

Channel D Lino C 3.0

**Balanced Transimpedance Direct-Coupled Wide Bandwidth
Low Distortion Low Noise Precision Phono Preamplifier**

For Low Output Moving-Coil Phono Cartridges

Optional Moving-Magnet and Voltage-Mode MC Inputs

Installation and Use Manual

QUICK START

1. Allow your Lino C to fully acclimate to ambient temperature for a few hours before removing it from the inner plastic bag.
2. Current mode phono preamplifiers use balanced input wiring. Balanced wiring consists of a twisted pair of two independent conductors inside a shield, for a total of three independent conductors. *Current mode phono preamps may exhibit audible hum with unbalanced (coaxial conductor with shield) wiring.* RCA to XLR adapters* may be usable, but a properly wired* balanced interconnect is needed to guarantee no audible hum.

*XLR pin 1 must be connected only to the cable shield; for adapters, pin 1 left open / not connected

3. *Unmodified* Rega turntables and tonearms cannot be connected to balanced preamplifiers because Rega connects the chassis ground to a cartridge signal connection, preventing making a balanced signal connection, resulting in noise and hum.

4. Connect the turntable and output connections. Connect the power adapter to your Lino C. **The barrel connector of the power adapter will *easily* slide into the power input jack on the rear of your Lino C.** If it seems to not slide in easily, verify the alignment of the plug and try again. It can be damaged by using excessive force. Next, plug the line cord into utility power.

5. A blue indicator on the bottom of the chassis will illuminate when the circuitry is powered.

6. Keep your Lino C continuously connected to utility power for optimum battery life; the internal Class A biasing circuitry also takes approximately 30 minutes to fully stabilize after a power down.

7. Disconnect the power adapter from the rear of the Lino C to fully power down the Lino C.



STANDBY

STANDBY

CHARGE LOCK

CHARGE LOCK

16Hz HPF

MONO

POLARITY

INPUT 2

INPUT 2/3

BATTERY POWER SUPPLY AUXILIARY SETTINGS

SIGNAL MODIFIER AND INPUT SELECTOR SWITCHES

Channel D Lino C 3.0 Installation and Use Manual

REVISION 2

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Congratulations on purchasing a Lino C phono preamplifier! Your Lino C is a low noise, low distortion, balanced transimpedance (*current mode*) design featuring a wide frequency bandwidth and extremely accurate RIAA de-emphasis. This provides you with the key to obtaining stunning and lifelike, three-dimensional music reproduction from your LP records.

Your Lino C is specifically designed to deliver extremely high quality music reproduction from low output moving-coil cartridges (and moving magnet cartridges, with the optional MM input).

Lino C incorporates newly available power supply components that enable circuit design strategies delivering power supply performance very closely approaching that of our flagship Seta® rechargeable-battery phono preamplifiers. Like our flagship Seta models, modern manufacturing methods are used, including low-noise, four-layer circuit boards and precision, surface mount components. Surface mount components provide the shortest signal paths and highly optimized circuit layouts, with low stray inductance, capacitance, improved unit to unit consistency and performance all eclipsing old-fashioned through-hole designs. The result is a phono preamplifier with exquisite performance far exceeding expectations, especially considering its relatively modest price in the arena of most high end components.

The high precision (guaranteed better than ± 0.1 dB) RIAA EQ accuracy provides standard RIAA-corrected phono preamplifier outputs with outstanding quality.

The low impedance AGM battery based power supply with proprietary Channel D - developed charging, maintenance and galvanic isolation circuitry provides outstanding “off the grid” isolation from power supply related noise and interference issues that preamplifiers with conventional power supplies must contend with.

Lino C also is perfect as a preamplifier for connecting to high resolution (192 kHz / 24 bit), balanced-input analog to digital converters (ADCs). The Lino C’s selectable Flat output used in conjunction with Channel D’s *Pure Vinyl™* software providing RIAA EQ correction combines the strengths of the latest cutting-edge analog and digital technologies, delivering superb, high definition transparent vinyl playback.

The benefit of having the availability of selectable Flat and RIAA outputs can facilitate linking analog LP playback with the performance and flexibility of high resolution digital audio, should you desire to do so later in the future.

Getting Started

Please take the time to read this Installation and Use Manual to familiarize yourself with the installation and operation of your Lino C.

Important: If the package you received from your shipper is substantially above or below ambient temperature, please allow your Lino C to acclimate at room temperature for a few hours before opening the plastic bag containing your Lino C, to avoid causing condensation on cold internal surfaces (if colder than ambient temperature), and to allow the internal battery to come to temperature equilibrium for optimal operation.

The following items are included. Please check the package and notify Channel D of any discrepancy:

- Lino C Preamplifier
- External 5 volt power supply, 2.1 mm tip positive, 110 to 220 Volt 50 - 60 Hz Input, US domestic two conductor power cord (can be used with international adapters)
- 3/32" Allen Key
- Nonconductive stylus for setting configuration switches
- Accessory interlock for enabling Off The Grid mode
- Accessory right-angle 2.5 mm barrel plug with stripped and tinned pigtail for optional Automatic Off The Grid Mode
- Plug covers for bottom switch access ports
- Performance Measurement Graph showing your own Lino C's measured RIAA EQ accuracy. The serial number of the RIAA circuit board inside your Lino C is the same as the serial number of your Lino C.

Before making any input signal connections, disconnect the power supply from the rear of the Lino C.

If using Channel D Pure Vinyl™ software: be sure to mute the Pure Vinyl application software, if running on the computer, or otherwise mute or power down your power amplifier(s) while making signal connections, to avoid generating noises which could damage loudspeakers.



Lino C 3.0 rear panel shown above with optional Moving Magnet and Voltage Mode Moving Coil Inputs

MC Transimpedance Input (also applies to optional Voltage Mode input)

- The Lino C MC transimpedance input requires balanced (shielded twisted pair, which is two conductors inside a shield for a total of three independent conductors; as contrasted with coaxial unbalanced cable which is one conductor plus a shield) connections to the turntable. Turntables with RCA jacks can be used with an RCA to XLR cable.

Important: Pin 1 of the XLR connector must not be connected to either of the signal conductors, or hum/noise/distortion will result. Pin 1 should only be connected to the cable shield. If you detect any hum/noise/distortion please detach and check your input connection cable using a continuity tester or ohmmeter to insure that Pin 1 of the XLR is not internally connected to Pins 2 or 3.

Balanced cable and signal connections provide better noise immunity (because of common mode noise rejection) than conventional shielded (single conductor plus coaxial shield) cable. They are also a requirement for a current mode preamplifier, or hum/noise/distortion will result.

Standard Transimpedance Input (and Shared Outputs for Optional Inputs)



Signal Ground

- Securely connect the ground wire from the turntable / tonearm (if so equipped) to the binding post on the rear panel of the Lino C. This terminal is connected to circuit common. It is not connected to the chassis, which is floating in a Faraday cage configuration. If your turntable doesn't have a grounding connection, leave this terminal disconnected. **Important:** *only* connect the ground to a turntable chassis or ground wire, not to a ground connection on any other equipment.

Chassis Ground

- The Chassis Ground is not normally used, however it is provided in response to requests to facilitate connecting the common terminal of a third-party power conditioner.

Balanced Outputs

- The low impedance, balanced XLR outputs are configured by the factory to supply conventional RIAA corrected output.

The balanced outputs also can be configured to bypass the RIAA EQ for connection to the balanced inputs of a professional audio interface, for use with Channel D's Pure Vinyl™ software (for Mac computers) for applying RIAA compensation. (Consult the Pure Vinyl software User Guide for more information.)

If necessary, XLR output pin 3 may safely be connected to circuit common / ground (Pin 1), because the Lino C has servo balanced (ground sensing) outputs.

Single-Ended Outputs

- The single-ended / unbalanced outputs supply conventional RIAA corrected output for use with single ended / unbalanced outputs for a line preamplifier lacking balanced inputs. This corresponds to a standard phono preamplifier (with RIAA EQ curve) output signal.

The RCA phono outputs are true, single ended (unbalanced) connections derived by differentially summing the balanced signal "legs," rather than taking the inadvisable shortcut of only using the positive polarity signal leg of the balanced circuit, which would deliver poor performance.

Also, the standard RIAA EQ compensated signal appearing on the RCA output connectors is generated from a signal side chain independent of the XLR / balanced outputs, and may be used simultaneously with the XLR outputs without compromising the performance of the Lino.

Note: the Balanced and Single-Ended outputs are on separate signal chains, and may be used simultaneously.

Optional Moving Magnet Input



Signal Inputs

- The Moving Magnet inputs are balanced, but use RCA input connectors. Input cables can be standard unbalanced coaxial cables, or balanced, shielded twisted pair. If using shielded twisted pair balanced cable, note that the capacitance can be 40 - 50 pF per foot, and this would need to be added to the capacitive load switch settings.

To configure the input for Unbalanced, set the UNBAL switch setting for each channel to on.

Cartridge Loading

- Adjust capacitive loading with the switches. Intermediate settings are available by combining the settings. The capacitances are additive. For example, selecting the 100 and 47 pF settings the resulting capacitance is 147 pF.

With all capacitive loading settings disabled, the background capacitance is approximately 5 pF. The minimum capacitive switch setting is 33 pF.

The fixed load resistance is 47000 ohms.

Signal Ground

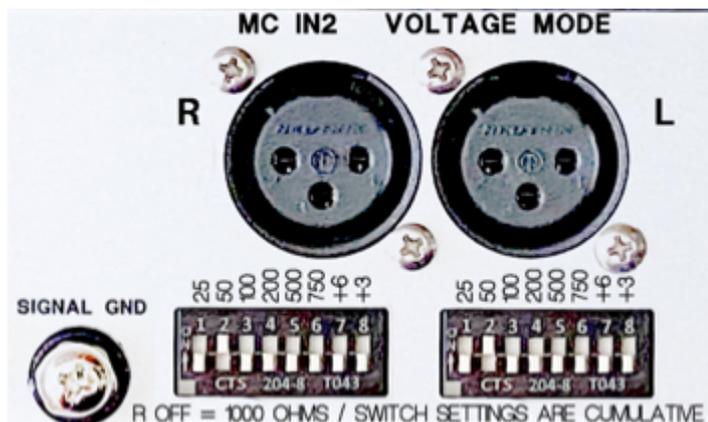
- Connect the ground wire from your turntable / tonearm (if so equipped) to the grounding lug. This terminal is connected to circuit common. A removable banana plug is provided, with a set screw for securing a ground lead terminated in a spade lug, otherwise a bare wire can be twisted around the set screw and the screw tightened.

If your turntable doesn't have a grounding connection, leave this terminal disconnected. **Important:** *only* connect the ground to a turntable chassis or ground wire, not to a ground connection on any other equipment.

Gain

- The input gain is 36 dB and can be increased via the Gain adjustment switches: 39 dB (+3), 42 dB (+6) or 45 dB (+3 and +6) dB.

Optional Voltage - Mode Moving Coil Input



Signal Inputs

- The Lino C second MC inputs are balanced, requiring balanced cables for optimal performance. An internal jumper setting is provided to configure the input for Unbalanced operation; however even when using a coaxial input cable, better results are usually obtained by keeping the input configured for Balanced operation.

Cartridge Loading

- Adjust resistive loading with the switches. Intermediate settings are available by combining the settings. Resistances combine geometrically. For example, selecting the 100 and 200 ohm settings, the resulting resistance is $1 / ((1/100) + (1/200)) = 67$ ohms. If selecting more switches, the same principle follows. For example, selecting the 200, 500 and 750 ohm settings, the resulting resistance is $1 / ((1/200) + (1/500) + (1/750)) = 120$ ohms.

With all resistive loading settings disabled, the resistance is 1000 ohms.

Signal Ground

- Connect the ground wire from your turntable / tonearm (if so equipped) to the grounding lug. This terminal is connected to circuit common. A removable banana plug is provided, with a set screw for securing a ground lead terminated in a spade lug, otherwise a bare wire can be twisted around the set screw and the screw tightened.

If your turntable doesn't have a grounding connection, leave this terminal disconnected. **Important:** *only* connect the ground to a turntable chassis or ground wire, not to a ground connection on any other equipment.

Gain

- The input gain is 58 dB and can be increased via the Gain adjustment switches: 61 dB (+3), 64 dB (+6) or 67 dB (+3 and +6) dB.

Power Up

- Connect the 5 volt power adapter to the power input jack on the back of the Lino C, and then connect the line to utility power. The Lino will activate after several seconds. A faint click may be heard as the internal relays are engaged.

Insert the barrel connector into the rear panel receptacle with gentle, minimal force. If it seems to not insert into the receptacle, please insure it is correctly aligned with the connector. Do not apply excessive force or the receptacle may be damaged. Two green power indicators will illuminate on the bottom of the chassis.

Power Down

- Any operating scenario: Unplug the 5 volt power adapter from the power input jack on the back of the Lino C.
- **Off The Grid Mode not enabled** (this is the default factory supplied mode): Unplug the 5 volt power adapter from the AC utility line.
- **Off The Grid Mode enabled** (by using the supplied interlock or pigtail accessory cord): Use the STANDBY button under the front panel. **Important:** if using an IoT Relay to automate Off The Grid Mode (see Appendix), you must also power down the relay using its power switch (or unplug it from the AC utility line), or your Lino C will not power down completely.

Please refer to the Off The Grid Mode section of the manual for additional information.

About the Lino C Rechargeable Battery Power Supply

- **Keep the Lino C continuously connected to utility power for maximum battery life.** The resulting quiescent power draw is low, less than 2 watts (and a fraction of that if placed in Standby mode). Battery charging is automatically managed. **The charging adapter is disconnected internally when an input signal is detected.** Then, the Lino C is galvanically isolated. The charging adapter will be automatically reconnected, recharging the battery, when an input signal is absent for approximately 10 minutes.

To prolong runtime indefinitely, engage CHARGE LOCK mode by pressing the right switch under the left side of the chassis.

If you wish to minimize idle power consumption while keeping the battery fully charged, engage STANDBY mode by pressing the middle switch under the left side of the chassis. This will power down the amplifier circuitry except for the battery charging and maintenance circuitry. **Important:** reduce the playback volume or power down the rest of your audio system before engaging or disengaging STANDBY mode to avoid any transient noises.

- The 9 ampere hour AGM battery will provide over 16 hours of continuous operation. Having the battery sited inside the chassis with the circuitry insures that it serves as a noise *sink* instead of antenna, if it were housed externally and connected via an umbilical. The benefits of its low impedance are also realized because the battery is physically close to the circuitry being powered.

Important note: Do *not* replace the power supply with a different one. The two-wire power supply has been very carefully selected for galvanic isolation and low noise. If replaced with a linear supply or a three-wire supply even of exactly the same rating, the internal circuitry may be damaged. ***This will void the warranty.***

In answer to user inquiries: the performance of the Lino C will *not* be improved by substituting a battery for the power adapter. The Lino C depends on having a relatively stable 5 volt (within ± 0.2 volt) DC input. This is not possible to achieve with any type of battery chemistry without also providing additional voltage regulation. An input supply voltage above 5.2 volts will damage the Lino C. An input voltage below 4.8 volts will result in diminished performance and battery life, and the Lino C may not even operate.

Power Adapter: The external, brick style supply adapter provides a galvanically isolated (a key consideration) raw DC voltage. The output is not used "straight" from the adapter, but stepped up inside the preamplifier to split supplies and then very highly filtered in multiple stages.

The circuitry employs a 4 layer circuit board with separate and continuous low inductance, low impedance internal ground and power planes congruent with the preamplifier circuitry. *The resulting power supply rails have much lower noise and ripple and tighter regulation than a linear DC supply can provide.* This is borne out in the signal to noise performance. A welcome additional benefit is very low idle power consumption and negligible heat production.

This kind of design wasn't even possible as recently as just 10 years ago. However, we now have a plentiful palette of new components to pick and choose from, thanks to the burgeoning consumer electronics industry's continuing quest for increasing miniaturization and reduced power consumption.

Off The Grid (OTG) Mode

Your Lino C may be operated entirely from the internal battery by disconnecting the wall plug from utility power and keeping the barrel connector inserted in the back of the Lino C. This can be confirmed by the power indicator on the bottom of the chassis, and of course, the Lino C's operation.

OTG mode is only enabled by inserting the supplied interlock or the included accessory 2-conductor pigtail signal cord into the port on the underside of your Lino C.

Reconnect the Lino and power adapter to utility power after using this mode to maintain the battery charge and to insure optimum battery life.

OTG Mode with automatic battery charging may be obtained by using an optional IoT relay. Please see the Appendix for more information.

Lino C Configuration - Bottom of Chassis

The internal signal routing of the Lino C is configurable. The factory “out of the box” settings are preconfigured for the most common usage scenario, or can be changed to suit your preferences.

Unplug the power supply from the jack on the back of the Lino C before changing the GAIN, DAMPING or BALANCED OUT settings.

Use the supplied nonconductive stylus to actuate the configuration switches. A fine tipped screwdriver also may be used, very carefully.

When making configuration settings, place the Lino on a flat surface covered by a soft cloth to avoid marring the finish.



(1) Pre-amplifier Gain, primary transimpedance input: The gain is adjustable via two four-pole DIP switches. There are 0 dB and +6 dB settings, plus maximum (+12 dB) gain by placing both of the two four-pole switches in the right-most position. The factory setting is for minimum gain (0 dB). **For maximum signal headroom, only select a higher gain setting if required for matching the level to other components in your system.** The gain settings are not cumulative; that is, the only settings are 0 dB, 6 dB and 12 dB.

Information for Pure Vinyl™ users: The *Pure Vinyl User Guide* includes complete information on setting the proper pre-amplifier gain for transferring LPs to digital files (with an external ADC - not included). Briefly, **you should aim for “Dry” signal level peaks in Pure Vinyl between -12 and -2 dBFS, for the music that you usually play.** Provided that peaks usually reach these levels, it’s not necessary to have to adjust the gain setting frequently, or at all. It’s prudent to allow at least 4 to 6 dB of headroom below full scale, to accommodate unexpectedly loud modulation levels. At the low end of the suggested signal range above, be certain that a signal peak represents music and not “pops” or “clicks.”

If your audio interface permits setting nominal input signal levels to consumer or professional format (true of professional audio interfaces from Lynx, RME, etc.), first try the consumer (“-10 dBV”) setting, in conjunction with the minimum gain setting on the Lino.

- **If signal levels are too high,** set the **input** of the audio interface to professional (“+4 dBu”) format.

- **If the levels are too low**, increase the gain on the Lino C. (For monitoring / playback, if the **output** levels of your interface can be adjusted independently of the input levels, use the +4 dBu setting for the **output**.)

(2) Balanced Output Signal Connectors (BAL OUT)

Balanced Output Phono Stage (factory setting): slide the two DIP switches to the RIAA position. The factory configuration is for the standard RIAA output setting.

Flat Phono Preamplifier for using with an external ADC and Pure Vinyl: slide the two DIP switches to the FLAT position.

Do not set the switches to any other setting than shown, or severe distortion will result.

(3) Cartridge Loading: As a current mode phono preamplifier, the Lino C doesn't require setting the cartridge load. All of the signal current produced by the cartridge is fully used with this design, which also insures that the cartridge's mechanical and electrical characteristics are fully damped and optimized.

(4) Cartridge Damping Setting: Low output moving-coil cartridges that have an internal impedance of about 12 ohms or more may perform more optimally by setting the Damping switches on the underside of the Lino C to the HIGH Z (high impedance) position.

All Damping switches must be set identically.

The factory setting of the Damping control is LOW Z (low impedance). This is optimal for low output, low impedance moving coil cartridges. However, it may be worthwhile to experiment with this setting. Some users who purchased Lino C version 2.2 preamplifiers that had incorporated this circuitry into the newest production units reported sound quality benefitted even with their low impedance cartridges.

(5) POWER indicator: Illuminates Blue when the circuitry is powered up.

(6) SIGNAL indicator: Illuminates Green when an input signal is detected.



Bottom of Chassis: Battery Power Supply Auxiliary Settings / Optional Signal Modifier and Input Selector Switches (viewing bottom front edge with Lino C upside-down)



Front Panel (with Optional Engraved Labelling and LED Indicators)

(7) Optional signal conditioning and additional inputs: Input selector and signal modifier settings are activated via silky smooth positive-action soft blue LED illuminated switches mounted underneath and along the front edge of the chassis, flush with the bottom of the bottom panel. The power supply auxiliary settings are operated by non-illuminated switches with a different tactile feel.

Mirror style labels are provided underneath along the front edge so that the switch labels can be viewed with a small mirror. A mnemonic card also is provided showing the switch locations.

Front panel function labelling and LED indicators are available as an option. LEDs are illuminated Blue with the function active and Green with the function off. The front panel LED indicators automatically adjust brightness in response to ambient light levels, becoming quite dim in a darkened room. The standard Lino C 3.0 is supplied without the indicators and engraved labels for those who prefer an uncluttered front panel.

Battery Power Supply Auxiliary Settings

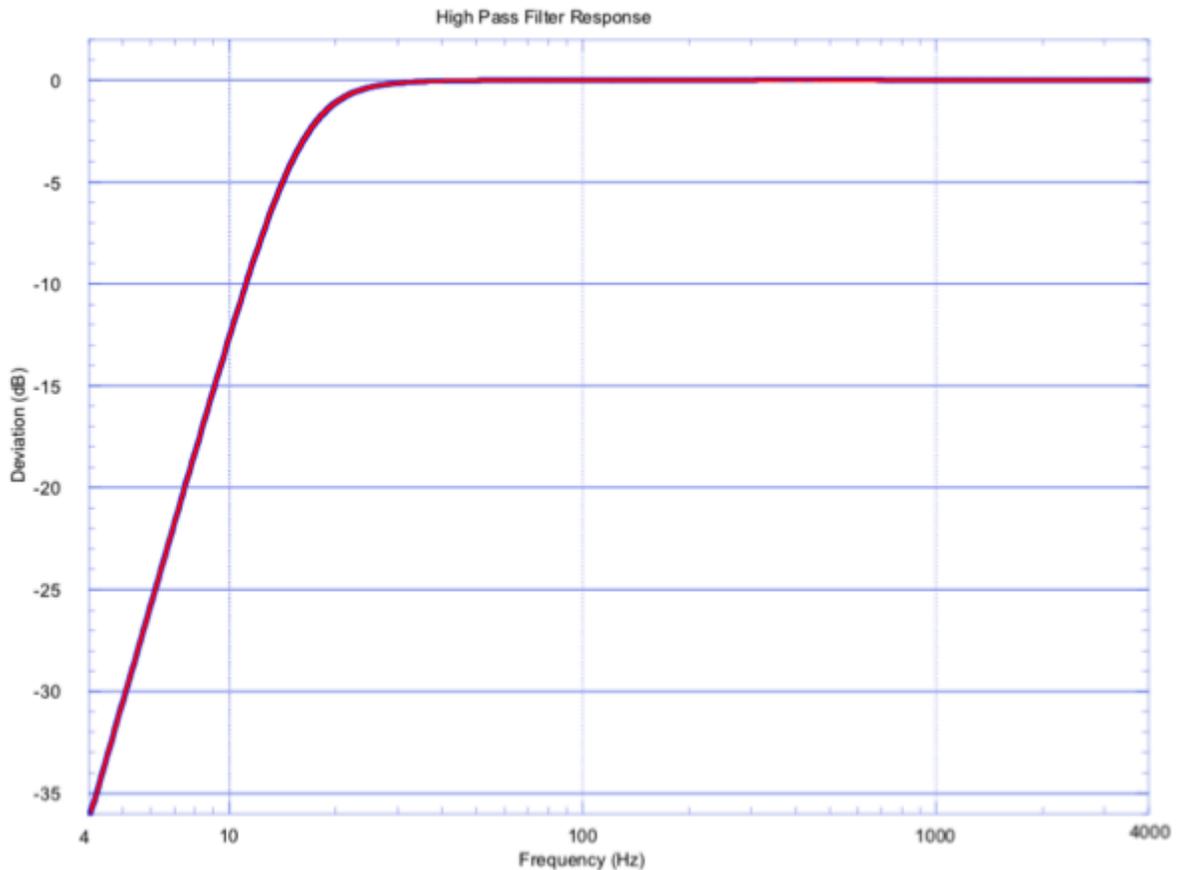
- **STANDBY:** Minimizes idle power consumption while keeping the battery fully charged. This will power down the amplifier circuitry except for the battery charging and maintenance circuitry.

In OTG Mode, operating the STANDBY switch will completely power down the Lino C. Otherwise, this would require unplugging the power adapter from the back of the Lino C to power down. See Off The Grid Mode for more information.

Important: reduce the playback volume or power down the rest of your audio system before engaging or disengaging STANDBY mode to avoid any transient noises.

- **CHARGE LOCK:** Prevents the battery charging circuit and power adapter from being disconnected. The battery will be kept fully charged.

Use this setting if you wish to operate your Lino C for extended periods of time, such as for component break-in. It also is used if the battery becomes depleted during a listening session, to keep the charging circuit from cycling on and off.



Measured Frequency Response (4 Hz to 4 kHz frequency range shown) of Optional 16 Hz 18 dB / Octave High Pass (Rumble) Filter

Optional Signal Modifier and Input Selector Switches

- **16 Hz HPF:** Activates the 16 Hz 18 dB / Octave high pass (rumble) filter. Use with warped records to preserve signal headroom and avoid low frequency woofer excursions.
- **MONO:** Sums the signal from both input channels and outputs the same signal to the Right and Left channel outputs.
- **POLARITY:** Inverts the absolute signal polarity.
- **MM IN (IN 2):** Activates the optional Moving Magnet input. If your Lino C is supplied with only an optional second MC input, this will be labelled MC IN.
- **MM/MC2:** In a Lino C equipped with optional MM and second MC inputs, selects between MM and MC2 inputs:
 - To use the MM input, activate MM IN and deactivate MM/MC2.
 - To use the second MC input (MC2), activate both MM IN and MM/MC2.

(8) Charging / On Grid Signal Port: A 2.5 mm barrel type connector jack is provided on the bottom of the preamplifier. When the Lino C is playing music (signal present) the jack (tip contact) will have 5 volts. When the Lino C is in charging mode (or powered down), 0 volts is supplied at the jack tip contact. The 0 volts is referenced to chassis ground (circuit common), which is connected to the “barrel” contact of the jack.

This can be used in conjunction with the Lino C’s “Off The Grid” (OTG) mode.

The charging supply is automatically disconnected internally when a signal is present. However, some audio enthusiasts express concern about external power supplies affecting the quality of the utility line power delivered to other components in the audio system. OTG mode addresses this concern by allowing the Lino C to operate for 16 hours without having the charging supply connected to AC utility power.

The “OTG Mode Enable Interlock”

OTG Mode requires that the supplied barrel-type Interlock plug be inserted into the Charging signaling port on the underside of the Lino C (or the pigtail extension wire and plug for the signaling port).

Without either of these inserted in the Charging signaling port, the Lino C will power down when utility power is removed, whether or not the power adapter plug is connected to the rear of the Lino C.

This insures that one must deliberately “opt in” to enabling / using OTG Mode, including the possibility of fully discharging the battery if the utility power is not reconnected.

- **MANUAL OTG Mode:** Disconnect the power supply two prong plug from the AC utility power line (or unplug the “figure 8” cord from the power supply). The power supply barrel must remain inserted in the Lino. Unplugging the barrel connector will power down the Lino.

When finished listening, be sure to remember to reconnect the power supply to the AC utility line to recharge the battery / prevent it from becoming discharged.

- **AUTOMATIC OTG Mode:** An optional, isolated power switching relay is required (not supplied). These can be obtained from vendors like Amazon. Example:

<https://www.amazon.com/Iot-Relay-Enclosed-High-Power-Raspberry/dp/B00WV7GMA2>
or search Amazon for “AC / DC Control Relay” or search the Internet for “IoT Relay”

These relays use a trigger input, such as the 5 volt signal supplied on the **Charging / On Grid Signal Port** to activate the power line.

The charging signal port can be used to automatically connect and disconnect the Lino C power supply from the utility power. When a signal is present and the preamplifier is in operation, the power supply is completely disconnected from the AC utility line. When a signal is not present, after a delay of several minutes the power supply is automatically reconnected, charging the battery.

Please see the Appendix of this manual for more information about using the external IoT relay.

About the AGM Rechargeable Battery

The AGM type lead/acid rechargeable (“secondary”) battery is superior to all other battery types for high-end audio.

Li-Ion: Audio doesn’t require the lower mass of lithium-ion needed in automotive or “drone” aircraft applications. The charging electronics of Li-ion are troublesome, and such batteries can fail in spectacular and hazardous ways.

Primary (non rechargeable) Li or any other disposable battery are inconvenient for use in a stationary product (and also see below comments regarding primary alkaline batteries).

NiCd / NIMH: Has low impedance but the disadvantage of low (1.2 volt) cell voltage, necessitating connecting nearly double the number of cells in series for the same operating voltage. Large-capacity sizes are difficult to obtain and very expensive, and recycling is cumbersome for small-volume end-users (who may be tempted to dispose of expired batteries in unsafe or environmentally unsound ways).

AGM will not leak electrolyte if the case is damaged/cracked because the electrolyte is contained by the sponge-like fiberglass battery plate separators. The battery may be operated in any position, even upside down (terminals facing downwards). AGM is also about one-fifth the cost of a Li-ion battery with the same energy storage capacity.

“Primary” (throw-away or non-rechargeable) batteries such as 1.5 or 9 volt alkaline cells are totally unsuitable for high quality audio applications because of their very high internal impedance and susceptibility to electromagnetic noise pickup.

The AGM battery is capable of supplying over 50 amperes of peak current. The battery is conditioned and kept float-charged by a proprietary circuit developed by Channel D, rather than use an "off the shelf" microprocessor based conditioning and monitoring circuit (which is necessary for Li-ion), which would introduce unwanted noise. Locating the battery inside the preamplifier chassis also insures that the battery is in the same electrical environment as the sensitive circuitry, eliminating many sources of noise pickup.

Though AGM contains lead, the recycling of lead batteries and complete recovery of lead as a valuable commodity is routine practice nowadays. Accordingly lead batteries have minimal environmental impact.

Rechargeable AGM Battery Operational Considerations: The Lino C should always be kept powered, to maintain a stable circuit temperature and the condition of the AGM battery. The power consumption (no signal) when the battery is fully charged is low, less than 2 watts. If necessary, the Lino C may be disconnected from the power supply for several months without adversely affecting the battery life. Do not store the Lino C at elevated temperatures, such as in an attic or garage.

The Lino C must be connected to the external power supply to initially power up. This design insures that the battery isn’t accidentally over-discharged, which could shorten its life. The power supply is used to activate two normally-open relays, which connect the battery to the Lino C circuitry, and the charging supply to the battery (see Appendix for a simplified diagram of the galvanic isolation circuitry). When a signal is detected (also true of the power-up state), the second relay is deactivated, disconnecting the charging supply from the battery (and the Lino C preamplifier circuitry). The battery voltage monitoring and power management are automatic. A new battery, when fully charged, is capable of supplying power for 16 hours of continuous operation.

The Lino C will automatically activate Charge mode (with the power adapter connected and connected to utility power) under either of the following two normal conditions:

- A signal resulting in an *output* level of less than -20 dBV isn't detected for about 10 minutes.
- The AGM battery has exhausted its charge.

Battery Life / Battery Replacement

Typical battery life will be between 3 and 5 years; up to 20 years is possible. The battery life is determined by three factors:

- (1) operating environment ambient temperature. Temperatures at or above 80 F should be avoided, as this will shorten the battery life
- (2) the number of deep discharges, defined as continuous operation with a signal connected (or in 100% battery mode) for more than 16 hours, or until the battery switches to charging mode
- (3) battery life will be extended by keeping the Lino C continuously connected to a power source and the battery fully charged. The idle power consumption is less than 2 watts.

Battery capacity also typically will increase slightly (by a few percent) during the first few discharge / recharge cycles.

Testing Battery Capacity: This test only would be performed annually, if at all, and unnecessary on a new Lino C which will always have a new and fully tested battery installed.

If not operating the Lino C in OTG Mode, insert the supplied Interlock in the socket in the port on the underside of the chassis. Disconnect the power adapter from the wall socket. If the Lino C shuts off in less than six hours, the internal rechargeable battery should be replaced. *In general, it is unnecessary to have to test the battery capacity.*

The battery is a widely available and economical type, commonly used for security alarm systems or remote power backup. They can be obtained from online retailers such as Amazon (search for Power Sonic PS-490; we recommend only using the genuine gray and blue Power Sonic brand rather than a putative "replacement" type). Alternatively, McMaster-Carr (mcmaster.com) part number 7448K25 is the Power Sonic PS-490. Overseas, Power Sonic has distributors and dealers on every continent.

- It's best to obtain a "fresh" replacement when needed, rather than keeping spares on hand, because degradation will begin to occur if stored for more than a few months without charging. The Lino C may be operated continuously, even with a degraded battery, so waiting for replacements to ship shouldn't be a problem.
- The replacement battery should be at ambient room temperature before installing.

If you don't wish to perform the battery replacement yourself, the Lino C can be shipped to Channel D for battery replacement. *Please contact Channel D for shipping information and pricing, and a Return Material Authorization number.*

End-User Battery Replacement Instructions

Important Safety Notice: when replacing batteries, hazardous voltages aren't present, but the battery is capable of supplying large currents (similar to an electric arc welder).

This high current capability is important to the superior audio performance of the Lino C, but also necessitates caution. If a battery terminal is accidentally shorted to a metallic conductor, such as a circuit board, the resulting electrical arc / sparking may severely damage the Lino C.

It's safe to touch or handle the battery terminals with your bare hands. However, **remove any metallic personal jewelry or items that could inadvertently contact and short the battery terminals together.** High temperatures generated by large currents conducted through metallic objects, possibly melting them, can result in serious burns and injury.

1. Remove the cover of the Lino C in accordance with the instructions below.
2. Disconnect the wire harness from the battery circuit board by carefully pulling the connector from its receptacle on the circuit board.
3. Disconnect the 4-pin connector from the battery PCB. The connector is attached to a cable that goes to the configuration switches on the left side of the Lino C. If necessary, lift and reposition the battery assembly for easier access to the connector.
4. If your Lino C has optional signal conditioning features or additional inputs, there may be a 2-conductor cable attached to the selector switch closest to the battery. Disconnect the 2-pin connector from the switch. Carefully handle the 2-conductor cable which is permanently attached to the battery PCB during subsequent steps.

There may also be a 6 or 8 conductor cable attached to the switch, routed over the battery. Leave the cable attached to the switch, and be careful of the cable when removing the battery.

5. Remove the battery with the attached circuit board from the chassis.
6. Carefully slide the circuit board off of the battery spade lug terminals:

Stand the battery on a table, with the terminals facing up. Grasp the battery with both hands, and press firmly along the bottom edge of the circuit board with both thumbs while holding your index fingers along the top edge of the battery and circuit board to steady the circuit board while sliding it off the terminals. (The top edge of the circuit board has the printing Lino C power supply.)

7. Very carefully attach the circuit board to the spade lug terminals of the replacement battery. The top edge of the circuit board will be flush with or slightly below the top edge of the battery when properly attached / seated. ***Handle the replacement battery gently.*** Its mass is suggestive of use as a hammer, but it is actually somewhat fragile internally. Avoid causing any mechanical impact which could cause internal damage, reducing its life.
8. Position the assembly inside the chassis and reattach the power connector and other connectors.
9. Replace the cover of the Lino C in accordance with the instructions below.

Opening the Lino C Chassis / Removing the Lid

1. Disconnect the power adapter and all signal connections from the Lino C.
2. Place a soft cloth under the work area to keep from marring the finish on the Lino C.

Opening the chassis of the Lino C requires removing a total of 6 fasteners.

3. Remove a total of four Phillips screws from the side panels with a Phillips screwdriver. There are two on each side.



4. Remove two flat head hex screws (indicated in image above) from the rear panel using the supplied 3/32" hex key.
5. The top, sides and front panel will detach together as one assembly. The rear panel will remain attached to the base.

The rear panel mates with the lid via a tongue and groove arrangement. To remove, place your fingers under the rear sides of the chassis. Brace your thumbs on the slight flange of the bottom portion of the chassis and use your thumbs to push away as you lift off the lid with your other fingers. Be careful not to rock the lid excessively, to avoid damaging the machined tongue.

The Lino C may be operated with the cover removed. Hazardous voltages are not present. However, be very careful (as with any electronic equipment) not to drop anything inside. If you do, immediately disconnect the power adapter from the rear of the Lino C before attempting to retrieve the object.

Reassembling the Lino C:

1. Position the lid so that the groove inside the rear edge of the cover is above the protruding tongue on the rear panel. Carefully guide the lid so that the machined tongue is inserted. When correctly positioned, the bottom of the back chassis plate will rest on the base, almost flush with the back edge of the base.

2. Insert the two 10-24 thread flat head Allen screws into the rear panel. Tighten the fasteners just finger tight at this stage (use the supplied 3/16" hex key to apply *gentle* persuasion if needed).

The screw threads should **easily** engage into the threaded holes in the bracket on the lid by using only your fingers (or the hex key, *gently*). If not, please confirm that the tongue and groove are properly mated and try again.

3. Reattach the Phillips screws. Tighten until just snug; do not over tighten.

The chamfered holes in the side panels must be centered on the threaded bushings in the base for the screw threads to engage properly. It may help to slightly brace the chassis against your body while applying pressure to make the holes align with the bushings.

4. Snugly tighten the two flat head Allen screws with the supplied 3/16" hex key.

Specifications - Lino C Current Mode Preamplifier for Low Output/Low Impedance (Moving Coil) Cartridges

- **Input Impedance:** less than 1 ohm, current mode (transconductance amplifier); adjustable resistive and capacitive loading for optional voltage-mode MM and MC inputs
- **Inputs:** Balanced, Neutrik Premium XLR (Gold RCA for optional MM input)
- **Outputs:** Balanced, Neutrik Premium XLR
- **Output Impedance:** less than 100 ohms balanced / less than 25 ohms unbalanced
- **Power:** 5 volt external power adapter, 2.1 mm barrel, two wire utility plug, tip positive
- **Power Consumption:** less than 2 watts idle
- **Circuit Topology:** Balanced, direct-coupled from input to output (no capacitors in the signal path). Modern surface mount component technology.
- **Gain (transimpedance):** The gain of the Lino C transimpedance phono preamplifier depends on the phono cartridge characteristics. The Lino C has more than 80 dB of signal gain at the maximum gain setting when using an ultra low impedance / ultra low output cartridge.

For example, the gain at the maximum (+12 dB) setting with a cartridge having 1 ohm internal resistance (the cartridge internal resistance is related to, but not the same thing as the cartridge load resistance applied with a conventional voltage-mode preamplifier) would be 85 dB. With a 5 ohm cartridge, maximum gain is 74 dB. If the cartridge has a higher internal resistance than 5 ohms, the gain will be less. Higher resistance cartridges have higher output voltage, and require less preamplifier gain. This dovetails perfectly with the current-mode design of the Lino C preamplifier.

The gain of the Balanced outputs, if configured for "Flat" gain (bypassing the RIAA compensation circuit), is 12 dB less. This is in accordance with the RIAA treble emphasis and typical tonal balance of a music signal from an LP record.

The balanced and unbalanced outputs are on separate signal chains, and the gains of the balanced and unbalanced outputs are equivalent. That is, signals appearing at the balanced (differential) and unbalanced (RCA ground-referenced) outputs will have the same peak to peak / RMS value.

- **Gain (optional MM Inputs):** 36, 39, 42, 45 dB
- **Gain (optional voltage-mode MC Inputs):** 58, 61, 64, 67 dB
- **RIAA Accuracy:** guaranteed better than ± 0.1 dB, 20 Hz - 20 kHz*
- **RIAA Channel Matching:** better than ± 0.02 dB, 20 Hz - 20 kHz
- **Channel Separation:** ≥ 80 dB, 20 Hz - 20 kHz
- **Distortion:** lower than 0.005%, 20 Hz to 20 kHz
- **Outputs:** Balanced, Neutrik Premium XLR (internal switch setting for FLAT or RIAA); Gold-plated RCA
- **RIAA Circuit Topology:** Direct coupled from input to output; no DC blocking capacitors in signal path. Two stage correction circuit. (1) Passive high frequency correction. (2) Active low frequency correction using low distortion, low impedance wide bandwidth amplifier.

* Factory certification also is optionally available for RIAA Accuracy better than ± 0.01 dB and RIAA channel matching better than ± 0.005 dB, 20 Hz - 20 kHz

General

- **Dimensions:** 17.1" x 2.9" x 9.3" (W x H x D)
- **Shipping Weight:** 18 pounds

Miscellaneous: Precision, 0.1 percent tolerance low temperature coefficient, low noise metal film resistors. Ultra low dissipation sputtered metal film polypropylene capacitors, selected and matched by hand to better than 0.1 percent tolerance for outstanding RIAA accuracy. Ultra low ESR power supply decoupling capacitors. Low noise, four-layer circuit boards with continuous internal ground and power planes. Carefully selected, low noise galvanically isolated brick battery charging power supply, filtered in multiple stages for extremely low noise. Automatic class A/AB biasing of input and RIAA amplifier circuitry. Independent balanced XLR and unbalanced RCA ground referenced outputs. Modern surface mount component technology.

Warranty

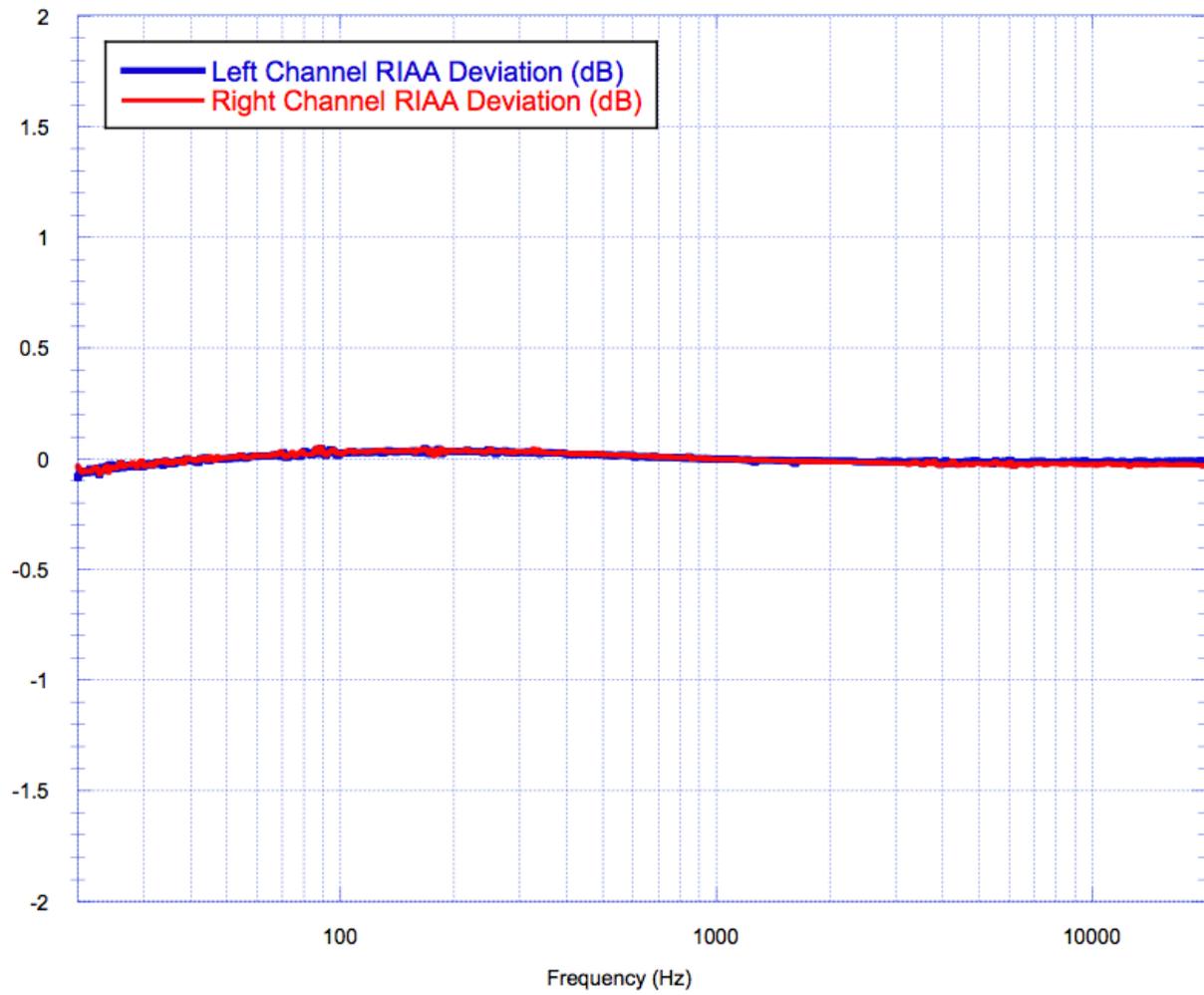
- Electronics, five years; battery, 3 years; parts and labor, limited warranty. In the unlikely event your Lino must be returned to Channel D for repair, **contact Channel D in advance for a return material authorization number and shipping instructions. Items sent without an RMA number will be refused delivery.**

In keeping with our ongoing efforts to enhance and improve our products, we reserve the right to change specifications, pricing, or included accessories without notice.

APPENDIX

20 Hz to 20 kHz Sample RIAA Accuracy Graph

This is a sample. The graph for your own preamplifier's actual measured RIAA accuracy is included separately.



APPENDIX - Troubleshooting

Troubleshooting / Problem:

There is a clicking sound emanating from the Lino C / or the power indicator LED cycles off and on (or doesn't come on at all) / or the Lino C is not producing any audio signal.

Diagnosis: The internal battery is depleted.

Causes:

1. The power adapter was disconnected from utility power while the power adapter was attached to the rear of the Lino C, and the Off The Grid Interlock or the accessory_pigtail signal cord is being used.

This activates “off the grid” mode. *This will discharge the battery if the power adapter is not connected to the AC utility line within 16 hours.*

- **Insure that the power adapter plug has not inadvertently become partially or completely dislodged from the back of the Lino.**
- **Insure that the power adapter “figure 8” shaped AC line cord connector is securely plugged into the power adapter.**



- Above has been verified? see Solution: on the next page.

2. A signal (playing LPs) is applied to the input continuously for more than about 16 hours.

When a signal is applied, the battery charging supply is automatically disconnected, galvanically isolating the Lino C. The battery capacity is sufficient to power the Lino for up to 16 hours. The battery charge must be replenished by connecting to utility power, same as needing to refuel your automobile (chainsaw, snow blower, power washer, backhoe, motorcycle, power boat or airplane) after using it. Lino C battery (re)charging happens automatically about 10 minutes after the signal is removed, unless the utility power cord is disconnected (either deliberately or accidentally).

3. There is excessive electronic noise in the signal connection from the turntable, which keeps the Lino C from activating battery charging mode.

Electronic noise from the signal connection will masquerade as an input signal. This will happen if there is a broken wire in the connecting cable or if an unbalanced (coaxial) cable is used with the balanced input instead of a correctly-wired **balanced** (*shielded twisted pair*) cable.

*See **Diagnosing Excessive Signal Connection Noise** below for diagnosing excessive signal connection noise issues. If you cannot resolve signal connection noise issues, operate your Lino C in CHARGE LOCK mode.*

Diagnosis / Solution:

1. Disconnect the power adapter from the rear of the Lino C.
2. Disconnect the input signal connections.
3. Reconnect the power adapter to the rear of the Lino C. Insure that it is fully engaged in the Lino. **Do not use force, the barrel plug should slide in easily. If it does not, check the alignment and try again.**
4. Insure that the power adapter is connected to the AC utility line, and that the figure-8 AC power cord connector is securely inserted into the power adapter.

5. If the clicking continues:

Activate CHARGE LOCK mode.

6. Allow the Lino C to charge for an hour with the signal input connections disconnected, then perform the steps listed below under Diagnosing Excessive Signal Connection Noise.

Note: Battery charging to 95% capacity takes about 8 hours if the battery has become fully discharged.

Generally, fully charging the battery takes about 1/2 of the time the Lino C has been driven with an input signal, to replenish the battery charge that was used.

Diagnosing Excessive Signal Connection Noise

1. Connect the signal input connections (if they were previously disconnected).
2. Connect the power adapter to the rear of the Lino C to power it on.
3. There are two “state” LEDs on the underside of the Lino C. The BLUE LED indicates that the circuitry is powered up. The other GREEN LED indicates a signal is present.

The GREEN LED should be off when you are not playing an LP.

4. If the GREEN LED illuminates when you are not playing an LP or doing something that could cause an input signal, e.g., cleaning the stylus, activate the STANDBY Mode using the external STANDBY switch. Wait 5 seconds, then deactivate STANDBY Mode. The Lino C will power up.

The GREEN LED should be off, and stay off (wait for 10 seconds for the Lino C to complete its power up sequence).

If not, and the GREEN LED stays extinguished only with the signal inputs disconnected (follow the steps listed under Solution above), there is an issue with the signal connections to the turntable that must be corrected for the Lino C to operate properly. Please contact Channel D if you need assistance.

In the meantime, only operate the Lino C with the CHARGE LOCK Mode activated. This will insure that the battery doesn't become excessively discharged.

Troubleshooting Questions

Question: Where is the serial number for my Lino C?

Answer: The serial number can be found in four places:

1. On the shipping document / packing list
2. On the printed graph of RIAA accuracy measurement supplied with your Lino C
3. On the graph of the RIAA accuracy measurement on the bottom chassis panel of your Lino C
4. On the top (RIAA) circuit board inside your Lino C

Question: Should I connect my Lino C to a UPS (uninterruptible power supply)?

Answer: A UPS typically will supply power for only about 15 minutes, to a maximum of a few hours (even very lightly loaded), so there is no advantage to doing this.

In the event of a power interruption, and the Lino C is configured for OTG Mode, the Lino C battery will provide power for approximately 16 hours, and automatically recharge the internal battery when power is restored (this includes using an IoT relay).

If the power interruption is longer than the UPS runtime, the UPS won't maintain power anyway. If the internal battery becomes exhausted, and the charging supply is not connected to an active AC utility line, the Lino C will automatically power down. However, if the power interruption is more than about 16 hours (or of an unknown anticipated duration), the Lino C should be powered down manually by unplugging the power adapter from the rear of the Lino C, and then reconnected to the AC utility line so the battery will be recharged when power is restored. Note: placing the Lino C in STANDBY mode will devote all of the input power to battery recharging, providing a faster charge.

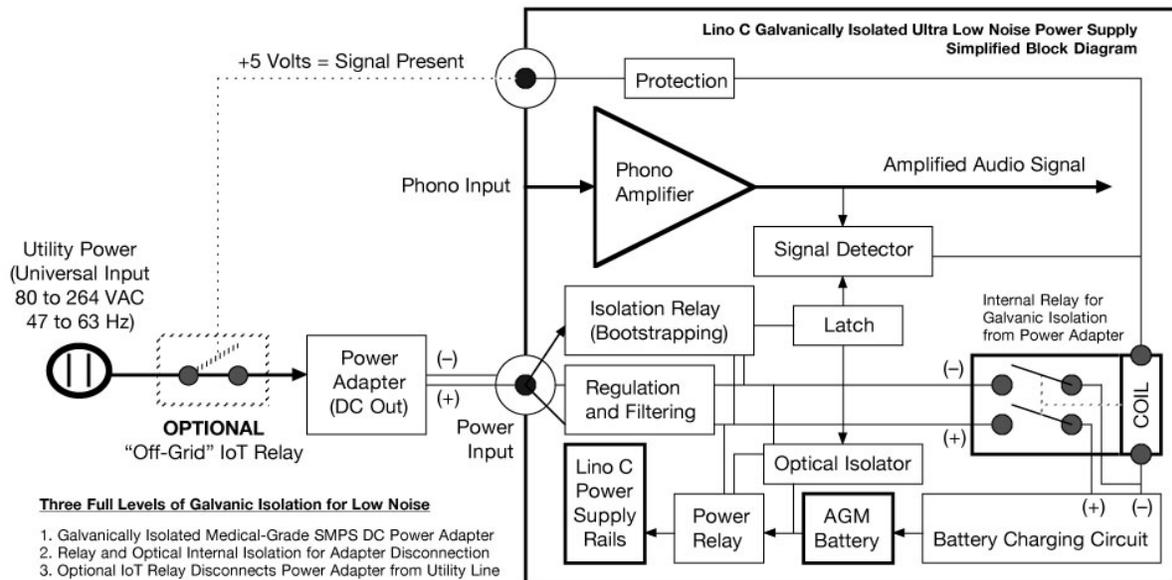
Problem: I hear a whining, beeping, humming, buzzing, whistling, or other kind of strange noise coming from my system.

Solution: Check to make sure you are using a Lino C, instead of another phono preamplifier!

The Lino C was designed for real-world usage “in the trenches” and works as well in any customer’s audio system as it does in a controlled, “perfect” isolated listening / system environment or lab test bench.

We have devised testing methodologies for stressing input circuitry with radio frequency interference well into the GHz range, simulating environments near cellular and broadcast transmission towers, for testing EMI and RF susceptibility and improving our preamplifier designs. This is necessary for working satisfactorily while immersed in the EMI and RF “soup” of our modern world, something preamplifier designers from an earlier era never had to contend with! *With properly wired balanced connections to your turntable / cartridge, the Lino C is guaranteed to have **no** hum, and will be immune to electromagnetic interference pick-up.*

Appendix: Block Diagram of Galvanic Isolation Circuitry

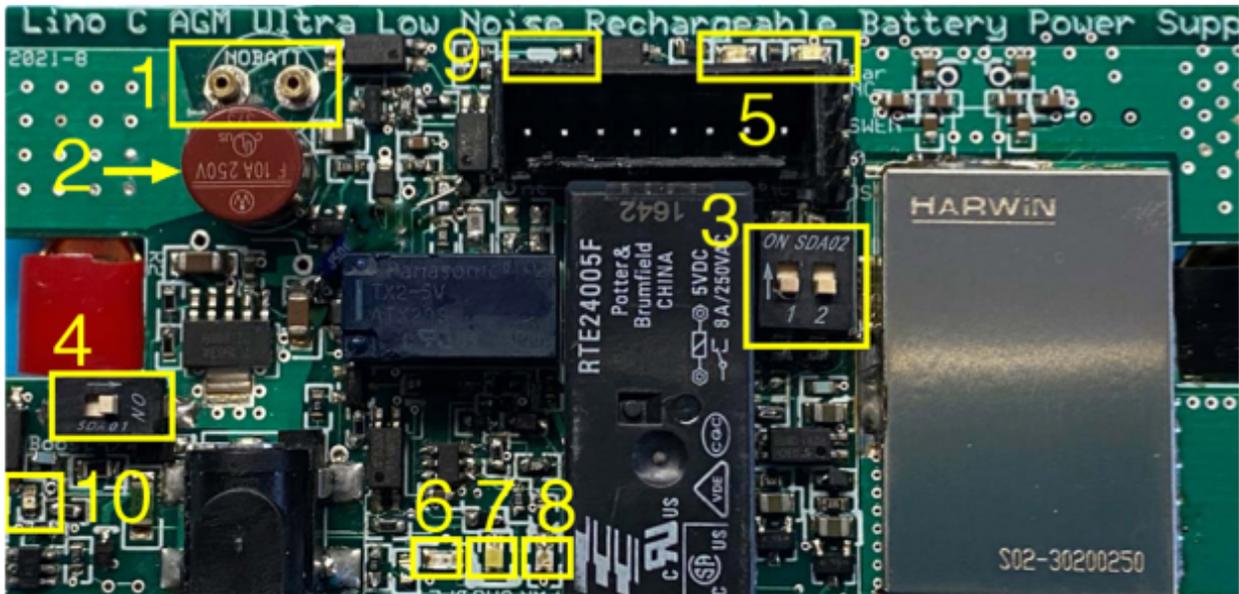


Much of the low-level functionality of the battery maintenance circuitry is omitted in the above diagram. For example, there are voltage sensors that determine when the battery is discharged and when to apply a topping-off equalization charge, which insures that all of the battery's electrochemically active storage material is fully charged, prolonging the battery's service life. (Different battery chemistries have different charging requirements. For example, the life of Li-Ion batteries is prolonged when kept at less than full charge. This is not true of AGM which lasts longest when kept fully charged.)

Interfacing this circuitry with the world "on the other side" of the galvanic isolation barriers is not trivial. The design solution incurs substantial expense (because of added complexity and additional components needed) and is a major obstacle to properly incorporating rechargeable battery power into a product while retaining all of the advantages of battery power. For example, there are two high-current plus two small-signal electromechanical relays incorporated on the battery circuit board, plus five phototransistor-based optical isolators (each rated for over 4000 volts of isolation voltage) for interfacing various signals across the galvanic isolation barrier.

The functionality is implemented with analog circuitry designed and developed through years of our own R&D efforts. These functions (presuming one already possesses expertise in battery technology) are nearly trivial to implement via software with a digital microcontroller; consider that Channel D also is well-versed in designing and developing digital computer software (after all, the "D" stands for digital)! However, we believe that incorporating computerized digital circuitry into a very sensitive analog component that's responsible for amplifying extremely low level signals is inadvisable.

Appendix: Battery Circuit Board and Auxiliary Settings



- IMPORTANT: Disconnect the power adapter from the rear of the Lino C to power it down before making changes to configuration settings.

- Use the supplied nonconductive stylus for changing any switch settings.

1 Protection Fuse Position for Battery Bypass

The battery may be bypassed and the Lino C operated without the battery by moving the circuit protection fuse to the sockets labelled NOBATT. The Red LED (6) will illuminate when power is applied.

2 Protection Fuse Position for Normal Battery Operation

This is the normal, factory-configured position for the circuit protection fuse.

3 “Soft” Isolation Switches

This slightly bypasses the full galvanic isolation of the power adapter as the battery discharges and will extend the runtime while the power adapter is connected, without fully switching into charge mode.

4 Battery Condition Charge Setting

Place this switch in the ON position to slightly boost the battery charging voltage. This will help to “condition” the battery in the event it is over-discharged. Keep the switch in the ON position for several days for full conditioning. *The Lino C may be operated with the switch in the ON position.*

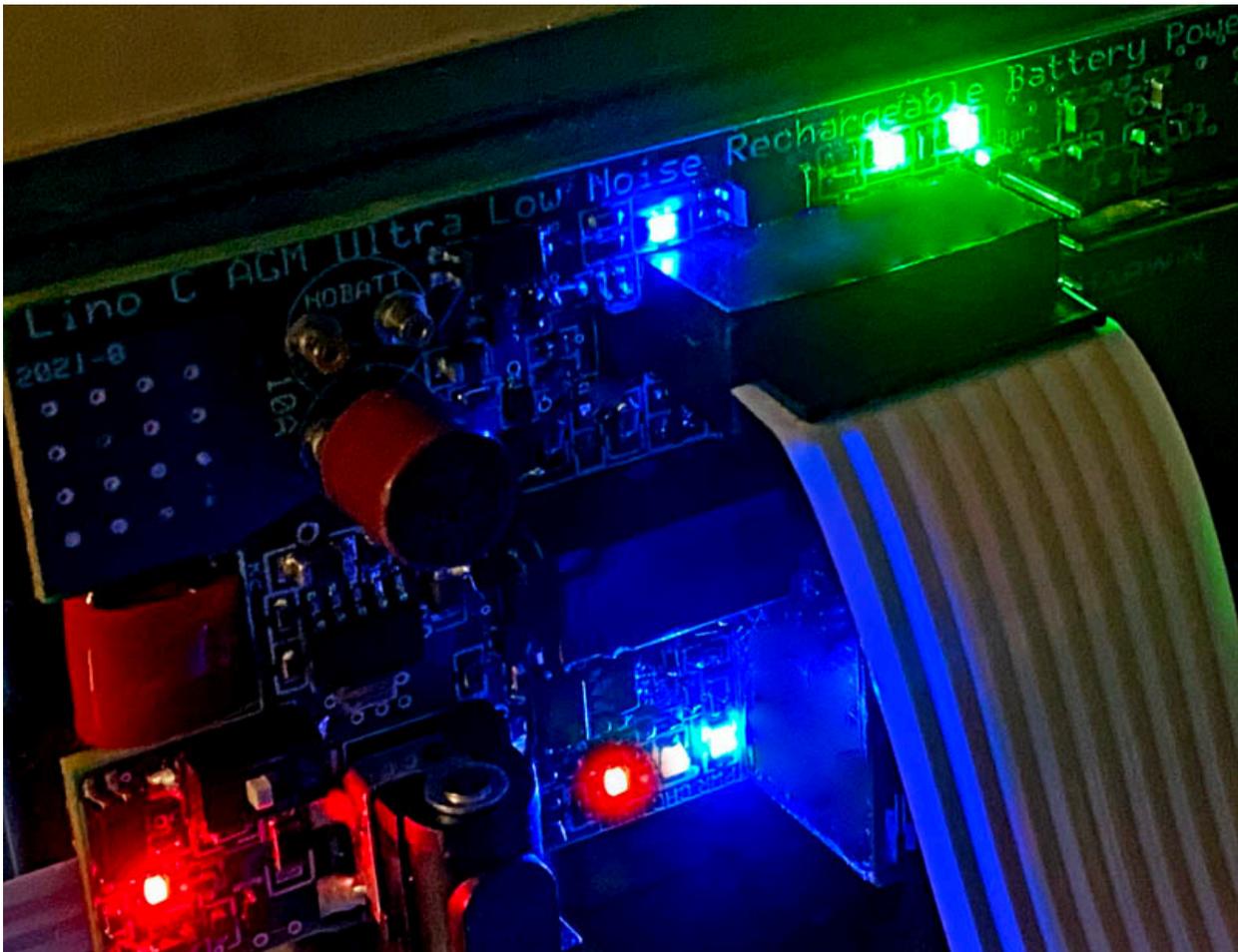
If the Lino C is operated in an environment where the ambient temperature is 80 degrees F or greater (note, ambient temperatures in this range are not recommended for continuous operation of the Lino C), keeping this switch in the ON position will help to prolong battery life. However, operating the Lino C at high ambient temperatures will always diminish the battery life.

Note: earlier versions of the PCB will have jumper terminals instead of a switch. To activate, place the supplied jumper in the bridging position (attached to both terminals). To deactivate, remove the jumper. It may be stored by “parking” it on just one of the terminals - as supplied from the factory.

5 Green LEDs - Power Supply Rails Present

6 Red LED - Battery Fault or Battery Absent or Battery Discharged

- 7 **White LED - Lino C is in Charge Mode / Battery Charging**
This LED will always be extinguished in Off The Grid Mode.
- 8 **Blue LED - Power Activated** (battery is connected to the Lino C preamplifier circuitry via a power relay)
This LED will always be illuminated whether or not the Lino C is in Off The Grid Mode.
- 9 **Blue LED - Input Adapter Power Present**
- 10 **Automatic Battery Equalization Charge (EC)**
If the battery is replaced or is very deeply discharged, the EC LED may illuminate. The charging circuit will apply a higher charging voltage until the battery has undergone an equalization charge. This will help to prolong battery life. The LED normally will extinguish within 24 hours. If it does not, activate Switch 4 and place the Lino C in Standby mode for 24 hours (unless the EC LED extinguishes first).



The photo above viewing the Lino C battery circuit board illustrates the Lino C idling (no signal applied for at least 10 minutes; accordingly, the battery is charging) with the power adapter connected to the AC utility line.

This shows the LEDs for:

- Power Supply Rails Present (Green, LED 5)
- Power Supply Input Adapter Power Present (Blue, LED 9)
- Battery is Charging (White, LED 7), and
- Power Activated (Blue, LED 8) illuminated.
- Battery Absent or Discharged (Red, LED 6) and Battery EC (Red, LED 10) also illuminated. This shows an abnormal condition that will be eliminated as the battery charges.

Instructions for using **optional** Amazon AC/DC control relay for automatic OTG Mode (described on pages 7 and 12 of the Lino C 3.0 manual)

The Lino C power supply will be completely disconnected from the utility line when a signal is present at the input of the Lino C. The Lino C power supply will be reconnected when a signal is absent. **Note: this isolation is in addition to the internal galvanic isolation and power supply disconnection performed inside the Lino C when a signal is present. Accordingly, it is optional to use the control relay.**

<https://www.amazon.com/Iot-Relay-Enclosed-High-Power-Raspberry/dp/B00WV7GMA2> (Or search Amazon for AC/DC Control Relay, or search the Internet for IoT Relay)



1. Attach the accessory pigtail supplied with the Lino C to the green two pole connector of the AC/DC Control Relay using a fine tipped slotted screwdriver. The striped wire of the pigtail corresponds to the positive polarity connection. Be sure to observe proper polarity.
2. Connect the right-angle barrel connector end of the pigtail cord to the port on the underside of the Lino C.
3. Connect the two pole connector to the port on the AC/DC Control Relay.
4. Plug the Control Relay into the utility line using the three prong utility power cord.
5. Plug the Lino C power supply barrel connector into the back of the Lino C.
6. Plug the Lino C power supply two prong utility cord into the “Normally On” outlet on the AC/DC Control Relay. (Note: unlike the Lino C 2.0, the Lino C 3.0 doesn't require a “priming” step.)
7. **Very Important:** confirm proper operation by the illumination of the green Switch Active LED on the AC/DC Control Relay. This must then extinguish when no signal is present for about 10 minutes. If not, see troubleshooting - **Diagnosing Excessive Signal Connection Noise.**

To fully power down the Lino C after turning off the IoT Relay, disconnect the barrel plug from the rear of the Lino C, or else operate the STANDBY switch.