nord lead 3
performance synthesizer

SERVICE MANUAL

Clavia

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The Nord Lead 3 Service manual is arranged to help our service centers in the best way possible. However the Nord Lead 3 user manual is a very useful guide, use it as a reference in addition to this service manual. If you have access to internet you'll find the user manual available for download and also a lot of useful information on our website www.clavia.se

⚠The information in this service manual is intended for service centers that repair Clavia products. It may **not** be copied, reposted, modified, served from other web pages, made into derivative works or distributed to other sources such as end users or retailers that do not repair Clavia products.

⚡**Important safety information**

Dangerous voltage levels are present within the unit.
-   Unit should be opened exclusively by qualified service personnel.
-   Always disconnect the power supply cord before opening to avoid electrical shock.
-   Components and complete circuitboards may only be put into service when they are securely fixed in the instrument casing.
Take necessary precautions against ESD before opening the unit.

Revision history

rev. 1.0   - First release.
rev. 1.1   - Added pictures.
             - Layout changes
             - Updated Hw / Sw section, overview section
             - Added part list and error codes.

Overview

Product line

There are two different
Nord 3 Models:

- 4 octave keyboard version
- Rack version

Internal memory
The internal sound memory of Nord Lead/Rack 3 consists of 8 Banks (1-8) holding 128
programs each for a total of 1024 programs plus 2 Banks (1-2) holding 128
performances each for a total of 256 performances.

Fuse ratings

Voltage	115 V	230 V
Fuse	300 mA	125 mA

Physical Dimensions

Lead 3
W: 870 mm
D: 278 mm
H: 100 mm
Weight: 6,3Kg

Rack 3
W: 19"
D: 100 mm (incl feet and knobs)
H: 5 rack units
Weight: 3,3 Kg

Test program

Running the test program

The test program is stored in the BootPROM position **U36**. Test program version is shown on the Lead / Rack 3 display when the test program is initiated.
If BootPROM version is older than 0.20, there is no test program available.
To find out which version that is installed, the Nord needs to be opened.

In order to trace a hardware error easier, each Nord synthesizer has a test program.
This program is primarily used in production in order to test all functions.
The functions provided by the test program allow a quick and easy search for possible errors on the hardware. On the Nord Lead/Rack 3, the display guides the user through the test program.

⚠**WARNING:** Improper use of the test program or powering off the synth during a test can result in malfunction of the synth. The test program may only be used by qualified service personnel and is not intended for end users.

In order to execute the different tests on a Nord Lead/Rack 3, press and hold buttons **[Synth + Store + Performance Mode]** at power up.
When test mode is entered a DRAM test is performed. The test progress is indicated by the two middle segments of the pitch LED display.
After the DRAM test has finished successfully, the test program will start.

If any RAM error is found, 'Er' is shown on the LED display

Navigating through the test program
- Press the designated slot button **[A]** to **[D]** to enter a test group.
- Press slot button **[D]** When a test has finished, to exit the test.
- Press **[Navigator Up]** or **[Navigator Down]** to toggle between tests in a test group.
- Press **[Navigator Left]** or **[Navigator Right]** to toggle within a test.
- Press **[Active Device]** to start or reset a test.

A text guiding through the different tests should appear on the LCDs.

Available tests are:

MNB: Mainboard
1. RAM: Not applicable
2. Flash: Tests the Flash memory.
3. DAC: Outputs a clean sine wave on the outputs. Select output with the slot buttons.
Adjust volume with the dial encoder or the Master Level knob.
See section "Calibrating the DACs" for more information.
4. MIDI: Tests MIDI communication. Connect a cable between MIDI in and MIDI out.
5. Pedal: Connect a sustain pedal to the sustain pedal jack to test its function.
6. Keyboard: Press one key at a time. Tests velocity response and counts the number
of keys pressed.
7. Serial: Displays the serial number.

LCD: LCD Board
1. Display: Test the LCD panel. Press **[Navigator Down]** to show all segments in LCD
2. Buttons: Press the buttons as indicated to verify their function.
3. Knobs: Turn the knobs as indicated. << indicates turning a knob fully
counter clockwise, >> indicates turning a knob fully clockwise.
Turning a knob too quickly requires restarting the test.
4. Dial: Turn the dial encoder in order to verify its function.
5. LED: Lights the LEDs in sections. Verify that each LED is lit.
6. Pitch Bend: Calibrates the pitch stick. After running the test, the display should show
a center value for the pitch stick.

PNL: Panel board
1. Buttons: Press the buttons as indicated to verify their function.
2. Encoder 1: Not applicable.
3. LED: Lights the LEDs in sections. Verify that each LED is lit.
4. Encoder 2: Turn the encoders as indicated. << indicates turning an encoder fully
counter clockwise, >> indicates turning an encoder fully clockwise.
Turning an encoder too quickly requires restarting the test.

Error Codes

Boot error codes:

E.0 Recv SysEx error (overflow or other low level error)
E.1 Recv begin error (SysEx begin message error)
E.2 Recv data error (SysEx data message error)
E.3 Recv end error (SysEx end message error)
E.4 OS erase error (can't erase OS in Flash)
E.5 OS write error (can't write OS to Flash)
E.6 No OS detected (no OS in Flash)
E.7 OS load error (OS with errors in Flash)
E.8 Flash init error (can't init Flash chip(s))
E.9 Flash unknown (unknown Flash chip(s))

Hardware

Hardware structure

The hardware structure differs in the rack and the keyboard version. Common for both products are one power supply unit, one main board and one panel board.
The keyboard version has one type of LCD board *(69072)* with the pitch stick and modulation wheel, while the rack version has another type of LCD board *(69076)* with no pitch stick or modulation wheel. They also differ in size.

Power supply
The Nord Lead 3 is supplied with several different voltages from the power board. These are +3.3V, ±5V and ±12V. For more information on where to measure these voltages see the appropriate schematic. The Power supply is connected to the main board with a 10 pole connector **P2** *(22480)*.

Main Board
The main board is equipped with six DSP´s **U24, U27-U31** *(21360)*, which is controlled by a host processor **U26** *(213200)* with two SRAM circuits **U33** and **U34** *(21410)* (128k*8 bits). Boot code for the host processor and test program is stored in the BootPROM **U36** *(23690)*. OS, user patches and performances are stored in a Flash memory **U32** *(21290)* (8M*8 bits).
Audio D/A conversion is performed by **U39** and **U42** *(21600)*.
A/D conversion of the control pedal takes place on the LCD board **U8** *(21580)*.
All input and output jacks are filtered from radio signals with an EMI-filter *(23110)* (component designator prefix F). External connectors are a 26 pole connector for the LCD board **P3** *(22520)*, a 20 pole connector for the panel board **P4** *(22500)*, a 10 pole connector for the power supply unit **P5** *(22480)*, two keyboard connectors **P1** and **P2** *(22670)*, one four pole connector for the after touch strip **P6** *(22550)*.

LCD Board
Main functions on the LCD board are the Lcd *(20810)*, main encoder *(22890)*, pitch stick *(10190)* and connector for the modulation wheel **P3** *(22710)*. The LCD board is connected to the main board with a 26pole connector **P1** *(22520)*

Panel Board
On the panel board you will find 26 encoders *(24010)* and a number of status LEDs. The panel board is connected to the main board with a 20 pole connector **P1** *(22500)*.
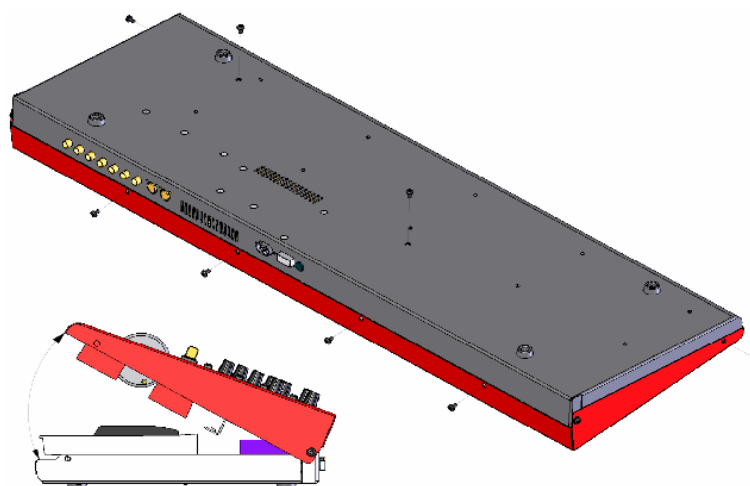
Opening the synth

WARNING: Take necessary precautions against ESD before opening the synth.

Nord Lead 3
Loosen the screws as shown in the figure. *(8x40018)*
The two screws on the sides work as hinges. Lift in the front to open the top.

Nord Rack 3
Unscrew the 4 panel screws *(40018)* Gently slide the top forward and lift it of.

Picture shows Nord Lead 3

Removing the Power Supply Unit
Loosen the five screws *(40262)* holding the PSU to the chassis. Loosen the two screws *(40013)* on the back panel next to the AC socket. Finally remove the 10 pole ribbon cable *(NL3 - 22390 NR3 - 22430)* and lift out the PSU.

Removing the Main Board
Loosen the three screws *(40262)* holding the main board to the chassis. Loosen the nuts and remove the washers around the ¼" jacks on the back panel. Also loosen the six screws *(40010)* holding the MIDI jacks to the chassis. Remove the 26 pole ribbon cable *(22410)* to the LCD board, the 20 pole ribbon cable *(22400)* to the panel board, the 10 pole ribbon cable *(Lead 22390 Rack 22430)* to the PSU, the two ribbon cables *(22290)* to the keyboard and the 4 pole after touch connector.
You can now lift out the main board.

Removing the Panel Board
Pull off all knobs *(22900)* on the front panel (not the buttons). Remove the ribbon cable *(22400)* from the panel board. Loosen the last two screws *(40018)* holding the top to the chassis. Loosen the nine screws *(40262)* holding the panel board to the upper lid.
You can now lift out the panel board.

Removing the LCD Board
Loosen the last two screws *(40018)* holding the top the chassis. Remove the LCD board ribbon cable *(22410).* Disconnect the three pole modulation wheel connector. Loosen the screws holding the pitch stick to the top. Loosen the screws *(40262* Lead x6 / Rack x7) holding the LCD board to the upper lid. You can now lift out the LCD board.

Hardware configuration

The N3 model (Lead, Rack) is decided by the LCD board. The keyboard version has one type of LCD board *(69072)* with the pitch stick and modulation wheel, while the rack version has another type of LCD board *(69076)* with no pitch stick or modulation wheel. They also differ in size.

Hardware versions

Main board	BootPROM	Notes
ver. 1.10	v0.24c	

⚠Important notes
-The latest available OS version will work on all officially released main board versions. However old OS versions might NOT work on newer main boards.
Always use the latest OS version!

Calibrating the DACs
The Nord Lead 3 is equipped with two stereo D/A converters **U39** and **U42** running at 18 bits 44,1 kHz. The DACs are calibrated with external trim potentiometers (trimmers) at the factory for lowest possible distortion.

In some rare cases it might be necessary to perform a new calibration of the DACs. To perform calibration first read section "Opening the synth".

- Start test Mnb/DAC as described in the "Test Program" section.
- Locate trimmers VR1-VR4 on the main board.
(index corresponding to respective output).

- Calibrate each DAC to lowest possible distortion.

Software

Uploading OS and sounds

The latest OS version for the Nord Lead/Rack 3 is available at
www.clavia.se

The software version is briefly shown on the LCD when you power up the Nord 3.

⚠Important Update Note

To make sure you don't accidentally overwrite Sounds or performances you want to keep, it's a good idea to back up the sounds. For information on how to back up programs and Performances, please refer to the Nord Lead 3 User Manual

Factory presets

All factory programs and performance Banks are available as MIDI SysEx files for download at www.clavia.se Please refer to the Nord Lead 3 User Manual for information on how to restore the factory presets

Spare Parts

Mechanical:

Part no.	Item
22090	Cable 3pol mod.wheel
22460	Cable clip, adhesive
40081	Display window, red N3/N2X
40005	Keyboard 4 Oct. NL3
22290	Keyboard cable
22900	Knob D-form with grey line
40111	Lower lid Nord Lead 3
40113	Lower lid Nord Rack 3
40008	Modulation wheel
40056	Nut M3
40068	Pop rivet 3,2x8
23040	Pot. mod wheel N2/3/NM2
22390	Ribbon cable 10 pol NL3/NE61/73
22430	Ribbon cable 10 pol NR3/NER
22400	Ribbon cable 20 pol N2/3/dd4
22410	Ribbon cable 26 pol N3/NE/NM/NER
40070	Rubber foot 19mm
50172	Rubber pipe Mod wheeel
40262	Screw M4x6
40010	Screw, midi
40013	Screw, AC input
40040	Screw, keyboard NL3/Wood NE61/73
40025	Screw, modulation wheel
40026	Screw, pitch stick/upper lid
40018	Screw, upper/lower lid
40110	Upper lid Nord Lead 3
40112	Upper lid Nord Rack 3
40046	Washer BRB 4,3*9*0,8

Panel Board:

Part no.	Item
69071	Panelboard Nord 3
20960	10uF/35V 5,0x6,0 Ellyt SMD
20980	100uF/16V 6,3x6,0 Ellyt SMD
20700	Diod Bav70 Sot23
20720	Diod Bav 56 sot23
21950	Transistor BCX53 Sot89 PNP
21940	74HC374 TSSOP
21930	74HC245 TSSOP
21920	74AC138 So16
21830	74HC138 So16
21810	74HC138 So16
20780	LED Eight
22500	Connector 20 pole
22030	Button black Nord/ddrum
22050	Button grey NE
24010	Encoder N3/NMG2 (Bourns)
20820	LED lens 15, N3/NM2
20830	LED lens shield 15, N3/NM2
22950	Knob neutral for N3/NMG2
20840	LED lens 6, N3/NE
20860	LED lens single, N2X/N3/NE/NM2
20850	LED lens shield 6, N3/NE

LCD board:

Part no.	Item
69072	LCD board Nord Lead 3
69076	LCD board Nord Rack 3
20960	10uF/35V 5,0x6,0 Ellyt SMD
20700	Diod Bav70 Sot23
20060	350ohm 0,1% 5ppm MK2
20200	Trim resistor, pitchstick
21930	74HC245 TSSOP
21940	74HC374 TSSOP
21810	74HC32 So14
21920	74AC138 So16
21580	Max1112 Cap 20ssop
21460	LF412CD SO8
21490	Op amp LMC662CM
20660	Pot.Cermettrim 10kohm SMD
10190	Pitch stick complete, short cable
22080	Cable pitch stick, short red + blue
40014	Screw, pitch stick/wood
40056	Nut M3
40088	Woodknob for Pitchstick
40159	Pitchbleck inkl.limning
20810	Display LCD NM/N3
40012	Screw, LCD display
40055	Nut M2,5
40059	Spacer 1mm nylon
20860	LED lens single, N2X/N3/NE/NM2
22520	Connector 26 pole
22740	Pin header 2x7pol
22710	Connector 3 pole, 90 deg.
22890	Rotary encoder
22880	Knob 21mm black N3/NM2
22940	Cover for 21mm knob
22030	Button black Nord/ddrum
22040	Button red Nord

Main board:

Part no.	Item
69073	Main board Nord 3
20980	100uF/16V 6,3x6,0 Ellyt SMD
20960	10uF/35V 5,0x6,0 Ellyt SMD
20960	10uF/35V 5,0x6,0 Ellyt SMD
20970	47uF/35V 6,3x6,0 Ellyt SMD
20700	Diod Bav70 Sot23
23110	EMI-Filter 2,2nF,+50/-20% 100V
23100	EMI-Filter 470pF,+50/-20% 100V
21960	Transistor BCX54 Sot89 NPN
21970	Transistor BC847B Sot23 NPN
21950	Transistor BCX53 Sot89 PNP
21980	Transistor BC857B Sot23 PNP
23690	BootPROM N3, programmed
21520	Op amp LM833M
21480	LF353D So 8
21810	74HC32 So14
21360	DSP N3/NE/N2X
21940	74HC374 TSSOP
21320	Host N3/NE/N2X
21290	Flash NM/N3/dd4
21410	SRAM 1Mb N3/NE/N2X
21900	74LV08 So14
21730	74HCT32 So14
21600	DAC N/NM/Ne/dd4
21480	LF353D So 8
21570	PC 400TSo
21500	Resetcircuit N3/NE
20670	Pot.Cermettrim 50kohm SMD
23080	Crystal 32,768 KHz SMD
22600	Connector 1/4" Stereo
22590	Connector 1/4" Mono
22640	Connector din 5pol Midi
22610	Connector 1/4" Stereo/switch
22670	Connector 16 pole, micromatch
22520	Connector 26 pole
22500	Connector 20 pole
22480	Connector 10pol
22550	Connector 4 pole, after touch 90 deg.

Power board:

Part no.	Item
69074	Power board N3/NE/N2X
69075	Power board N3 Jpn 100V
20910	Capacitor 4700pF X2
20950	10uF/63V 2m Elektrolyt
21020	3300uF/25V 85gr Ellyt axiell
20990	1000uF/40V 85gr Ellyt axiell
50061	Plastic strip black 200mm
20930	100nF/63V/10% 2m Polyester
20730	Diod 1N5404 3A
22840	Fuse house nord/dd4/mod
40076	Heatsink
23120	Drossel RN112-0,8/02
22620	Socket AC N3/NE
22480	Connector 10pol
22000	Powerswitch On/off
22020	Button grey power on/off
22630	AC-Switch
22780	Trafo N2X/N3/NE Eur/Usa
40017	Screw, keyboardNL2/transformer
21650	Regulator -3,3 BT
22960	Insulating insert TO-220
40042	Screw, regulator powerboard
40056	Nut M3
21660	Regulator -5Low
21680	Regulator +12V
21700	Regulator -12V
21690	Regulator -5V
40176	Plastic isolator
40180	Spacer 2mm Nylon
22790	Trafo N3 Jpn