



**MLA400-800 MMA400-800**  
**LINE AND MICROPHONE AMPLIFIERS**  
**OPERATING AND MAINTENANCE MANUAL**

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## DESCRIPTION

Our engineers insist on including this section in all of our instruction books. We know it is really just an excuse to blow their own horns by telling you about all the clever things they have done inside your Multiple Amplifier Array. If they have really been clever, you will never have to even think about what's inside the box and this whole section will be superfluous.

Multiple Amplifier Arrays provide you with either four or eight identical Line or Microphone Amplifier channels depending on the model selected. These channels may be used as individual independent and isolated amplifiers or they may be combined at internal summing points brought out to the rear connector to form mixers, summing amplifiers, distribution amplifiers etc.

Multiple Line Amplifier Arrays (MLA) apply balanced or unbalanced line level input signals directly to a differential input stage with good common mode rejection and RC bypassing of any RIF signals picked up on the inputs. This stage will accept line levels up to +22dBm (10Vrms) without clipping and has a typical equivalent input noise (EIN) of only -96dBm thus yielding an 118dB dynamic range. More to the point, even with line inputs as low as -20dBm, you will maintain a 76dB S/N ratio. An input impedance greater than 30,000 ohms is high enough to avoid loading of even IHF (phono jack output) lines. A bi-fet input IC (LF347) provides fast and symmetrical slew rate performance along with high loop gain for minimum transient and harmonic distortion generation.

Additional gain of 41dB and improved noise performance for low-level signals is provided in the Multiple Microphone Amplifier Arrays (MMA). A dual, low noise IC (OPA2227) is interposed ahead of the differential stage in an instrumentation amplifier configuration. EIN of -120dBm allows good S/N performance with typical microphone input levels. A very high input impedance of 20,000 ohms for balanced inputs avoids all loading effects on the microphone. Input DC blocking capacitors allow use of external phantom power supplies with no fear of input overload. MMA inputs will accept levels up to -20dBu. As a convenience when mixing high and low level inputs into the MMA, removing jumper wires J3, J6, J9 or J12 will convert the selected channel into a unity gain, high-level input, and avoid the necessity for external attenuator pads.

An adjustable gain stage follows the input networks in all models. This stage utilizes a unique circuit arrangement that allows us to provide a smooth, full range logarithmic gain control in each channel using an inexpensive (but good) linear cermet potentiometer. This circuit provides an additional 20dB gain at full clockwise rotation, unity gain in the 12 o'clock position and tapers smoothly to full off at the full CCW position. Since we actually vary the gain of the stage rather than attenuating the input to a fixed gain stage, we can use the channel at low output levels with very little noise penalty. You can easily match channel outputs

to console medium level inputs (-20dBm) or to drive IHF inputs (single ended at .10Vrms) without requiring outboard attenuator pads.

A summing junction, isolated from the adjustable gain stage output by a 1K-ohm build out resistor, is brought out to the rear connector to allow channel inputs to be added together and single inputs to drive multiple outputs. Any channel may be interconnected with any or all other channels. Unused inputs should have their pots turned to off (full CCW). Each summed channel is attenuated in proportion to the number of connected channels, e.g. 2 ch = 6dB, 3ch 10dB, 4ch = 12dB, 8ch = 18dB.

The summing junction is also the input terminal of the channels output line driver. The output stage is a balanced driver, which is either transformer or resistively coupled to the output line. Each channel is programmable for different output stage gains with a jumper plug connector. The basic stage gain is 6dB with the plug in the center position; additional gain of 10 or 20dB is selected by moving the plug. Units are generally shipped set up for +10dB (16dB total stage gain).

Transformer coupled outputs (-1 models) are recommended when driving long lines since the low source impedance will minimize high frequency roll off due to cable capacity and the total primary to secondary isolation prevents AC power line ground system voltage differentials from adding in with the audio at the receiving end. Transformer outputs are also best for driving both balanced and unbalanced lines. The output transformer is a low leakage reactance design and it is loaded with an RC network to maintain smooth high frequency response and excellent square wave performance whether it is resistively terminated with 600 ohms or left unloaded.

Active balanced outputs (-2 models) are more economical and are preferred for short cable runs driving known loads. Avoid driving an active output into a device with a single ended, unbalanced, one side grounded input since this condition effectively shorts out the amplifier driving the low output. These inputs, of which IHF phono jacks are typical, can be driven from an active balanced output by connecting the load between a HI output terminal and a GND (rather than HI and LO terminals). Each active output is isolated from the output terminals by DC blocking capacitors and 150 ohms of build out resistance. The build out resistors are split and bypassed to prevent any RF signals that might be picked up on an output line from feeding back into the amplifier.

The Multiple Amplifier Arrays operate from an internal bipolar 15VDC regulated supply. The power supply is designed for minimum susceptibility to power line transients and conducted RFI using ferrite beads, double capacitive bypasses and a non-concentric wound semi-toroidal power transformer with a mumetal shield.

## APPLICATIONS

The Multiple Amplifier Arrays provide you with four or eight high gain channels (MMA400, MMA800) or four or eight lower gain channels (MLA400, IVILA800).

The high gain channels of the MMA are ideal for general microphone to line amplification and for use as program amplifiers operating from low impedance, low level console buss levels. A single microphone may be paralleled into several inputs to make a mike distribution amplifier that can be set up to drive each output at a different level, each output having its own independent gain control. Since each input has 20,000-ohm balanced input impedance, even paralleling one microphone into all eight inputs will not cause any noticeable loading of the microphone.

A single input channel with its single gain control may feed multiple outputs by jumping channels together at the summing points available on the rear connector. All outputs are then adjusted by the single gain control and may either be set all to the same level or offset in ten dB steps (with the output gain jumper plugs P1 through N) to drive outputs at approximately -10dBv, 0dBm and +10dBm for use in a press box application. Unused inputs should have their gain pots turned off at full CCW rotation to avoid excess noise.

Multiple inputs may be summed to multiple outputs by interconnecting the rear connector jumpers. You can make an effective and simple mike mixer this way for pre-set installations such as conference rooms that don't require continuous adjustment.

Any high gain input of the MMA400 and MMA800 may be converted to accept line level inputs up to +22dBu by clipping wire PC board jumpers J3, J6, J9, or J12 to change channels 1, 2, 3 or 4 respectively. This will allow balanced high level sources and unbalanced IHF sources at -10dBv to be mixed with mikes or other low level sources.

The Line Input MLA400 and MLA800, with up to 46dB gain available, are ideal for building up IHF phono plug outputs (-10dBu, high Z) to balanced 600 ohm levels. With four or eight channels available, they are a natural fit for interfacing small recording consoles into balanced systems. The high impedance balanced inputs will not load down an IHF output and will provide good cancellation of any common mode hum that is picked up by the input wiring. MLAs will also interface from balanced 600 ohm lines to unbalanced, one side grounded, IHF inputs by connecting the center conductor to the high (or low) side of the active balanced output with the shield tied to ground.

MLAs are useful for making stereo L+R summing networks, mixing systems and various types of distribution systems by combining channels with

the rear panel jumpers. They also make convenient gain blocks and telephone line interfaces.

## **INSTALLATION**

### **MOUNTING**

Your Multiple Amplifier Array is designed for rack mounting on standard E.I.A. 1-3/4 inch centers. Each unit dissipates approximately 20 watts and is ventilated through slots in the rear panel. We have absolutely no idea how many MMAs you can stack up in a rack before the solder melts, but we will be happy to sell you enough to find out.

### **WIRING**

Our insurance company insists on three wire grounded plugs. The power line ground could cause a loop with your studio ground. If you are sure your studio ground will provide adequate protection to your personnel in case of an AC line short to chassis, a 3 to 2 AC adapter can be used to isolate the power line ground. We recommend that the adapter be removed and the power line ground reconnected prior to any service work requiring removal of the studio ground from the chassis.

To allow maximum flexibility of ground in high RF environments, the circuit board amplifier grounds are isolated from case ground. For normal operation, you must add a ground jumper from a barrier strip ground terminal to the chassis ground screw. Failure to ground the circuitry will result in excessive crosstalk, possible oscillation and increased susceptibility to RF pickup.

The four inch, silver bearing, low inductance copper strap which you are, of course, using for your studio ground is not going to fit around the #6 chassis ground screw on the amplifier rear panel. Run the strap to within a few inches of the chassis and jump to the chassis ground screw with shield braid.

We have taken heroic measures to keep RIF pickup out of your amplifier. This heroism includes split and bypassed input and output resistor networks, Faraday shielded output transformers, beaded, bypassed and isolated power inputs, non-concentric wound power transformers, double ground plane PC boards and a nice enclosure which will keep rain and snow off the circuit boards. However, in a difficult broadcast environment, any RF shielding and suppression system is going to be no better than the ground system into which it is trying to dump the unwanted RF. If you have a decent ground system and still have RF problems, give us a and we will hold a telephone prayer meeting. If you don't have a ground system, you will still be O.K. as long as you don't turn on your transmitter.

Audio inputs and outputs should be connected using the rear panel labels as a guide. HI outputs are all in phase with each other and are in phase with the HI inputs. Fanning strips are provided with your unit so that our ears won't start burning in the middle of the night when you try to wrap wires around those tiny barrier block screws. The fanning strips can be cut up into individual groups of terminals, if desired. The fanning strips are Kulka part number 649A22 and extras are available at exorbitant prices from our Parts and Accessories Department. Kulka sells them cheaper, but they have a six-month lead-time, which isn't going to do you any good when you have to be operating by Thursday and somebody threw out the original strips with the packing material.

*CAUTION: Your Multiple Amplifier Array has active drivers for the balanced outputs if the model number on the rear panel serial number label has a -2 suffix, e-g, MMA400-2, MLA800-2. (Models with -1 suffixes have transformer-balanced outputs). Units with active balanced outputs have active drivers for both the HI and the LO output terminals. DO NOT GROUND EITHER THE HI OR LO OUTPUT TERMINALS OF ACTIVE BALANCED OUTPUT MODELS. If you are driving a single ended, unbalanced, one side grounded, IHF, phono jack type input either high impedance or 600 ohms, it should be connected from either HI to GND or LO to GND but NOT from HI to LO. Only if you are driving a balanced load, connect it between HI and LO output terminals. It is not necessary to terminate an active output driver although placing a 600-ohm terminating resistor across a hi-Z input at the receiving end will sometimes reduce RF pickup.*

Transformer output units may be connected to either grounded or balanced loads with impunity (wire works better). Transformer outputs prefer to be terminated in their rated impedance (600 ohms) for flattest response, however, you can leave these unfermented with only minimal effect since we provide internal high frequency loading networks.

To further confuse the issue, all MMAs have active balanced INPUTS, these are NOT the same as active balanced outputs and nothing in the previous two paragraphs has anything to do with them. Active balanced inputs can be driven from active or transformer balanced outputs, unbalanced outputs, IHF phono jacks or practically any other signal source below +22dBm maximum level. Connect the signal HI to input HI and the source LO (if balanced) or Shield or Ground (if unbalanced) to the LO input terminal. Unless the source has a transformer balanced output there should be a ground connection carried between the source and the MAA ground. DO NOT FLOAT THE LO INPUT, either connect it to the source or jumper it to ground, otherwise the input stage gain and frequency response will be affected.

## **ADJUSTMENTS**

It is sometimes difficult to maintain good noise performance when using a high output amplifier to drive medium level console inputs (-20dBm) or IHF (-10dBu, .25V) equipment inputs. You may have found it necessary in the past to insert attenuator pads to allow the amplifier to operate at a high enough level to maintain a good signal to noise ratio. The MAA will reduce its already low noise as you turn down its gain pot and in the lowest output gain position will provide a comfortable S/N ratio even a -20dBu out. In the absence of high RF levels, you can distribute levels from 0 to -20dBm...and avoid building, trimming and repairing all those nasty little attenuator pads.

## **MAINTENANCE**

Power supply voltages are + and - 15VDC nominal.

IC output DC voltages under no signal; shorted input conditions should remain within .1VDC of ground. Greater deviation is a good sign of IC or circuit problems.

Five to ten years from now replace all the aluminum electrolytic capacitors.

Keep 250W soldering guns out of the amplifier.

If hit by lightning, replace U1 through U12 and anything else that has turned black or smells bad.

## **MODIFICATIONS**

Your MAA is wired for 1 15VAC, 50/60Hz operation unless otherwise requested at the time of ordering. It can be easily modified for 230VAC operation by removing the power transformer primary jumpers J17 and J19 and inserting a jumper in J18

Different types of attachment plugs or line cords may be required for connection to alternate supply voltages.

If your name is CBS, you can convert the transformer outputs to 150 ohms line impedance by removing jumpers J13, J14, J15 and J16 and replacing each with two jumpers from the original jumper terminals to the immediately adjacent terminals on either side of the original pairs.

A shaft extender kit (Model SE-8) is available to convert the screwdriver adjustments to fingertip control. This is a user installed option which requires removal of the front panel (4 screws), removal of the original screwdriver adjust shafts by pinching the rear of the shaft and pulling it out of the pot, replacement of the original shafts with the new ones and finally replacement of the panel (3 screws are enough, forget the one you dropped on the floor). In case you think that we are giving you the shaft, forget it, these aren't free. Call Mr. Rockefeller in our Parts and Accessories Department to order.

Output stage gains are set to +6dB, +16dB or +26dB by moving jumper plugs P1, P2, P3 or P4 from their center position to the +10dB position on the right or to the +20dB position on the left.



## SPECIFICATIONS

OUTPUT LEVEL:	+24dBm into 600 ohm loads. 15Vrms into high impedance loads.
DISTORTION:	Transformer balanced outputs, .25% maximum THD, 30 to 20,000 Hz, +22dBm. Active balanced outputs, .05% maximum THD, 20 to 20,000-1z at +22dBm.
FREQUENCY RESPONSE:	+/- .25dB, 20 to 20,000-1z. -3dB at 3Hz and 40kHz typical. Square wave rise time, 6uSec, symmetrical.
NOISE:	MMA400/MMA800; E.I.N. = -120dBm maximum with 150 ohm source resistance. MLA400/MLA800; E.I.N. = -92dBm with 600 ohm source resistance. Both are measured with 20kHz equivalent square bandwidth. All hum components are at least 10dB below white noise.
GAIN:	MMA400/MMA800: 64, 74 or 84dB. MLA400/MLA800: 22, 32 or 42dB. Each channel's gain is dependent on output gain jumper plug position.
CMR:	60dB at 60Hz.
CROSSTALK:	-70dB maximum at 10kHz.
OUTPUTS:	MMA/MLA -1: Transformer Balanced, 60 ohm source Z. MMA/MLA-2: Active Balanced, 300-ohm source Z, protected and RF bypassed.
INPUTS:	MMA400/MMA800: Balanced 40dB gain, RF bypassed Instrumentation Amplifier, Zin = 20Kohm. Maximum input = -20dBu. Gain can be reduced to 0dB by removing a jumper to accept line levels up to +22dBu. MLA400/MLA800: Balanced, -2dB, RF bypassed Differential Amplifier, Zin = 30Kohm, +22dBm maximum input.
POWER:	115/230 VAC +/-10%, 47 - 63 Hz., 20VA. SIZE: 1 9"W x 1-3/4"H x 7-1/2"D, 10 lbs.
TERMINALS:	Rear barrier blocks for all input, output and summing jumpers. Fanning strips with solder terminals provided for easy prewiring and servicing.

Specifications are subject to change at the whim of the manufacturer.

## MODELS AVAILABLE:

MLA400-1	Four Line-to-Line Amplifiers, Transformer Balanced Outputs.
MLA400-2	Four Line-to-Line Amplifiers, Active Balanced Outputs.
MLA800-1	Eight Line-to-Line Amplifiers, Transformer Balanced Outputs.
MLA800-2	Eight Line-to-Line Amplifiers, Active Balanced Outputs.
MMA400-1	Four Microphone-to-Line Amplifiers, Transformer Balanced Outputs.
MMA400-2	Four Microphone-to-Line Amplifiers, Active Balanced Outputs.
MMA400-1-PH15	MMA400-1 with 15 VDC Phantom Power Option
MMA400-2-PH15	MMA400-2 with 15 VDC Phantom Power Option
MMA400-1-PH48	MMA400-1 with 48 VDC Phantom Power Option
MMA400-2-PH48	MMA400-2 with 48 VDC Phantom Power Option
MMA800-1	Eight Microphone-to-Line Amplifiers, Transformer Balanced Outputs.
MMA800-2	Eight Microphone-to-Line Amplifiers, Active Balanced Outputs.
MMA800-1-PH15	MMA800-1 with 15 VDC Phantom Power Option
MMA800-2-PH15	MMA800-2 with 15 VDC Phantom Power Option
MMA800-1-PH48	MMA800-1 with 48 VDC Phantom Power Option
MMA800-2-PH48	MMA800-2 with 48 VDC Phantom Power Option

Other configurations are possible, consult factory for unusual requirements.