

BinLout-120x XLR balanced in > line out buffer module

With this very tiny module we most probably provide the best available balanced input circuitry available today. It appears to show a transformer-like behaviour but then way better actually.

Unlike about everybody else, we use the patented [*InGenius™*](#) principle to convert and buffer a balanced signal into a single line. This is normally only used in very expensive equipment.

- Convert your balanced input(s) to a line signal with high class input transformer-like behaviour!
- Exchange an input audio transformer by this module showing a wider bandwidth, far better impulse response, no coloration at all, no phase shifts, etc.
- Change unbuffered balanced inputs to buffered ones and improve sound quality.

In many cases a balanced input is made by an audio transformer or a regular Opamp, which are not designed for the difficulties which can occur while using a balanced signal. The IC we use is especially made for this purpose and designed by Bill Whitlock of Jensen Audio Transformers.

With the [THAT 1200, 1203 or 1206 *InGenius™*](#) chip you obtain an about perfect balanced input on your (pre)amplifier with a CMRR ratio of over an unbeaten 90dB!

Also (even) an unbalance in the line, which often occurs, is taken care of and you can use even very long signal cables without problems.

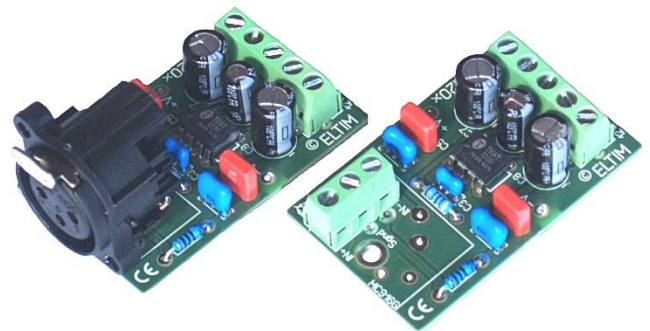
The frequency range, phase response and impulse behaviour is far superior to transformers.

RF interfering signals are also taken care of in the best possible way and immediately behind the input connector, as it always should be.....

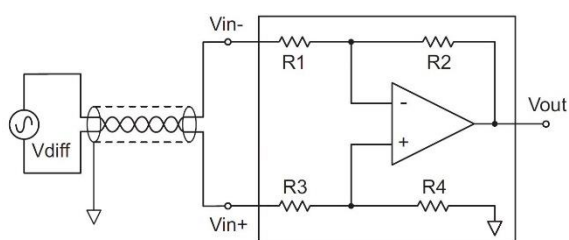
Bin/Lout-120x layout

The tiny, 34x55mm PCB contains all the parts required and an input screw terminal (internal use) or a quality XLR female chassis connector.

The active device is a single 8-pin DIP of the THAT1200 series, normally used in highest quality equipment. The input is filtered by high quality mica capacitors and double protected against electrostatic discharges. The supply capacitors are long lasting (>10k hours) PANASONIC FR-A capacitors.



Theory of operation



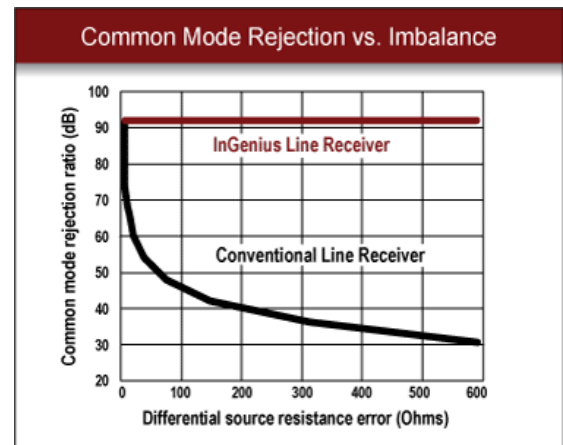
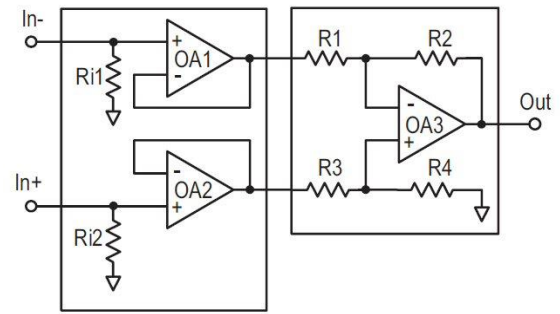
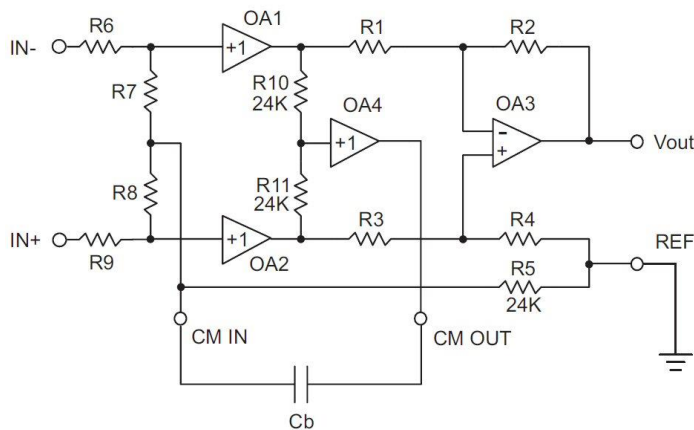
Unlike about 90% of all balanced inputs in all kinds of equipment, we are **NOT** using a simple Opamp layout as in the picture at left, where a balanced (XLR) signal is converted by an Opamp to a single line signal for internal use. These circuits just invert one input, sum both and convert it into a single line. All line imbalances (f.e. due to poor connector contacts), etc. are passed on to the output as well!

These circuits behave poor where an imbalance in the connections or prior circuits is a fact.

Neither do we use the circuit used in many professional audio- and measuring equipment, known as an instrumentation amplifier, where the circuit mentioned before is preceded by a pair of extra Opamps:

They do behave better already, but still have an unpredictable CMRR ratio, depending on the line balance. Besides the fact that there are extra Opamps in the signal path, degrading sound a bit, this is still not an optimal situation to gain a maximum CMRR (line unbalance) figure.

Instead, we are using THAT's patented **InGenius™** design:



Here, OA1, 2 and 4 are quite simple circuits, possible by the function of OA4. All in one 8-pin DIP. OA3 still has the function as in both other circuits. The internal R1-4 are laser trimmed at 0,1% tolerance. Since they are internal, there are no parasitic effects like self-inductance, etc.

The THAT 1200-series **InGenius™** balanced line receiver IC's overcome a serious limitation of conventional balanced (Opamp) input stages: poor common mode rejection in real-world applications. While conventional input stages measure well in the lab and perform well on paper, they fail to live up to their CMRR specs when fed from even slightly unbalanced source impedances — a common situation in almost any High-end and Pro sound environment. This is because conventional stages have low common-mode input impedance, which interacts with imbalances in source impedance to unbalance common-mode signals, making them indistinguishable from desired, balanced signals. Especially where connectors are (dis)connected often and/or become dirty over time, this causes a loss in sound quality rapidly due to an imbalance in the first two circuits.

Developed by Bill Whitlock of Jensen Transformers, the patented **InGenius™** input stage uses clever bootstrapping in order to raise its common-mode input impedance into the megohm range without the noise penalty from the obvious solution of using high-valued resistors.

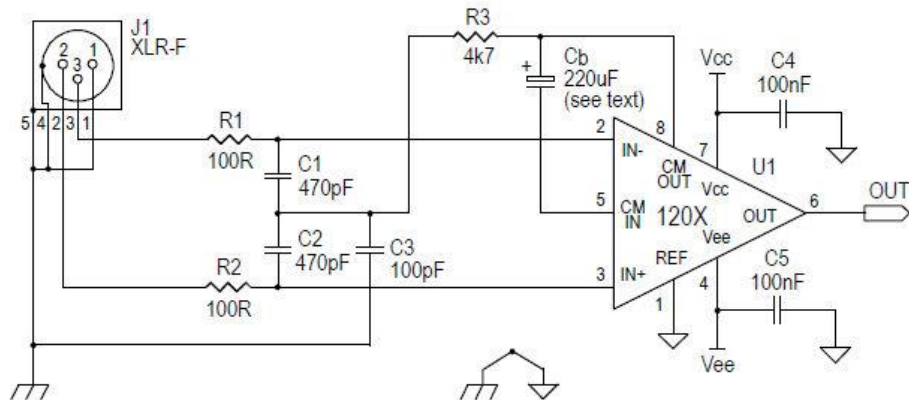
Like transformers, **InGenius™** line receivers maintain their high CMRR over a wide range of source impedance imbalances — even when fed from single-ended sources. So, while using this circuit you could feed a single line signal as well (into IN+) in this setup. For reversing polarity, use IN-.

Unlike transformers, these wide bandwidths (>22MHz) solid state devices offer dc-coupling, low distortion, and transparent sound in a small 8-pin package.

For those who are allergic to Opamp circuits: this is **NOT** what you are used to! Perhaps you were right. The "sound" is fully transparent. It simply just does what it must do: balanced > single line transformation.

Circuit

The practical and actual schematic as we use on our BinLout-120x v2 module is from the THAT datasheet:



In practise, we only added some power supply related components to this by THAT recommended circuit. Even though the IC has transient voltage suppressor diodes on board, we added better (TVS) ones.

Power Supply

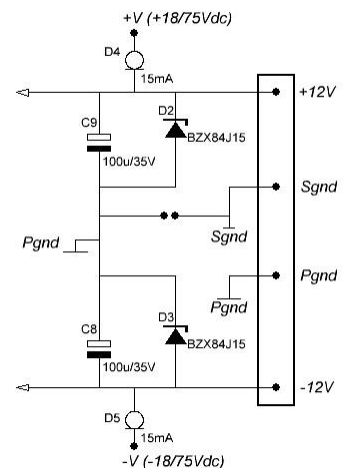
Basically, we just added a pair of quality power supply capacitors to the basic THAT schematics as shown above to allow some longer supply leads than normally used. There are power supply connections (+12V and -12V) for use in low voltage applications below +/-13V.

Do not use higher voltages here, since these lines are paralleled by 15V Zener diodes which will draw severe currents otherwise! For ±15V operation, remove both SMD zener diodes!

In a Power Amplifier there is mostly no low supply voltage available, so we arranged some extra's. Higher PS voltages can be applied to the extra V+/V- pins in the range of ±18 - 75Vdc. These are then connected to the amps power supply rails without any extra required supply parts.

15mA Constant Current Diodes (CCD) provide a constant current over this wide voltage range. Then 15V Zener diodes regulate the internal supply to ±15Vdc. Aprox. 6mA flows into the IC, the other 9mA via the zeners.

Works perfect in a most compact way especially since we used SMD CCD and Zener parts.



Mounting

There are two versions of our BinLout-120x available.

There is a version meant for internal use and provided with screw connectors for both in- and output signals. This one can be fixed with a single M3 bolt somewhere in the cabinet.



The second one we provide with an XLR female chassis connector.

You can decide whether the connector body is connected to Signal- or power ground or not at all, depending on your design. It can prevent hum either way.

Since this module has hardly any weight, attaching the connector to the cabinet is sufficient. Just widen up your Line input hole to Ø22mm, drill two small holes for the mounting screws, mount this PCB and connect the former Line input to the output tab of this PCB, that's it.

In either case, the output connector also has connections for ±4-12V, power ground and signal ground.

At the bottom side you can connect both grounds via solder pads.

For high voltage purposes there are solder isles (V+ and V-) for feeding it with up to ±65Vdc.

Models

This **InGenius™** chip is available in three versions with different amplification values:

0dB (mostly 1V), -3dB (2 Volt line signal) and -6dB (4 Volt line signal).

Normally we supply the 0dB variant, -3/-6dB on request where higher than normal signal levels are used, as f.e. in PA- and Studio equipment. Just change the chip to a 1203 or 1206 type, that's all.

- **BinLout-1200** Balanced in/Line out with 0dB gain (transferring 1V balanced to 1V line signals)
- **BinLout-1203** Balanced in/Line out with -3dB gain (transferring 2V balanced to 1V line signals)
- **BinLout-1206** Balanced in/Line out with -6dB gain (transferring 4V balanced to 1V line signals)

We add a letter for the input connector type: X = XLR connector, S = screw connector.

The -3/-6dB types are mostly used where high output (2V or 4V professional) sources deliver the sound.

Also, while using our balanced line drivers providing +3/+6dB output levels in sending equipment.

While using a setup like this, a possible interference will be degraded even more by 3 resp. 6dB due to the -3dB or -6dB attenuation of our BinLout-1203/1206 respectively.

Some figures

Input impedance:	48 kohms
Frequency range:	> 22MHz
Slew rate:	> 12V/uS
Distortion:	< 0,0005% THD
Noise figure:	< 107dBu
CMRR:	> 90dB @60Hz under all circumstances
Power Supply voltage:	+/- 3 to 13V @ $\pm 12V$ connections, <8mA +/- 18 to 75V @ +V/-V connections, 15mA
Dimensions	55x34x27mm (LxWxH)

[BinLout-120xx is available in our webshop now](#)

*Both input connector type and
gain can be selected there.*

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