

*the*

# LEON AUDIO

*company*

A high performance line level Isolation Transformer designed for the serious audio professional where sonic performance and freedom from earth loops and ground noise is of utmost importance.

Suitable for the most demanding of situations in both live and recording applications.

A no-compromise audio isolation transformer designed by The Leon Audio Company provides extremely high sound quality and the maximum possible rejection of external electrical interference, such as dimmer buzz.

The transformer also provides excellent isolation of large *common mode* (earth) voltages due to an optimised internal design. This translates into excellent performance when isolating input and output circuits.

An optimally balanced output, provided by the transformer, is ideal for driving long balanced cables, such as multicores.

The fully floating balanced input and output are able to accept either 3 conductor balanced circuits or 2 conductor unbalanced circuits, providing an ideal unbalance/balanced or balanced/unbalanced interface.

When used with unbalanced inputs or outputs, the unused pin must be tied to earth for correct operation.

Effective screening against hum pickup from nearby transformers, such as those in power amplifiers, is provided by a MU metal shield which totally encloses the transformer.

A parallel loop through connector is provided on the input. Totally passive design means that no batteries are required.

## Line Isolation Transformer

**Professional Grade  
Line Drive & Receive  
+20dB high isolation**



### Specifications

All measurements made with 50 ohm source impedance and 600 ohm load impedance. 0dBu=0.775Volts

<b>Frequency Response</b>	30Hz - 15kHz $\pm 1.5$ dB
<b>Common Mode Rejection Ratio</b>	>115dB (see test circuit)
<b>Recommended Source Impedance</b>	less than 100 ohms
<b>Recommended Load Impedance</b>	600 ohms or higher
<b>Maximum Input Level</b>	+20dBu
<b>Total Harmonic Distortion (T.H.D.)</b>	0.05%, 30Hz - 20KHz at +20dBu
<b>Power Supply</b>	None required
<b>Finish</b>	Powder coated die cast aluminium
<b>Weight</b>	510 grams net.
<b>Dimensions</b>	W 95mm H 120mm D 67mm

## Earth Loops

An earth loop can occur when 2 pieces of audio equipment are connected together. Lets take a musician's keyboard and connect it directly to a mixing desk. The keyboard is connected to the mains earth via more than one path. The first path is via the instrument's own power cable to the mains earth. The second path is via the interconnecting audio cable to the mixing desk, then via the mixing desk's power cable back to the mains earth. This is an earth loop.

If there is any difference in the voltage between the two mains earth connections, a circulating earth current will flow and is amplified and manifests itself as a hum or buzz. Connecting both pieces of sound equipment to the same power source will often reduce the magnitude of the circulating earth currents, but they will still be there.

Using a balanced interconnection will often reduce the effects of circulating earth currents, but the currents will still be there. In this case, how much noise is heard is very equipment dependent as it depends a lot on where the earth currents flow inside each piece of equipment.

Earth loops are often "fixed" by cutting the mains earth wire in the power lead of one of the pieces of equipment. This is a very unsafe practice, because should a fault occur, electrocution is a possibility. A technically correct solution is to use an audio isolation transformer.

## Transformer Isolation

An audio isolation transformer connected between two pieces of equipment will prevent the flow of circulating earth currents. This is because there is no electrical connection between the input and output of the transformer. The audio signal is coupled magnetically.

So you go out and buy a Radio Shack, or similar, audio transformer, connect it up and you still get earth noise and it now sounds distorted as well.

So what went wrong?

A budget transformer will have insufficient (if any) screening between its input and output. While there is no direct DC connection, as measured on the ohms range of a multimeter, there is considerable capacitive coupling between the windings. Audio frequency signals will simply "hop" from the input to the output winding if there are no screens to prevent this. Substantial screening is required to prevent capacitive coupling. One screen is often inadequate.

A magnetic shield is also required to prevent external magnetic fields from generating unwanted signals into our transformer. One common source magnetic interference is the power transformer in the power supply of virtually every piece of mains operated equipment. The solution is to enclose the transformer in a MU metal case. MU metal is a nickel/iron laminate with excellent magnetic screening characteristics.

The main source of audible distortion in an el-cheapo transformer would come mainly from saturating the transformer core at low frequencies. The solution is to use a core of sufficient size to give adequately low distortion figures at the lowest frequency of interest (usually 20Hz) and at the maximum signal levels to be handled. If the low frequencies are rolled off, it is often possible to get a transformer to handle signals above its design maximum while still maintaining low distortion figures.

The Leon Audio Isolation Transformer incorporates multiple screens to achieve the best possible isolation of capacitively coupled signals. The transformer is totally enclosed in a MU metal case. A large core enables distortion of only 0.05% at 30Hz while passing a +20dB signal ( $R_s = 50\Omega$ ,  $R_L = 600\Omega$ )

Transformers are almost always better at interfacing to balanced lines than the electronic circuits commonly used in audio equipment to provide balanced inputs and outputs. Even though the equipment may be balanced in terms of legal/advertising requirements, problems can still be experienced. Electronic designs usually fall short of what is required technically to perform well under adverse conditions. A classic case of electronic design by accountants.

## Common Mode Rejection

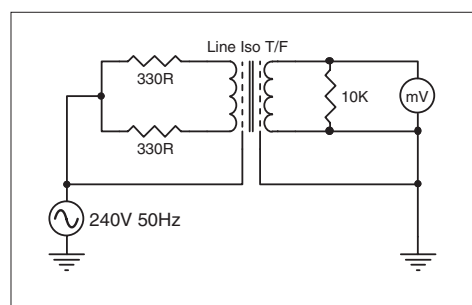
This is the ability of a device to reject any signal that is common to both of its input terminals with reference to the output circuit. The most common case is where a signal source is connected to a different power source to that of the load. While the voltage on each of these 2 power source's earth wires should ideally be zero, this is rarely the case. The test circuit uses 2 x 330 ohm resistors to provide a balanced source. This source has a few volts of earth noise (with reference to the output circuit). In this case, the earth noise is 240 volts 50Hz AC. A pretty severe case. The load is a 10K ohm resistor in parallel with a millivolt meter.

In the common mode test circuit the meter measured 0.1mV which equates to a Common Mode Rejection Ratio (CMRR) of 115dB. It also equates to an output 65dB below 0dB (.775V)

In the real world, earth voltages are usually much less than 240V (<5V is typical), so we can expect any noise due to earth voltages to be buried in the signal's noise floor.

**Note:** The above tests were carried out under controlled conditions.

These transformers are NOT rated for connection to 240 volt mains, nor are they intended to provide safety isolation from dangerous voltages.



Common mode test circuit

## Warranty

The Leon Audio Isolation Transformer is guaranteed for two years from date of original purchase against defects in workmanship and materials. If such malfunction occurs, the item will be repaired or replaced (at our option) without charge for materials or labour if delivered prepaid to THE LEON AUDIO COMPANY. Unit will be returned prepaid. Warranty does not cover finish or malfunction due to abuse or operation at other than specified conditions. Repairs by other than THE LEON AUDIO COMPANY or authorised agents will void this guarantee.

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