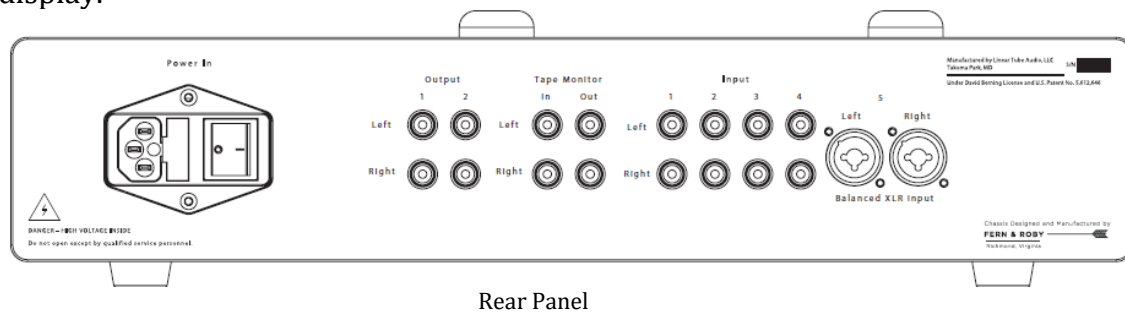


microZOTL Preamplifier User Guide

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.

The Linear Tube Audio microZOTL Preamplifier is a full size, full function, high quality Class A preamplifier and headphone amplifier utilizing ZOTL (Zero-hysteresis Output Transformer-Less) technology. There are 5 inputs, 2 preamplifier outputs, a tape monitor, remote control and front panel controls, input LEDs, and a front panel display.



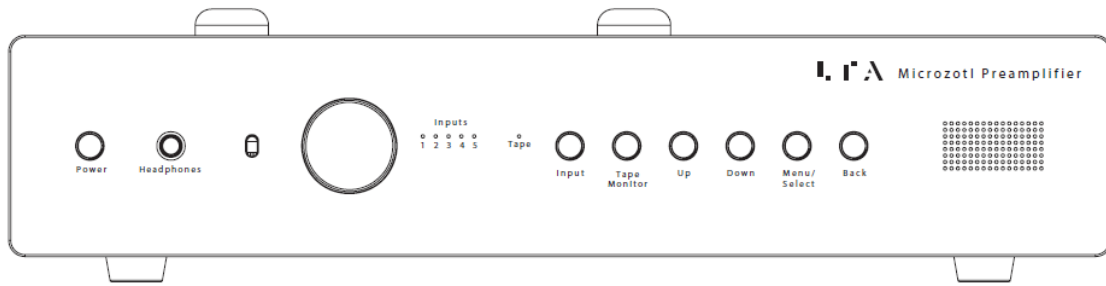
Rear Panel Connections:

Power In: The unit operates in both 115V 60hz and 220-240V 50Hz, but has to be configured at the factory. The unit should be wired for your country when you receive your unit from the factory.

Inputs: There are 5 inputs to the microZOTL Preamplifier. All are single ended (not balanced). Four are RCA stereo pairs. Input 5 uses combination XLR/Phone Jack inputs. These are not true balanced inputs unless the optional True Balanced Input option has been purchased and configured at the factory. Connect your DAC, CD player, Phono Preamp or other line level device to these inputs.

Preamp Outs: There are two identical preamplifier outputs. These are also single ended (not balanced). Connect your amplifier or subwoofer to one of these outputs.

Tape Monitor In and Out: Whatever Input (1 thru 5) is selected is always present at the Tape Out connector. This is true even when listening to the Tape In. The Tape Monitor switch selects whatever is being sent to the Tape In connector. This is typically a Tape Recorder playback output, but can be used with any device's line level output.



Front Panel

Front Panel Controls:

The microZOTL Preamplifier utilizes touch switch controls and a remote control.

Power button: The amplifier is first powered on by the Power In switch on the rear of the unit. Turning the rear power switch on activates the internal power supply but not the amplifier circuitry. The user then touches the front panel Power switch to activate the amplifier. There is a 30 second warm up time for the tubes and the front panel display will display a message “warming up”, which upon completion displays the current volume setting.

Volume Control: The volume can be turned up or down by turning the amplifier’s volume knob clockwise or counter-clockwise or pressing the up or down button on the remote. There is a clicking sound when the volume is changing that comes from the relays controlling the volume level. There are 99 levels of volume. The amplifier has more gain than is typically needed as a preamplifier, so it is typical to never use the higher volume levels. Whenever the volume is changed, the level is saved. Each input independently saves the last used volume setting.

Input Control: The Input button is a touch button that toggles through each of the inputs and displays which input is selected using the input LEDs on the front panel. The remote right and left arrow buttons can be configured to perform the input button function using the remote. The remote must be configured to operate this way – see the front panel menu functions.

Tape Monitor: The tape monitor touch button toggles the tape in rear panel input with the normal inputs 1 thru 5. When the tape in is on and being heard on the amplifier output, the tape out rear panel connection is still outputting the selected 1 thru 5 input. The tape monitor LED is illuminated whenever the Tape In input is selected.

Headphone Output:

The headphone jack takes a standard ¼ inch stereo phone plug.

Front Panel Menu

The front panel menu is selected by pressing the Select/Menu button. There are several menu functions. The menu selections can be seen by using the up or down touch buttons or the up and down remote buttons. When the desired menu function is displayed, use the Menu/Select touch button of the center button on the remote to enter the desired menu.

Balance Control: The volume attenuator has 99 steps for each channel. Balance is achieved by creating a numerical offset which is applied to the volume steps between the channels. The offset is stored in memory so that the amplifier can automatically apply the balance offset when the amplifier is next powered on.

To enter balance mode, press the Menu/Select button to enter the Menu and the first selection in Balance. Press the Menu/Select button or the remote control center button to enter Balance. While in balance mode, using the Up and Down touch buttons or right and left remote buttons (if the remote is configured for balance control). The front panel display will add a bar for each button press that indicates the balance increase and channel increased. Only two bars lit indicates the balance set to zero. The amplifier reflects the balance change as it is set. When the desired balance level is selected, press the Menu/Select button or the remote control center button to save the balance setting. A message will appear on the display to indicate which setting the balance has been set to. The balance setting is saved across all inputs and will be utilized upon power up to the last saved setting. The maximum balance setting is 16 levels difference.

Display Setting: There are 16 levels of brightness the Front Panel Display can be set to. The brightness levels are saved and recalled upon power on.

Home Theater Mode: Home Theater mode locks a selected input to a fixed volume level. Once set the volume control is locked for that input. The expectation is the user will connect their home theater receiver to adjust the volume level and to expect a fixed volume level from the microZOTL Preamplifier. Enter the Menu mode as above, scroll down using the arrow keys to the Home Theater selection. Use the Menu/Select button or the center button to select Home Theater mode. Then select the input desired to have a fixed volume. This setting is saved and the selected input will henceforth be locked at that volume level until the Home Theater mode is removed from that input.

Display Timeout: The Display and the Input LEDs can be set to turn off after 10 seconds, and then will come back on if a button on the remote control is pressed or the volume knob or front panel switch is changed. There are 3 settings:

- Display Only - where the Display times out, but not the Input LEDs
- Both - where both the Display and Input LEDs timeout, or
- None - where the Display and Input LEDs are always on

Reset to Default: The amplifier controls are set to Balance = 0, Display Timeout = Off, Home Theater Mode = None, and Display Brightness = 8, and Remote Left-Right Arrow buttons set to Not Active.

Remote Left-Right Arrow Buttons: There are three functions that can be selected for the Left-Right Arrow buttons as follows:

Off – the remote Left-Right arrow buttons are deactivated. Prevents accidental selection

Balance – the remote Left-Right arrow buttons will control the balance

Inputs - the remote Left-Right arrow buttons will control the input selected

Other Controls

There are a couple of special functions:

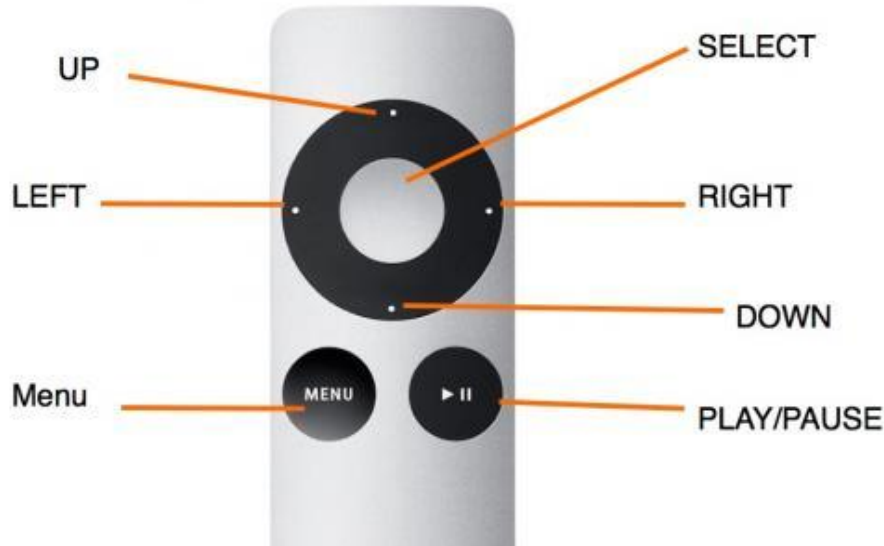
Remote Pairing: The unit uses the Apple TV remote commercially available through Apple and their distribution. The remote sent with the unit will already be paired to the unit and this function does not need to be performed. In the event that the user wants to use a different Apple TV remote, it can be paired by holding down the remote control Play button for approximately 30 seconds until a message appears on the display indicating the remote is now paired to the amplifier.

Tape Monitor using the remote: Holding down the Menu button on the remote for approximately 6 seconds will toggle the Tape Monitor on or off in the same manner as using the Tape Monitor touch button on the front panel.

Remote buttons and functions:

There are two modes, the normal operation mode and the Menu mode, when configuring your unit inside the Menu functions:

The buttons are as follows:



Up and Down Buttons: These normally function as Volume Up and Volume Down. They can be held down or used in a single step mode. In Menu mode, they function to move up and down in the menu as displayed on the operator display.

Left and Right Buttons: In the normal operation mode these do not do anything. They can be configured in the Left-Right Remote Button Menu to function as either Balance controls or to control the Inputs. In the Menu mode, the Right button is Select and the Left button is Back.

Center Button: This normally functions as a Mute function. When the unit is muted, there are two Xs on the display. The Center button is a Mute toggle. When in Menu Mode, the Center button functions as a Select button.

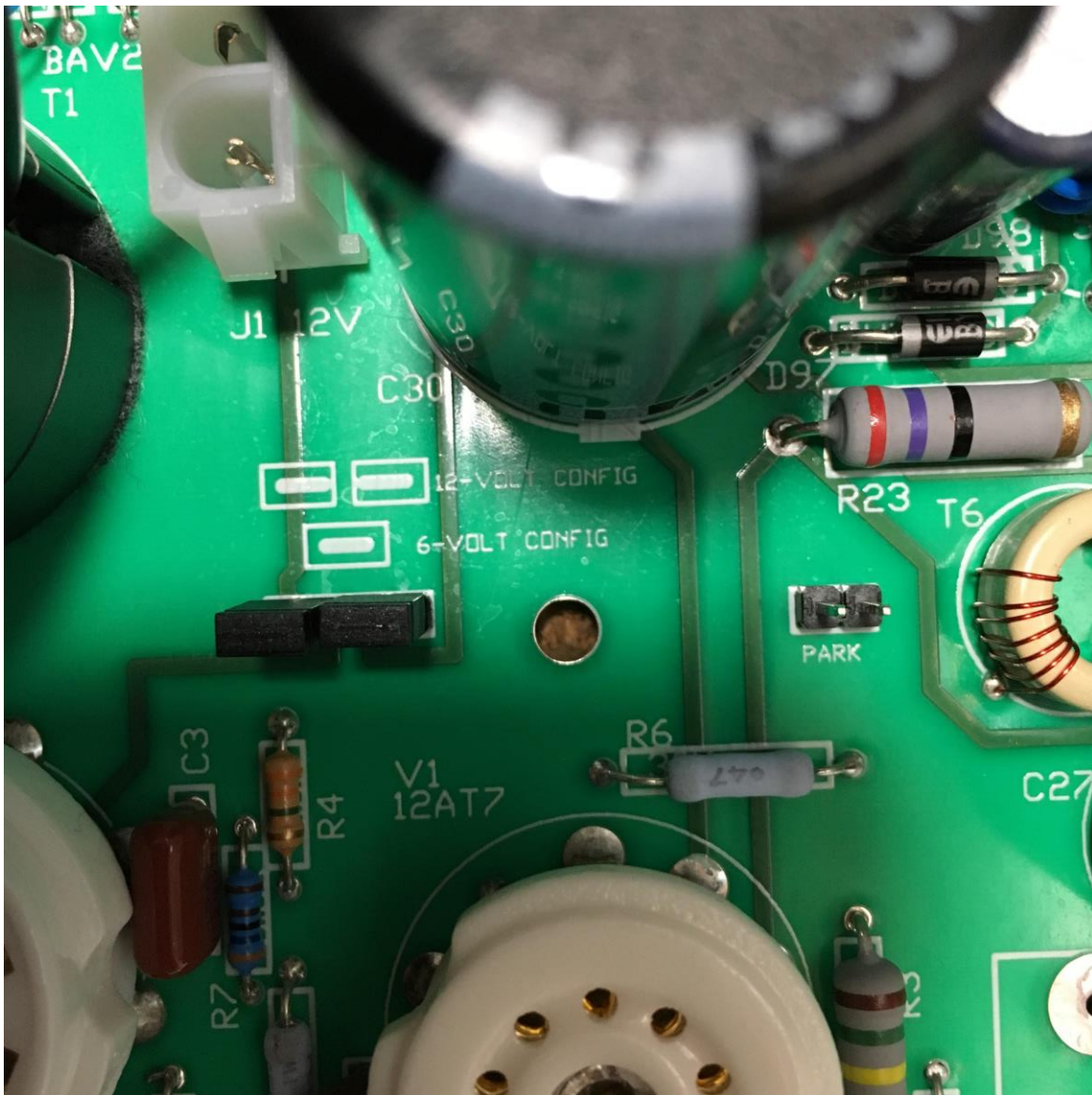
Menu Button: When in normal operation, you can hold the Menu button down for 6 seconds to toggle the Tape Monitor on or off. Pressing the Menu button in normal operation selects the Menu Mode.

Play/Pause Button: When in normal operation the Play/Pause button toggles through the Inputs. When in Menu mode, it also has no function assigned. Holding the Play/Pause button for 30 seconds will pair a new Apple remote to the unit, but this is only done in the event of replacing the remote.

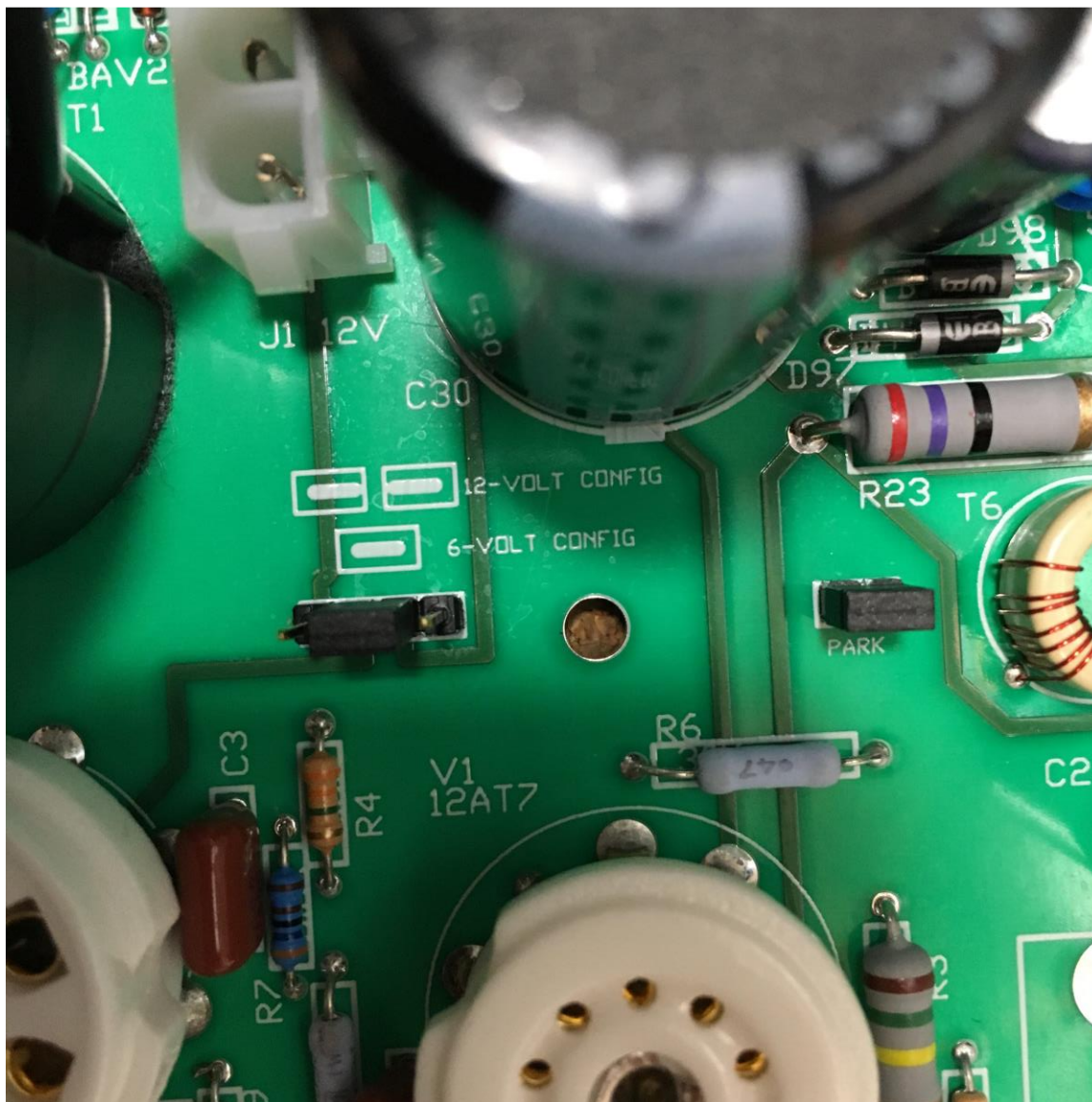
Tube Complement: The microZOTL Preamplifier utilizes and is shipped with 2 12AT7 input tubes and 2 12SN7 power tubes. There are jumpers on the amplifier board to allow 6SN7s to be used instead of the 12SN7s (see the following section for details on configuring the jumpers). Sometimes 12AU7s are used instead of 12AT7s to lower the gain of the unit.

Power Tube Heater Voltage Jumper Settings: The power tubes (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 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 12SN7 to a 6SN7 (or the reverse)**.



For 12 volt operation, one jumper should be installed across 1 and 3, and a second jumper should be installed across 2 and 4. The two jumpers will fill completely the 4 pins.



To set the jumpers for 6 volt operation (using a 6SN7), there should be only one jumper installed, across the two center pins.

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. If you are never changing tubes or do not understand any of this, just ignore this section of the manual.**

Tube Replacement and Tube Rolling: The microZOTL Preamplifier utilizes the ZOTL technology which operates the tubes at 1/3 the heat than other tube amplifiers and subsequently the tube life is typically 3 times as long as other amplifiers. Unused tubes will typically last 10,000 hours of operation.

Note: there are very high voltages in the preamplifier. When removing the cover ensure the power cord is disconnected. 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.

NOS (New old stock) tubes are available and almost always sound better than Russian or Chinese tubes in current production. However, where these tubes have been for the last 50 years is never certain, so sometimes they can fail or become noisy (static or rushing sounds), and require replacement. And of course, one can develop an affliction known as "tube rolling". As the amplifier sound will change to reflect the quality and "tone" of the tubes installed in it, some are often changing between different brands to optimize the sound to their taste. In extreme cases, adapter sockets are utilized to use exotic tubes not directly electrically compatible.

The amplifier has a powerful autobias circuitry, which means the amplifier automatically adjusts to the optimal levels for the tubes and no adjustments are required (except the jumpers must be correctly set for 12 volt or 6 volt power tubes – designated by 12SN7 or 6SN7).

When replacing the tubes, the two smaller ones are the input tubes. They must be matched so that the gain of each channel is the same (you could possibly correct for unmatched tubes using the balance control). The power tubes typically do not have to be matched in gain. For the input tubes, any 12xxx equivalent tube can be used. Typically 12AT7s are used (they have a gain of 60) or 12AU7s (gain of 20) to lower the gain. There are many variants like 6201s, 5751s, 5814s, etc. that all work well and if one set of tubes sounds better, use it. (12AX7s have a gain of 100 and is typically too much). 12SN7s are sonically identical to 6SN7s. Since few amplifiers use them, they are considerably less expensive than 6SN7s.

Also, even though the amplifier uses 450V on the tubes, it is at a different frequency and current than the tube rating. So, 350V and even 250V rated tubes can be used. In short, don't worry about the tube voltage rating.

When removing the tubes, use a gentle rocking motion as you pull out the tube. When replacing in the socket, make sure the pins are straight and aligned correctly with the hole pattern.

When replacing tubes, in rare cases the tubes might have a short. This typically results in blowing the fuse on the amplifier board. The replacement is a 5mm x 20mm 2.5 amp fast blow, preferably ceramic (glass will work fine) fuse. The other issue is tube noise. With no input to the amplifier connected, you should not hear any static or rushing sounds. Sometimes tubes will make a little noise as they warm up, as this is normal, but should disappear after a couple of minutes.

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, as well as provides many other advantages such as better frequency response and accuracy, longer tube life, less tube heat and far better coupling from the tube to the output device.

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

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 (or headphones and power amplifiers). 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. With output transformers, 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 (called impedance converters). Without the parasitics to affect the audio, these impedance converters 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 MicroZOTL, the effective 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 12SN7/6SN7 tube 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 MicroZOTL2.0, the 6SN7 works well, and a very low output impedance is achieved without using negative feedback.

Amplifier Maintenance:

Adjustments: The amplifier is self-biasing, and has no adjustments.

Fuses: The MicroZOTL Preamplifier has a fuse on the amplifier board and two inside the AC input assembly accessible from the rear panel. All are the 5x20mm type. There is a 2.5A fuse on the amplifier board inside the unit. There are two 3.15A fuses in the AC assembly on the rear panel (there is a little plastic door that is opened with a small screwdriver).

Specifications (Typical Performance Values):

- 4 single-ended RCA inputs using Cardas connectors
- 1 single-ended XLR input pair using Neutrik connectors
- Volume controlled by stepped attenuator with Dale precision resistors and remote control
- 2 preamp outputs
- Headphone output
- Tape in/out and Tape Monitor control
- Linear power supply with over 60Kuf storage, choke isolated Belleson regulator, super low ESR poly-organic capacitors
- Balance control - uses software to control channel volume level
- Remote control with Apple remote for volume and menus
- LED array display with adjustable brightness
- Ceramic circuit board with low dielectric loss
- Advanced protection circuit to eliminate speaker turn on/off thumps even in the event of a power outage
- NOS 12SN7s and 12AT7s included
- Auto-bias for all tubes
- Brightness control for display - 16 levels
- Display timeout - 10 seconds turns off - configurable
- Home Theater Mode - sets input of choice to fixed volume
- Volume levels stored at last level used separately for each input
- Optional true balance input
- Sensitivity: 0.6V RMS for full output
- Output impedance (measured at 0.5A, 60 Hz): 2 ohms for headphone out and 50 ohms for preamplifier outputs
- Input impedance: 50k
- 100V / 120V / 240V operation: Factory set
- Hum and noise: minimum 60 μ V RMS or 90dB below full output (20Hz-20kHz)
- Carrier: -50dB (250kHz)
- Power consumption from ac power source: approximately 50W
- 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
- Finish: Aluminum case with anodized front and rear panels and powder coat painted top and bottom.
- Size: 17 inches (43.2 cm) wide, 4.2 inches (10.7 cm) tall, 12.4 inches (31.5 cm) deep (including knob and connectors)
- Net weight: 14 lbs. (6.35 kg.) Shipping weight: 22 lbs. (10 kg.)

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. The tubes are also under warranty.
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 improper 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.
6. There is a one year warranty for overseas customers. Handling and shipping costs are the responsibility of the overseas customer.

Service:

The ZOTL circuitry is a unique circuitry very different from most other tube amplifiers. We strongly recommend that you contact the factory by phone or email before having anyone attempt to service your unit.

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