



**DA 2x4a & 4x4a  
Distribution Amplifier  
Manual**



**EMC and Safety Conformity**

# Contents

<b>Overview .....</b>	<b>3</b>
<b>Mounting .....</b>	<b>3</b>
<b>Operation .....</b>	<b>3</b>
<b>Connections .....</b>	<b>3</b>
<b>Connection Examples .....</b>	<b>5</b>
<b>Schematic Page 1 .....</b>	<b>6</b>
<b>Schematic Page 2.....</b>	<b>7</b>
<b>Parts Layout Page 1 .....</b>	<b>8</b>
<b>Parts Layout Page 2 .....</b>	<b>9</b>
<b>Parts List .....</b>	<b>10</b>
<b>Specifications .....</b>	<b>11</b>
<b>Using Active Balanced Circuitry .....</b>	<b>12</b>
<b>Warranty .....</b>	<b>14</b>
<b>Repair Policy .....</b>	<b>14</b>
<b>Return Instructions .....</b>	<b>14</b>
<b>Declaration of Conformity .....</b>	<b>15</b>

## Overview

The Radio Systems DA-4x4a is designed to function as a super low noise, low distortion audio distribution amplifier which may be user wired to function in various flexible input and output configurations.

Excellent isolation is provided between outputs. Each balanced channel, regardless of level set and load, is unaffected by the other channels. The Radio Systems DA-4x4a Distribution Amplifier allows audio sources to be routed to multiple locations with various level requirements and impedances while maintaining the integrity of signal quality throughout.

The distribution amplifier is configurable to a dual channel, 2x4 output version, or quad channel, 4x4 output version.

## Mounting

The 4x4a occupies only 1 rack unit (1-3/4 inch) of height in a 19 inch EIA rack. To allow for adequate ventilation, avoid mounting the unit directly above large heat producing equipment such as power amps or power supplies.

When stacking units, it is recommended that one rack space (1-3/4 inch) remain open between every three units.

## Operation

Apply an input level of approximately 0dB to the input terminals. The gain of any stage may be increased by 20dB in 10dB steps by changing the internal gain straps.

To locate and reset these jumpers, refer to the parts layout for the location of JU1 and JU2. The lid of the unit must be removed to access these jumpers. Place a shorting strap across the center and rear pin (pin towards the rear barrier strip) to increase input gain by 10dB. Place a shorting strap across the center and forward pin to increase input gain by 20dB.

Output level is factory set for unity gain. Each output can be individually set via its front panel recessed level pot over a range from -60 to +18dBm. Nominal operating levels are 0dBm input and +10dBm output. Higher operating levels can cut dynamic range by operating too close to the clipping point. Adjust each output to the desired level, keeping clipping in mind.

## Connections

The units are primarily designed for balanced inputs and outputs. The input ground is connected to the chassis and power supply at a single point. If unbalanced lines are used, tie the unused input terminal to ground. However, do not tie any unused output terminals to ground. Wire an unbalanced output between one output terminal and the input ground terminal. For further details, see the section on using active balanced circuitry in this manual.

Although the outputs are short circuit protected, operating into less than a 600 ohm load is not recommended. The input is bridging (high impedance) and will not load down any

source.

Because the unit is actually four separate 1 input x 4 output amplifiers, internal jumpers JU3 and JU4 allow for the following configurations:

1 input x 8 outputs (stereo)

4 inputs x 4 outputs (mono)

2 inputs x 4 outputs (stereo)

Additionally, by wiring the inputs in parallel, the following configuration is possible:

1 input x 16 output (mono)

Refer to the connection diagram on the following page for details.

AC line voltage is user selectable from the lid of the cabinet by inserting a thin shafted screw driver through the vent holes to move the red line voltage selector switch to the left for 230V operation, and to the right for 110V operation (factory setting).

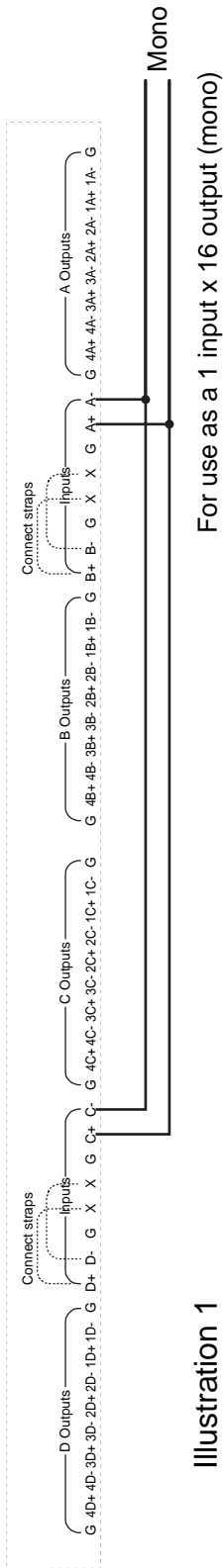


Illustration 1

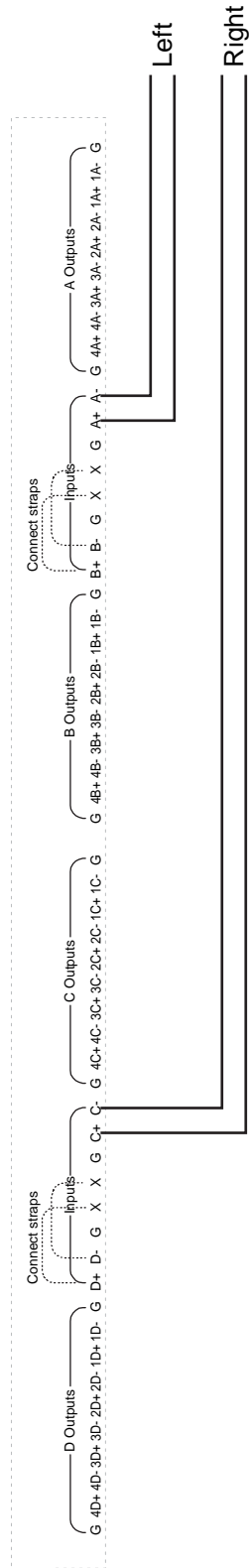


Illustration 2

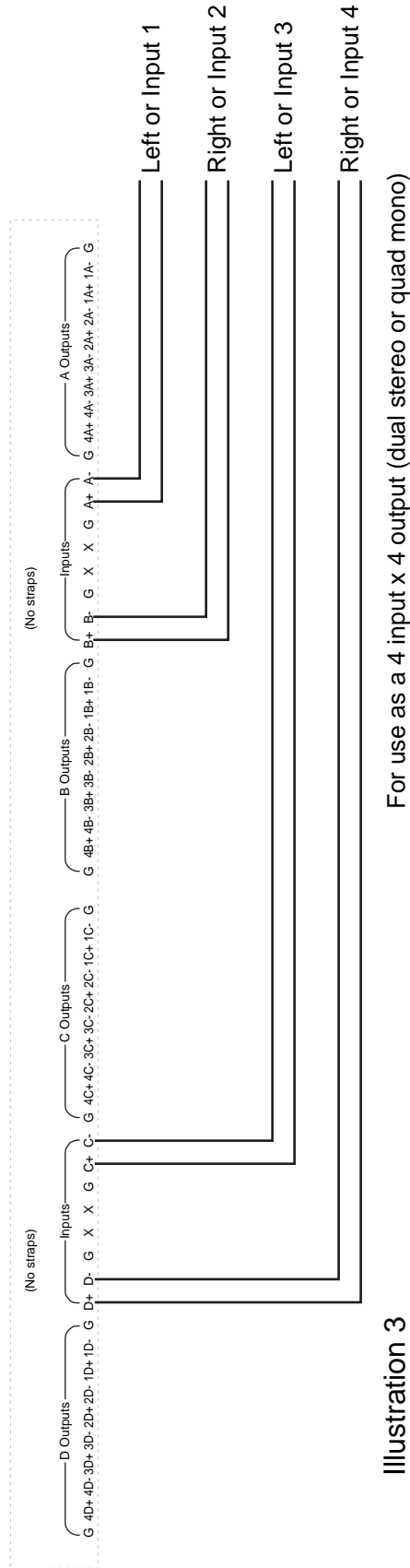


Illustration 3

Note:  
 The 2x4 (mono) version uses only the left-hand circuit board. Configure it as shown above for:  
 Illustration 1 - 1 input x 8 output (mono)  
 Illustration 3 - 2 input x 4 output (stereo)

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

D

D

C

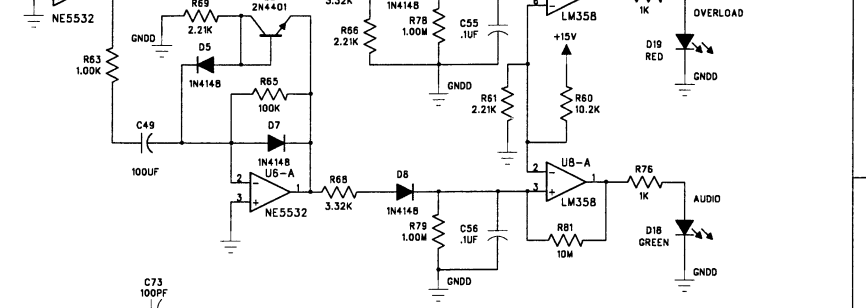
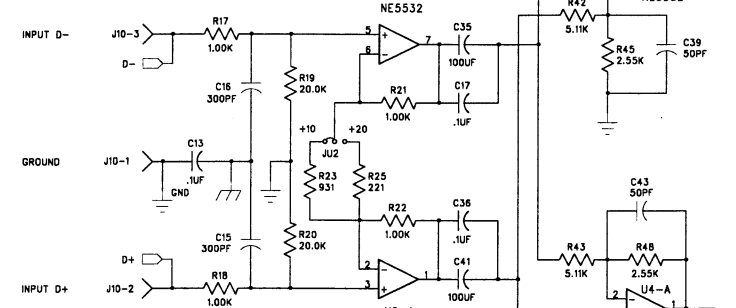
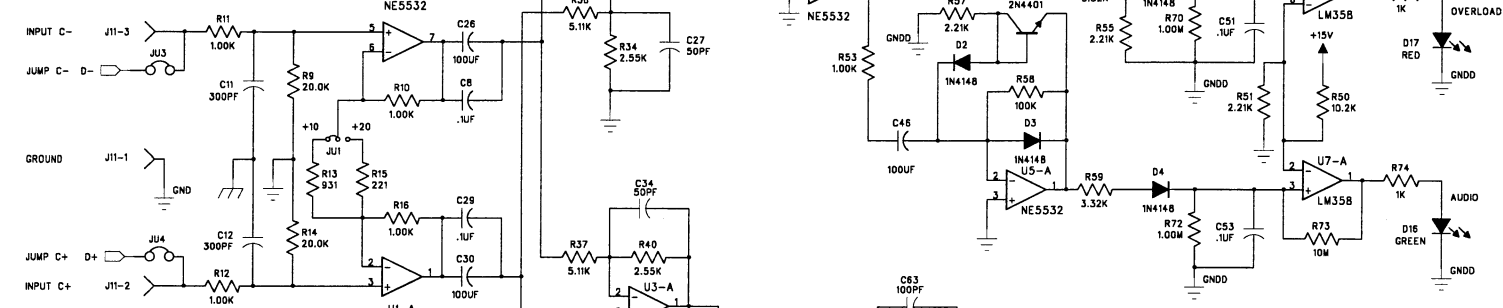
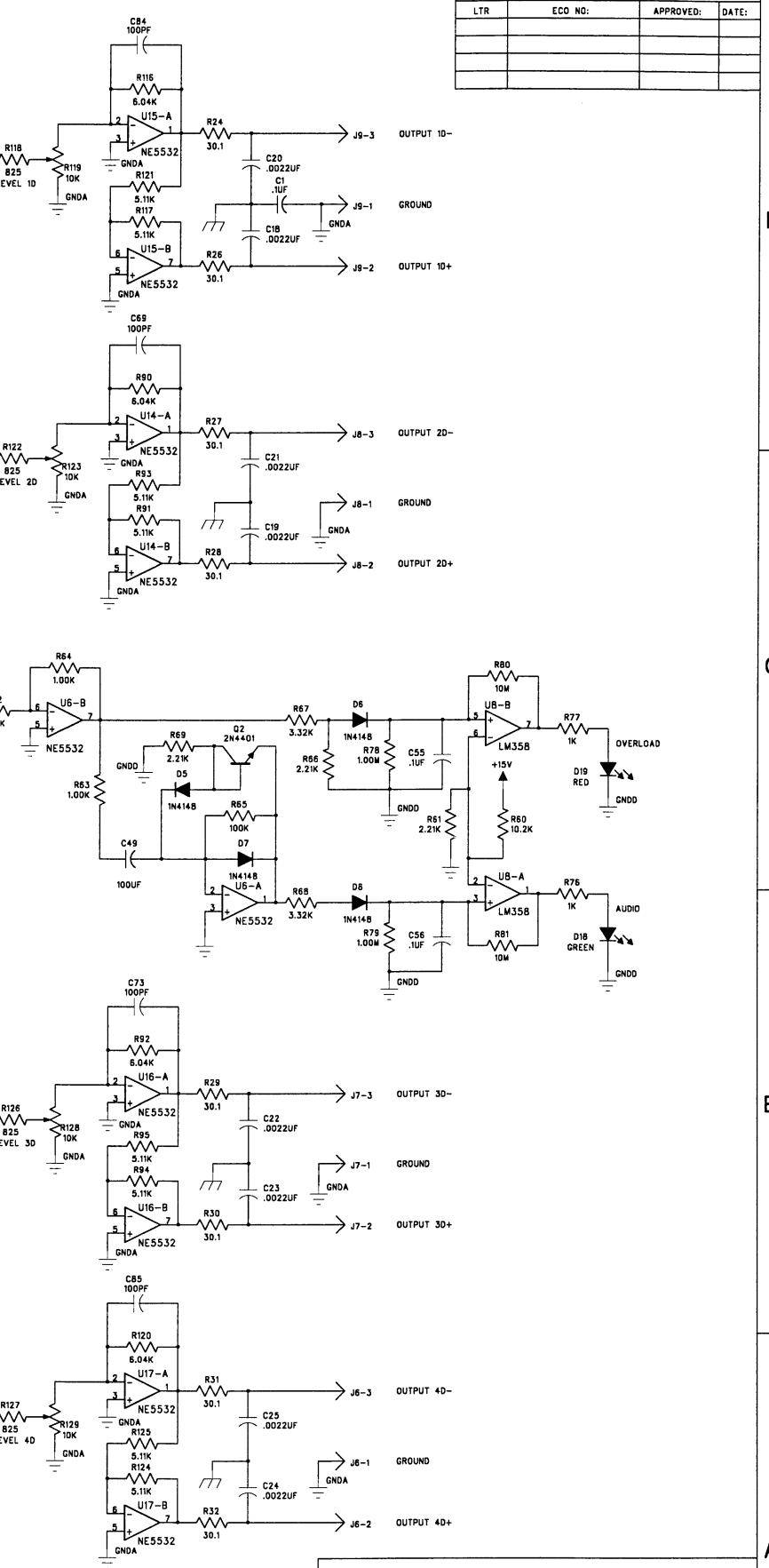
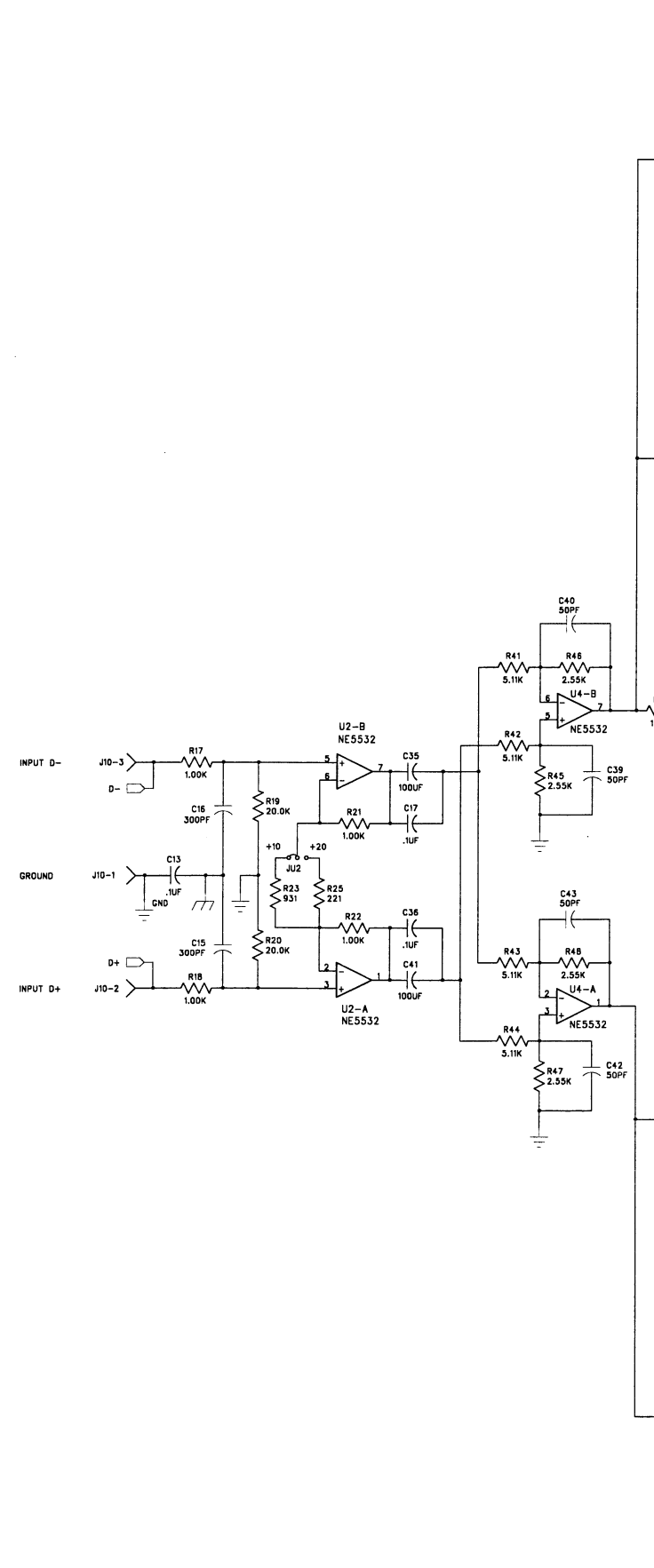
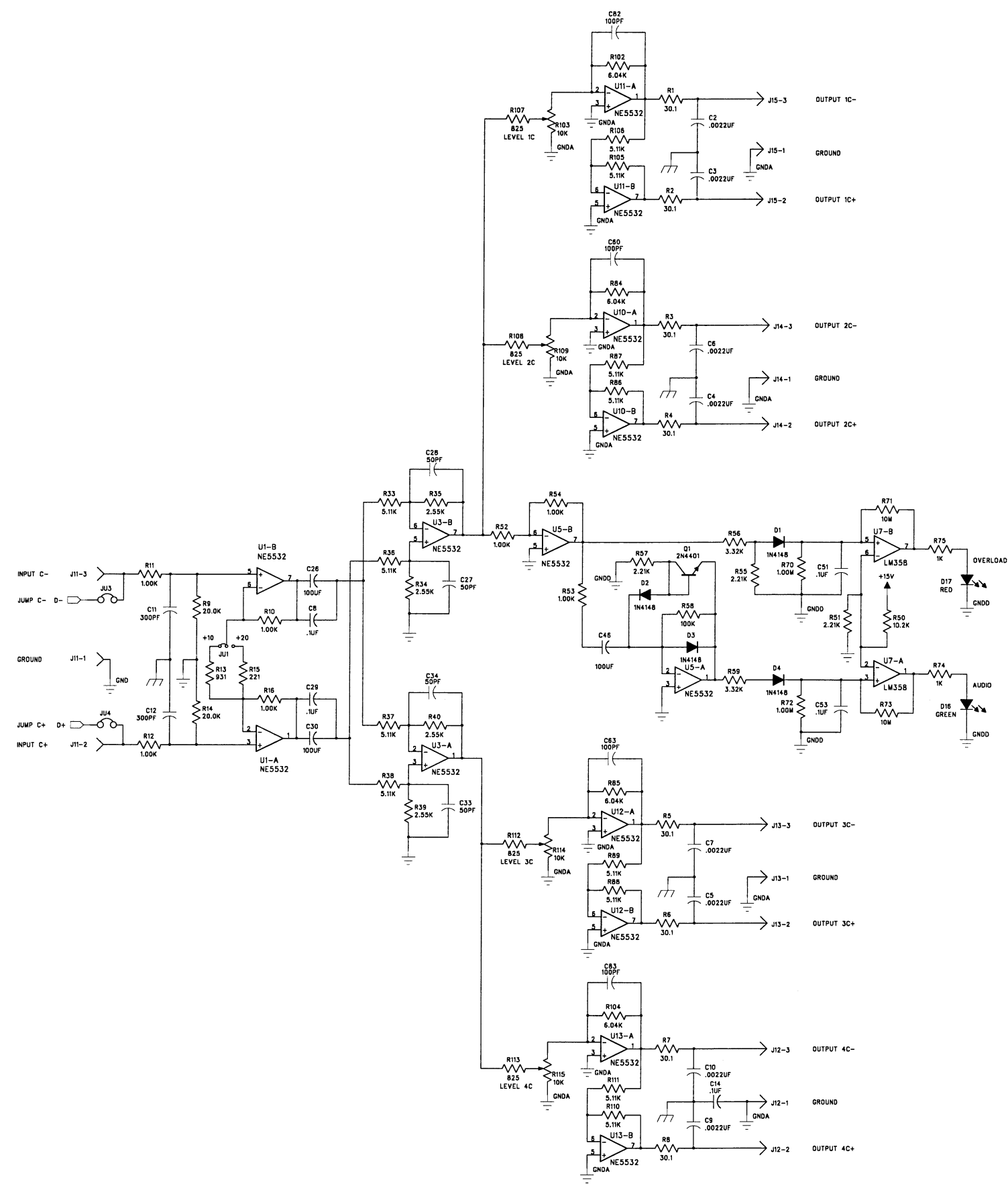
C

B

B

A

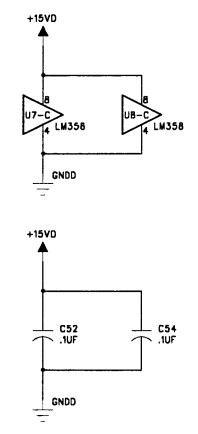
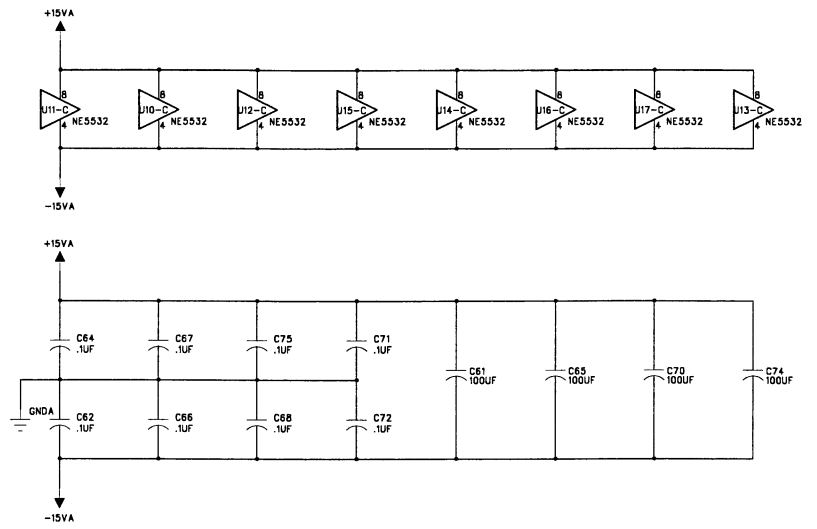
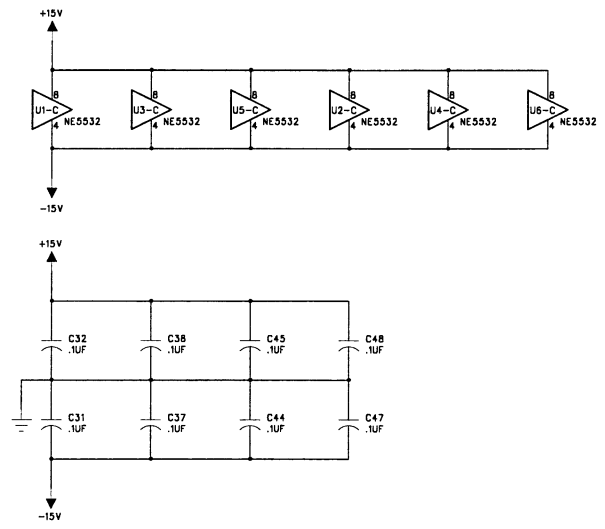
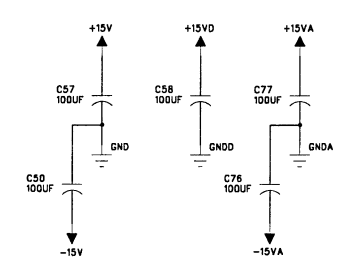
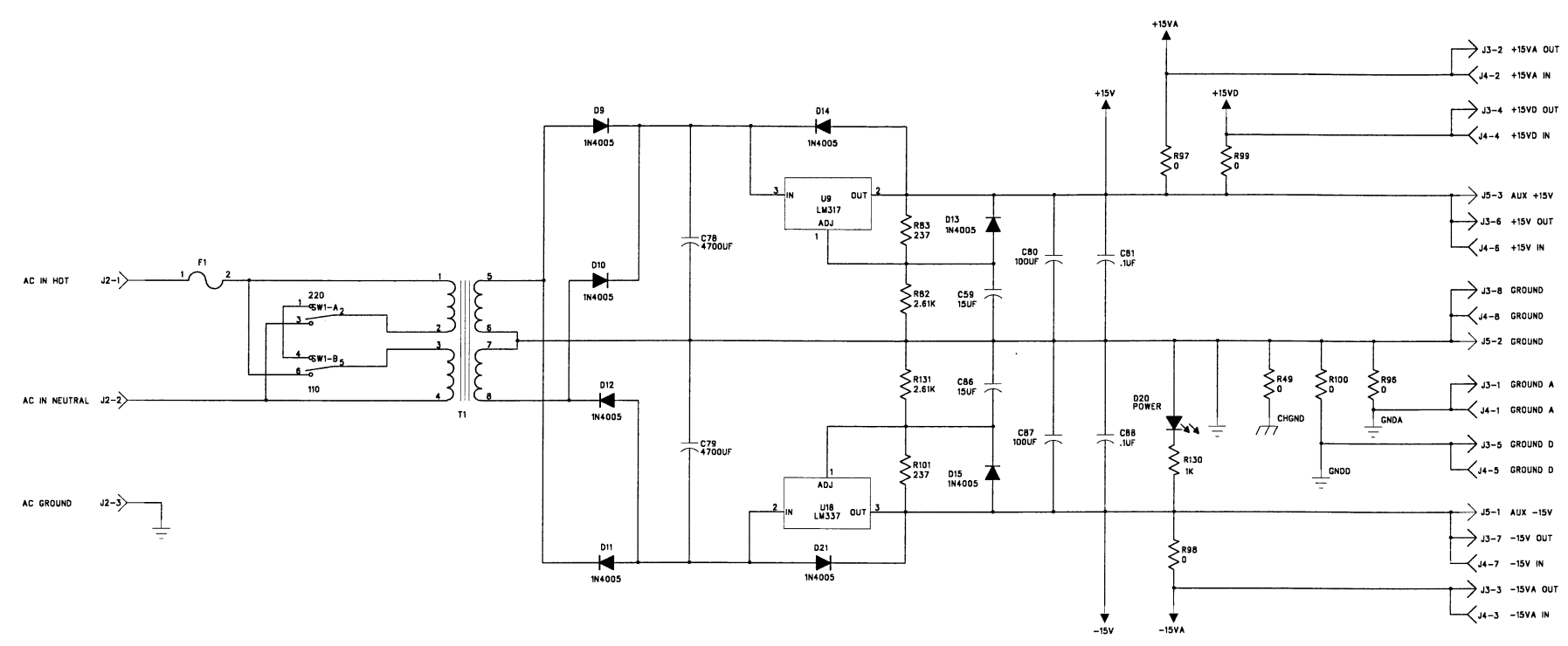
A



NOTES:  
 1. R49, R96, R97, R98, AND R99 SHOWN AS ZERO OHMS HAVE BEEN REPLACED BY COPPER FOIL ON THE BOARD.

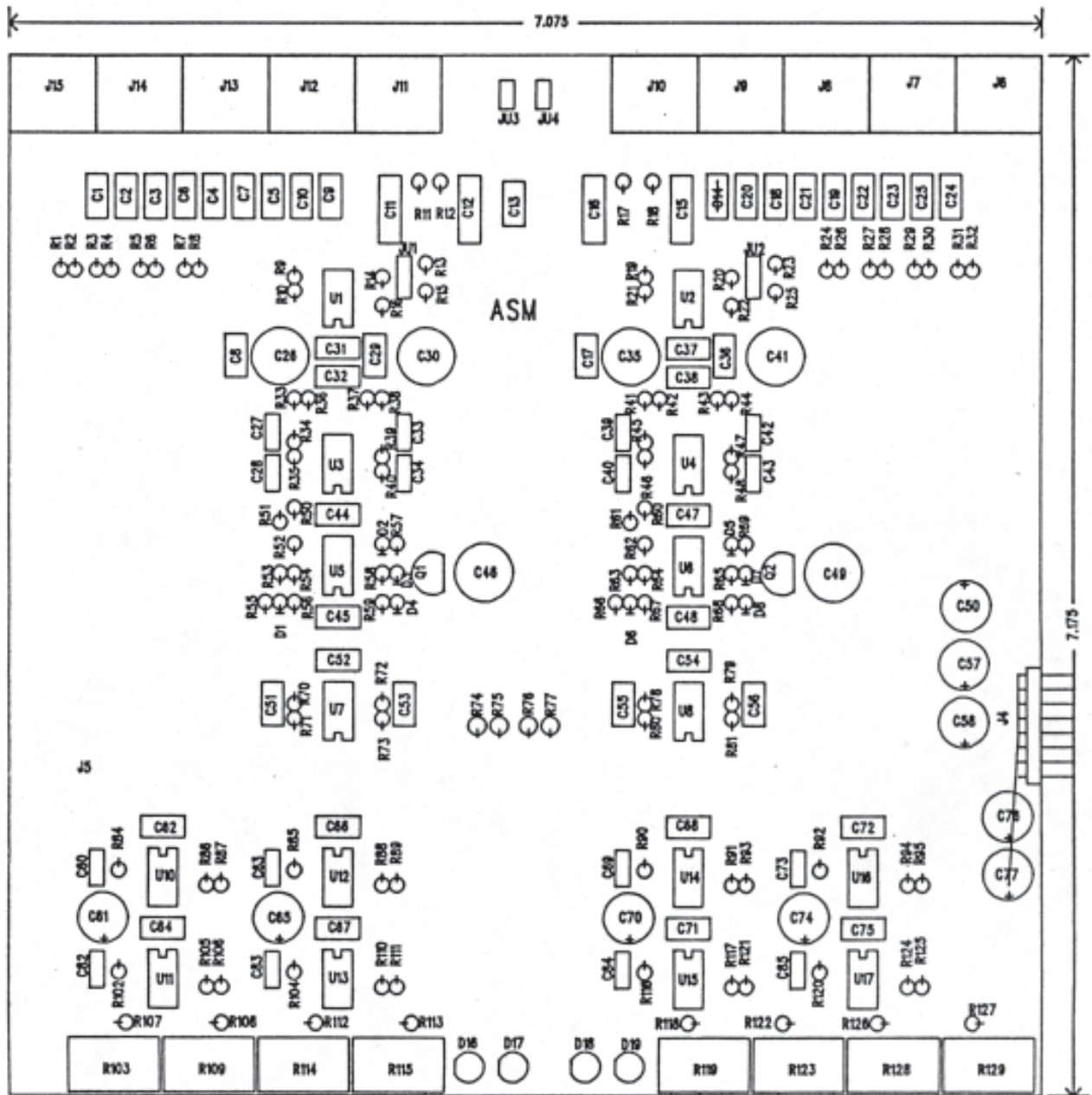
COMPANY: RADIO SYSTEMS		TITLE: DA 1X4A	
DRAWN: SIRKIS	DATED: 11-5-97	CODE:	SIZE:
CHECKED:	DATED:	BLANK BOARD 11077	REV:
DUALITY CONTROL:	DATED:	ASSEMBLY 11078	
RELEASED:	DATED:	SCALE:	SHEET: 1 OF 2

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:



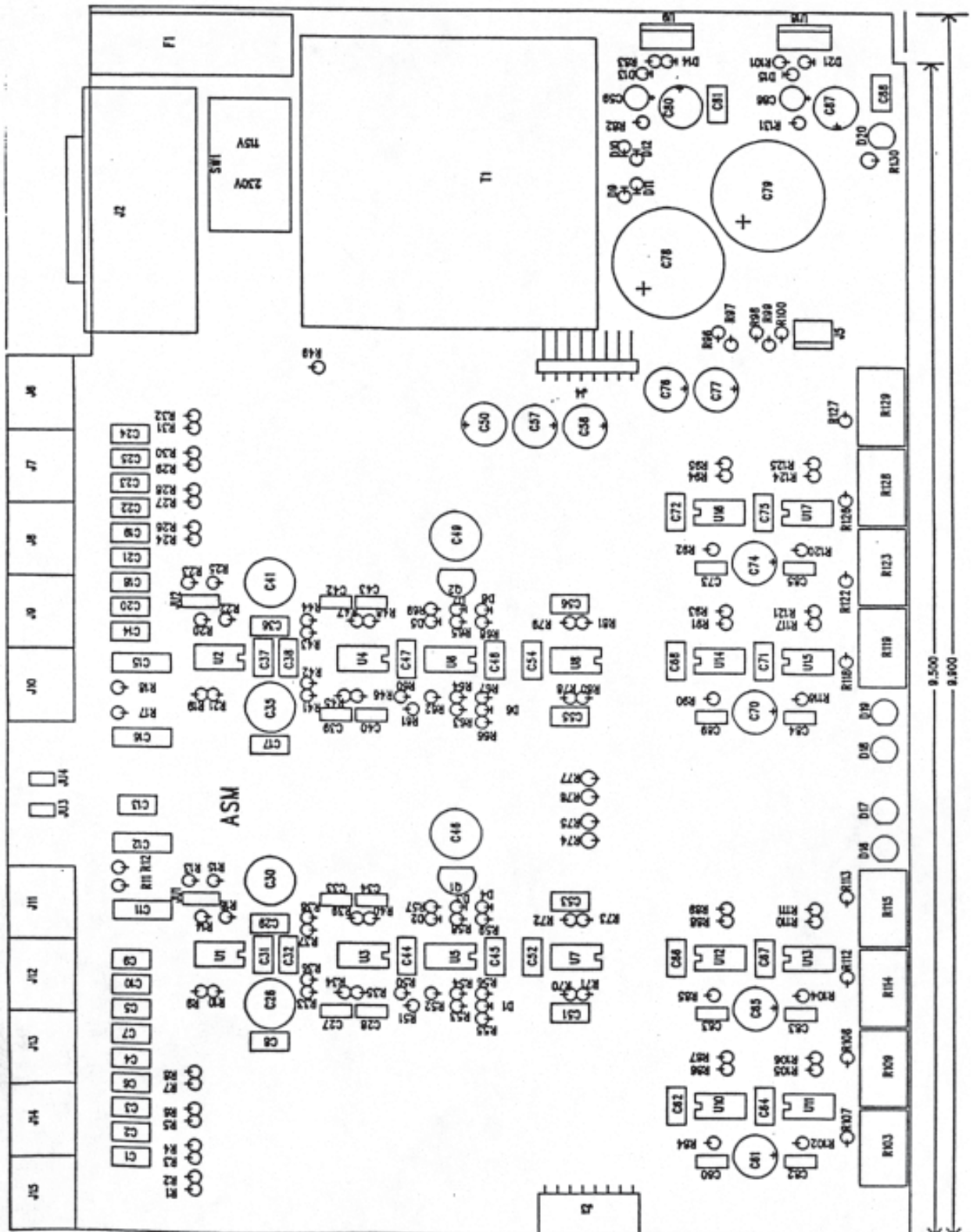
COMPANY: <b>RADIO SYSTEMS</b>			
TITLE: <b>DA 1X4A</b>			
DRAWN: SIRKIS	DATED: 11-5-97	CODE:	SIZE:
CHECKED:	DATED:	DRAWING NO: BLANK BOARD 11077	REV:
QUALITY CONTROL:	DATED:	ASSEMBLY 11078	
RELEASED:	DATED:	SCALE:	SHEET: 2 OF 2

# Parts Layout Page 1





# Parts Layout Page 2



## Parts List

Part#	Qty	Description	Ref. Designation
11077	1	DA Board (Power)	
11078	1	DA Board (Slave)	
2831	5	res 1k 1/2w 5%	R74; R75; R76; R77; R130
5872	14	res 1k 1/4w 1%	R10; R11; R12; R16; R17; R18; R21; R22; R52; R53; R54; R62; R63; R64 R70; R72; R78; R79
1047	4	res 1 meg 1/4w 5%	R51; R55; R57; R61; R66; R69
5729	6	res 2.21k 1/4w 1%	R34; R35; R39; R40; R45; R46; R47; R48
9278	8	res 2.55k 1/4w 1%	R82; R131
9582	2	res 2.55k 1/4w 1%	R56; R59; R67; R68
7514	4	res 3.32k 1/4w 1%	R33; R36; R37; R38; R41; R42; R43; R44; R86; R87; R88; R89; R91; R93; R94; R95; R105; R106; R110; R111; R117; R121; R124; R125
3558	24	res 5.11k 1/4w 1%	R84; R85; R90; R92; R102; R104; R116; R120
9071	8	res 6.04k 1/4w 1%	R71; R73; R80; R81
1162	4	res 10 meg 1/4w 5%	R50; R60
5718	2	res 10.2k 1/4w 1%	R9; R14; R19; R20
4205	4	res 20k 1/4w 1%	R1; R2; R3; R4; R5; R6; R7; R8; R24; R26; R27; R28; R29; R30; R32
10485	16	res 30.1 1/4w 1%	R58; R65
5876	2	res 100k 1/4w 1%	R15; R25
8794	2	res 221 1/4w 1%	R83; R101
9585	2	res 237 1/4w 1%	R107; R108; R112; R113; R118; R122; R126; R127
10486	8	res 825 1/4w 1%	R13; R23
10487	2	res 931 1/4w 1%	C1; C8; C13; C14; C17; C29; C31; C32; C36; C37; C38; C44; C45; C47; C48; C51; C52; C53; C54; C55; C56; C62; C64; C66; C67; C68; C71; C72; C75; C81; C88
5743	31	cap .1uF film	C2; C3; C4; C5; C6; C7; C9; C10; C18; C19; C20; C21; C22; C23; C24; C25
5863	16	cap .0022uF +/-50V film	C80; C87
5744	2	cap 100uF 25V rad +/- 20%	C61; C65; C70; C74
8866	4	cap 100uF 50V elec	C59; C86
1026	2	cap 15uF pol 35V LL	C78; C79
10597	2	cap 4700uF 35V	C26; C30; C35; C41; C46; C49
1049	6	cap 100uF 25V NP	C27; C28; C33; C34; C39; C40; C42; C43
8825	8	cap 50 pF silver mica	C60; C63; C69; C73; C82; C83; C84; C85
9124	8	cap 100 pF silver mica	C11; C12; C15; C16
2906	4	cap 300 pF silver mica	D9; D10; D11; D12; D13; D14; D15; D21
7012	8	diode 1N4005	D1; D2; D3; D4; D5; D6; D7; D8
1012	8	diode 1N4148	R103; R109; R114; R115; R119; R123; R128; R129
10659	8	pot 10K variable	D16; D18; D20
10683	3	LED green 3mm	D17; D19
10684	2	LED red 3mm	Q1; Q2
6118	2	transistor 2N4401	U9
1077	1	VR LM317T	U18
1076	1	VR LM337T	U7; U8
4390	2	IC LM358N	U1; U2; U3; U4; U5; U6; U10; U11; U12; U13; U14; U15; U16; U17
1010	14	IC 5532	U1; U2; U3; U4; U5; U6; U7; U8; U10; U11; U12; U13; U14; U15; U16; U17
1011	16	socket 8 pin DIP	SW1
10492	1	switch DPDT	T1 $\Delta$ (ISO 7000-0434)
10788	1	transformer 25V toroidal	J3
10490	1	8 pin header	JU1; JU2
7770	2	3 pin .1 header	F1
10489	1	fuse holder	J2
10491	1	IEC power connector	J6-10; J11-15
11130	2	socket 15 position	J6; J7; J8; J9; J10; J11; J12; J13; J14; J15
11131	10	connector 3 position	
8524	1	screw phillips M4x10	
8525	1	washer lock 4MM	
10847	1	fuse 300 mA slo-blo	F1

## Specifications

Frequency Response	+0, -.1dB 20Kz – 20kHz
Distortion THD + N	.002% over 20Hz – 20kHz, any output level from +4dBm to +24dBm (with 600 ohm load)
Distortion IMD SMPTE	.003% any output level from +4dBm to +24dBm (with 600 ohm load)
Distortion DIM	.002% any output level from +4dBm to +24dBm (with 600 ohm load)
Crosstalk	-105dB over 20Hz – 20kHz
Noise	102dB below +4dBm output level unity gain measurement bandwidth 20 Hz - 20kHz with 600 ohm input and output termination
Maximum input	+28dBm
Maximum output	+25dBm (with 600 ohm load)
Headroom	21dB above +4dBm output (with 600 ohm load)
Dynamic Range	123dB
Maximum Gain	jumper selectable for: 16dB, 26dB, or 36dB
CMRR	-50dB over 20Hz – 20kHz
Input Impedance	40k ohms
Output Impedance	60 ohms
LED Audio Input Indicators	-24dBm input level audio present trip point +24dBm input level audio overload trip point

## Using Active Balanced Circuitry

Balanced lines have been used for many years and are in continuing use today because of their immunity to stray pickup. Induced signals appear on both sides of the balanced line. The receiving end of the balanced line responds only to the difference voltage between the lines which is the desired signal. Induced signals are common to both and are balanced out.

Transformers have been the mainstay of balanced circuitry for decades. Unfortunately, transformers cause distortion and ringing, and are susceptible to magnetic flux pickup. Further, good quality audio transformers are very expensive.

The use of op-amp balanced circuitry has the advantage of transformers without the disadvantages. The only caveat is that careful wiring practices are more important with active balanced than with transformers.

Active balanced outputs and inputs use three wires: +, -, and ground. The + and - terminals are both driven and neither should ever be connected to ground. For best performance, a three-conductor shielded wire should be used. The third wire completes the ground circuit. The shield should be connected to the ground at one end of the wire only. If a two-wire shielded cable is used, it is important that a ground connection be made between the sending and receiving units. A ground circuit through equipment chassis or through three-prong AC cord ground is also acceptable.

Single-ended audio interconnections lack the interference immunity of balanced hook-ups. For the reason, keep unbalanced connections short, direct, and well separated from AC power wires. To drive a single-ended load from an active balanced source, use coaxial wire: + to center conductor and ground to shield, leaving the - output unconnected. To feed an active balanced input from a single-ended source, use coaxial wire, connecting the hot center conductor to +. Connect the shield to ground and put a jumper from ground to -.

When driving an active balanced input from a transformer balanced floating source, use two conductor shielded wire. Ground the shield at the source end. Establish good ground between the chassis either directly or through AC plug ground prongs. At the load, connect the + lead to the + input and the - lead to the - input. Put two 300 ohm resistors in series between the + input and the - input and connect their mid-point to the load ground. This correctly terminates the source output transformer for optimum frequency and transient response (freedom from ringing) and provides a low impedance return path for leakage and induced hum. If more than one active balanced load is to be placed across a floating balanced transformer source, install this resistive termination once only. From that location to the active balanced loads, run three-conductor shielded wire, shield continued from the sources chassis, + from +, - from -, and ground from the mid-point of the terminating resistors.

To drive a balanced floating transformer load from an active balanced source, use shielded wire. Connect the shield to source ground and leave the shield open at the load end. Connect + to + and - to -, and establish a good source ground to load chassis connection, either through a third wire in the interconnect cable or through chassis contact or AC cord third wire ground.

Interconnections between pieces of stereo equipment require doubling the connections described above without duplicating the ground connection. Between pieces of active balanced stereo equipment, then, 5 shielded conductors should be run.

When testing active balanced equipment with single ended test equipment, do not connect the - to test equipment ground. Most modern test equipment provides balanced inputs. In many dual-trace oscilloscopes, balanced signals may be displayed by running the two inputs in the "add" mode with one input switched to invert. To perform a test with single-ended equipment, + and - outputs must be tested independently and their results added. Testing only a single output results in a 6 db loss in output level.

The active balanced equipment interconnection format makes possible state of the art fidelity. Careful attention to detail and conservative practice will be rewarded with outstanding flat frequency response, low distortion, and wide dynamic range.

## Warranty

Radio Systems warrants this equipment to be free from defects in materials and workmanship for a period of one (1) year.

This warranty extends to first users of the product and future owners who purchase the product within the warranty period.

The terms of this warranty are null and void if this product is stored or operated in an environment not conducive to electronic equipment, or shows signs of misuse or modifications which affect the proper functioning of the product. This warranty does not apply to damage caused by fire, smoke, flood, lightning, or acts of nature and physical abuse.

Radio Systems, and its associated companies, authorized distributors, and personnel are not liable for loss of revenues or other damages or effects to the broadcast signal quality or coverage which may result from the improper functioning of this product.

## Repair Policy

Technical assistance is available at any time, at no charge, by phone or correspondence.

During the warranty period, there will be no charge for parts or service made to units which show no sign of misuse by customer or lightning caused damage. The customer is responsible for the cost of shipping their unit back to Radio Systems for repair.

During the warranty period, shipment of small parts and assemblies may also be made at a charge to the user. Emergency shipments of replacement parts and circuits will be made at the user's request for an extra shipping and service charge. Chargeable services will be made COD or on Net-30 day terms to users with established accounts.

During the warranty period, full credit or return of COD charges (less any service and expedited shipping charges) will be made to users who return the defective parts or circuits within 30 days, if the damage is covered under the terms of the warranty.

## Return Instructions

Contact Radio Systems at 856-467-8000 for a return authorization number.

Pack all items carefully and ship pre-paid, via UPS insured, to:

Radio Systems

601 Heron Drive

Logan Township, NJ 08085

Attn: R.A.# \_\_\_\_\_

Enclose a note which includes your name, company, phone number, the serial number, return address (no box numbers), and a complete description of the problem.

## Declaration of Conformity

We: Radio Systems, Inc.

601 Heron Drive

Logan Township, NJ 08085 USA

Declare under our sole responsibility that the product listed below:

Audio Amplifier – model DA-4x4a

To which this declaration relates to is in accordance with the following product standards:

EN55013 – Emission

EN55020 – Immunity

EN61000 – Harmonic/Voltage Fluctuations

EN60065 – Product Safety

Following the provisions of:

89/336/EEC – EMC Directive

92/031/EEC – Amendment Directive of 89/336/EEC

73/023/EEC – Low Voltage Directive

93/068/EEC – Amendment Directive of 73/023/EEC

-----  
Date Issued

-----  
Signature

