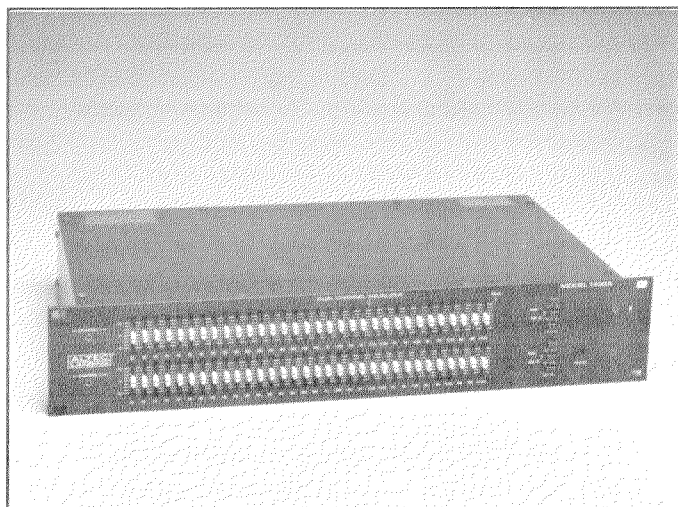




1432A

Variable Q Active Filter

Stereo 31 Band $\frac{1}{3}$ Octave Equalizer



KEY FEATURES

- ★ Variable Q filter set
- ★ 31 bands of boost and cut
- ★ Select between 6 dB or 12 dB of boost and cut

KEY SYSTEM SPECIFICATIONS

Center Frequencies: 20, 25, 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1k, 1.25k, 1.6k, 2k, 2.5k, 3.15k, 4k, 5k, 6.3k, 8k, 10k, 12.5k, 16k Hz, 20k Hz

Maximum Boost/Cut: ± 12 dB

Operating Gain: 0 dB

**Low-Cut Filter
Corner Frequency:** 43 Hz

**Frequency Response
at Unity Gain:** 20 Hz - 20 kHz, ± 1 dB
(High-Pass Filter Disengaged)

**Total Harmonic Distortion
at Unity Gain:** $< 0.01\%$
(20 Hz - 20 kHz, 0 dBu Output)

Noise at Unity Gain: < -85 dBu
(20 Hz - 20 kHz)

**Maximum Input Level
at Unity Gain:** + 20 dBu (7.75 Vrms)

Maximum Output Level: + 20 dBu (7.75 Vrms)

DESCRIPTION

The Altec Lansing 1432A Dual Channel Stereo $\frac{1}{3}$ -Octave Graphic Equalizer is a boost and cut equalizer whose primary use is for tuning the overall frequency response of a sound reinforcement system, both to increase gain-before-feedback and to compensate for the deficiencies in the acoustic environment and the sound system.

The active Q variable filter set utilized in the 1432A allows effective equalization with few problematic side effects. As Figure 2 illustrates, the filter characteristics vary with the amount of boost or cut used. At low control settings, the filter Q is very wide. As the control is boosted or cut, the filter

Q narrows so that there is minimum interaction between adjacent frequency bands. The filter response is designed to affect a $\frac{1}{3}$ -octave range.

Each of the 31 $\frac{1}{3}$ -octave filters provide 12 dB of boost or cut at ISO frequencies 20 through 20,000 Hz. The faders have a positive detent in the center, flat-response position. The gain control also has a center detent at unity gain.

A low-cut filter switch, with a 43 Hz corner frequency and 18 dB per octave slope, is located on the front panel. A range select switch allows selection of either 6 dB or 12 dB of boost or cut.

1432A Specifications (cont'd)

Input:	(Ref. 0 dBv = 0.775 Vrms)		
Type:	Electronically balanced		• EQ-ON Equalizer ON select switch
Impedance:	44 k Ω balanced 22 k Ω unbalanced		• AC Power switch
Normal level:	0 dBv (0.775 Vrms)		• Ground-Lift Switch
Output:	(Ref. 0 dBm = 0.775 Vrms across 600 Ω)	Connectors:	
Type:	Electronically balanced	Input:	3 Terminal barrier strip (balanced)
Impedance:	120 Ω balanced 60 Ω unbalanced	Output:	3 Terminal barrier strip (balanced)
Load Impedance:	600 Ω or higher	AC Power:	115, 230 Vac 50/60 Hz 18 Watts
Peak Indicator:	Red LED + 14 dBu (6 dB before clipping)	Operating Temperature Range:	Up to 50° C (122° F)
Available Gain:	± 6 dB or ± 12 dB	Dimensions:	
High-Pass Filter:	Switch selectable with cutoff below 43 Hz and a slope of 18 dB per octave.	Height:	3.46 inches (88 mm)
		Width:	19.0 inches (483 mm)
		Depth:	9.24 inches (235 mm)
Controls:	<ul style="list-style-type: none"> • 31 center detent slide controls at $\frac{1}{3}$-octave center frequencies from 20 Hz to 20 kHz, selectable ± 6 dB or ± 12 dB boost/cut. • LEVEL control with center detent • LO-CUT select switch • RANGE ± 6 dB or ± 12 dB select switch 	Net Weight:	8.8 lbs (4.0 kg)
		Enclosure:	Rack Mount Chassis (1 $\frac{3}{4}$ inch rack space)
		Accessories:	(Included) Power cord, mounting screws, rubber feet, decal and fuse for 230 Vac line operation, 1432A Installation and Operating Instructions

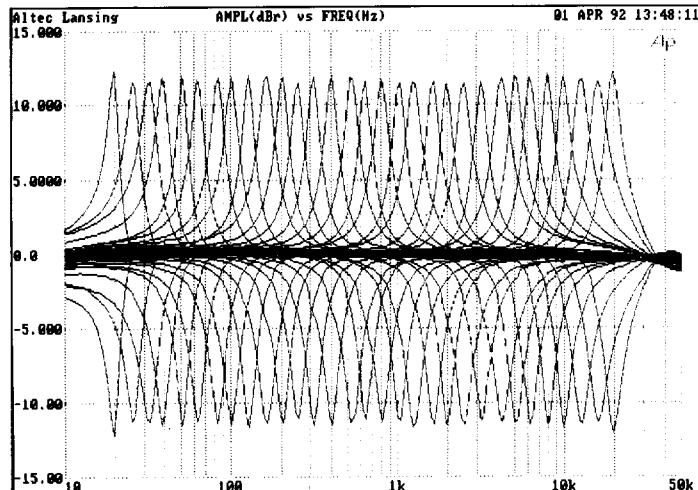


Figure 1
 ± 12 dB Control Settings, Individually Set

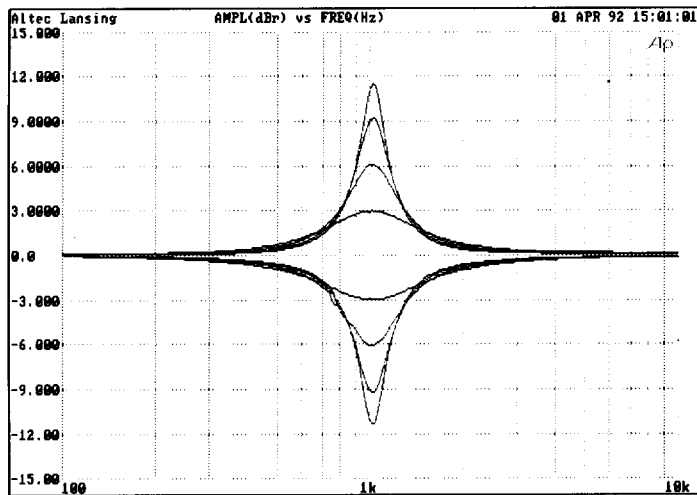


Figure 2
Filter Characteristics at 1 kHz (± 12 dB)

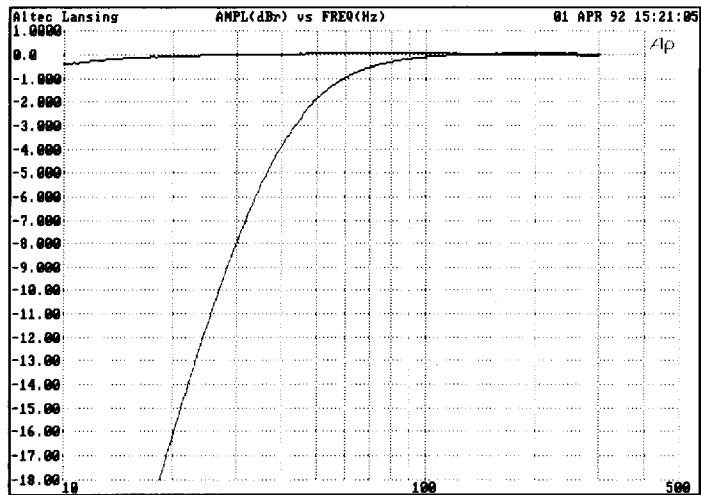


Figure 3
Lo-Cut Filter Roll-Off Characteristics

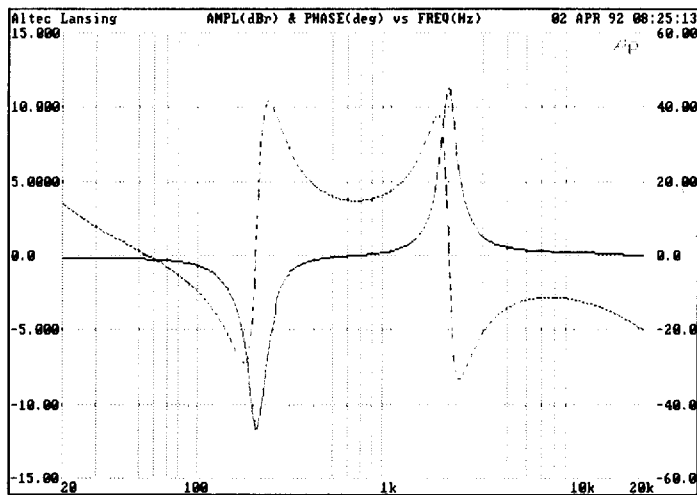


Figure 4
200 Hz Filter Set at -12 dB, 2 kHz Filter at +12 dB.
Respective Phase Angle (deg) Vs. Frequency (Hz)

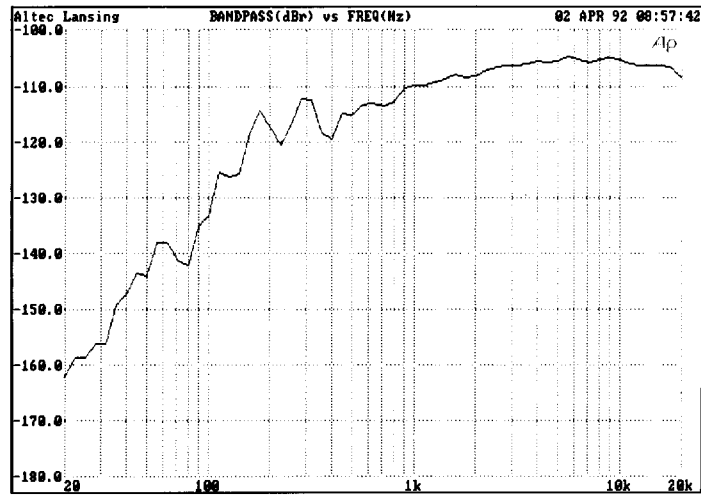


Figure 5
A-Weighted Noise (dBr) Vs. Frequency (Hz)

ARCHITECT'S and ENGINEER'S SPECIFICATION

The equalizer shall be a dual channel, stereo equalizer with 31 filters centered at the ISO standard $\frac{1}{3}$ -octave frequencies between 20 and 20,000 Hz. Furthermore, the filters shall provide either 6 dB or 12 dB of boost or cut and be set by 22.5 mm linear controls.

The front panel shall have the following controls (per channel): a gain control that is continuously variable from - 12 dB to + 12 dB from unity gain; a high-pass filter with a slope of 18 dB per octave and a corner frequency of 43 Hz; a range switch to select either 6 dB or 12 dB of boost or cut from the filters; an EQ-on switch to put the filters in the signal path and an on/off switch.

The rear panel shall have input and output connectors, a ground-lift switch, and an IEC connector with an integral fuse holder that allows voltage selection by the way it is inserted.

The input and output of the equalizer shall be accessible via 3-terminal barrier strips. The input shall be actively balanced. The output shall be balanced on the 3-terminal barrier strip.

The equalizer shall meet or exceed the following performance specifications: frequency response at unity gain, ± 1 dB, 20 - 20,000 Hz at 0 dBu; a noise level of less than - 85 dBu; gain of ± 6 dB or ± 12 dB; balanced-input impedance of 44 k Ω ; output impedance of 120 Ω ; a maximum input level of + 20 dBu at unity gain; a maximum output level of 20 dBu into loads greater than or equal to 600 Ω .

The equalizer shall operate on 115/230 Vac, 50/60 Hz, and consume less than 18 watts. The unit shall be operable over the temperature range as high as 50° C or 122° F. The chassis shall be steel with a black front panel and black top, bottom, sides and back with white nomenclature. The chassis shall occupy one rack space in a standard 19-inch rack (Height: 3.64 inches, Depth: 9.24 inches, Width: 19 inches). The weight shall be 8.8 lbs.

The equalizer shall be the Altec Lansing model **1432A**.



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the sound of experience.

1432A

Stereo 31 Band 1/3 Octave Equalizer

Installation and Operating Instructions



ALTEC LANSING CORPORATION

a MARK IV company

P.O. Box 26105 • Oklahoma City, OK • 73126-0105 USA • Tel: (405) 324-5311 • FAX: (405) 324-8981

Table of Contents

1	ELECTRICAL	1
1.1	115 Vac, 50/60 Hz Power Connections	1
1.2	230 Vac, 50/60 Hz Power Connections	1
1.3	Fuse Replacement	1
2	INSTALLATION	1
2.1	Rack Mounting	1
2.2	Ventilation	1
3	SIGNAL CONNECTIONS	1
3.1	Input Connections	1
3.2	Output Connections	1
4	OPERATION	1
4.1	Front and Rear Panel Controls	1
4.2	BOOST/CUT Slider Adjustments	1
4.3	PEAK Indicator	2
4.4	LEVEL Control	2
4.5	LO-CUT Switch	2
4.6	EQ ON Switch	2
4.7	RANGE Switch	2
4.8	POWER Switch	2
4.9	Ground-Lift-Switch	2
5	IN CASE OF PROBLEMS	2
6	SPECIFICATIONS	3
7	SERVICE INFORMATION	5
7.1	Parts Ordering	5
7.2	Factory Service	5
7.3	Technical Assistance	5

1 ELECTRICAL

1.1 115 Vac, 50/60 Hz Power Connections

The 1432A is provided with the primary of the power transformer selected for 115 Vac operation from the factory.

NOTE: Verify that the ac line voltage is in accordance with the selected voltage rating before connecting the equalizer to the ac line.

1.2 230 Vac, 50/60 Hz Power Connections

The 1432A may be powered from 230 Vac line voltages by removing the fuse holder from the power receptacle and then pulling the fuse clip out, turning it 180 degrees and reinserting it, making sure 230 shows in the fuse holder window. Next remove the 500 mA fuse and install the 315 mA fuse (found in the bag marked European) and then place the holder back in the power receptacle.

1.3 Fuse Replacement

If the fuse needs replacement, it must be replaced by one of the same type and rating for the power connections being used. See below:

500mA/250V SB (115 Vac line)

315mA/250V NB (230 Vac line)

2 INSTALLATION

2.1 Rack Mounting

The 1432A may be installed in a standard 19 inch equipment rack. It requires 3 1/2 inches of vertical rack space and mounting is accomplished by using the four rack mount screws provided.

2.2 Ventilation

The 1432A must be adequately ventilated to avoid excessive temperature rise. It should not be used in areas where the ambient temperature exceeds 50°C (122°F). To determine the ambient

air temperature, operate the system in the rack until the temperature stabilizes. Measure the ambient air with a bulb-type thermometer held at the bottom of the upper-most unit. Do not let the thermometer touch the metal chassis because the chassis will be hotter than the ambient air. If the temperature exceeds 50°C (122°F), the equipment should be spaced at least 1 3/4 inches apart or a blower installed to provide sufficient air movement within the cabinet.

WARNING: Do not operate the equalizer within a completely closed, unventilated housing.

3 SIGNAL CONNECTIONS (Both Channels)

3.1 Input Connections

Balanced input connections are made to the 3 terminal barrier strip (one for each channel). For single-ended inputs, strap terminals - and GND. Refer to Figure 1 for typical input connections.

3.2 Output Connections

Balanced output connections are made to the 3 terminal barrier strip (one for each channel). For unbalanced output strap terminals - and GND. Refer to Figure 2 for typical output connections.

4 OPERATION

4.1 Front and Rear Panel Controls

FRONT PANEL

- BOOST/CUT slider controls for frequency bands.
- PEAK. Peak indicator.
- LEVEL. Output level control.
- LO-CUT. Bass cut switch.
- EQ ON. Equalizer

on/off switch.

- RANGE. Boost/Cut range switch.
- ON/OFF. Power switch.

REAR PANEL

- Electronically balanced inputs.
- Balanced/Unbalanced outputs.
- Ground-Lift-Switch.
- Fuse holder/ac line voltage selector.

4.2 BOOST/CUT Slider Adjustments

The primary tones of the bass drum, bass tuba, electric and acoustic bass guitar and the organ pedal clavier are affected mostly by the frequency bands 20 Hz to 100 Hz. In special cases the 63 Hz band can be used to filter out line hum (setting slider to max cut).

To modify lower vocals, drum fundamentals, upper bass, and lower bass instruments such as tuba and trombone use the frequency bands 125 Hz through 250 Hz. The 250 Hz band can be used for a slight boost, giving vocals added fullness where a degree of additional support is desired.

The frequency bands 315 Hz to 630 Hz affect the lower mid-range of musical material, such as the fundamental frequencies of voices, string and percussive instruments.

The frequency bands 800 Hz to 2 kHz and especially 1 kHz and 1.6 kHz bands enhance harmonics and fundamental frequencies of voices, strings, percussive, and keyboard instruments. These bands also accent the effects of flanging and phasing.

The 2.5 kHz through 6.3 kHz bands affect vocal fricatives, drums, and guitar. The use of these bands is highly dependent

on the acoustical characteristics of the hall, its reverberation and sound absorption.

Cymbals and the synthesizer in particular will be markedly accentuated by boosts in the frequency bands 8 kHz to 20 kHz. By turning up the 8 kHz control, the presence of a singer's voice can, for example be reinforced. One possibility for reduction of noise in PA systems is to cut the 16 kHz and 20 kHz frequency range slightly.

4.3 PEAK Indicator

The PEAK indicator will light when the output level reaches a point 6dB below output clipping. The 1432A should be operated below this point.

4.4 LEVEL Control

The LEVEL control provides $\pm 6\text{dB}$ or $\pm 12\text{dB}$ of level control (from the detent position) only when all Boost/Cut sliders are in the detent position. The 6 and 12 dB ranges are determined by the RANGE switch.

4.5 LO-CUT Switch

When the LO-CUT switch is depressed the red LED will light, indicating the frequency response below 43 Hz will be rolled off at 18dB per octave.

4.6 EQ ON Switch

When the EQ ON switch is depressed the red LED will light, indicating the EQ is activated. In the EQ OFF position, it causes the equalizer to be by passed.

4.7 RANGE Switch

When in the 6dB position (red LED on) it will allow the sliders to adjust the boost and cut by approximately $\pm 6\text{dB}$. The 12dB position (green LED on) will likewise allow approximately a $\pm 12\text{dB}$ boost and cut adjustment.

4.8 POWER Switch

Power is turned on or off by this switch.

4.9 Ground-Lift-Switch

Slide switch for eliminating hum from ground loops. Disconnects circuit chassis. If several units are installed in one rack, the switch should be set to "GROUNDED" on only one of the units.

5 IN CASE OF PROBLEMS

Please check the following items:

1. Verify that the 1432A is properly connected to an ac power source and that the source is active.
2. Verify that the input connections are properly made. Refer to Figure 1.
3. Verify that the output connections are properly made. Refer to Figure 2.
4. Check the input and output cables for proper wiring and continuity.
5. Check the signal source and the load.

Check that the EQ-ON switch is in the ON position.

6 SPECIFICATIONS (Both Channels)

Filter Type: Variable Q Active filter set.

Number of Bands: 31 bands at ISO center frequencies: 20 Hz, 25 Hz, 32 Hz, 40 Hz, 50 Hz, 63 Hz, 80 Hz, 100 Hz, 125 Hz, 160 Hz, 200 Hz, 250 Hz, 315 Hz, 400 Hz, 500 Hz, 630 Hz, 800 Hz, 1 kHz, 1.25 kHz, 1.6 kHz, 2 kHz, 2.5 kHz, 3.15 kHz, 4 kHz, 5 kHz, 6.3 kHz, 8 kHz, 10 kHz, 12.5 kHz, 16 kHz, 20 kHz

Input:

(Ref. 0dBu = 0.775Vrms)

Type: Electronically balanced

Impedance: 44K Ω balanced
22K Ω unbalanced

Normal level: 0dBu(0.775Vrms)

Maximum level: +20dBu(7.75Vrms)

Output:

(Ref. 0dBu = 0.775Vrms)

Type: Electronically balanced

Impedance: 120 Ω balanced
60 Ω unbalanced

Maximum level: 20dBu

Load Impedance: 600 ohms or higher

Peak Indicator: Red LED
+14dBu(6dB before clipping)

Frequency Response:

(Ref. 1 kHz = 0dBu) Across 600 Ω
20 Hz-20 kHz ± 1 dB

Operating Gain: 0dB

Available Gain: ± 6 dB or ± 12 dB

High-Pass Filter: Switch selectable with Cutoff below 43 Hz and a slope of 18dB per octave.

THD: <0.01% from 20 kHz to 20 kHz, all bands at 0 dB

Noise: <-90dBm A-wtd (500 kHz BW), all bands at 0 dB

Controls:

- 31 center detent slide controls at 1/3 octave center frequencies from 20 Hz to 20 kHz, with selectable ± 6 dB or ± 12 dB boost/cut.
- LEVEL control with center detent
- LO-CUT select switch
- RANGE ± 6 dB or ± 12 dB select switch
- EQ-ON Equalizer ON select switch
- AC Power switch
- Ground-Lift-Switch

Connectors:

Input: Terminal Strip (balanced)

Output: Terminal Strip (balanced)

AC Power: 115, 230 vac 50/60Hz 18 Watts

Operating Temperature

Range: Up to 50°C (122°F)

Dimensions: 88 mm (3.46 in.) high;
483 mm (19.0 in.) wide;
235 mm (9.24 in.) deep

Net Weight: 4.0 kg (8.8 lbs)

Enclosure:

Rack Mount Chassis (1 3/4 inch rack space)

Accessories (Included):

- Power cord
- One pkg. of mounting screws
- One pkg. of rubber feet
- One decal and fuse for 230 Vac line operation
- One 1432A Installation and Operating Instructions

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



1432A

STEREO

31 BAND 1/3 OCTAVE EQUALIZER

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.

7 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.*

7.1 Parts Ordering

To order replacement parts, look up the ordering number from the parts list and write or 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

7.2 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 as much detail as possible. Include other helpful information such as test conditions, where used, how used, etc.

7.3 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

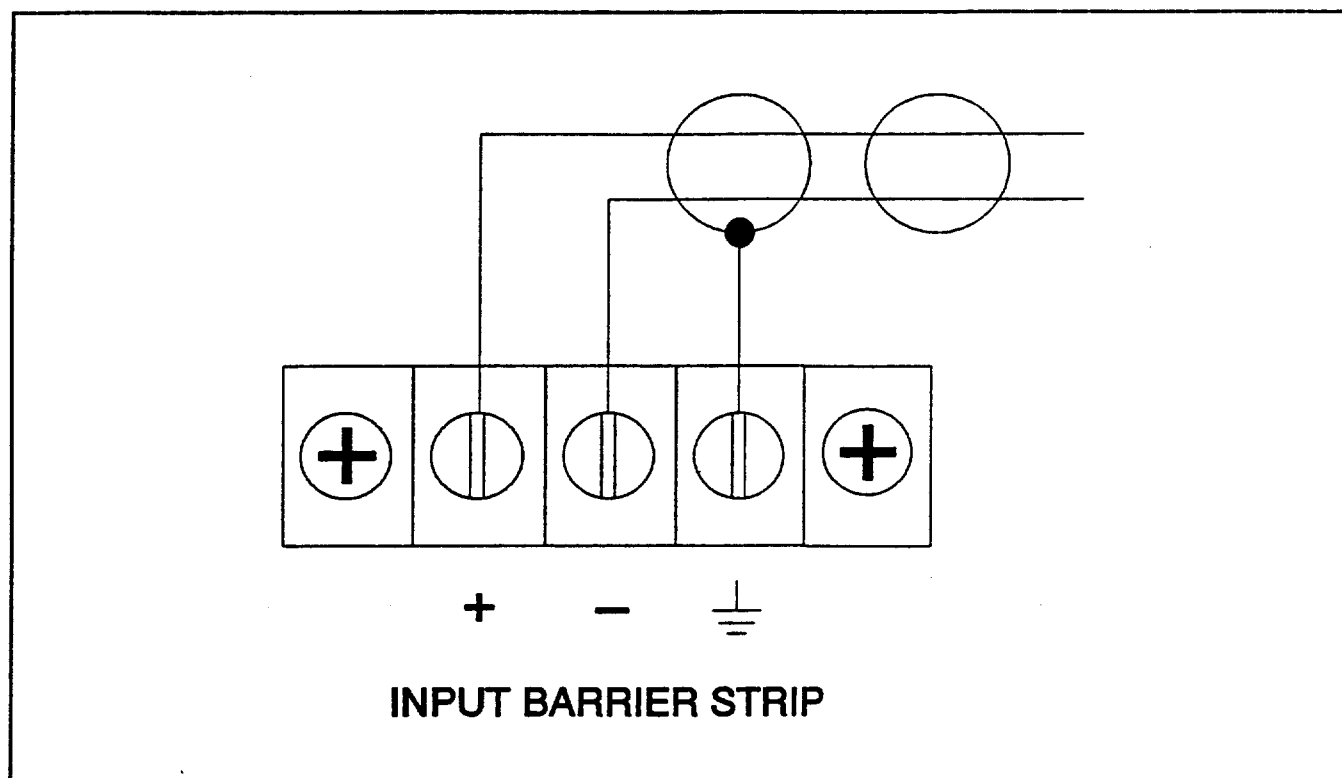


Figure 1 Input Connections

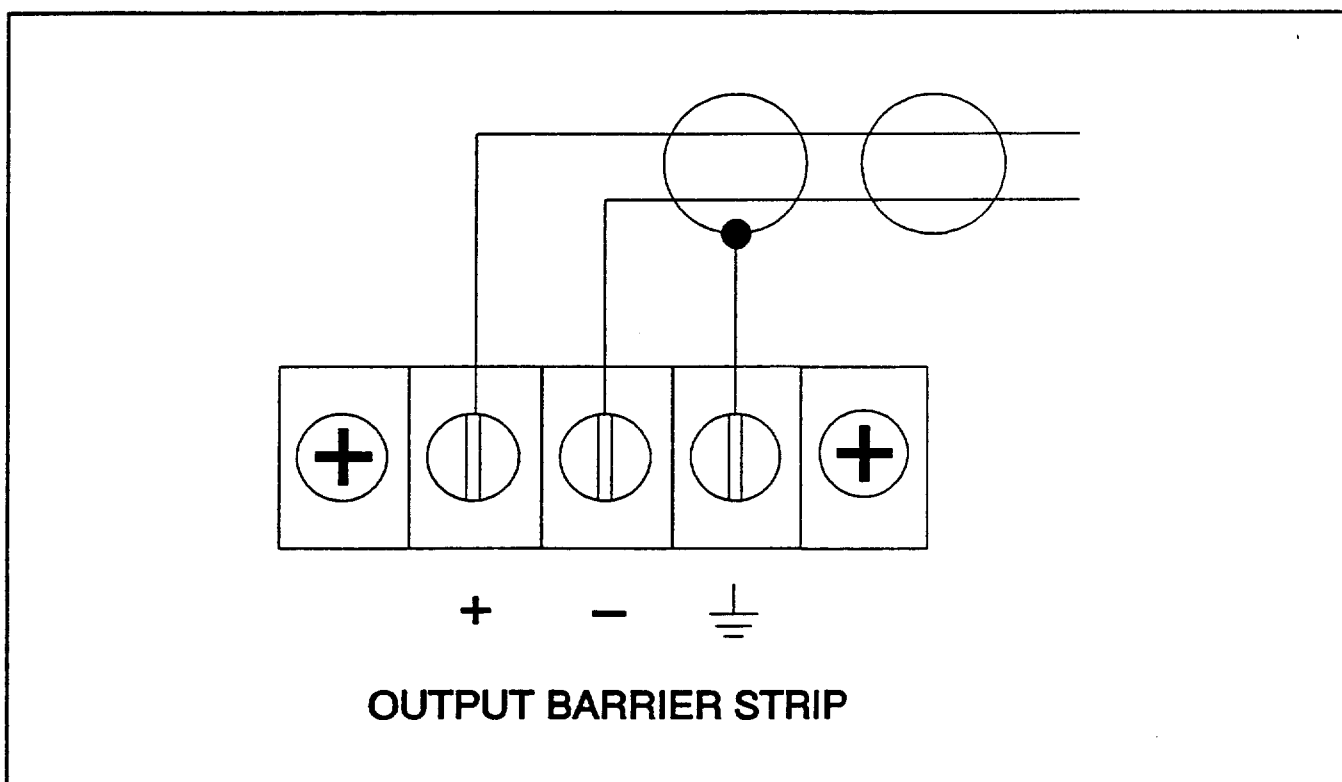
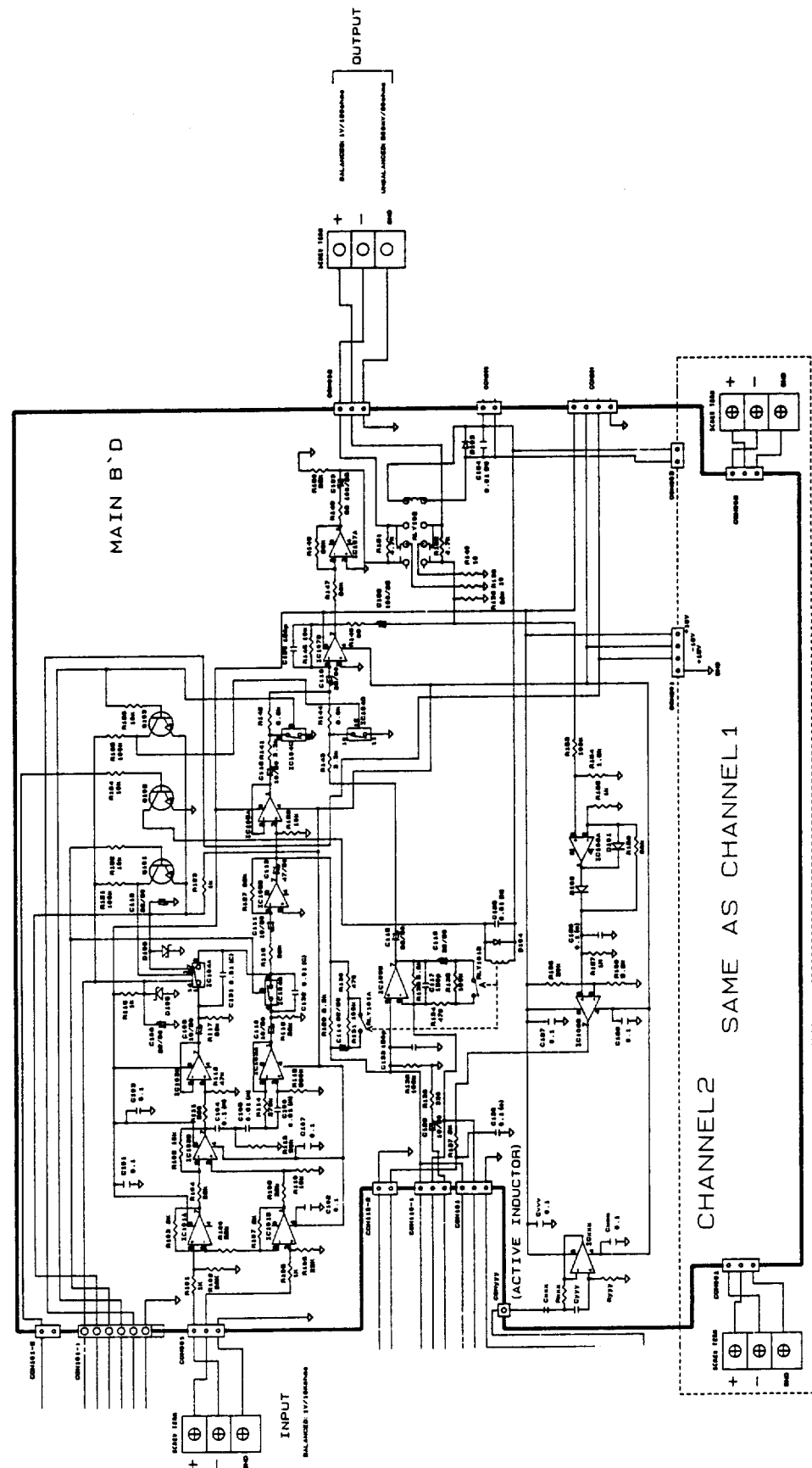
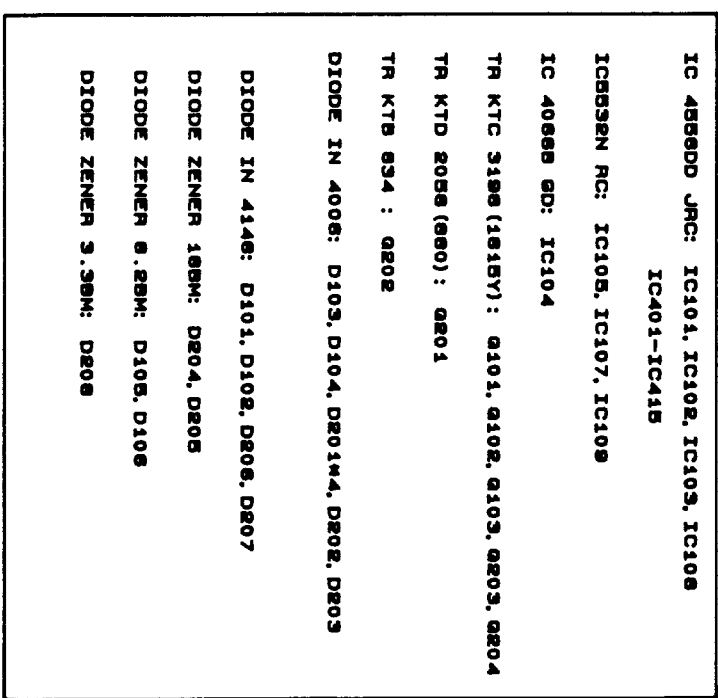
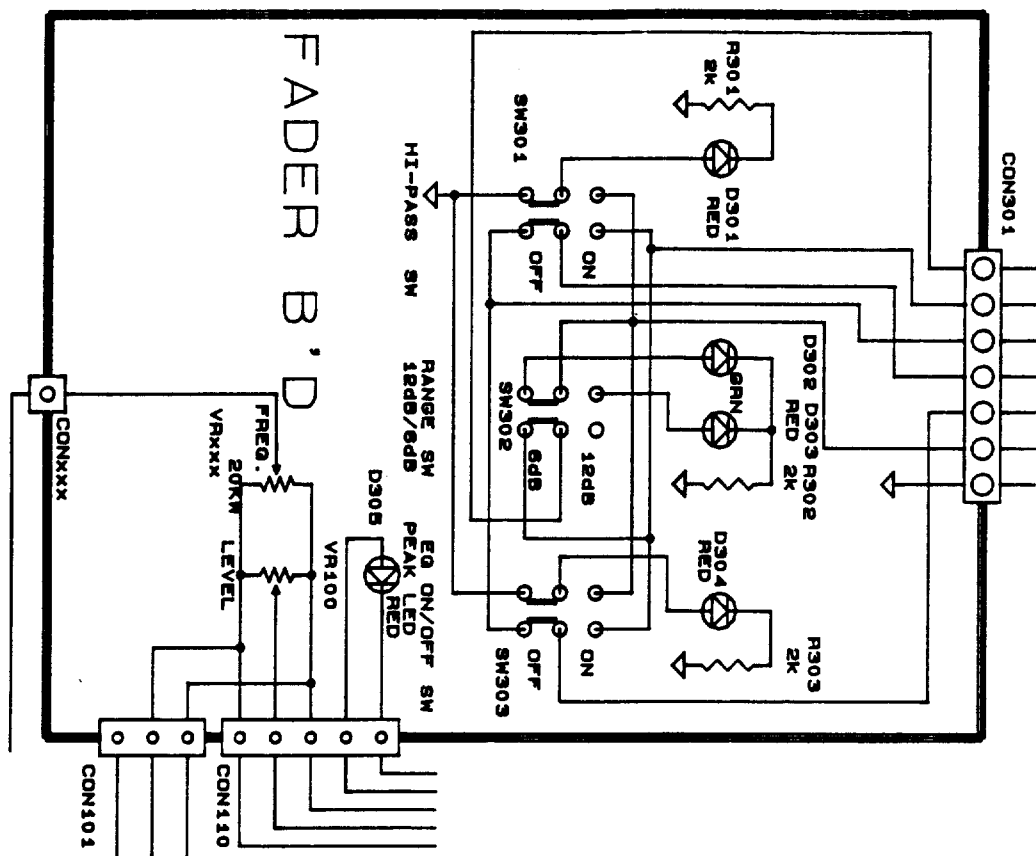


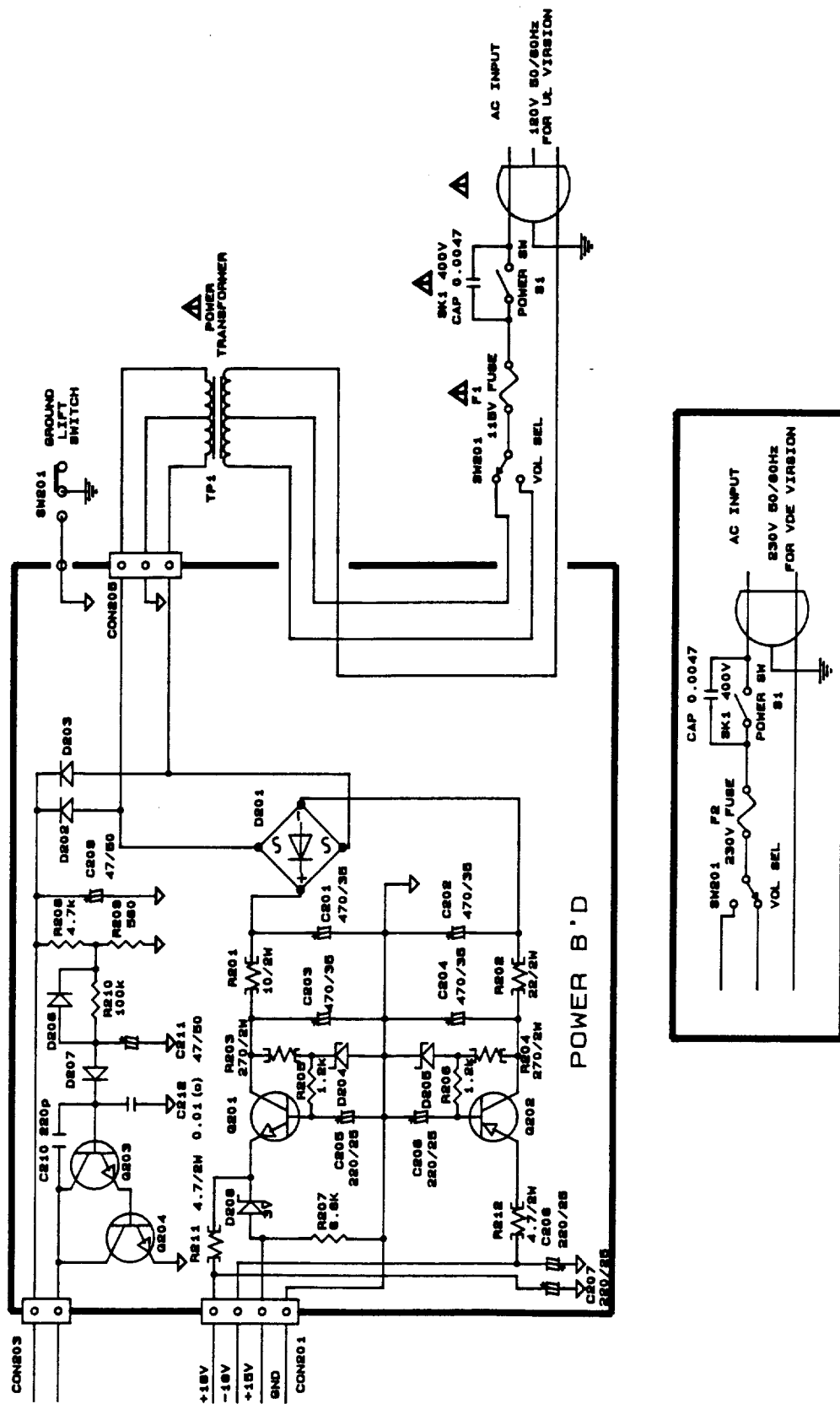
Figure 2 Output Connections



Schematic of 1432A (11D959) Sheet 1 of 4



Schematic of 1432A (11D959) Sheet 2 of 4



Schematic of 1432A (11D959) Sheet 3 of 4

Parts Value for Active Inductor

Freq.	VRxxx	ICxxx	Cxxx	Cyyy	Cvvv	Cwww	Rxxx	Ryyy	CONxxx	CONyyy
20Hz	VR101	IC401b	C701: 2.2u	C702: 0.47u	C784	C783	R701: 309	R702: 198k	CON102	CON102
25Hz	VR102	IC401a	C703: 2.2u	C704: 0.47u			R703: 318	R704: 124k	CON102	CON102
32Hz	VR103	IC402b	C705: 2.2u	C706: 0.47u			R705: 301	R706: 78.7k	CON102	CON102
40Hz	VR104	IC402a	C707: 1.5u	C708: 0.33u			R707: 280	R708: 115k	CON102	CON102
50Hz	VR105	IC403b	C709: 1u	C710: 0.22u			R709: 287	R710: 158k	CON103	CON103
63Hz	VR106	IC403a	C711: 1u	C712: 0.15u			R711: 294	R712: 143k	CON103	CON103
80Hz	VR107	IC406b	C729: 0.62u	C730: 0.15u			R729: 287	R730: 115k	CON103	CON103
100Hz	VR108	IC406a	C731: 0.68u	C732: 0.1u			R731: 294	R732: 127k	CON103	CON103
125Hz	VR109	IC404b	C713: 0.47u	C714: 0.088u			R713: 287	R714: 178k	CON104	CON104
160Hz	VR110	IC404a	C715: 0.47u	C716: 0.088u			R715: 294	R716: 110k	CON104	CON104
200Hz	VR111	IC409a	C725: 0.27u	C726: 0.047u			R725: 287	R726: 120k	CON104	CON104
250Hz	VR112	IC409b	C727: 0.33u	C728: 0.088u			R727: 287	R728: 105k	CON104	CON104
315Hz	VR113	IC405b	C717: 0.22u	C718: 0.047u			R717: 242	R718: 102k	CON105	CON105
400Hz	VR114	IC405a	C719: 0.18u	C720: 0.033u			R719: 255	R720: 105k	CON105	CON105
500Hz	VR115	IC410a	C723: 0.15u	C724: 0.022u			R723: 280	R724: 120k	CON105	CON105

Freq.	VRxxx	ICxxx	Cxxx	Cyyy	Cvvv	Cwww	Rxxx	Ryyy	CONxxx: PINxxx
630Hz	VR116	IC410b	C721: 0.1u	C722: 0.022u			R721: 243	R722: 120k	CON105 CON105
800Hz	VR117	IC406b	C737: 0.1u	C738: 0.015u	C765	C767	R737: 255	R738: 102k	CON106 CON106
1K	VR118	IC406a	C739: 0.068u	C740: 0.01u			R739: 255	R740: 143k	CON106 CON106
1.25K	VR119	IC411a	C743: 0.068u	C744: 0.0082u			R743: 261	R744: 110k	CON106 CON106
1.6K	VR120	IC411b	C741: 0.047u	C742: 0.0088u			R741: 255	R742: 120k	CON106 CON106
2K	VR121	IC407b	C733: 0.033u	C734: 0.0088u			R733: 242	R734: 143k	CON107 CON107
2.5K	VR122	IC407a	C735: 0.033u	C736: 0.0047u			R735: 249	R736: 105k	CON107 CON107
3.15K	VR123	IC412a	C747: 0.022u	C748: 0.0039u		C766	R747: 232	R748: 127k	CON107 CON107
4K	VR124	IC412b	C745: 0.022u	C746: 0.0033u			R745: 255	R746: 88.7k	CON107 CON107
5K	VR125	IC413b	C749: 0.015u	C750: 0.0027u			R749: 243	R750: 110k	CON108 CON108
6.3K	VR126	IC413a	C751: 0.012u	C752: 0.0022u			R751: 220	R752: 110k	CON108 CON108
8K	VR127	IC414b	C753: 0.0082u	C754: 0.0018u			R753: 205	R754: 130k	CON108 CON108
10K	VR128	IC414a	C755: 0.0088u	C756: 0.0015u			R755: 215	R756: 115k	CON108 CON108
12.5K	VR129	IC102a	C761: 0.0056u	C762: 0.0015u			R761: 237	R762: 82k	CON109 CON109
16K	VR130	IC415b	C757: 0.0047u	C758: 0.001u			R757: 294	R758: 71.5k	CON109 CON109
20K	VR131	IC415a	C759: 0.0033u	C760: 820p			R759: 261	R760: 88.7k	CON109 CON109

Schematic of 1432A (11D959) Sheet 4 of 4

Component Parts Listing for the 1432A

Reference Designator	Ordering Number	Name and Description
C101, 102, 103, 107, 126, 127, 128, 130, 763, 764, 765, 766, 767	15-02-037884	Capacitor, .1 μ F, +80-20%, 50V, Axial Ceramic
C104, 721, 732, 737	15-06-037885	Capacitor, .1 μ F, 5%, 50V, Mylar
C105, 106, 124, 125, 740,	15-06-037208I	Capacitor, .01 μ F, 5%, 100V, Mylar
C108, 112, 114, 115, 116, 119	15-01-037886	Capacitor, 22 μ F, 50V Elect.
C109, 110, 111, 118, 129	15-01-037222	Capacitor, 10 μ F, 50V
C113	15-01-026641	Capacitor, 47 μ F, 50V
C117, 120, 133	15-02-037887	Capacitor, 150 PF, 10%, 50V, Axial Ceramic
C122, 123	15-01-038331	Capacitor, 100 μ F, 25V Elect.
C131, 132, 212	15-02-038072	Capacitor, .01 μ F, +80-20%, 25V, Axial Ceramic
C701, 703, 705	15-01-037888	Capacitor, 2.2 μ F, 50V Elect.
C702, 704, 706, 713, 715	15-06-037889	Capacitor, .47 μ F, 5%, 50V, Mylar
C707	15-01-037890	Capacitor, 1.5 μ F, 50v Elect.
C708, 727	15-06-037891	Capacitor, .33 μ F, 5%, 50V, Mylar
C709, 711	15-06-037892	Capacitor, 1 μ F, 5%, 50V, Mylar
C710, 717	15-06-037893	Capacitor, .22 μ F, 5%, 50V, Mylar
C712, 723, 730	15-06-037894	Capacitor, .15 μ F, 5%, 50V, Mylar
C714, 716, 728, 739, 743	15-06-037895	Capacitor, .068 μ F, 5%, 100V, Mylar
C718, 726, 741	15-06-037896	Capacitor, .047 μ F, 5%, 100V, Mylar
C719	15-06-037897	Capacitor, .18 μ F, 5%, 50V, Mylar
C720, 733, 735	15-06-037898	Capacitor, .033 μ F, 5%, 100V, Mylar
C722, 724, 745, 747	15-06-037211	Capacitor, .022 μ F, 5%, 100V, Mylar
C725	15-06-037899	Capacitor, .27 μ F, 5%, 50V, Mylar
C729	15-06-037900	Capacitor, .82 μ F, 5%, 50V, Mylar
C731	15-06-037901	Capacitor, .68 μ F, 5%, 50V, Mylar
C734, 761	15-06-037194	Capacitor, .0056 μ F, 5%, 100V, Mylar
C736, 757	15-06-037902	Capacitor, .0047 μ F, 5%, 100V, Mylar
C738, 749	15-06-037903	Capacitor, .015 μ F, 5%, 100V, Mylar
C742, 755	15-06-037207	Capacitor, .0068 μ F, 5%, 100V, Mylar
C744, 753	15-06-037904	Capacitor, .0082 μ F, 5%, 100V, Mylar
C746, 759	15-06-037140	Capacitor, .0033 μ F, 5%, 100V, Mylar
C748	15-06-037905	Capacitor, .0039 μ F, 5%, 100V, Mylar
C750	15-06-037906	Capacitor, .0027 μ F, 5%, 100V, Mylar
C751	15-06-037209	Capacitor, .012 μ F, 5%, 100V, Mylar
C752	15-06-037192	Capacitor, .0022 μ F, 5%, 100V, Mylar
C754	15-06-037139	Capacitor, .0018 μ F, 5%, 100V, Mylar
C756, 762	15-06-037190	Capacitor, .0015 μ F, 5%, 100V, Mylar
C758	15-06-037907	Capacitor, .001 μ F, 5%, 100v, Mylar
C760	15-02-037908	Capacitor, 820 PF, 10%, 50V, Axial Ceramic
C201, 202, 203, 204	15-01-037909	Capacitor, 470 μ F, 35V Elect.
C205, 206, 207, 208	15-01-037910	Capacitor, 220 μ F, 25V Elect.
C209, 211	15-01-037144	Capacitor, 47 μ F, 50V Elect.
C210	15-02-037911	Capacitor, 220 PF, 10%, 50V, Axial Ceramic
D101, 102, 206, 207	48-01-122601	Diode, 1N4148
D103, 104, 201-1, 201-2, 201-3, 201-4	48-01-027300	Diode, 1N4006
D105, 106	48-01-037912	Diode Zener, 8.2V, 5%, .5W
D204, 205	48-01-113386	Diode Zener, 18V, 5%, .5W

Reference Designator	Ordering Number	Name and Description
D208	48-01-037913	Diode Zener, 3.3V, 5%, .5W
D301, 303, 304, 305	39-01-037914	LED, Red, KLR124
D302	39-01-037915	LED, Green, EL 204GD
Q101, 102, 103, 203, 204	48-03-026624	Transistor, NPN, KTC 1815Y
Q201	48-03-037916	Transistor, NPN, KTD 2058Y
Q202	48-03-037917	Transistor, PNP, 834Y
R101, 105, 116, 123, 155,	47-01-037121I	Resistor, 1 k Ω , $\pm 5\%$, 1/5 W, C.F.
R102, 104, 106, 108, 117, 118, 119, 120, 127, 138 147, 148, 150	47-01-037919	Resistor, 22 k Ω , $\pm 5\%$, 1/5 W, C.F.
R103, 107, 137, 301, 302, 303	47-01-037920	Resistor, 2 k Ω , $\pm 5\%$, 1/5 W, C.F.
R109, 110, 122, 124, 126, 128, 145	47-01-037169I	Resistor, 10 k Ω , $\pm 5\%$, 1/5 W, C.F.
R111, 209	47-01-037423	Resistor, 560 Ω , $\pm 5\%$, 1/5 W, C.F.
R112	47-01-037258	Resistor, 47 k Ω , $\pm 5\%$, 1/5 W, C.F.
R113	47-01-037175	Resistor, 56 k Ω , $\pm 5\%$, 1/5 W, C.F.
R114	47-01-037921	Resistor, 270 k Ω , $\pm 5\%$, 1/5 W, C.F.
R115	47-01-037365	Resistor, 680 k Ω , $\pm 5\%$, 1/5 W, C.F.
R121, 125, 131, 132, 135 153, 210	47-01-037126	Resistor, 100 k Ω , $\pm 5\%$, 1/5 W, C.F.
R129, 133, 159	47-01-037255	Resistor, 5.6 k Ω , $\pm 5\%$, 1/5 W, C.F.
R130, 134	47-01-037210	Resistor, 470 Ω , $\pm 5\%$, 1/5 W, C.F.
R142, 144, 207	47-01-037922	Resistor, 6.8 k Ω , $\pm 5\%$, 1/5 W, C.F.
R136	47-01-037159	Resistor, 330 Ω , $\pm 5\%$, 1/5 W, C.F.
R139, 140	47-01-102030	Resistor, 10 Ω , $\pm 5\%$, 1/5 W, C.F.
R141, 143	47-01-037254	Resistor, 3.3 k Ω , $\pm 5\%$, 1/5 W, C.F.
R146, 149	47-01-037422	Resistor, 68 Ω , $\pm 5\%$, 1/5 W, C.F.
R151, 152, 208	47-01-037166	Resistor, 4.7 k Ω , $\pm 5\%$, 1/5 W, C.F.
R154	47-01-037923	Resistor, 1.8 k Ω , $\pm 5\%$, 1/5 W, C.F.
R156	47-01-037259	Resistor, 68 k Ω , $\pm 5\%$, 1/5 W, C.F.
R157	47-01-108491	Resistor, 1 M Ω , $\pm 5\%$, 1/5 W, C.F.
R158	47-01-037172	Resistor, 20 k Ω , $\pm 5\%$, 1/5 W, C.F.
R701	47-03-038342	Resistor, 309 Ω , $\pm 1\%$, 1/5 W, C.F.
R702	47-03-037925	Resistor, 196 k Ω , $\pm 1\%$, 1/5 W, C.F.
R703	47-03-038341	Resistor, 316 Ω , $\pm 1\%$, 1/5 W, C.F.
R704	47-03-037926	Resistor, 124 k Ω , $\pm 1\%$, 1/5 W, C.F.
R705	47-03-038340	Resistor, 301 Ω , $\pm 1\%$, 1/5 W, C.F.
R706	47-03-037928	Resistor, 78.7 k Ω , $\pm 1\%$, 1/5 W, C.F.
R707, 723	47-03-038339	Resistor, 280 Ω , $\pm 1\%$, 1/5 W, C.F.
R708, 756	47-03-037930	Resistor, 115 k Ω , $\pm 1\%$, 1/5 W, C.F.
R709, 713, 729	47-03-037927	Resistor, 287 Ω , $\pm 1\%$, 1/5 W, C.F.
R710	47-03-037931	Resistor, 158 k Ω , $\pm 1\%$, 1/5 W, C.F.
R711, 715, 731, 757	47-03-037932	Resistor, 294 Ω , $\pm 1\%$, 1/5 W, C.F.
R712, 734, 740	47-03-037933	Resistor, 143 k Ω , $\pm 1\%$, 1/5 W, C.F.
R714	47-03-037935	Resistor, 178 k Ω , $\pm 1\%$, 1/5 W, C.F.
R716, 720, 728, 736	47-03-037198	Resistor, 105 k Ω , $\pm 1\%$, 1/5 W, C.F.
R717, 733	47-03-037936	Resistor, 242 Ω , $\pm 1\%$, 1/5 W, C.F.
R718, 738, 750	47-03-123017	Resistor, 102 k Ω , $\pm 1\%$, 1/5 W, C.F.

Reference Designator	Ordering Number	Name and Description
R719, 737, 739, 741, 745	47-03-038337	Resistor, 255 Ω , $\pm 1\%$, 1/5 W, C.F.
R721, 749	47-03-038335	Resistor, 243 Ω , $\pm 1\%$, 1/5 W, C.F.
R722, 726, 742	47-03-037938	Resistor, 120 k Ω , $\pm 1\%$, 1/5 W, C.F.
R724, 730, 744, 752	47-03-121457	Resistor, 110 k Ω , $\pm 1\%$, 1/5 W, C.F.
R725, 727	47-03-038338	Resistor, 267 Ω , $\pm 1\%$, 1/5 W, C.F.
R732, 748	47-03-037940	Resistor, 127 k Ω , $\pm 1\%$, 1/5 W, C.F.
R735	47-03-038336	Resistor, 249 Ω , $\pm 1\%$, 1/5 W, C.F.
R743, 759	47-03-037976	Resistor, 261 Ω , $\pm 1\%$, 1/5 W, C.F.
R746, 762	47-03-037941	Resistor, 82 k Ω , $\pm 1\%$, 1/5 W, C.F.
R747	47-03-037937	Resistor, 232 Ω , $\pm 1\%$, 1/5 W, C.F.
R751	47-03-037943	Resistor, 220 Ω , $\pm 1\%$, 1/5 W, C.F.
R753	47-03-038332	Resistor, 205 Ω , $\pm 1\%$, 1/5 W, C.F.
R754	47-03-037945	Resistor, 130 k Ω , $\pm 1\%$, 1/5 W, C.F.
R755	47-03-038333	Resistor, 215 Ω , $\pm 1\%$, 1/5 W, C.F.
R758	47-03-037947	Resistor, 71.5 k Ω , $\pm 1\%$, 1/5 W, C.F.
R760	47-03-037948	Resistor, 88.7 k Ω , $\pm 1\%$, 1/5 W, C.F.
R761	47-03-038334	Resistor, 237 Ω , $\pm 1\%$, 1/5 W, C.F.
R201	47-01-037949	Resistor, 10 Ω , $\pm 5\%$, 2 W, M.O.
R202	47-01-037950	Resistor, 22 Ω , $\pm 5\%$, 2 W, M.O.
R203, 204	47-01-037951	Resistor, 270 Ω , $\pm 5\%$, 2 W, M.O.
R205, 206	47-01-037371	Resistor, 1.2 k Ω , $\pm 5\%$, 1/5 W, C.F.
R211, 212	47-01-038444	Resistor, 4.7 Ω , $\pm 5\%$, 2 W, M.O.
RLY101, 102	45-01-037394	Relay, RY24W
SK1	15-02-037953	Capacitor, .0047 μ F, 400V (Spark Killer)
SW1	51-02-037954	Switch, Power
SW201	51-02-037955	Switch, Slide, S.P.D.T.
SW301, 302, 303	51-02-037956	Switch, Push, 122SC
TP1	56-08-037957	Transformer, Power
VR100-VR131	47-06-037958	Potentiometer, Slider, 20 k Ω , RS2011106-20KW
F1	51-04-038446	Fuse, 0.5A/250V SB, 20 MM, UL/CSA
F2	51-04-038357	Fuse, 0.315A/250V NB, 20 MM, UL/CSA
AI1	21-02-037961	Receptacle, AC Power
AC1	60-06-124962	Cable, Power, 18GA 3 Cond. 120V
ST1, ST2	21-04-038306	Strip, Barrier, 3 Terminal
IC101, 102, 103, 108, 401-415	17-01-038348	Circuit, Integrated, 4558DD
IC105, 107, 109	17-01-038349	Circuit, Integrated, 5532N
IC104	17-01-038347	Circuit, Integrated, 4066B
	24-03-038353	Knob, (used on slider pots)
	24-03-038354	Knob, (used on SW301, 302, 303)
	24-03-038355	Knob, (used on SW1)