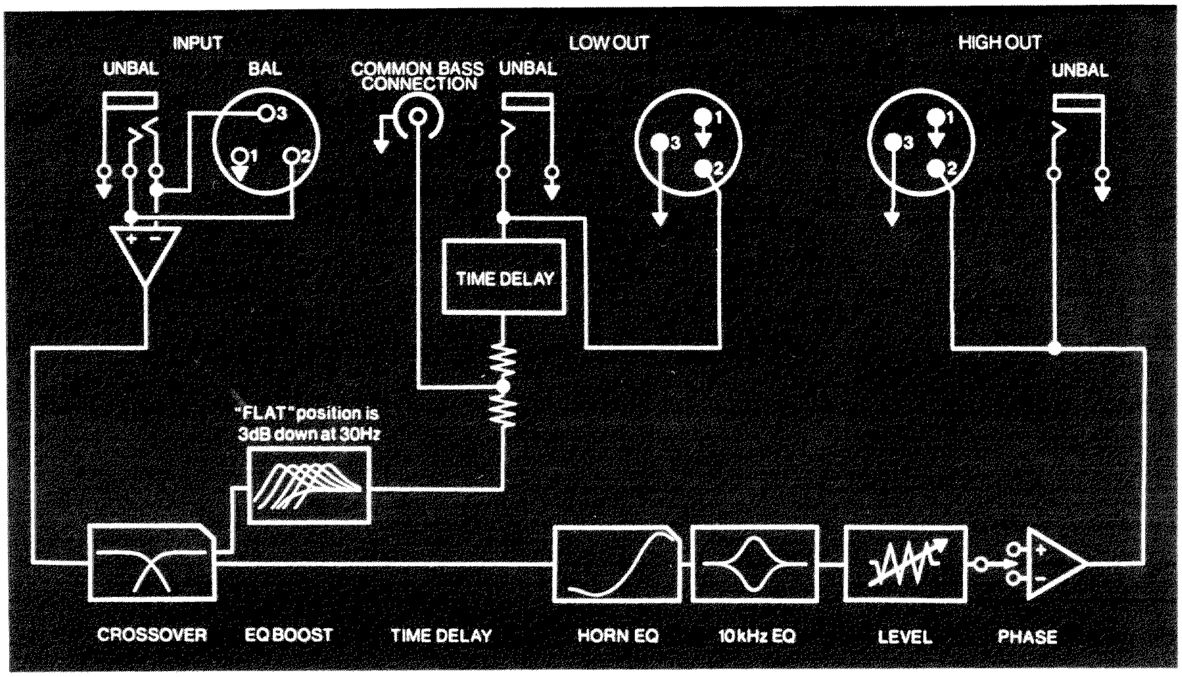
The Electronic Dividing Network shall have a user selectable crossover frequency within the range of 100 Hz to 8000 Hz using a field configurable plug-in module. It shall be possible to select separately the frequency, order and characteristic of the high-pass and low-pass filter sections.

The Electronic Dividing Network shall meet the following specification criteria: it shall provide an input impedance of 15,000 ohm unbalanced or 30,000 ohm balanced. The high-pass and low-pass outputs shall accept a minimum load of 600 ohms and shall have an internal source impedance of 47 ohms. The gain shall be 0 dB direct and the network shall have a frequency response of +/- 0.5 dB from 30 Hz to 20 kHz, representing a combined output of high-pass and low-pass filter sections with the controls set flat. The total harmonic and intermodulation distortion shall be less than 0.1% at 20 kHz at maximum output of +20 dBm. Noise level shall be less than -88 dBm for 20 Hz to 20 kHz bandwidth.

The Electronic Dividing Network shall have the following controls: 1 high-frequency output level, 1 high-frequency equalization, 1 low-frequency signal delay adjustment, 1 push-button high-frequency polarity reversal switch, 1 six-position low-frequency equalization selector switch, 1 rocker power switch. All controls except the power switch shall be completely enclosed by a transparent security cover. A universal power transformer shall permit use on 100, 120, 220, 240 VAC lines. The power consumption shall be 15 watts @ 120 VAC 50/60 Hz line operation. The unit shall have a standard IEC type detachable AC line cord.

The Electronic Dividing Network shall conform to the following dimensions: 1.73" H x 19.0" W x 4.875" D, with a weight of 4.74 pounds.

The Electronic Dividing Network shall be the Altec Lansing Model 1631A.



ELECTRONIC DIVIDING NETWORK BLOCK DIAGRAM

ALTEC LANSING®

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1631A

Electronic Dividing Network

Operating and Service Instructions

ALTEC LANSING CORPORATION

a MARK IV company

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1 INTRODUCTION

The Altec Lansing **1631A** Electronic Dividing Network is a single-channel, active crossover designed to provide a user selectable crossover frequency from 100 Hz to 8000 Hz. The unit may be used as a two-way frequency dividing network for bi-amplified systems or in pairs for tri-amplified applications. Operating at line level (+16 dBm maximum) with zero insertion loss, the **1631A** has both 15,000 ohm unbalanced input and 30,000 ohm balanced input configurations. Unbalanced High Frequency and Low-Frequency outputs will accept a minimum load of 600 ohm and deliver a maximum level of +20 dBm.

The frequency and characteristics of the filters are determined by a plug-in module. This allows the user complete freedom in choosing the frequency, order and characteristic of the high-pass and low-pass sections. Each section may be controlled independently, allowing for crossover frequency overlap or spread, or even different slopes for each section. Modules for 500 Hz and 800 Hz maximally flat third-order Butterworth filters are supplied with the unit.

Several types of equalization are available. A continuously variable control provides up to 4 dB of boost or cut at 10 kHz. A selector switch allows 6 dB peak boost at five frequencies commonly used for Thiele B-6 aligned low-frequency speaker systems.

A plug-in module may be configured to provide custom equalization to compensate for the falling high-frequency response of various combinations of horns and drivers. Additional controls include a low-frequency delay adjustment and high-pass output level and polarity adjustments.

2 INSTALLATION

2.1 Rack Mounting

The **1631A** may be installed in a standard 19 inch equipment rack. It requires 1 ¾" inches of vertical rack space and secures to the rack cabinet with the four rack mount screws provided in the hardware kit. Prior to mounting it is recommended that the security cover be removed.

2.2 Ventilation

The dividing network should be adequately ventilated to avoid excessive temperature rise. It should not be used in areas where ambient temperature exceeds 55°C (131°F). It should not be used in areas where the it is subjected to excessive dust or mechanical vibrations.

3 SIGNAL CONNECTIONS

3.1 Input Connections

Both unbalanced and balanced inputs are available to receive signal from any high or low impedance, active or passive, balanced or unbalanced source. Both a ¼" phone jack and a female XLR type connector are provided. Either or both may be used. The input impedance for an unbalanced connection will be 15,000 ohms. For a balanced connection the input impedance will be 30,000 ohms. Connection details are shown in Figure 1. In cases where the source must see a 600 ohm load, it will be necessary to connect a 600 ohm resistor across the input line as shown in Figure 1D. A ¼ w or ½ w, 5% tolerance resistor is suitable. When the circuit is matched to 600 ohms there will be a termination loss of 6 dB.

In keeping with good grounding and shielding practices, the use of two-conductor shielded cable is recommended for all connections. The unbalanced connecting arrangement shown in Figure 1E is not usually recommended. However, if it must be used, allow only very short lengths of cable, otherwise the interconnecting circuit may become noisy. Before making a final selection of a connection arrangement, be sure to read the section titled "Shield Connections".

3.2 Output Connections

The outputs of the unit are unbalanced and have an internal impedance of 47 ohms. This is suitably low for driving one or more loads whose combined impedance is 600 ohms or greater. The output appears on both a ¼" phone jack (tip, sleeve) and a male XLR type connector. Both connectors may be used at the same time, but the combined load must not be less than 600 ohms.

Connection arrangements for balanced and unbalanced loads are shown in Figures 2A and 2B. When an actual 600 ohm source impedance is required, an external 560 ohm resistor may be installed in series with the output signal lead as shown in Figure 2C. Note that there will be a 6 dB decrease in the system gain due to the matched impedance termination.

3.3 Shield Connections

The rules of good grounding and shielding practice dictate that the shield of twoconductor cables be grounded at one end of the cable only. On the input cable, the shield would be best grounded at the driving source end of the cable rather than at the input of the **1631A**. If the shield must be grounded at the **1631A**, use the XLR connector, connecting the shield to pin 1 since it connects directly to the chassis and to the green wire ground of the AC line cord and is a suitable connecting point for the shield. Since the sleeve connection of the input ¼" phone jack presents a 2 ohm path resistance to true chassis (green-wire) ground, it is not the best point for shield connection where maximum noise reduction is desired.

The shield connection for the output cables should be made at the receiving end of the cables. Pin 1 of the output XLR connectors and the sleeve of the ¼" phone jacks are connected to the internal circuit common of the **1631A** and present a 2 ohm resistance path to true chassis ground.

3.4 Common Bass

A recent trend is to add sub-woofers to audio systems. In all except the largest systems where there is a separate sub-woofer for each of the left and right channels, one common sub-woofer channel is used. The stereo system shown in Figure 3 is typical of such a system. This common LF channel reproduces frequencies of 125 Hz and below and is the sum of the LF signals from the left and right channels of the stereo. The COMMON BASS connections provide a means of summing these signals. When two **1631A** units have their COMMON BASS jacks connected together, both low-frequency channels are mixed together. This common signal appears at the LOW-FREQUENCY OUTPUTS of both units. Since only one output is required, either jack may be used, but only the unit whose output is used will have an operable LOW-FREQUENCY DELAY control.

4 OPERATION

4.1 System Integration

The **1631A** is a two-way dividing network. The typical arrangement of a bi-amplified system is shown in Figure 4. Two units may be used to create tri-amplified (three-way) system. This arrangement is shown in Figure 5. A bi-amplified stereo system with a common sub-woofer can be achieved by using four units in the arrangement shown in Figure 3.

4.2 Unit Configuration

Prior to powering up the unit, the front panel controls must be placed at their initial settings and the unit must be configured to the exact requirements of the system by installation of the proper plug-in modules. If the transparent security cover has not already been removed, do so at this time.

The front panel controls should be set as shown below.

Control	Start-Up Settings
Power	Off
EQ Boost	Flat
Time Delay	0
10 kHz EQ	0
Level	-20 dB (max CCW)
Phase	0 (button out)

Two plug-in modules must be selected and plugged into the proper receptacles on the front of the unit before the unit will function correctly.

1. The crossover frequency must be set. This is done by plugging a module into the socket at the left end of the front panel labeled CROSSOVER FREQUENCY. Two modules have been provided with the unit. Both configure the internal circuitry to provide 18 dB per octave maximally flat Butterworth crossover filters. One sets the crossover frequency at 500 Hz (labeled 500 Hz-3B) and one to sea the crossover frequency at 800 Hz (labeled 800Hz-3B). If another frequency is required, refer to the section of this manual titled "Custom Crossover Frequencies". Select and install the module for the desired crossover frequency.

2. The second module to be selected sets the "Horn Equalization". A module marked FLAT is provided with this unit. Install it in the socket on the front panel marked HORN EQUALIZATION.

Custom fabrication of modules to provide "pre-equalization" compensation of the falling high-frequency response of certain combinations of compression drivers and constant directivity horns is possible; however, this is not currently supported by Altec Lansing Corporation.

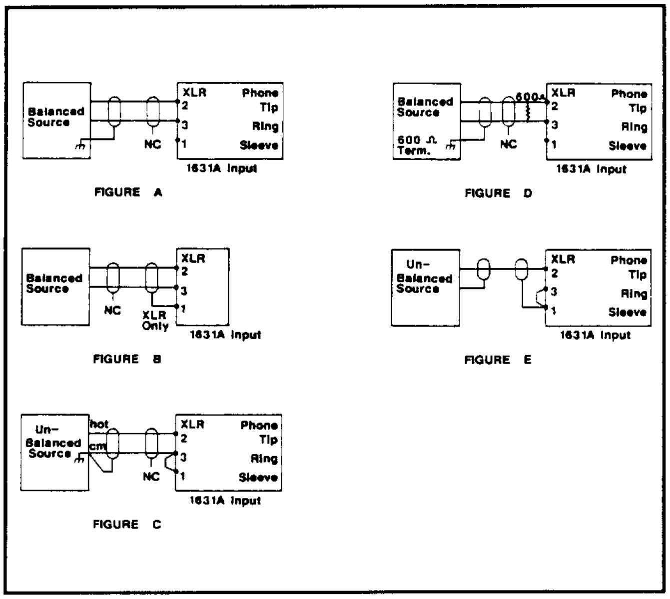

Figure 1: Typical Input Connections

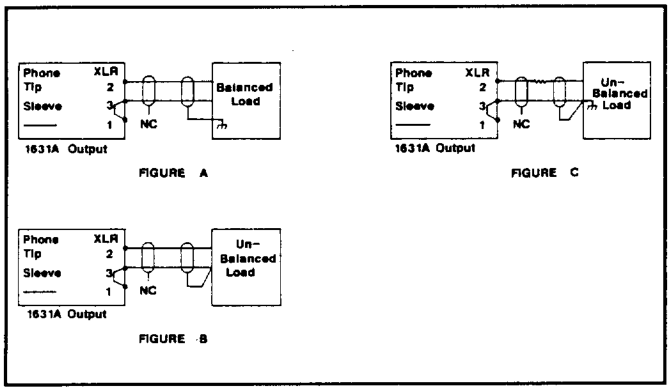

Figure 2: Typical Output Connections

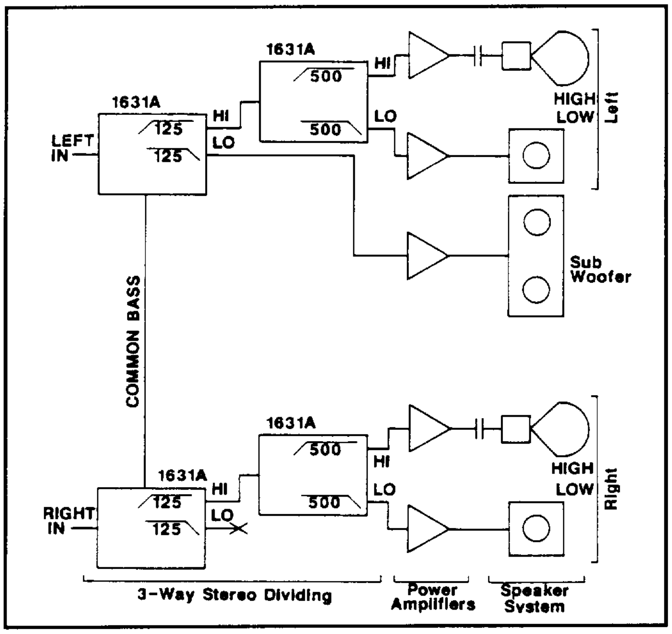

Figure 3: Bi-Amplified System with Subwoofer

4.3 Adjusting The System

Setting up the system and adjusting the **1631A** controls correctly is not difficult. The system cannot simply be turned-on all at once. It must be powered-up and adjusted one unit and one speaker at a time until the entire system is operating as desired. Usually the low-frequency speakers are adjusted first, then the high-frequency horns are adjusted, one-by-one, starting with the farthest throw horns and ending with the shortest throw horns.

The following procedure is typical and is intended to serve as a guide to adjusting the system in a rapid and orderly way.

1. Connect all system components and all loudspeakers. Have a pink noise source and a source of music available to use in testing and balancing the system.

2. Set all mixer and amplifier controls for MAXIMUM ATTENUATION of signal thru the system.

3. Apply AC power to the mixer or console.

4. Feed a pink noise signal at a suitable level into one input of the system mixer or console and adjust its controls to obtain a signal at "Normal Working Level" on its output. This usually will be in the range of 0 dBm to + 8 dBm.

5. Adjust any signal processing units between the mixer and the input of the **1631A** to feed an unprocessed signal of "Normal Working Level" to the input of the **1631A**. Since the **1631A** has unity gain, this signal must be large enough to drive the power amplifiers connected to the **1631A** outputs to full output. This is particularly true of the amplifiers driving the low-frequency speakers and the horns with the longest throw distances. If the signal is not large enough, increase the output level of the mixer or provide the required gain in the processing units between the mixer and the **1631A**.

6. Set up a sound level meter in the center of the listening area. Adjust the volume control on the low-frequency amplifier until the desired sound pressure level is obtained. This level should be at or slightly above the normal operating level of the system. If more than one amplifier and low-frequency speaker is used in the system, each amplifier should be turned on and adjusted separately. When all the low-frequency speakers have been adjusted, turn them all on and take a sound pressure level reading to use as a reference for adjusting the horns.

7. Verify that the INPUT LEVEL control of all the high-frequency amplifiers are set for MAXIMUM ATTENUATION (max CCW).

8. Adjust the HIGH-FREQUENCY LEVEL control on the **1631A** to the -4 dB position.

9. Locate the sound level meter in the center of the area covered by the horn with the longest throw.

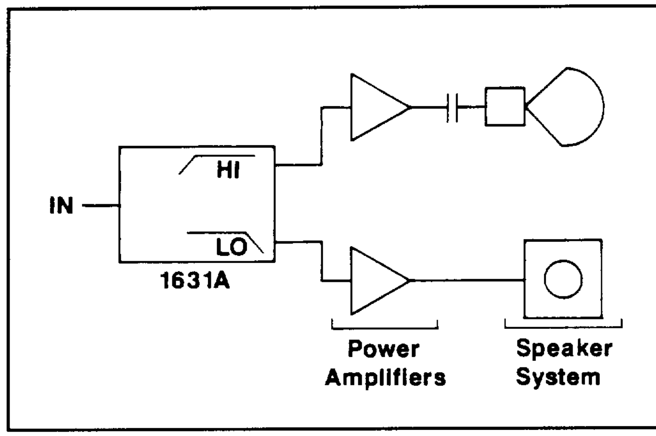

Figure 4: Typical Bi-Amplified System

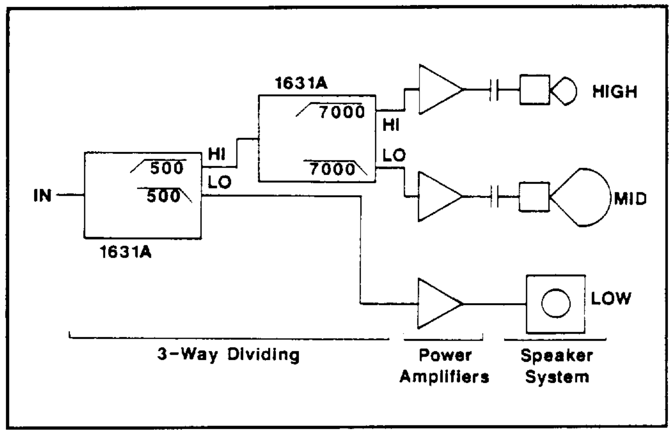

Figure 5: Typical Tri-Amplified System

Slowly adjust the INPUT LEVEL control on the amplifier driving that horn until the reading on the sound level meter reads the same as was obtained from the low-frequency speakers in step 6 above. Cautions advised here. It is assumed that the compression drivers have been correctly selected to give the sound level required without overloading and allowing for a suitable amount of headroom. Increase the level slowly and *listen* to the speakers while watching the sound level meter. If any sign of distortion or overload is detected, reduce the level and DO NOT proceed until the cause is determined. Replacement of driver diaphragms is expensive and usually unnecessary if proper precautions are taken.

10. If the system has more than one horn, adjust the level of the power amplifier driving the horn with the next shortest throw distance. Follow the same procedure used in step 9 locating the sound level meter in the center of the coverage pattern of the horn being adjusted. Adjust for the same SPL obtained in steps 6 and 9 above. Only one horn should be on at one time. Use the AC power switch, not the volume control to turn the signal to each horn off and on.

11. Repeat step 10 until all amplifiers have been adjusted.

12. Now, with all speakers and horns on, use the sound level meter to measure and record the sound pressure level at a number of locations within the listening area. Be sure to include all corners as well as the centers of all seating areas.

The sound pressure level in areas covered by individual horns may be adjusted by using the INPUT LEVEL of the power amplifier driving that horn. If it is necessary to balance the high-frequencies (all horns) against the low-frequencies (all LF speakers) the HF LEVEL control should be used.

13. Play the music or speech source through the system. Walk throughout the seating area listening for uniformity of sound level and changes in tonality. Our ears provide us with a really "high-tech" measuring system. If the system does not sound "good" then further adjustment may be necessary. Adjust the levels of horns as required. Re-aim horns if necessary.

4.4 Low-Frequency Signal Delay Control

A delay control is provided which electronically delays the low-frequency channel with respect to the high-frequency channel. The amount of delay is continuously variable between 25 psec (essentially 0 sec) and 2 msec. Often it is not possible to mount the horns and low-frequency speakers of a cluster with their acoustic centers in alignment. Adjusting the delay is acoustically equivalent to physically moving the low-frequency speaker away from the listener, thus electronically aligning the acoustical centers from the listeners vantage point.

A second order Pade delay circuit is used to provide a delay, T, which is essentially constant up to the frequency, F, where F = 1/T. This relationship is shown in Figure 6 as a graph of delay vs frequency for various settings of the delay control. The frequency response of the circuit is always flat and is independent of the delay setting. Twenty five microseconds of delay is equivalent to a distance of 0.339 inches. Two milliseconds is equivalent to a distance of 27.12 inches.

4.5 High-Frequency Equalization

The 10 kHz EQ control provides either boost or cut of 4 dB at 10 kHz. It is a continuously variable control whose response is shown in Figure 7. This control has negligible effect below 5 kHz and can be used in conjunction with other equalizers to trim the system high-frequency response as desired.

4.6 Low-Frequency Equalization

The LOW-FREQUENCY BOOST EQ circuit provides the low-frequency contouring necessary for "step-down" operation of bass speaker systems that have Thiele B-6 alignments. The switch selects the peak frequency of the boost. The characteristics of this low-frequency contouring are shown in Figure 8. Altec Lansing bass loudspeaker systems are not Thlele B-6 aligned, therefore, the switch should be left in the FLAT position. In all positions of the switch, the circuit also provides a high-pass filter with a 12 dB per octave slope to remove subsonic energy below the lowest usable speaker frequency. Such energy is not audible, but wastes amplifier power and can cause modulation distortion of the higher bass frequencies. Such subsonic energy can also damage the woofer due to excessive cone excursion. In the FLAT position the 3 db-down frequency is 30 Hz.

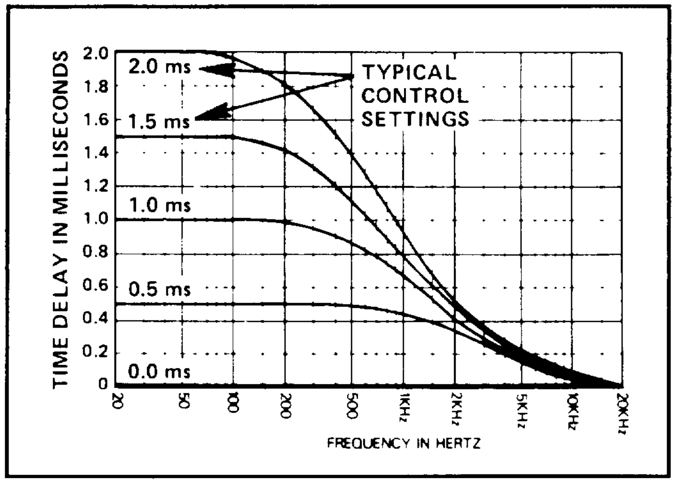

Figure 6: Low Frequency Time Delay

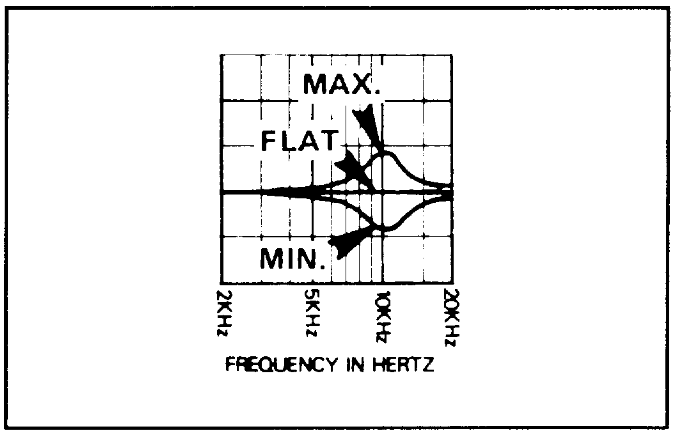

Figure 7: 10 kHz Equalization

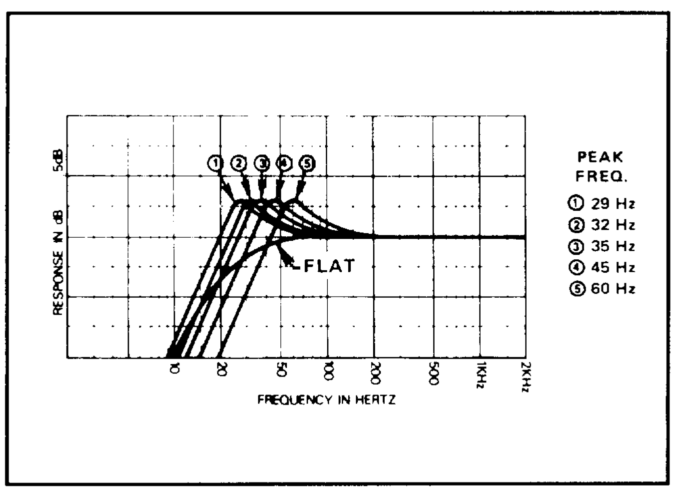

Figure 8: Low Frequency Equalization

4.7 Polarity Reversal Switch

A two-position push-button switch is provided to change the phase of the high-frequency channel relative to the low-frequency channel by 180 degrees. The "normal" (out) position provides the conventional phase relationship between the high- and low-frequency channels for a third-order Butterworth (18 db-per-octave slops) filter. In some acoustic situations it may be advantageous to reverse the phase. This will allow the user to optimize the crossover response for drivers having widely different phase characteristics or polarity. Additional useful information on the subject of polarity and phasing may be obtained by reading Altec Lansing application note AN-9, "Polarity and Phase". It is available upon request from the Altec Lansing Literature Department.

4.8 Custom Crossover Frequencies

The crossover filters in the **1631A** are configured by the plug-in CROSSOVER FREQUENCY MODULE. Two modules for standard frequencies are provided with the unit. These configure the crossover filters to have 18 db-per-octave maximally flat third-order Butterworth characteristics at frequencies of 500 Hz and 800 Hz. The frequency response of this filter type is shown in Figure 9.

The module is a 16 pin dual-in-line (DIP) plug containing six resistors. This allows construction of modules to provide non-standard crossover frequencies.

Assembly should be undertaken only by those persons having experience in precision soldering. One empty module and label are supplied with the unit. The only additional parts required are six ¼ watt 1% resistors. The values of the resistors may be selected from the chart in Table I or calculated from the formulas in Table II.

After calculating the exact values, select the nearest standard value. In general, raising the value of all three resistors by a fixed percentage will lower the crossover frequency by the same percentage, while maintaining the same shape of the curve. Altering the resistance ratio among the three resistors will change the shape of the knee of the curve, causing either a more gradual crossover or a more peaked response. Only the maximally-flat Butterworth type filter offers a flat response in the passband. All other types of filters exhibit some sort of ripple in the amplitude response or phase anomalies that are not usually desired for crossovers.

Resistors RL1, RL2 and RL3 determine the characteristic of the low-pass filter section. Similarly, RH1, RH2 and RH3 determine the characteristic of the high-pass filter section.

In these formulas R is in ohms, F is the crossover frequency, (the 3 db down frequency) in Hertz, M stands for meg or one million.

4.9 Module Construction

The following items are required for construction of a custom crossover frequency module:

1. Blank 16 pin DIP empty module. (One supplied)
2. Six resistors, values calculated or from table.

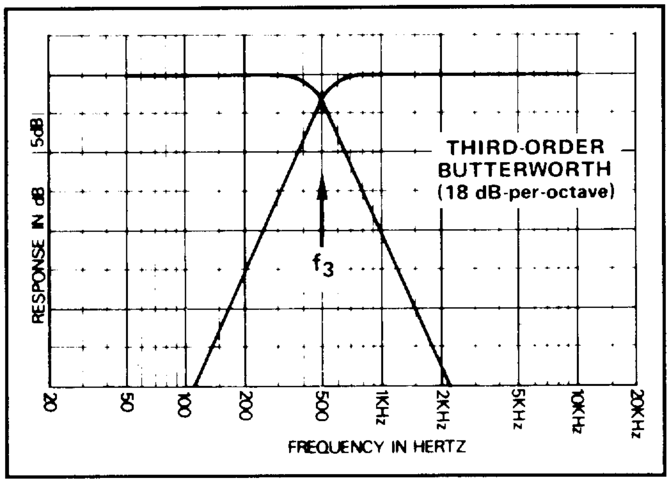

Figure 9: Crossover Response Curve

Freq. Hz	RL1	RL2	RL3	RH1	RH2	RH3
	Resistor Values (ohms)					
125	124k	887k	162k	196k	76.8k	1.43M
500	32.4k	232k	41.2k	48.7k	19.1k	340k
800	20.5k	147k	26.1k	30.1k	11.8k	210k
1500	11k	76.8k	14k	16.2k	6.34k	113k
3500	4.64k	33.2k	6.04k	6.98k	2.74k	47.5k
7000	2.32k	16.9k	3.01k	3.48k	1.37k	23.7k

Table I: Resistor Values for Butterworth Filter

Low-Pass Section:

RL1 = 16.39M / (F+6)
RL2 = 116.97M / (F+6)
RL3 = 21.03M / (F+6)

High-Pass Section:

RH1 = 24.32M / F
RH2 = 9.55M / F
RH3 = 167.3M / (F-7.6)

Table I: Resistor Value Formulas

3. Short length of 22 AWG bus wire for jumper.
4. Low watt soldering iron with small chisel tip.
5. Electronic grade solder, 63/37 or 60/40 alloy with rosin core flux.
6. Flush cutting diagonal cutters.
7. A spare 16 pin DIP socket.
8. Adhesives: epoxy, super glue or hot melt.
9. Various other hand tools as required.

Assembly procedure: (Refer to Figure 10)

1. Insert the empty DIP plug of the module into the DIP socket or use the socket on the **1631A**. This will help keep the pins in alignment during the soldering.

2. Locate pin 1 by the cutoff corner.
3. Place and solder the resistors one by one. Trim each lead close enough to allow installation of the cap later. Be sure that the leads are clean so they will solder easily. Excessive heat will melt the plastic base.
4. Use the 22 AWG bus wire for the jumper.
5. Check all connections and resistor values.
6. Glue the cap in place.
7. Mark the module for the implemented crossover frequency using the self adhesive label provided.

Additional empty modules are available as replacement parts. Order part number 56-11-124395.

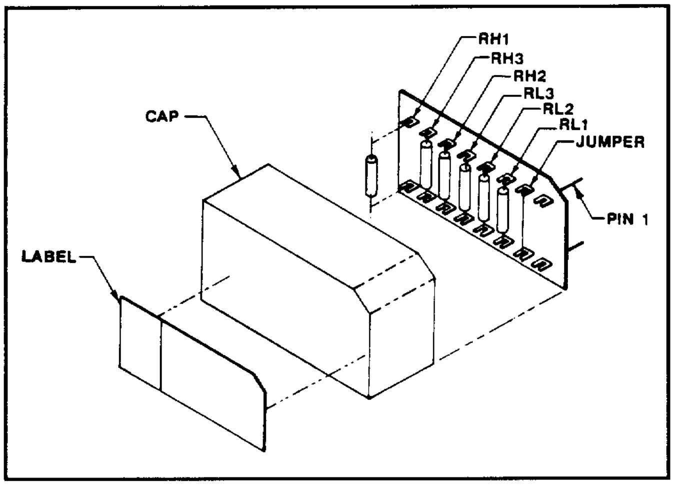

Figure 10: Crossover Module Construction

5 SPECIFICATIONS

Type: Single channel, two-way electronic dividing network with user selectable crossover frequency.

Input Configuration: Single balanced or unbalanced input. Accepts signal input from any high- or low-impedance, active or passive, balanced or unbalanced source.

Input Impedance:
- Balanced: 30,000 ohms.
- Unbalanced: 15,000 ohm.

Input Common-Mode Rejection: 55 dB typical, 60 Hz to 1000 Hz.

Output Configuration: One unbalanced high-pass output, one unbalanced low-pass output.

Output Impedance: Internal 47 ohm source impedance. 600 ohm minimum load.

Maximum Output Level: + 20 dBm (+ 18 dBV).

Output Protection: Safe for short circuit or ± 25 VDC.

Overall Gain: 0 dB with controls set flat.

Frequency Response: ± 0.5 dB, 30 Hz to 20 kHz with high-pass and low-pass outputs combined.

Distortion: Total harmonic and intermodulation distortion typically 0.02%, 0.1% maximum at 20 kHz, +20 dBm output with controls set flat.

Noise Output: -88 dBm (-90 dBv) maximum, 20 Hz to 20 kHz bandwidth.

High/Low Channel Crosstalk: 60 dB typical.

Crossover Frequency Range: 100 Hz to 8000 Hz. Set by miniature plug-in module. 500 Hz and 800 Hz modules supplied. An empty module is also provided for custom construction by the user.

Filter Type: 18 dB per octave, third-order Butterworth for normally supplied modules. Possible custom module constructions by user include first-, second-, and third-order Butterworth, Bessel, or Chebyshev configurations, chosen independently for high-pass and low-pass channels.

Signal Delay: Continuously variable from 0 msec (actually 25 usec) to 2 msec for low-pass output.

Relative Phase:
- Low-Pass Output: Output in phase with input with delay control at minimum.
- High-Pass Output: Switchable, 0 or 180 degrees, output relative to input.

Equalization:
- High-Frequency: Continuously variable, ± 4 dB at 10 kHz, Q = 3.
- Low-Frequency: Second-order underdamped filter with 6 dB peak boost switchable for frequencies of 29, 32, 35, 45 or 60 Hz. Also a "flat" position provides a high-pass filter with a 12 dB per octave rolloff, 3 dB down at 30 Hz for sub-passband speaker protection. These peak boost filters provide the equalization required for Thiele B-6 aligned low-frequency speaker/enclosure combinations.
- Horn/Driver: Miniature plug-in modules provide custom equalization to compensate for the falling high-frequency response of various combinations of horns and drivers. A module with flat response is provided.

Transient Performance: Not limited by slew rate or power bandwidth of 20 Hz to 20 kHz under normal operating conditions.

Controls:
- 1 - rotary low-frequency equalization selector.
- 1 - continuously variable low-frequency delay adjustment.
- 1 - high-frequency gain control.
- 1 - high-frequency equalization control.
- 1 - push-button high-frequency polarity (180 degree phase) reversal switch.
- 1 - rocker power switch.

Indicators: 1 - power-on indicator.

Connections:
- Input:
  - 1 - stereo ¼" phone jack (tip, ring, sleeve) for balanced or unbalanced input.
  - 1 - XLR-3 type female for balanced or unbalanced input.
- Output:
  - 1 - mono ¼" phone jack (tip, sleeve) for unbalanced low-frequency output.
  - 1 - XLR-3 type male for unbalanced low-frequency output.
  - 1 - mono ¼" phone jack (tip, sleeve) for unbalanced high-frequency output.
  - 1 - XLR-3 type male for unbalanced high-frequency output.
- Special:
  - 1 - RCA phono jack for common bass connection.

Power Requirements: 100, 120, 220, 240 VAC 50/60 Hz, user selectable. Supplied wired and fused for 120 VAC with a power consumption of 15 watts. A detachable IEC line cord with 120 volt grounding plug is supplied.

Power Protection: Universal fuse holder accepts 1/16 amp, 250 volt ¼" x 1-¼" MDL type slo-blo fuse for 100 or 120 VAC. A replacement fuse-post cap is available to allow use of 5 mm x 20 mm slo-blo fuses for 220/240 volt operation.

Mounting:	Standard 19" rack space, 1-3/4" high (1 standard rack unit), requires 8-1/2" behind panel including connectors.
Dimensions:	
Height:	1.73 inches (4.4 cm).
Width:	19.0 inches (48.3 cm).
Depth:	4.88 inches (12.4 cm).
Weight:	4.74 pounds (2.15 kgs).
Color:	Black.
Accessories:	Removable transparent plastic security cover is supplied with the unit.

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

Notes:

1631A
Electronic Dividing Network

SERVICE INSTRUCTIONS

*****CAUTION*****

No user serviceable parts inside. Hazardous voltage and currents may be encountered within the chassis. The service information contained within this document is for use only by ALTEC LANSING'S 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 SERVICE INFORMATION

CAUTION: *No user serviceable parts inside. Hazardous voltages and currents may be encountered within the chassis. The service information contained within this document is for use only by* ***ALTEC LANSING*** *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. 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 therefrom shall not be covered under warranty or otherwise.*

6.1 Parts Ordering

To order replacement parts, look up the ordering number from the parts list and write/call:

ALTEC LANSING Parts Sales
P.O. Box 26105
Oklahoma City, OK 73126-0105 U.S.A.
Phone: (405) 324-5311 FAX: (405) 324-8981

6.2 Factory Service

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

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

Enclose a note describing the problem in detail. Include other helpful information such as test conditions, where used, how used, etc.

6.3 Technical Assistance

For applications assistance/technical information, write or call:

ALTEC LANSING Technical Assistance
P.O. Box 26105
Oklahoma City, OK 73126-0105 U.S.A.
Phone: (405) 324-5311 FAX: (405) 324-8981

6.4 Electrical

6.4.1 120 Vac, 50/60 Hz Operation

The unit is set at the factory to operate at 120 Vac, 50/60 Hz. The correct fuse and fuse label should be in place for 120 Vac operation.

6.4.2 For Other AC Line Voltages

In order to change the voltage setting on the **1631A**, you must perform the following steps:

1. Unplug the **1631A** from the AC line.
2. Remove and save the three screws securing the top cover and three screws on the back of the unit.
3. Referring to Figure 11, remove and salvage the jumper wires between pads 3-6 and 1-4.
4. Referring to Table III, connect the wire(s) to the designated pads for the desired voltage.
5. For voltages of 100 and 120 volts use a 1/16 amp, 250 volt, slow-blo type fuse. The fuse holder cap supplied with the unit holds type AGC ¼" x 1 ¼" fuses.

NOTE: *For 220 and 240 volts use a 35 milliamp, 250 volt, slo-blo fuse. A replacement cap for the fuse holder is available to hold 5 mm x 20 mm fuses. Order Altec Lansing part number 51-07-124391.*

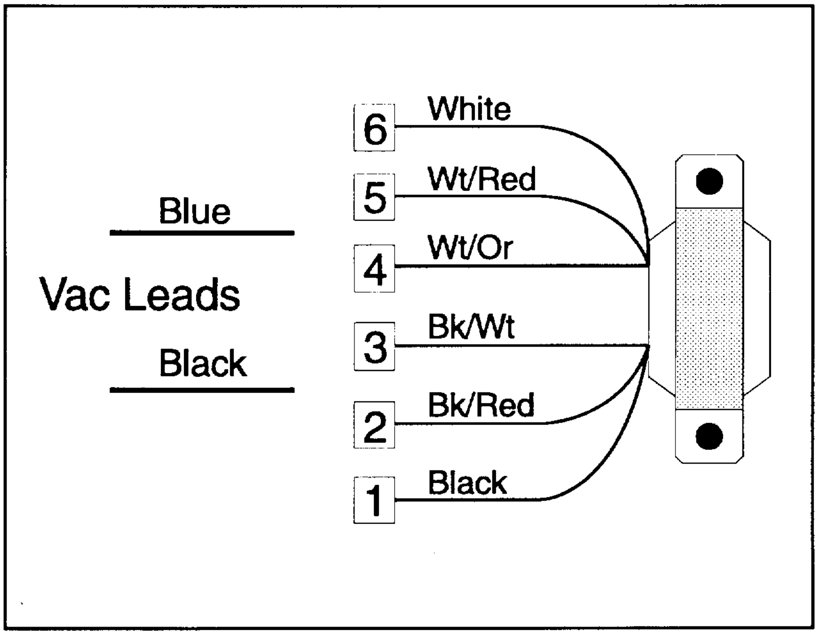

Figure 11: Power Transformer Connections

Voltage	VAC Leads	Strapping
100 VAC	Black - 1, Blue - 5	1 - 4, 2 - 5
120 VAC	Black - 1, Blue - 6	1 - 4, 3 - 6
220 VAC	Black - 1, Blue - 5	3 - 4
240 VAC	Black - 1, Blue - 6	3 - 4

Table III: AC Conversion Chart

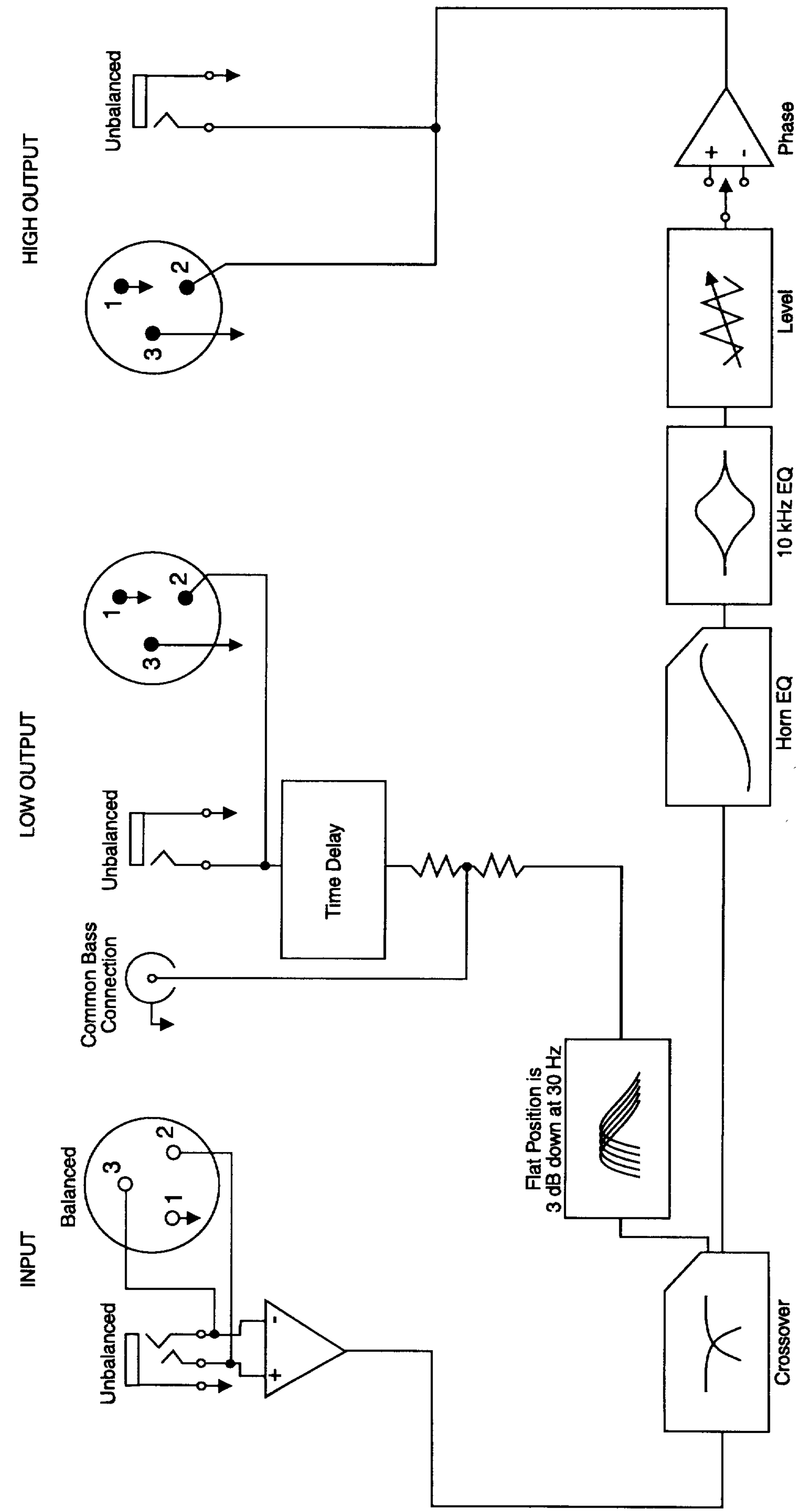

Figure 12: Block Diagram of 1631A

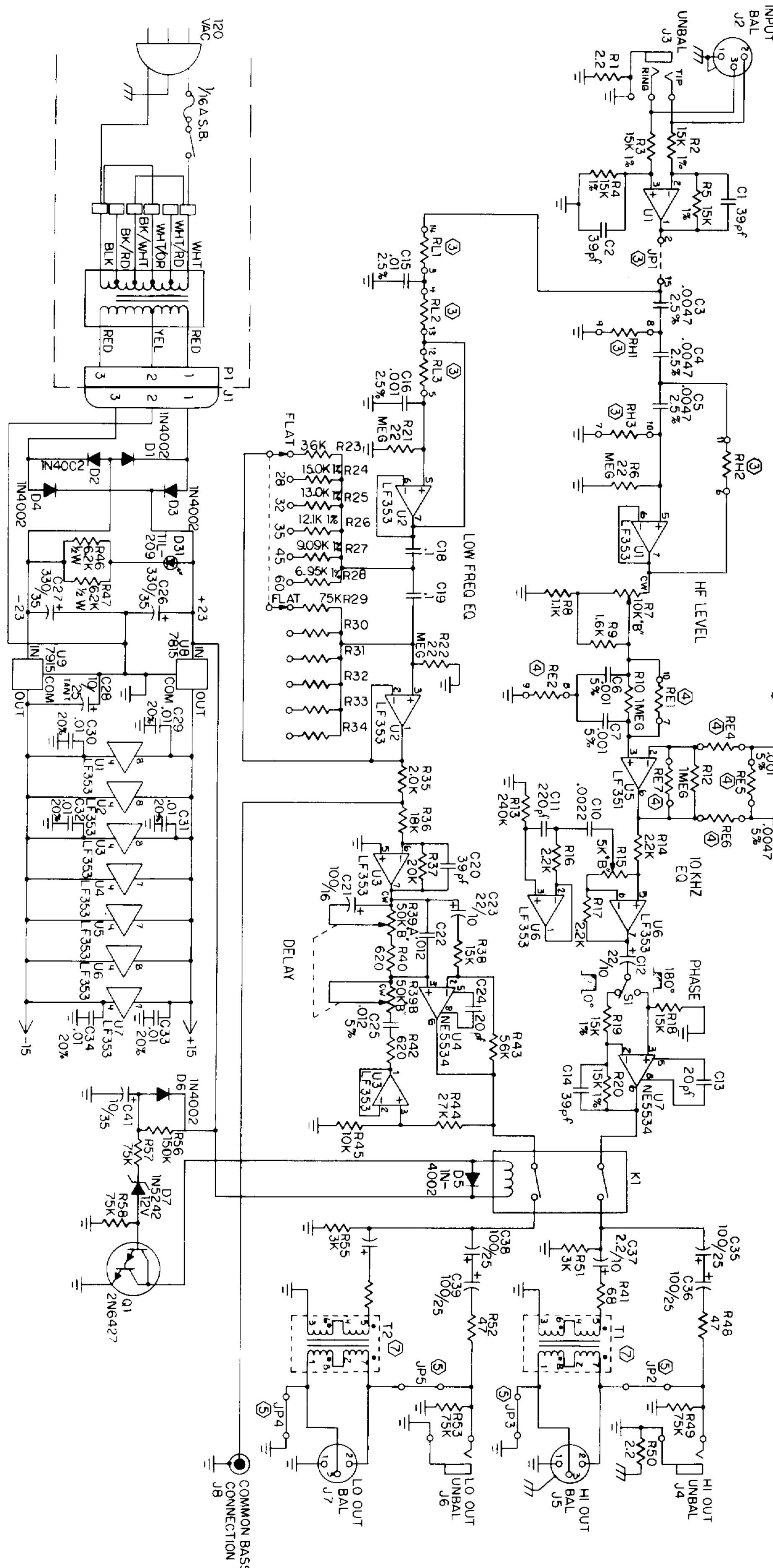

Figure 13: Schematic Diagram of 1631A (11D138)

Component Parts List

Main Board Assembly (27-01-026787)

Reference Designator	Ordering Number	Name and Description
U9	17-01-121659	Voltage Regulator, 7915.
U8	17-01-121660	Voltage Regulator,
U4, 7	17-01-121879	Op Amp, 5534A.
U5	17-01-124462	Op Amp, TL071CP.
U1, 2, 3, 6	17-01-124688	Op Amp, TL072CP.
DS1	39-01-026843	LED, red.
D1-6	48-01-027300	Diode, 1N4006.
D7	48-01-028360	Diode, zener.
Q1	48-03-026801	Transistor, NPN, 2N6426.
K1	45-01-026811	Relay, DPST.
S1	51-02-026810	Switch, DPDT.
S2	51-01-026812	Switch, Rotary, 2P6T.
T1	56-08-026844	Power transformer.
F1	51-04-026721	Fuse holder.
J1	21-01-026804	Header, 3-pin.
J2	21-01-124470	Connector, XLR, female.
J3	21-01-026806	Connector, 1/4" phone jack, stereo.
J4, 6	21-01-026803	Connector, 1/4" phone jack, mono.
J5, 7	21-01-124642	Connector, XLR, male.
J8	21-01-026802	Connector, RCA phone jack.
J9, 10	21-02-026805	Socket, 16-pin.
JP1-24	21-01-110310	Jumper.
	21-02-026774	AC power receptacle.
	60-06-124962	Power cable.
	28-09-026777	Rubber foot.
	21-01-026730	Module, 500 Hz.
	21-01-026732	Module, 800 Hz.
	21-01-038831	Module, 1000 Hz.
	21-01-026734	Module, Horn EQ.
	21-01-028128	Module, user configurable.