

# MZ2

## HEADPHONE AMPLIFIER, PREAMP, & STEREO AMPLIFIER

### USER GUIDE

Linear Tube Audio  
Takoma Park, MD, USA

**WARNING: For safety, the cover of this amplifier should be secured at all times.** DC voltages as high as 450V and peak AC voltages as high as 800V are present inside. The service information contained in this manual is intended only for trained service personnel. Furthermore, this amplifier generates radio-frequency energy that can interfere with communications equipment.

#### Quick Start Guide

- Remove the amp and power supply from the box and bags.
- Plug the AC cable into the power supply and into an outlet.
- The DC cable has locking connectors on both ends\*. You should screw it securely onto the threads of the DC jack.
- Turn on the power supply using its toggle switch (if you are outside the US, make sure the voltage is set correctly on the linear power supply, which is visible directly above the IEC connector).
- Turn on the amp with the power button on the faceplate. You may want to attach interconnects or speakers before powering on, but it isn't necessary. If you are using the MZ2 as a preamp, it is best to have your power amp off (and **necessary to have it off if it is a DC-coupled amp**) when powering on and connecting the MZ2, to avoid off/on transients. **Please read this entire guide if using a DC-coupled power amp.**

**\*Earlier versions of the cable have no locking connectors or locking only on one side**

#### Introduction

The MZ2 is a high quality Class A tube headphone amplifier utilizing ZOTL (Zero-hysteresis Output Transformer-Less) technology. Additional uses of MZ2 include tweeter amplifier, preamplifier, and high-efficiency speaker amplifier recommended for small rooms or desktop setups.

#### Features

- External power supply – extremely low noise floor
- More than enough power for most headphones
- Drives all types of dynamic and planar headphones of any impedance
- Drives speakers to adequate volume with 1watt output (small room) if speaker sensitivity is 93db efficiency or higher, for critical listening 98db or higher is recommended.
- Transparent top cover

- Universal voltage power supply – works in any country automatically (the LPS can be easily switched by the user between the two most widely used voltages, with the exception being Japan)
- Front switch selects between three\* inputs
- Preamp output

\*Earlier versions of the amp had only two inputs or the option between two and three. The current model is only offered with three inputs.

### **Advantages of ZOTL technology**

- Eliminates intermodulation distortion
- Low impedance output easily matches wide range of speakers and headphones
- Designed by David Berning – one of world's leading amplifier designer
- Same technology and tone as Berning amps that cost thousands of dollars more
- No heavy audio transformers on the audio board
- Patented impedance conversion technology
- Tubes operate in a low current manner to last over 10,000 hours

### **Power Supply**

The power supply for the unit is in a separate case. The external power supply has a connection to the AC cord and a connection for 12V Output. A cable with 5.5mm OD, 2.5mm ID locking barrel connectors on either end is attached between the power supply and the main amplifier unit. Other manufacturer's power supplies may be used as long as they supply 12VDC at 2.5 amps. The MicroZOTL2.0 is fused at 2.5 amps (5x20mm fast-blow).

### **Power Sources\***

The universal input features automatic voltage selection, and requires no rewiring to change from 100VAC to 240VAC, or from 50Hz to 60 Hz. Power consumption is 33 watts.

\*The LPS requires manual switching from 115V to 220V, which can easily be done without opening the power supply case.

### **Operation**

Operation of the MZ2 amplifier is straightforward. The amplifier can be used with a high-level source such as a CD player or DAC directly, and the level control on the amplifier can be used as a volume control.

## Burn in

Units are shipped after an initial burn in period but benefit from 50-75 more hours of use before becoming effectively fully burned-in.



Rear View

## Speaker Outputs

The amplifier outputs 1 watt (4 ohms). If your speakers are 93db efficiency or higher, speakers can be driven to a surprising volume with only a watt. 93+db is recommended only for near-field listening. For a small room, 98+db is recommended. The preamp and speaker outputs are disconnected when headphones are plugged in.\*

\*Earlier models have a locking headphone jack and all outputs are always active.

## Preamplifier Outputs

There is a pair of RCA jacks on the back of the unit labeled “Preamp Out” which is designed to provide the input for a power amplifier when using the MZ2 as a preamplifier.

**CAUTION:** when connecting to a direct coupled solid state power amplifier, the turn on and turn off transients might be dangerous to the speakers and possibly the amplifier. **It is necessary that when using the MZ2 as a preamplifier with direct coupled solid state power amps, first turn on the MZ2, then turn on the power amplifier, and when powering your system off, first turn off the power amplifier, then turn off the MZ2.** This is not an issue when using tube power amps.



**Front View**

## Inputs

There are three inputs that are switched with toggle switch in the front.

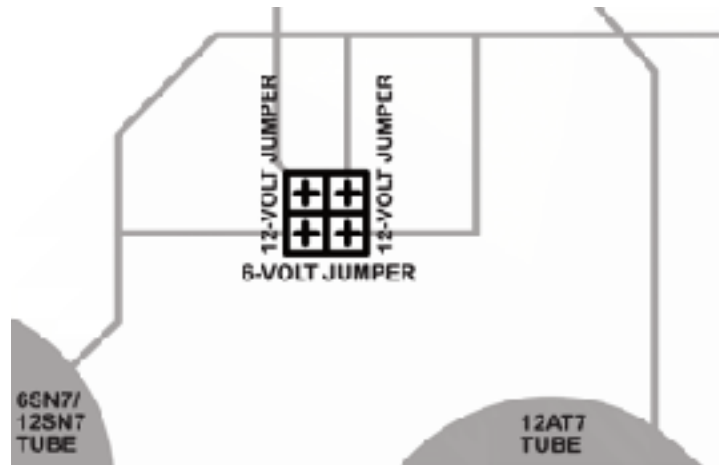
## Headphone Output

The headphone jack takes a standard ¼ inch stereo phone plug. When headphones are plugged in, the preamp and speaker outputs are turned out.

## Power Tube Heater Voltage Jumper Settings

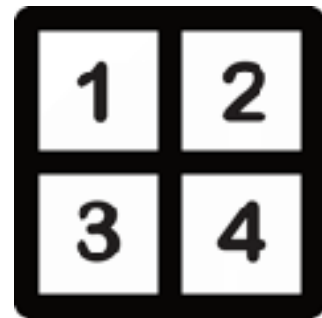
MZ2 tube sockets labeled V2 and V3 can be used with either 6 volt 6SN7 tubes or 12 volt 12SN7 tubes. There are two voltages for each tube. One is the high voltage that carries the audio. The other is the heater voltage. This makes the tube heat up and glow. There are two jumpers that are

## Jumper Position 1st Version



Jumper location on circuit board.

set at the factory to match the tubes shipped with the unit. So, you should never need to ever change these jumpers unless you are changing from a 6SN7 to a 12SN7 or from a 12SN7 to a 6SN7. To set the jumpers for 6 volt operation (using a 6SN7), there should be only one jumper installed, across 3 and 4 (you can “store” the extra jumper on pin two, so that it is not connected to any other jumper). For 12 volt operation, one jumper should be installed across 1 and 3, and a second jumper should be installed across 2 and 4. If you accidentally plug a 12 volt tube into a microZOTL configured for 6 volts, it won’t hurt it, it just won’t work. If you accidentally plug a 6 volt tube into a 12 volt heater, it will glow very brightly and will burn out in a few minutes. A brief time at 12 volts usually doesn’t hurt it, except shorten the life. It is recommended to avoid having the voltage jumpers set wrong.



Jumper Positions

## Jumper Position 2nd Version





In the second version of the circuit board, there is a “park” spot to put the unused jumper when configured for 6V tubes.

### **Technology**

In 1996 David Berning developed a new and technically advanced vacuum tube architecture designated as ZOTL. ZOTL stands for Zero-Hysteresis Output-Transformer-Less amplifiers. The ZOTL architecture eliminated the problematic sound quality issues that audio-output transformers caused.

Since ZOTL technology was introduced in 1996, the MZ2 amplifier has the lowest power output of all ZOTL amps so far.

The ZOTL amplifier uses radio frequency to change the voltage-current transfer characteristics of the output tube from its normal impedance plane to one suitable for driving a dynamic loudspeaker. The radio-frequency remapping is implemented using special high-frequency power-conversion techniques. The high-voltage, low-current tube impedance plane is remapped to the high-current speaker impedance plane through special transformers operating at a constant RF carrier frequency of 250kHz. Because the audio signal is riding on a carrier, it is not subject to parasitic elements of the transformer that would distort the audio signal. Unlike the conventional audio-output transformer, this impedance transformation operates on both the ac and dc components of the signal.

In the transformer-coupled amplifier, the turns ratio of the output transformer determines the impedance matching between the output tube(s) and the speaker. There are practical limits to how large this ratio can be made because of the parasitic elements of the windings, and it is difficult to make an output transformer with more than a 25:1 ratio.

With the ZOTL technology, the impedance matching is determined by the effective turns ratio of the RF converter transformers. Without the parasitics to affect the audio, these RF transformers can have much higher effective ratios, opening the door to using various tubes under unusual operating conditions that cannot be implemented with output transformers.

In the MZ2, the effective (plate to plate) turns ratio is 168 to 1, making it possible to

use a tube for output that is normally used for input or intermediate gain stages. The 6SN7 is respected for its linearity, but prospects for making a high-fidelity output transformer for this tube are dim indeed. With the high effective turns ratio in MZ2, the 6SN7 works well, and a 2-ohm output impedance is achieved without using negative feedback.

## **Amplifier Maintenance**

Fuses: The MicroZOTL2.0 has a fuse in the chassis and either one or two fuses in the external power supply. All are the 5x20mm type. There is a 2.5A fuse on the audio board in the main amplifier enclosure and there are two 2.5A fuses in the linear power supply enclosure.

Vacuum Tube Replacement: The amplifier operates the tubes in a manner that maximize tube life. The tubes are expected to give 10 to 20 years of service based on several hours of use per day. If you choose to change the tubes, be extremely careful to ensure the unit is off for at least 5 minutes to allow voltages to dissipate. **Avoid touching the board, as high voltages may still be present even if the unit is off.** Ensure the tab on the 8 pin tubes is aligned with the slot on the tube socket. The amplifier is self-biasing, so there are no adjustments necessary. The tube sockets we use are very tight: proceed gently and gradually when changing tubes to avoid damage. Any damage caused by changing the tubes is not under warranty.

## **Specifications (Typical Performance Values)**

- Sensitivity: 0.6V RMS for full output
- Output impedance (measured at 0.5A, 60 Hz): 2 ohms
- Input impedance: 50k
- 100V / 120V / 240V operation: Auto-switching or manually switched with linear power supply
- Hum and noise: minimum 60 $\mu$ V RMS or 90dB below full output (20Hz-20kHz)
- Carrier: -50dB (250kHz)
- Power consumption from ac power source: 33W
- Power output with 4-ohm load: 1W, 1% THD
- Power output with 14-ohm load: 0.5W, 1% THD
- Channel separation (4-ohm loads): 46dB, 100Hz-10kHz
- Channel separation (14-ohm loads): 54 dB, 100H-10kHz
- Frequency response (4-ohm load): +0, -1dB 10Hz-20kHz, full power
- Frequency response (14-ohm load): +0, -1dB 5Hz-50kHz, full power
- Amplifier class: Push-pull Class A, no feedback
- Voltage gain (4-ohm load): 10.3dB
- Voltage gain (14-ohm load): 12.4dB
- Size: 9 1/2 inches (24.1 cm) wide, 4 3/4 inches (12.0 cm) tall, 7 7/8 inches (19.7 cm) deep (including connectors)
- Net weight: 2.5 kg (5.3 lb)
- Finish: Aluminum case with acrylic cover
- Tube complement: two NOS 12AT7/6201 and two 6SN7 or 12SN7

### **Limited One-Year Warranty\***

1. Your new product is covered by a limited one-year warranty against defects in material and workmanship. Any repairs required will be made at no charge within the first year after purchase as a new unit.
2. Any units returned for warranty repair must be shipped prepaid after receiving return authorization. For safe handling, and if at all possible, the unit should be shipped in its original carton. If such is not possible, the unit should be well packed with particular attention paid to protection of all corners and avoidance of any looseness in the carton.
3. This warranty does not apply to damage resulting from physical abuse or unauthorized alterations or repairs; or from tube rolling, or damage to exterior finish resulting from careless use. The warranty is void if the serial number has been removed, altered, or defaced.
4. This warranty is void if improper voltage is applied to any input or output.
5. Linear Tube Audio reserves the right to improve or change its products without obligation to modify previously manufactured units.

\* Applicable for domestic sales only. There is a one year warranty for overseas customers. Handling and shipping costs are the responsibility of the overseas customer.