



DA 2x4b & 4x4b Distribution Amplifier Manual



EMC and Safety Conformity

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Overview

The Radio Systems DA-4x4b 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-4x4b 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 4x4b 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 default).

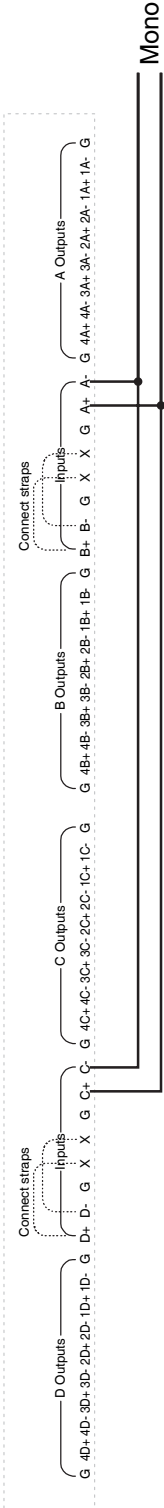


Illustration 1
For use as a 1 input x 16 output (mono)

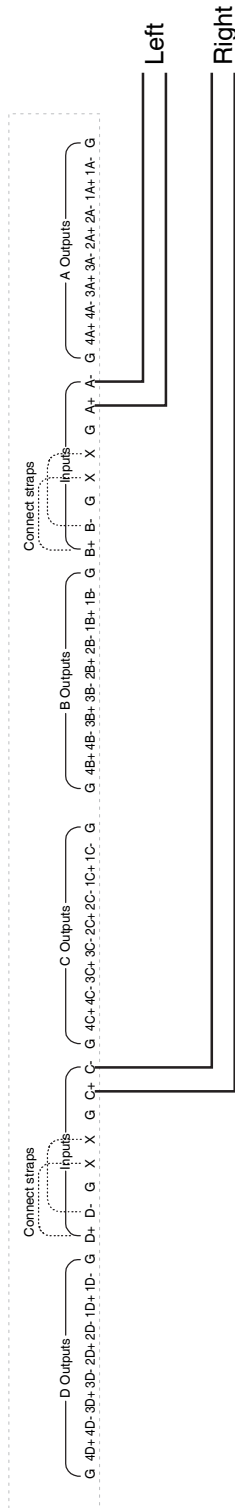


Illustration 2
For use as a 2 input x 8 output (stereo)

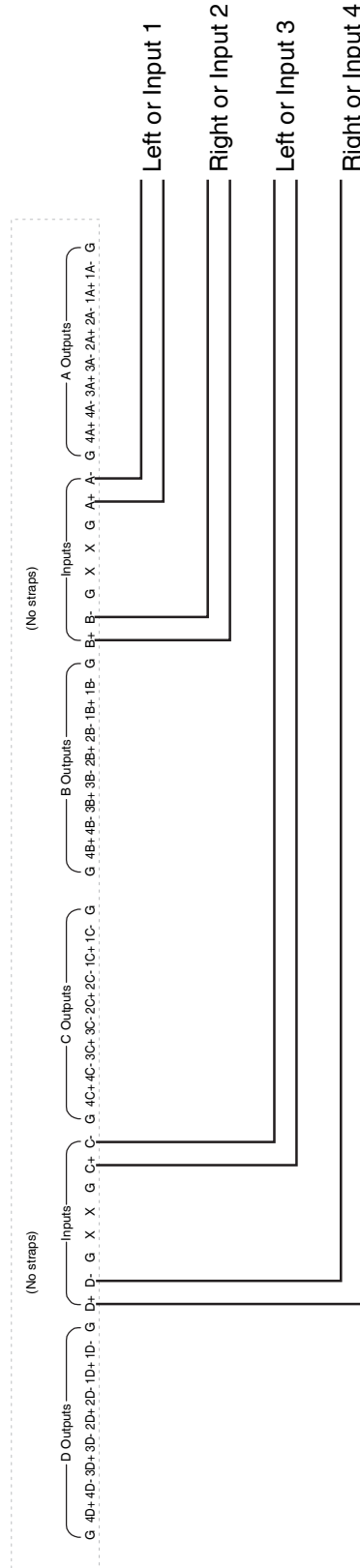
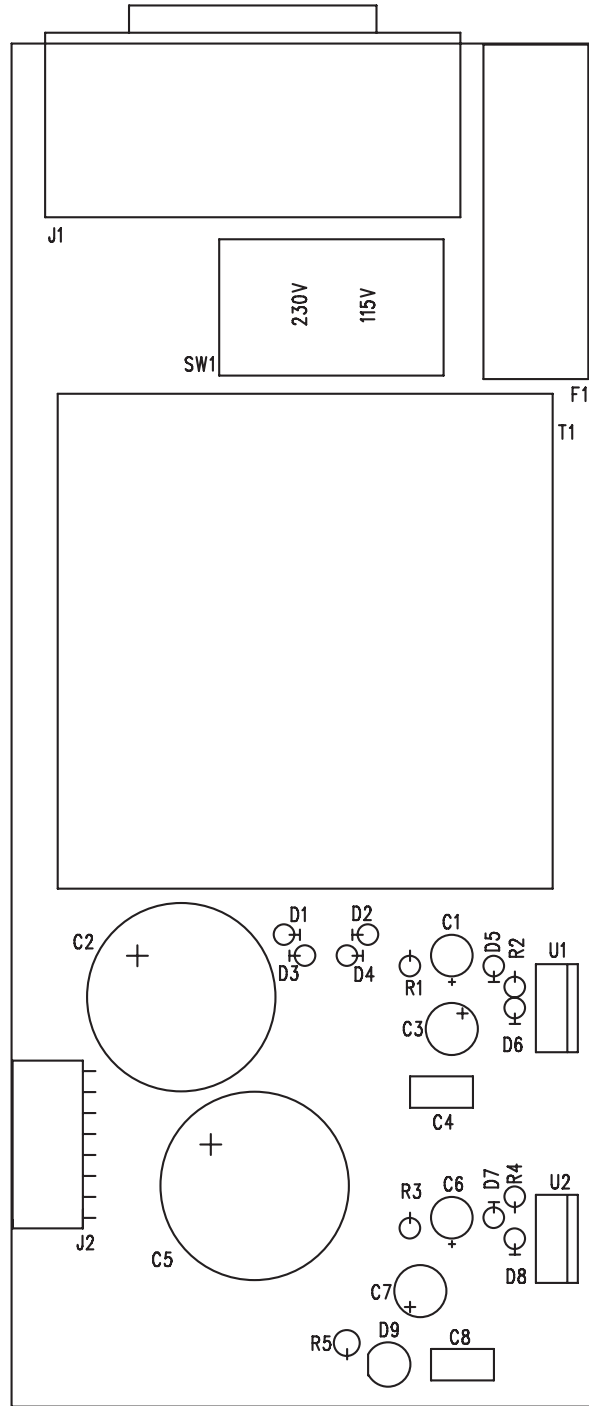


Illustration 3
For use as a 4 input x 4 output (dual stereo or quad mono)

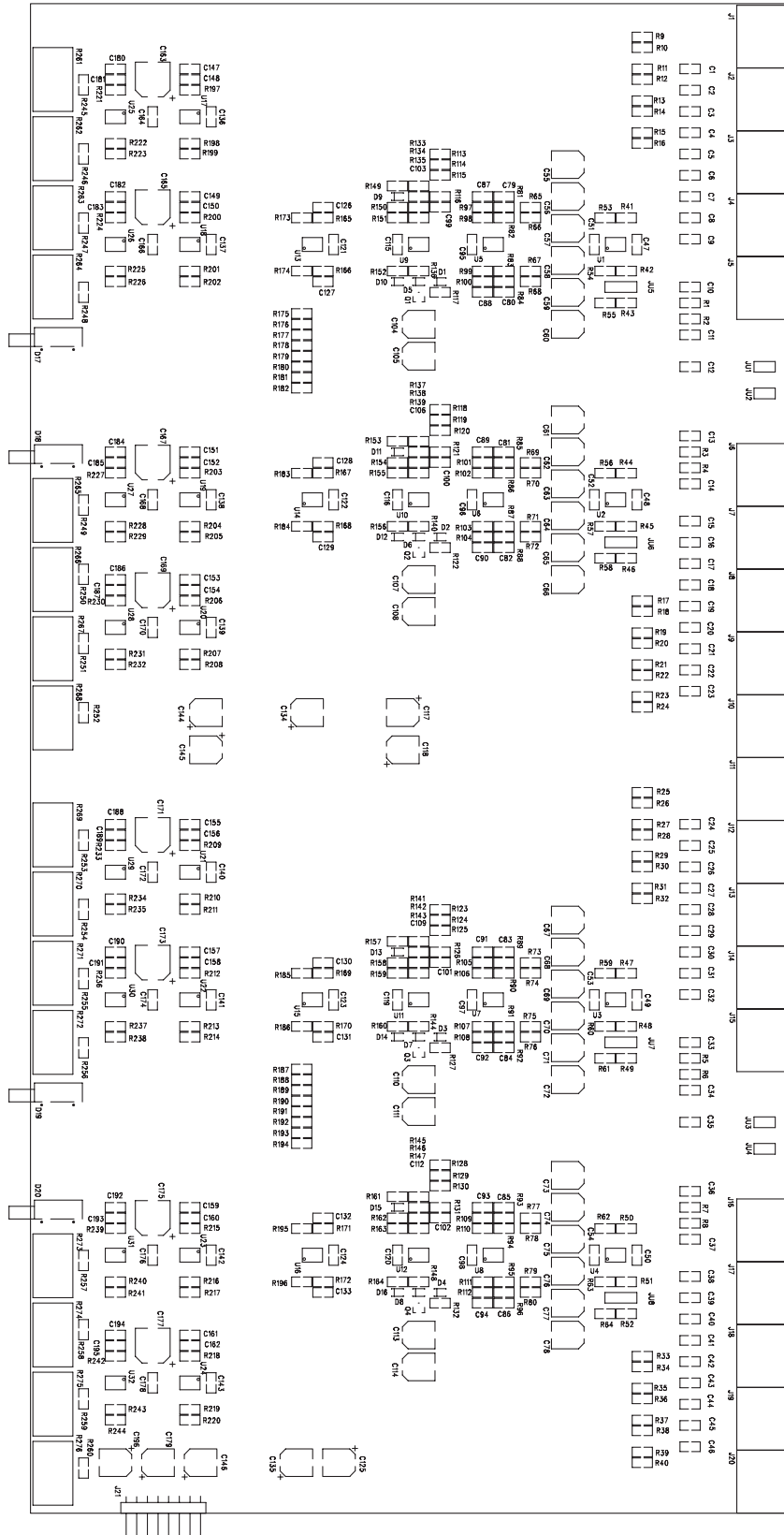
Note:
The 2x4 (mono) version uses only the left-hand circuit board. Configure it as shown above for:

- Illustration 1 - 1 input x 8 output (mono)
- Illustration 3 - 2 input x 4 output (stereo)

Parts Layout Power Supply



Parts Layout Amplifier



Parts List Power Supply

Part #	Qty.	Description	Reference Designation
16298	1	DA 4X4B POWER SUPPLY DETAIL	
1026	2	CAP 15UF 35V	C1;C6
10597	2	CAP 4700UF 35V	C2;C5
5744	2	CAP 100UF 25V RAD +/-20%	C3;C7
5743	2	CAP .1UF FILM	C4;C8
7012	8	DIODE 1N4005	D1;D2;D3;D4;D5;D6;D7;D8
10489	1	FUSE HOLDER	F1
10847	1	FUSE 0.3 AMP	F1
10491	1	IEC POWER CONNECTOR	J1
10490	1	SAMTEC 8 PIN FRT HEADER	J2
2831	1	RES 1K 1/2W 5%	R5
9585	2	RES 237 OHM 1/4W 1%	R2;R4
9582	2	RES 2.61K 1/4W 1%	R1;R3
10492	1	SWITCH POWER DPDT 110/220V	SW1
10788	1	TRANSFORMER DA TOROID	T1
1076	1	VR LM337T	U2
1077	1	VR LM317T	U1
10683	1	LED 3MM GREEN HIGH CURRENT	D9

Parts List Amplifier

Part #	Qty.	Description	Reference Designation
16295	1	DA 4X4B SMT DETAIL	
16019	20	RES SMT 1.0K 1/8W 1%	R1-R8;R53-60;R62;R63;R151;R155;R159;R163
16350	32	RES SMT 30.1 OHM 1/8W	R9 THRU R40
16074	8	RES SMT 20.0K OHM 1/8W	R41;R42;R44;R44;R45;R47;R48;R50;R51
16022	4	RES SMT 221 OHM 1/8W 1	R61;R55;R58;R64
16351	83	RES SMT 5.11K OHM 1/8W	R65-112;114-116;119-121;124-126;129-131;133-135;137-139;141-143;145;147;198;199;201;202;204;205;207;208;210;211;213
16351	21	RES SMT 5.11K OHM 1/8W	R214;216;217;219;220;222;223;225;226;228;229;231;232;234;235;237;238;240;241;243;244
16040	16	RES SMT 1.00M OHM 1/8W	R169-174;R183-R186;R195;R196;R165-R168
14424	28	RES SMT 2.2K	R177;R178; R187-R194;R179;R180;R128;R122;R123;R113;R132;R117;R118;R127;R149;R153;R157;R161;R181;R182;R175;R176
16021	4	RES SMT 100K 1/8W 1%	R136;R148;R144
16352	8	RES SMT 3.32K OHM 1/8W	R150;R152;R154;R156;R158;R160;R162;R164
16353	4	RES SMT 931 OHM 1/8W 1	R43;R46;R49;R52
16354	16	RES SMT 6.04K OHM 1/8W	R221;R230;R218;R206;R233;R197;R227;R236;R215;R224;R239;R209;R203;R242;R200;R212
16355	16	RES SMT 825 OHM 1/8W 1	R245-R260
16005	50	CAP SMT .1UF 50V CERM	C1;C12;C15;C24;C35;C38;C47-C54;C95-C98;C115;C116;C164;C178;C119-C124;C126-C133;C136-C143;C166;C168;C170;C172;C174;C176
16151	12	CAP SMT 330PF 50V CERM	C11;C13;C14;C103;C106;C109;C112;C33;C34;C36;C37;C10
16346	48	CAP SMT 47PF 50V CERM	C87-C94;C79-C85;C147-C162;C86;C180-C195
16347	36	CAP SMT .0022PF 50V CE	C17;C19-C23;C4;C25-29;C43-C46;C7-C9;C30-C32;C18;C99;C5;C100;C101;C6;C39-C42;C102;C2;C3;C16
14750	32	CAP SMT 22UF 16V ELECT	C55-C78;C104;C105;C107;C108;C110;C111;C114
14753	10	CAPACITOR SMT 100UF	C117;C118;C125;C134;C135;C144-C146;C179;C196
16153	8	CAP SMT 100UF 50V ELEC	C163;C165;C167;C169;C171;C173;C175;C177
10659	16	POT PIHER PT15LH06-103	R261-R276
16032	16	DIODE SMT MMDB4148 SOT	D1-D16
16356	4	LED SMT RED	D17B;D18B;D19B;D20B
16357	4	LED SMT GREEN	D17A;D18A;D19A;D20A
16348	4	LIGHT PIPE 3MM DUAL TO	D17;D18;D19;D20
16012	4	TRANSISTOR SMT MMBT440	Q1;Q2;Q3;Q4
16349	4	IC SMT LM358	U13;U14;U15;U16
16063	28	IC SMT NE5532D	U1-U12; U17-U32
11130	4	HEADER 15 PIN	J1-J20
10484	1	HEADER 8 PIN RIGHT ANG	J21
7903	4	HEADER 2 PIN SINGLE RO	JU1;JU2;JU3;JU4
7770	4	HEADER 3 PIN SINGLE RO	JU5;JU6;JU7;JU8
5758	8	JUMPER PLUG .1	JU1;JU2;JU3;JU4;JU5;JU6;JU7;JU8

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-4x4

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

February 1, 1997

Date Issued

daniel j. branerman

Signature

For Assy:
Part# DA-4x4b
5/07



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