



**MA-4  
Four Channel  
Mixer Amplifier  
Manual**



# MA-4 MANUAL

## 1. OVERVIEW

The Radio Systems MA-4 functions to mix 4 stereo balanced audio input signals to one stereo output. Features include variable input stage gain straps, continuously variable mix-bus attenuators, individual channel front panel test points and an on-board headphone amplifier.

The unit is also designed to house an optional 2x4 output distribution amplifier on the left-hand side of the cabinet (Radio Systems model #DA 2x4a).

## 2. MOUNTING

The MA-4 occupies only 1 rack unit (1 ¾ inch) of height in a 19 inch EIA rack. To allow for adequate ventilation, do not mount 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 ¾ inch), remain open between every three units.

## 3. WIRING

Wire each input channel and the left and right stereo output feed to an individual 3-pin removable barrier strip connector (provided). Pin-outs are as follows for all cables:

Pin 1 – ground    Pin 2 – positive (+)    Pin 3 – negative (-)

For unbalanced inputs wire the hot lead to the positive terminal (pin 2) and the shield to the ground terminal (pin 1). Short the negative terminal (pin 3) to ground (pin 1).

For mono inputs, wire the feed in parallel to both left and right inputs for that channel. Inputs are bridging (20k ohm) impedance so the output loading of your source device will not be effected.

Unused inputs can be left unterminated (unconnected).

For unbalanced outputs, connect to the positive (pin 2) and ground (pin 1) terminals. Leave the negative terminal (pin 3) unterminated. Do not short this pin to ground (see the "Using Active Balanced Circuitry" page at the end of this manual for more information).

## 4. 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 compensate for low-level source equipment.

To locate and reset these input jumpers, refer to the parts layout for the location of JU1 through JU8. The lid of the unit must be removed to access these jumpers. Locate the pins corresponding to the appropriate input and set both the left and right channels. Place a shorting strap across the center and rear pin to increase input gain by 10dB. Place a shorting strap across the center and forward pin to increase input gain by 20dB.

Apply a sine wave test signal to any one left input. Connect an AC voltmeter (with audio frequency response) or oscilloscope to the left channel output test point. Set the input's left channel front panel mix-bus attenuator for an output level using the following formula:

$$\text{output voltage of a single input} = \frac{\text{desired total output voltage}}{\text{number of active inputs}}$$

For example, if the desired output voltage is 2.18 Vpp (0dBm), and there are 4 active inputs per channel, then the output voltage of any single input should be 0.545 Vpp.

Disconnect this input and repeat for all additional inputs you will be connecting. Repeat the procedure for the right channel inputs.

Next, connect and simultaneously apply sign wave from all inputs. Check that the output now equals the desired total output voltage. Use the individual channel test points to check, tweak and match each input level.

The unit is now ready for unattended, full-time operation. Use the headphone output to monitor mixed output material. Do not use phones of less than 2K ohms impedance.

## 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.

## Specifications

Distortion THD + N .002% 20Hz to 20kHz

Frequency Response  $\pm .1$ dB 20Hz to 2kHz

Input Impedance 20k ohms

Output Impedance 60 ohms

Input gain jumper selectable 0 to +20dB

Output level +25dBm into 600 ohm load

Headroom 21dB above +4dBm output

(with 600 ohm load)

Dynamic Range 123dB

Crosstalk > 105dB full bandwidth

Noise 102dB below +4dBm

## WARRANTY

Radio Systems, Inc., 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, Inc., 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 for a return authorization number.

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

Radio Systems, Inc.

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

601 Heron Drive

Bridgeport, NJ 08014-0458

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