



Final Drive User Manual

Empirical Audio Rev. 1.2

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Important: read all red warnings before operating
Some break-in is required, at least 2 weeks

1. Function/Technology

The Final Drive is a pair of passive transformer buffers/selectors, one for the left channel and one for the right channel. The Final Drives can be inserted between DAC and amps or between preamp and amps. The Final Drive can be beneficial in virtually any system. (The Final Drive is not a variable Volume Control)

The purposes and benefits of the Final Drive are numerous:

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- 1) Improves audio quality
- 2) When driving direct from DAC to amps, it provides a method to select other analog sources such as SS preamp (HT) or Vinyl preamp
- 3) Provides a method for conversion of balanced to single-ended
- 4) Provides a method for conversion of single-ended to balanced
- 5) Eliminates DC offset in balanced signals
- 6) Eliminates positive-negative signal amplitude differences in SS generated balanced signals
- 7) Adjustment for differences in levels from sources/preamps
- 8) Breaks the ground connection between DAC and amps or preamp and amps

#6 is an interesting problem and not obvious. Most modern balanced outputs from preamps and DACs are generated using solid-state circuits and no transformer. Because of these designs, it is impossible for the positive output and the negative output to be exactly the same amplitude. One is always a bit higher in level than the other. It is also impossible for these to have zero DC offset (#5) unless they are capacitively coupled. The impact of these things is that the amplifiers don't sound as good as they could if the signal was truly balanced. The ONLY way to get a truly balanced signal is using a transformer.

The benefits of #8 should be obvious. The ground-loop created by a stereo amp or monoblocks and the DAC or preamp driving them has to be the most problematic in most systems. If it does not create hum, there is a lot of RF pickup of the big loop antennas of the ground-loops. Many systems have dedicated power runs to the amplifiers, which is good for the amps, but bad for the system because it creates very large ground-loops with different circuits. The Final Drive eliminates these ground-loops.

Some will claim that inserting yet another component in the signal chain is a negative thing, but in this case they are dead wrong. The transformers used in the Final Drive pair are simply the best on the planet. These use the Finemet core and winding technology from Japan. These are some of the most expensive signal transformers available which have been customized specifically for this application. The wiring inside the Final Drive uses cotton-insulated continuous-cast silver from Japan. Only the best ELMA and C&K switches with the optimum contact plating are used for the selectors. Neutrik XLR and Vampirewire solid-copper direct-gold plated RCAs are used. Only the very best and the sound quality improvement reflects this.

When the Final Drives are inserted in a system, the noise floor will drop significantly. Low-level high-frequency information in the music will not be masked by ground-loop noise anymore. Amplifiers will behave more ideally. More detail will be heard. DACs will sound more analog. Analog will sound more lifelike. The stereo image will be more 3-D. Even movies will sound more live.

Typical usage is: DAC XLR output -> Final Drive XLR1 input
SS Proc RCA output -> Final Drive RCA input
Final Drive XLR output -> amplifier

This would be a typical system with DAC for music and SS Proc. for movies. A flip of the rotary switch and you select movies or 2-channel music. (only XLR or RCA output can be selected, not both at the same time)

Each of the inputs can be boosted +6dB with toggle switches. This allows for differences in level from different sources, such as SS proc and DAC or RCA versus XLR. (The RCA path automatically adjusts for RCA/XLR amplitude

difference)

1.2.Theory of Operation

The Final Drive is a passive device requiring no power. One is required for each analog channel. It consists of a signal transformer, switches and connectors with connecting wiring. The main functions are:

1. Isolation of ground
2. Amplitude/level shifting
3. True balanced output
4. SE to balanced conversion
5. Balanced to SE conversion

1.3.Performance/function of different inputs and outputs

All inputs are isolated from all outputs. The XLR output has pin 1 (ground) connected to transformer ground. This is not connected to the chassis or any other connector contacts. All XLR and RCA inputs and outputs are isolated from each other.

Using a balanced input and RCA output can be beneficial because it achieves the noise reduction of balanced while outputting single-ended.

2. Front-Panel:



2.1.1Input Select Rotary Switch

Three position switch that selects the input connector. Can be switched at any time during music or theater playback. If there is DC offset in any of the input signals or static charge on the cables, there may be a thump or click when switched.

2.1.2Output Select Toggle

Two position toggle that selects between RCA and XLR output. Only one is active at a time.

3. Back-Panel



3.1.XLR1 and XLR2 Inputs

Signals on these input connectors are directed to the output when selected by the front-panel rotary switch. These inputs can be driven from an analog source, DAC output or preamp. Pin 1 grounds of XLR1 and XLR2 are unconnected and floating. DC-isolated from all other connectors.

3.1.10 and +6 dB Boost

Above each XLR input is a toggle that can be set for 0dB or +6dB boost. This selects different windings on the transformer to allow more signal voltage gain. Each switch is independent and only affects the input connector below.

3.2.RCA input

Signal on this connector is directed to the output when the front-panel rotary switch is set to "RCA". This input can be driven from an analog source, DAC output or preamp. This is a DC-isolated input, not connected to ground of other inputs or outputs.

3.2.10 and +6dB Boost

Above the RCA input is a toggle that can be set for 0dB or +6dB boost. This selects different windings on the transformer to allow more signal voltage gain.

3.3.XLR Output

Active when selected by the front panel output selector toggle switch.

Otherwise floating. DC-Isolated from all other connectors. Pin 1 (ground) is connected to transformer ground, but isolated from all other inputs and outputs. This reduces static charge build-up when connected

to other grounded equipment.

3.4.RCA input

Active when selected by the front panel output selector toggle switch.

Otherwise floating. Isolated from pin 1 grounds on the input XLR connectors or the ground of the input RCA connector. DC-Isolated from all other connectors.

4. Specifications (Each Final Drive)

Inputs

RCA

XLR1

XLR2

Outputs

RCA

XLR

Controls

RCA-XLR1-XLR2 input select rotary switch

RCA-XLR output select toggle switch

0 or +6dB RCA input select

0 or +6dB XLR1 input select

0 or +6dB XLR2 input select

5. Compatibility

The Final Drive is compatible with most high-impedance analog systems that use RCA or XLR connectors. The bandwidth may be reduced when used in a 600 ohm terminated balanced system.

Included

1. 2 Final Drives

Options

Cable options may be available in the future.

Photos By Steve Tague Studios