

## *Channel D Lino C*

**Balanced, *Current Mode* Direct-Coupled Wide Bandwidth  
Low Distortion Ultra Low Noise Precision Phono Preamplifier**

**For Low Output / Low Impedance Moving-Coil Phono Cartridges**

**Installation and Use Manual**

Revision 2a

## QUICK START

1. Allow your Lino C to fully acclimate to ambient temperature before removing it from the inner plastic bag.

2. **Current Mode phono preamplifiers *require* 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 cannot operate properly with unbalanced (coaxial conductor with shield) input wiring.* Hum, noise and distortion will result. When connected properly, the Lino C is guaranteed to have no audible hum.

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 power adapter to the Lino C. **The barrel of the power adapter will *easily* slide into the power input jack on the rear of the 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. Two green indicator lights on the bottom of the chassis will illuminate when the Lino C has power and is operating.

6. It's best to keep the Lino C continuously connected to utility power. Unplugging the power adapter from the utility line will place the Lino C into 100% battery mode. Read the manual for important information about using 100% battery mode.

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

## **Channel D Lino C Installation and Use Manual**

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**Congratulations on your purchase of a Lino C phono preamplifier!** The Lino C is a low noise, low distortion fully balanced *current mode* preamplifier featuring a wide frequency bandwidth. This provides you with the key to obtaining stunning, three-dimensional music reproduction from your LP records.

The Lino is specifically designed to deliver extremely high quality music reproduction from low output moving-coil cartridges.

The Lino 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 (better than  $\pm 0.1$  dB) RIAA EQ accuracy provides standard RIAA-corrected phono preamplifier outputs with outstanding quality. The 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, 21st century 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
- RCA female to XLR male adapters, pin 1 open
- Performance Measurement Graph showing your own Lino C's measured RIAA EQ accuracy. Note: the serial number of the RIAA circuit board inside your Lino C is the same as the serial number of your Lino C.

Signal connections can safely be made to the Lino C while the power supply is connected and powered.

***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.

### Signal Inputs

- The Lino C, as a current mode MC preamplifier, 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.

### Chassis Ground

- Securely connect the chassis ground wire from your turntable / tonearm (if so equipped) to the grounding lug on the rear panel of the Lino C. 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.**

### 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 unadvisable 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.

### 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. 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. (This indicator setup was also used in our Nano phono stage from 2009.)

### **Power Down**

- Disconnect the 5 volt power adaptor from the power input jack on the back of the Lino C.
- **100% Battery Mode:** The Lino C may be operated entirely from the internal battery by disconnecting the wall plug from utility power and leaving the barrel connector inserted in the back of the Lino C. This can be confirmed by the power indicators on the bottom of the chassis, and of course, the Lino C's operation. ***Reconnect the Lino and power adapter to utility power after using this mode to maintain the battery charge and to insure optimum battery life.***

### **Rechargeable Battery**

- The 9 ampere hour AGM battery will provide over 24 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.
- **Keep the Lino C continuously connected to utility power for maximum battery life.** The resulting quiescent power draw is low, less than 2 watts. 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.

**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  $\pm 0.2$  volt) DC input. This is not possible to achieve with any type of battery chemistry without also providing additional voltage regulation. Input supply voltages above 5.2 volts will damage the Lino C. Voltages 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 setup 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.

### Accessing the internal components for gain and configuration settings:

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.
3. Remove a total of four side panel Phillips screws with a Phillips screwdriver. There are two on each side. It's easiest to stand the Lino C on its side and remove them in pairs.

After removing the Phillips screws, carefully support the Lino C by placing a hand under the base, between the feet, and carefully place it right side up, resting on the feet.



4. Remove the four flat head hex screws (indicated in image above) from the rear panel using the supplied 3/16" hex key.

5. The lid, sides and front panel will detach together as one assembly. The rear panel is 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 rear panel with the signal connections will remain attached to the base.

The Lino C may be operated with the cover removed.

### To reassemble the Lino C:

1. Position the lid so that the groove on the rear of the cover is above the protruding tongue on the rear panel. Carefully guide the lid so that the machined tongue is inserted. Apply moderate pressure and it will snap into place. 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. Reattach the four flat head hex machine screws to the rear panel.

The screw threads should easily engage by using only your fingers. If not, please confirm that the tongue and groove is properly mated and seated and try again. It may be helpful to start with one of the screws

closest to an outside edge and work your way to the other side, rather than starting with one of the two screws which are closest to the center. Finally, snugly tighten all four screws with the supplied 3/16" hex key using moderate pressure. Do not over tighten.

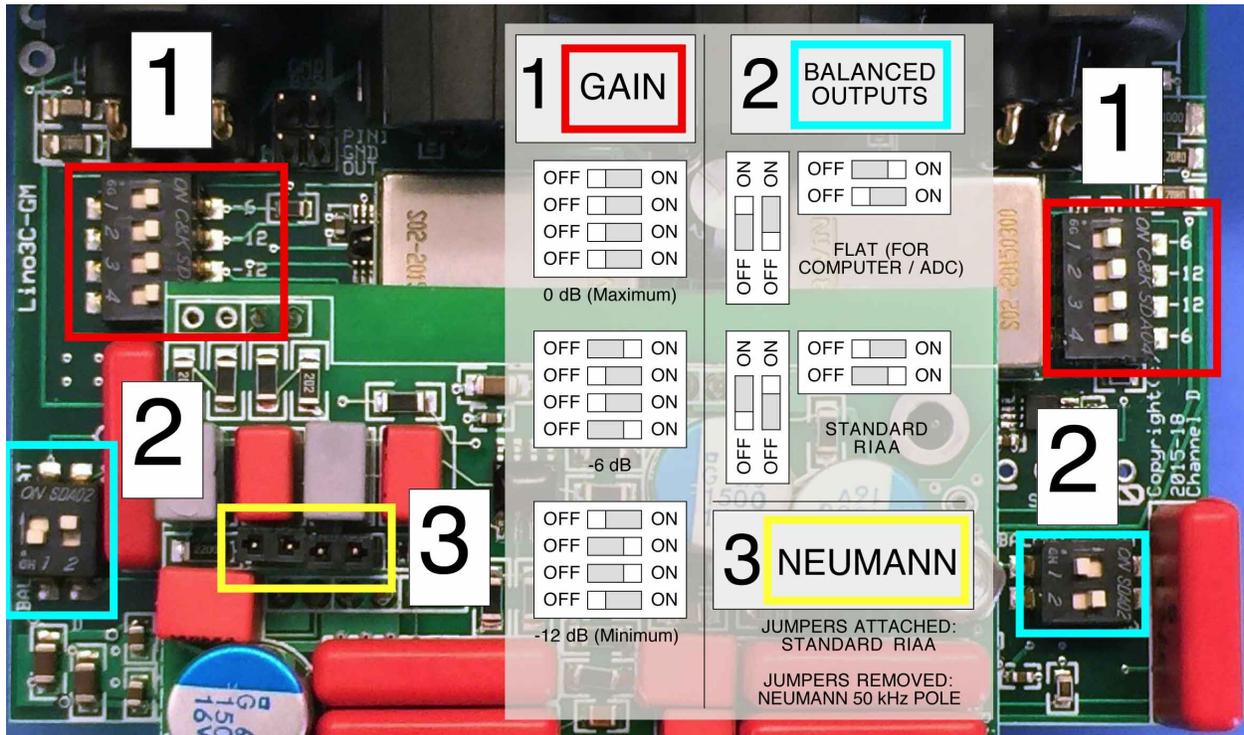
3. Stand the Lino C on one side and reattach two Phillips screws. Repeat with the other side. Tighten until just snug; do not over tighten.

The chamfered holes in the side panels must be centered precisely on the threaded bushings in the base for the screw threads to engage properly. It may help to brace the chassis against your body while applying pressure on the chassis to make the holes align with the bushings. The chassis is stressed to attain higher rigidity for better immunity to external vibrations.

## Balanced Output Configurations - Flat or RIAA output

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.

**Disconnect the Lino C power supply from the jack on the back of the Lino C before changing any configuration settings.**

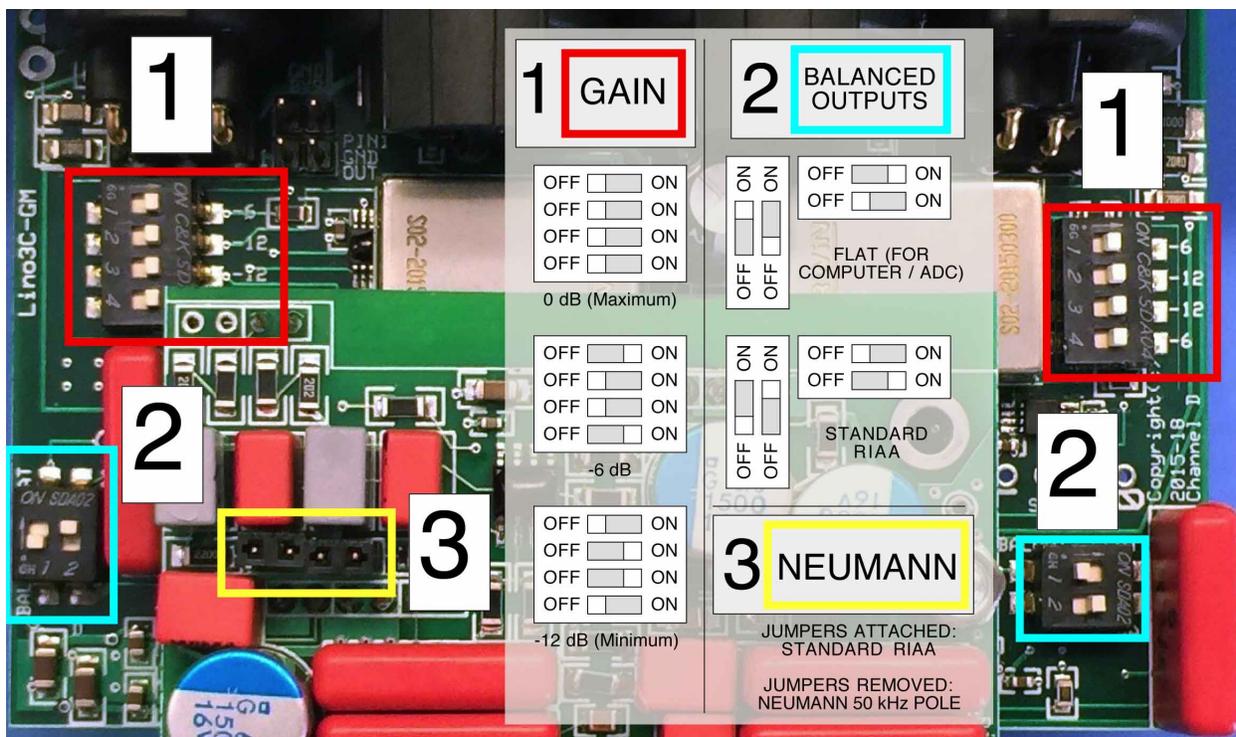


**(1) Preamplifier Gain:** The gain (actually configured as attenuation) is adjustable via two four-pole DIP switches on the circuit board. There are -12 dB and -6 dB settings, plus maximum (0 dB) gain by placing all settings on the two four-pole switches (1) in the OFF position. The factory setting is for medium attenuation (-6 dB). Only select the highest gain if needed 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 and -12. Setting the -6 and -12 switches simultaneously will also provide -12 (as shown in the image above).

**Information for Pure Vinyl™ users:** The *Pure Vinyl User Guide* includes complete information on setting the proper preamplifier 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 -20 and -4 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,” which also should remain below 0 dBFS at the high amplitude end of the signal range.)

**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) Stand Alone, Balanced Output Phono Stage (the factory setting):** slide the two DIP switches on the two, two-pole DIP switches labeled RIAA on the circuit board to the ON position, and slide the switches labeled FLAT to OFF. This is the setting shown in the image above, and is the factory configuration unless Channel D is advised in advance of shipment that you intend to use the Lino with an external ADC.

**Flat Phono Preamplifier for using with an external ADC and Pure Vinyl:** slide the two DIP switch settings on the two, two-pole DIP switches labeled FLAT on the circuit board to the ON position, and slide the switches labeled RIAA to OFF.

Do not set more than one of the switches on each two-pole switch to the ON position.

**(3) Neumann RIAA Curve Modification (on RIAA module)**

The Lino is configured from the factory for the standard RIAA phono correction curve. The so-called “Neumann” modification introduces an additional high frequency time constant at 50 kHz to compensate for the putative roll-off of the mastering lathe cutting head. The Neumann setting can be enabled by removing the two jumpers on the RIAA module (or placing them in a “parking” position with one jumper socket open). *The factory setting is with the jumpers bridged (standard RIAA phono correction).*

**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.

### **AGM Rechargeable Battery Operation and Charging**

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. 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 well over 24 hours of continuous operation. The AGM type lead/acid battery is superior to *all* other battery types used in high-end audio applications. Audio doesn't require low mass (such as automotive or aircraft), and the charging electronics of other chemistries such as Li-ion are troublesome (and such batteries can fail in spectacular and dangerous ways). AGM will not leak electrolyte if the case is damaged / cracked because the electrolyte is contained by the sponge-like fiberglass separator mat which separates the battery plates. AGM is also about one-fifth the cost of a Li-ion battery with the same energy storage capacity.

The battery is capable of supplying over 20 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 potential sources of noise pickup.

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 6 years; up to 20 years is possible. The battery life is determined by three factors:

- (1) operating environment temperature. Temperatures 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 24 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.

The 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, and not on a new Lino C which will always have a new and fully tested battery installed. 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.

The AGM (Absorbent Glass Mat plate separator type) lead/acid 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 (at 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.

- 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.

**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.

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.*

1. Remove the cover of the Lino C by following the instructions on Page 4.
2. Disconnect the silicone insulated wire harness from the battery circuit board by depressing the locking latch on the connector and carefully pulling the connector from the circuit board.
3. Remove the battery with attached circuit board from the chassis.
4. Carefully slide the circuit board off the battery spade lug terminals.
5. 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.
6. Position the assembly inside the chassis and reattach the power connector.
7. Replace the cover of the Lino C by following the instructions on Page 4.

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

- **Input Load Resistance:** less than 1 ohm, current mode (transconductance amplifier)
- **Inputs:** Balanced , Neutrik Premium XLR
- **Outputs:** Balanced, Neutrik Premium XLR
- **Output Impedance:** 20 ohms
- **Power:** 5 volt external power adapter, 2.1 mm barrel, two wire utility plug, tip positive
- **Power Consumption:** less than 2 watts idle
- **Dimensions:** 17.1" x 2.9" x 9.3" (W x H x D)
- **Shipping Weight:** 18 pounds
- **Circuit Topology:** Balanced, direct-coupled from input to output (no capacitors in the signal path). Modern surface mount component technology.

### RIAA Outputs

- **Gain:** Depends on phono cartridge characteristics; 80 dB or more at maximum setting, when using an ultra low impedance / ultra low output cartridge
- **Deviation from RIAA Standard:** less than  $\pm 0.1$  dB, 20 Hz - 20 kHz
- **RIAA Channel Matching:** within  $\pm 0.02$  dB, 20 Hz - 20 kHz
- **Channel Separation:**  $\geq 80$  dB, 20 Hz - 20 kHz
- **Distortion:** less than 0.005%, 20 Hz to 20 kHz
- **"Neumann" setting:** 50 kHz RIAA modification, can be enabled with internal jumpers
- **Outputs:** Balanced , Neutrik Premium XLR (internal switch setting for FLAT or RIAA) ; RCA
- **Output Impedance:** 20 ohms
- **Circuit Topology:** Direct coupled from input to output; no DC blocking capacitors in signal path. Two stage correction circuit. (1) Completely passive high frequency correction. (2) Active low frequency correction using premium, low distortion wide bandwidth FET amplifier. Independent single ended / unbalanced (RCA) ground referenced outputs. Modern surface mount component technology.

**Miscellaneous:** Precision (0.1 percent) low temperature coefficient, low noise metal film resistors. Ultra low dissipation sputtered metal film polypropylene capacitors, selected and matched by hand to match design within 0.1 percent tolerance for RIAA curve 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 power supply, stepped up to split supplies and filtered in multiple stages for extremely low noise.

### Warranty

- Five 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.

*In keeping with our continuing efforts to enhance and improve our products, we reserve the right to change specifications without notice.*

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# 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.

