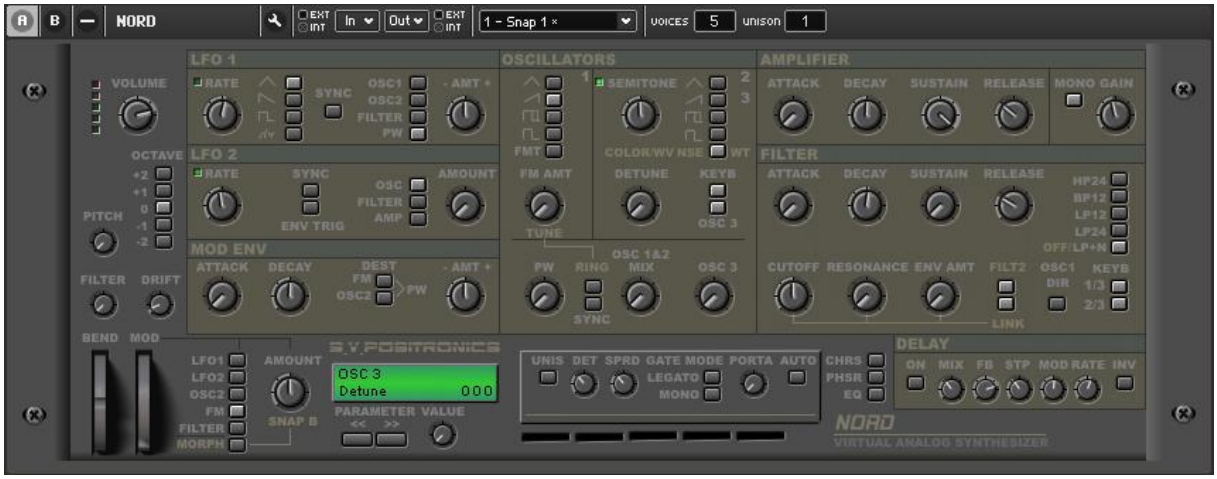
Nord

Virtual Analog Synthesizer



User Manual

s.v.positronics 2009

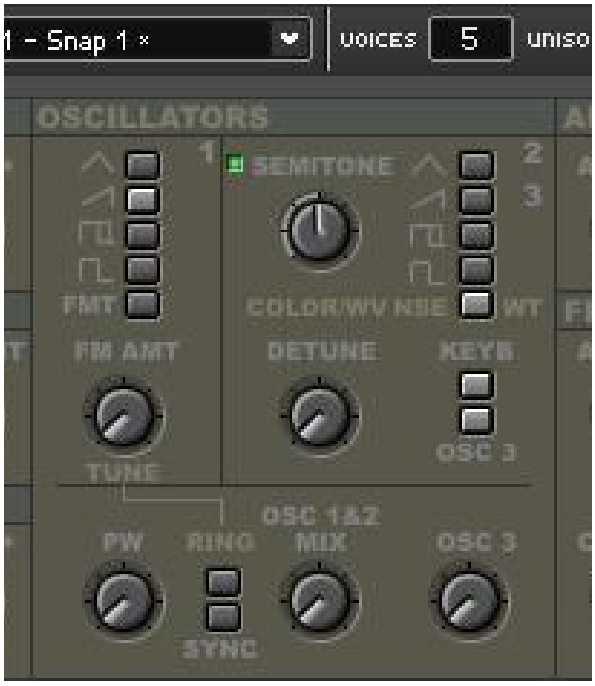
Welcome to NORD! NORD is a polyphonic virtual analog polyphonic synthesizer with three oscillators, two multimode filters, two LFOs, three envelope generators, a lot of modulation routing options and some simple effects. It is designed for a wide variety of sounds at a low CPU consumption.

The instrument features a full bank of preset sounds (128) which give a good impression of the sonic capabilities of this synthesizer.

Table of contents

1. The Oscillator Section

Nord features three independent oscillators. Each oscillator offers the choice of 5 different waveforms. Osc 1 features linear FM, except for the formant waveform.
Osc 2 and 3 are almost identical, osc 2 features oscillator synchronisation and a noise generator, osc 3 has a built in wave table oscillator with 43 wave sets onboard.



1.01 Osc 1 Controls

Waveform selector — Triangle, sawtooth, variable pulse, square and formant wave

Fm Amt: — Amount of linear frequency modulation by osc 2. If the formant wave is selected, the knob controls the formant frequency. If ring modulation is on, the knob controls the frequency of osc 1 within a range of 12 semitones.

1.02 Osc 2 Controls

Waveform selector: — Triangle, sawtooth, variable pulse, square and noise. If osc 2 is synced to osc 1 the noise signal is replaced by one of 9 different spectral waveforms.

Semitone: — Tunes osc 2 up or down within a range of 10 octaves. If noise is selected, the knob controls the colour of the noise signal. In noise-sync-mode it selects one of the 9 spectral waves. The small lamp to the left lights up if the semitone is set to a full octave.

Detune: — Detunes osc 2 up to 1/2 semitone.

Keyb: — Osc 2 key follow on or off

1.03 Osc 3 Controls

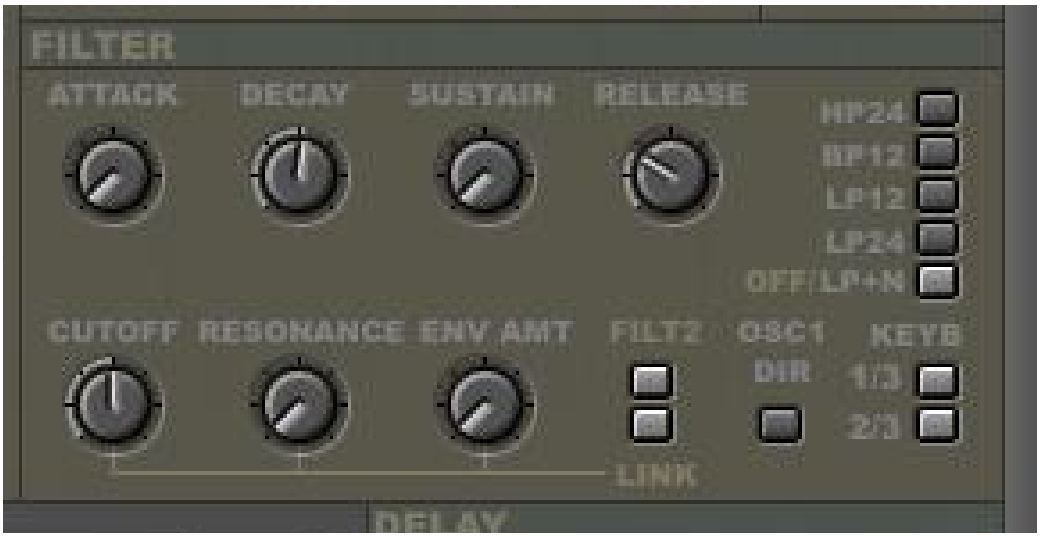
Osc 3 has the same tuning controls as osc 2, but the detune knob tunes the osc downwards. If the wave table osc is selected (WT) the wave set can be chosen via the small menu which is explained later on and the pulse width knob controls the position in the wave table.

1.04 Osc Common Controls

PW:	Sets the pulse width of osc1 & 2. This works only with the variable pulse wave, all other waveforms are unaffected. For osc 3 it controls the readout amplitude
Ring:	Enables ring modulation between osc 1 and 2
Sync:	Osc 2 hard sync to osc 1
Osc 1&2 Mix:	Cross-fades between osc 1 and 2
Osc 3 Mix:	Cross-fades between osc 1&2 and osc 3

2. The Filter Section

NORD features two independent multimode filters with 24dB high pass, 12 dB band pass, and 12 and 24dB low pass filters. Additionally filter 1 has a combined 12dB low pass – band stop filter.

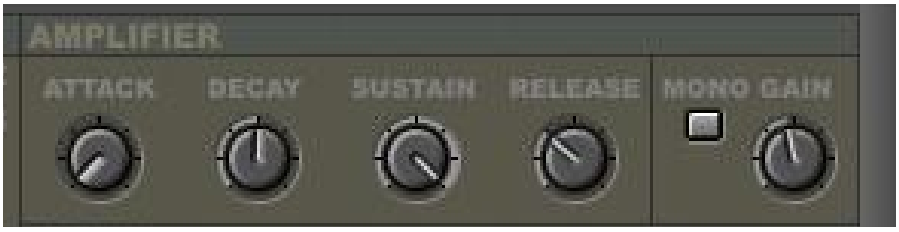


2.01 Filter Controls

Attack:	Filter envelope attack time
Decay:	Filter envelope decay time
Sustain:	Filter envelope sustain level
Release:	Filter envelope release time
Cutoff:	Filter cut off frequency
Resonance:	Filter resonance
Env Amt:	Filter envelope modulation amount
Filt 2:	Enables the controls for filter 2
Link:	Links all controls of filter 2 (frequency, resonance, filter mode and envelope amount) to filter 1. The frequency knob now controls the frequency offset between filter 1 and 2

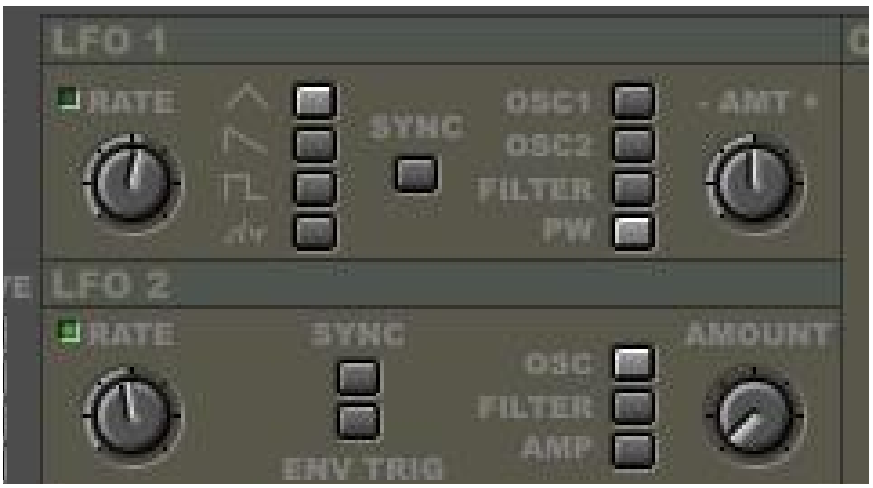
Osc 1 Dir:	Routes the signal of osc 1 directly to the amplifier without passing the filter section
Mode selector:	Chooses one of 5 filter modes
Keyb:	The filter frequency follows the note pitch within 4 steps. To enable full key tracking, press both buttons.

3. The Amplifier Section



The amplifier section features a simple ADSR-envelope and a saturation stage with four different saturation modes.
The saturation stage can operate in monophonic or polyphonic mode. In monophonic mode, the sum off all voices goes thru the saturation whereas the saturation is placed behind the amplifier, in polyphonic mode each voice is distorted separately and the saturation is placed between the filters. The gain knob controls the amount of distortion. Below a value of 64 there's no saturation except for the sine shaper and quantisation which take effect at all values.
The saturation stage has four different types of distortion: Soft (saturation), hard (clipping), sine (sine shaper) and quant (bit depth reduction). The saturation type can be selected via the menu.

4. The LFOs

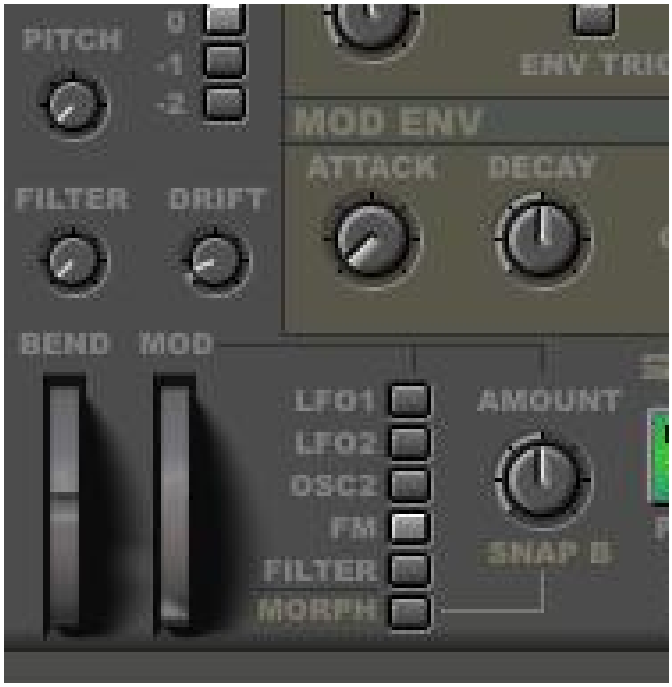


NORD features two LFOs. The LFOs are quite simple with just a few destinations. For a more versatile modulation, there's a modulation matrix on panel B which is described later on.
Both LFOs have a rate-control which controls the frequency of the oscillator. LFO 2 is always synced to the song tempo. The small lamps beside the label give a visual feedback of the current rate.
LFO 1 has four different waveforms (triangle, sawtooth, square and random). The waveform of LFO 2 is always a triangle wave.
Both LFOs can be gate synced. When synced, LFO 1s random wave gives a random value each time a note is played.
LFO 2 has a env trig feature which triggers the envelope at the set rate. This can be used for some very basic arpeggios.
LFO 1 has four destinations (osc 1 pitch, osc 2 pitch, filter frequency and osc pulse width). For every destination the amount of modulation can be set independently with the bipolar amt-knob. LFO 2 has three destinations (osc pitch, filter frequency and amp level). The modulation of LFO 2 can only be applied to one of these destinations; the amount is controlled by the amount knob.

5. The Modulation Envelope

The modulation envelope is a simple attack-decay-envelope. The signal can be routed to three destinations (osc 1 fm amount, osc 2 pitch or osc pulse width). If the upper button is lit, the signal goes to osc 1 fm, the lower button routes the signal to osc 2 pitch. If both buttons are lit, the signal is routed to osc pulse width. The amount of modulation can be controlled by the bipolar amount knob.

6. Manual Modulation

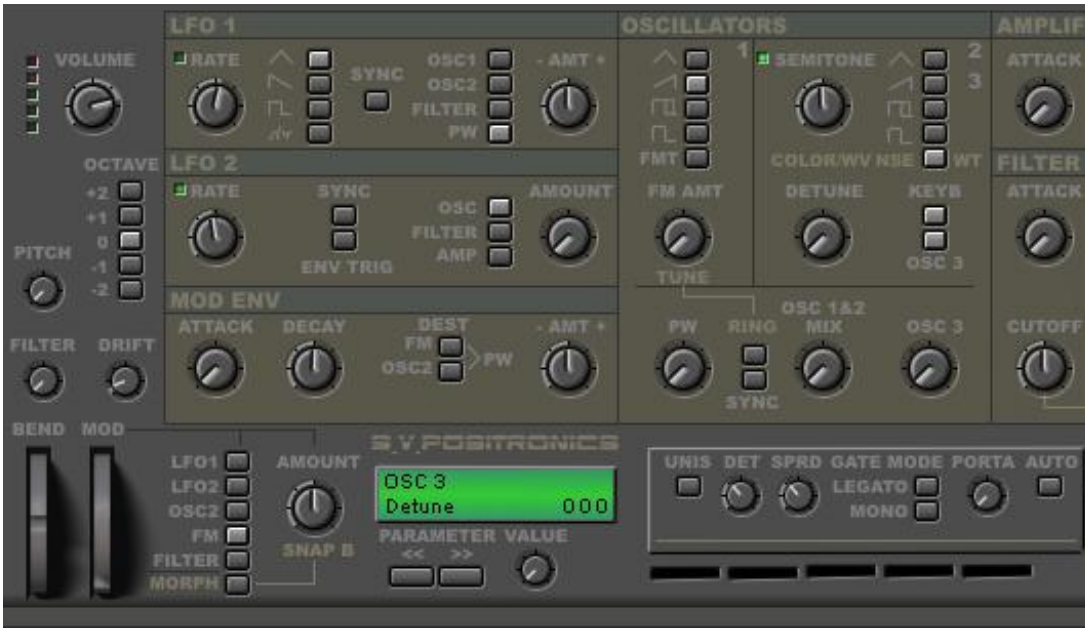


Several parameters can be directly modulated by the wheel in the lower left corner of the instrument panel. The pitch bend wheel can modulate the osc pitch and the filter frequency. The amount of modulation can be controlled via the small pitch and filter knobs.
The mod wheel can be routed to LFO 1and 2 amount, osc 2 pitch, osc1 fm amount and filter frequency. To modulate the amplitude of LFO 1, one modulation destination has to be set to a value unequal to zero, otherwise there will be no effect. The amount of modulation is controlled by the amount knob.

6.01 Snapshot Morphing

NORD features a snapshot morphing function controlled by the mod wheel. If the morph button is lit, the destinations above are inactive, The B-snapshot is chosen by the amount knob.

7. Global Setup



Volume: Controls the overall volume of the instrument

Octave: Transposes the keyboard up or down within 5 octaves

Drift: Adds a slight detuning to all oscillators for a more “analog” sound

Unison: If lit, all voices play when a note is pressed

Det: Unison detuning

Sprd: Unison pan spread

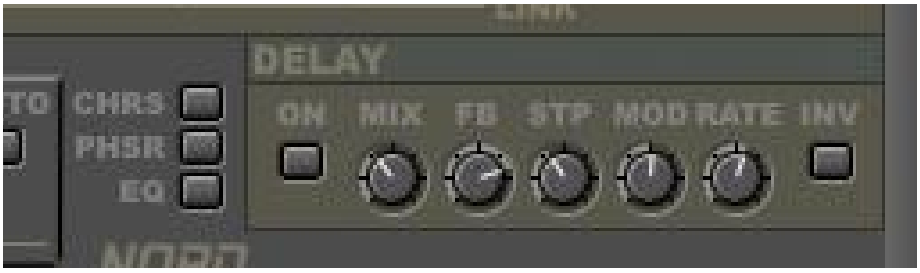
Gate mode: The instrument can be set to monophonic and legato mode.

Porta: Portamento time

Auto: Autoglide

Some remarks on pan spread: Pan spread works only if the unison button is lit. If you set the number of unison voices in the instrument header, pan spread will not work.

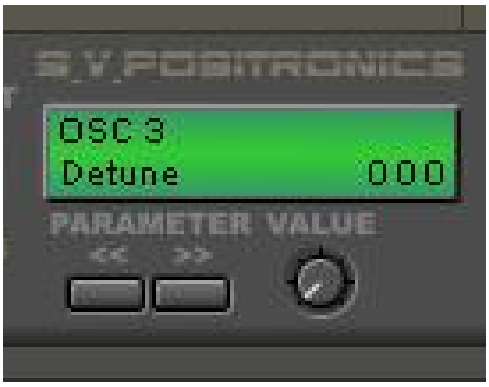
8. Effects



NORD is equipped with four effects: chorus, phaser, equalizer and a delay effect.
On panel A the chorus, phaser and equalizer effect can only be switched on or off, the controls are on panel B.
The delay effect is a modulated delay, which can also produce chorus or flanger effects. The delay time is always synced to the song tempo and is divided in 16” steps (0 – 8 steps). The feedback signal can be inverted for flanger sounds.

9. Menu Controls

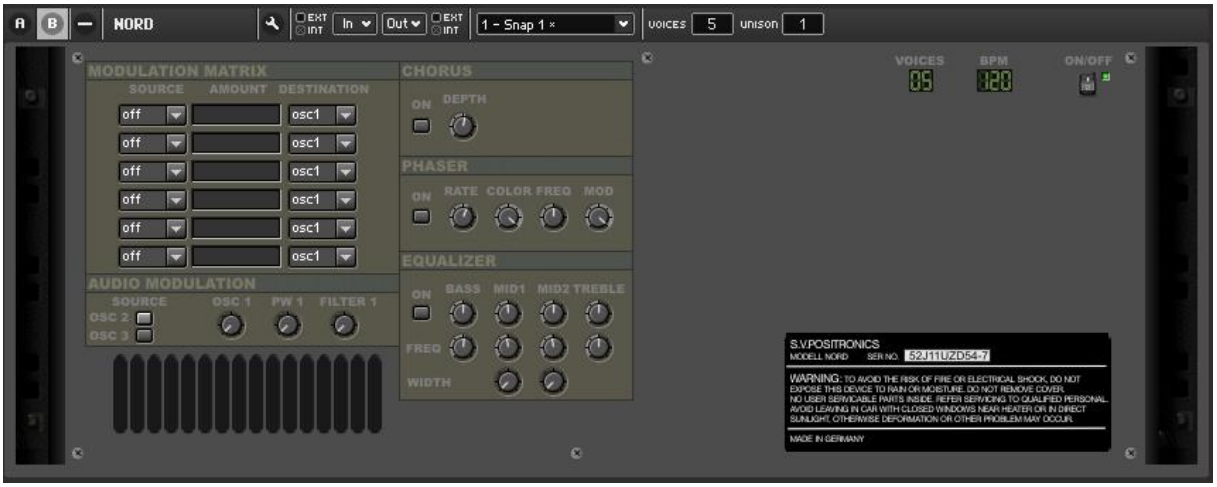
Several parameters are accessible via a small menu. The menu is controlled via the control elements below the display. The parameter buttons switches thru the menu. The value knob sets a value for the displayed parameter.



The parameters are:

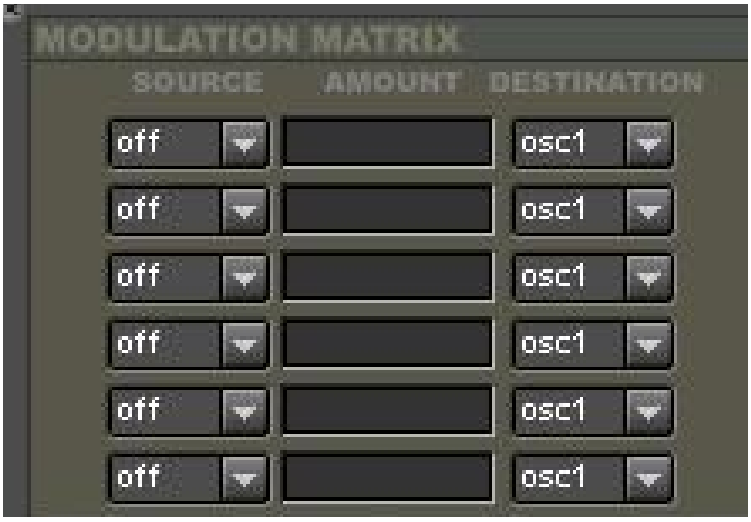
Osc 3 wave set	selects one of the 43 wave sets of osc 3. This menu entry only appears if osc 3 operates in wave table mode.
Filter routing	selects a filter routing (serial or parallel)
Filter balance	in parallel mode it cross-fades between the signals of the filters. In serial mode this control has no function.
Saturation type	soft or hard distortion, sine shaper or bit reduction
Velocity	sets the velocity sensitivity for the three envelopes. (three menu entries: amp env, filter env and mod env)

10. Panel B Controls



On panel B you find the modulation matrix, the audio modulation and the effect settings. There are also two numeric displays that show the instrument's number of voices and the global tempo in BPM. The on/off switch and the small lamp beside only show if the instrument is connected to an audio output.

10.01 Modulation Matrix

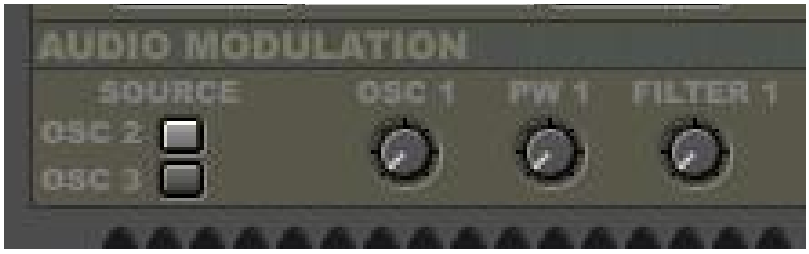


The modulation matrix has six slots each with the choice of 9 modulation sources, a bipolar amount control and with 14 destinations.

Sources: lfo1, lfo 2, mod env, filter env, velocity, keyboard, random, mod wheel and control voltage input.

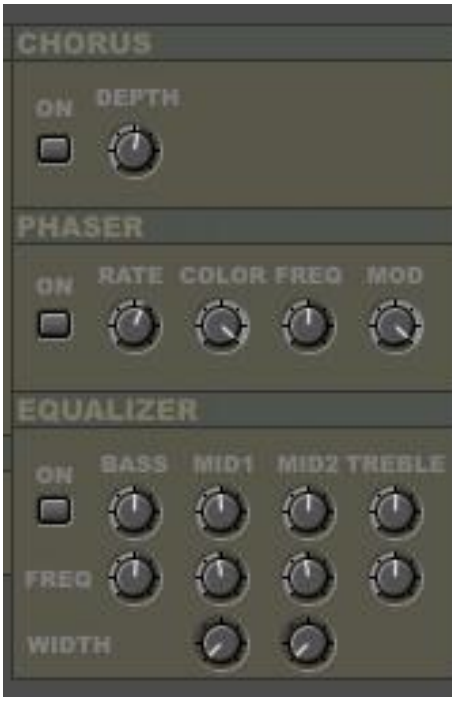
Destinations: Osc 1 pitch, osc 2 pitch, osc 3 pitch, osc pulse width, osc 1 fm amount, filter frequency, filter resonance, filter env decay, lfo 1 rate, amp level, filter balance, phaser center frequency and delay time
The last slot can be routed to the audio modulation amount of the three AM destinations instead of being routed to the effects.

10.02 Audio Modulation



The audio modulation is a modulation of three parameters in audio rate. The modulation source can be selected via the switch on the left, the destinations are osc 1 pitch, osc 1 pulse width and filter 1 frequency.

10.03 Effects



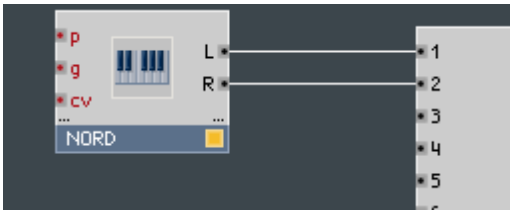
The chorus, phaser and equalizer controls are also placed on panel B. The chorus has only a depth control which adjusts the frequency of the internal LFO.
The phaser has four controls:

Rate:	Frequency of the internal LFO
Colour:	Feedback level
Freq:	Center frequency
Mod:	Modulation depth

The equalizer is a combination of two shelving filters (bass and treble) and two parametric filters. The upper row of knobs controls the gain of the corresponding bands, the middle row controls the filter's frequency. The parametric filters also have a control over their band with or filter quality (Q).
EQ frequency ranges:

Bass:	20 – 320 Hz
Mid1:	200 – 1200 Hz
Mid2:	1.1 – 8.2 kHz
Treble:	8 – 15 kHz

11. Connections



In the structure view you can see the in and out ports of the instrument. It has two outputs (left and right) and three inputs (pitch, gate and control voltage). The inputs can be connected to a sequencer or a modulation output of another instrument.

MIDI Implementation Chart

Instrument		Nord		Date	03.02.2009							
Version		5										
Ctrl Nr.	Ctrl Name	Parameter		Ctrl Nr.	Ctrl Name	Parameter		Ctrl Nr.	Ctrl Name	Parameter		
0	*Bank Sel MSB*			43	Controller 43	filter 1 env amt		86	Controller 86	audio mod -> osc1		
1	Modulation	mod wheel		44	Controller 44	filter 1 mode		87	Controller 87	audio mod -> pw		
2	Breath			45	Controller 45			88	Controller 88	audio mod -> filter		
3	Controller 3			46	Expr LSB	filter 2 mode		89	Controller 89	phaser center freq		
4	Foot			47	Controller 47	filter 2 env amt		90	Controller 90	phaser mod		
5	Portamento	portamento		48	Controller 48	osc 3 mix		91	ExtEff 1 Depth	delay on/off		
6	*Data Ent MSB*			49	Controller 49	unison detune		92	ExtEff 2 Depth	chrs on/off		
7	Main Volume			50	Controller 50	mod whl amount		93	ExtEff 3 Depth	phsr on/off		
8	Balance	osc mix		51	Controller 51	amp gain		94	ExtEff 4 Depth	eq on(off		
9	Controller 9			52	Controller 52	unis pan spread		95	ExtEff 5 Depth	audio mod source		
10	Pan			53	Controller 53			96	*Data Incr*			
11	*Expression*			54	Controller 54			97	*Data Decr*			
12	Controller 12	pb -> osc		55	Controller 55	lfo1 gate sync		98	*NRPN LSB*			
13	Controller 13	pb -> filter		56	Controller 56			99	*NRPN MSB*			
14	Controller 14	legato		57	Controller 57	ring mod		100	*RPN LSB*			
15	Controller 15	mono		58	Controller 58	osc1 dir		101	*RPN MSB*			
16	Gen Purp 1	unison		59	Controller 59	m.env - fm		102	Controller 102	chorus depth		
17	Gen Purp 2	octave		60	Controller 60	m.env - osc2		103	Controller 103	phaser rate		
18	Gen Purp 3	mod wheel dest		61	Controller 61	osc 3 waveform		104	Controller 104	phaser colour		
19	Gen Purp 4	lfo1 rate		62	Controller 62	osc 3 semitone		105	Controller 105	delay steps		
20	Controller 20	lfo1 wave		63	Controller 63	osc 3 detune		106	Controller 106			
21	Controller 21			64	*Damper Ped*			107	Controller 107	delay mod		
22	Controller 22	lfo2 gate sync		65	Porta On/Off	autoglide		108	Controller 108	delay rate		

23	Controller 23	lfo2 rate		66	Sostenuto	temp drift		109	Controller 109	
24	Controller 24	lfo2 dest		67	Soft Pedal			110	Controller 110	delay feedb
25	Controller 25	lfo2 amount		68	Legato FS	filter keyb 1/3		111	Controller 111	
26	Controller 26	mod env att		69	Hold 2	filter keyb 2/3		112	Controller 112	
27	Controller 27	mod env dec		70	Sound Var	osc1 fm amt		113	Controller 113	
28	Controller 28	lfo2 env trig		71	Harmonic	filter 1 reso		114	Controller 114	
29	Controller 29	mod env amt		72	Release	amp release		115	Controller 115	
30	Controller 30	osc1 wave		73	Attack	amp attack		116	Controller 116	delay level
31	Controller 31	osc2 wave		74	Brightness	filter 1 cutoff		117	Controller 117	
32	*Bank Sel LSB*			75	Controller 75	filter 2 reso		118	Controller 118	
33	Modulation LSB	osc2 detune		76	Controller 76	filter 2 cutoff		119	Controller 119	
34	Breath LSB	osc2 keyb		77	Controller 77	filter routing		120	*AllSndOff*	
35	Controller 35	osc2 sync		78	Controller 78	filter balance		121	*Reset Ctrl*	
36	Foot LSB	amp decay		79	Controller 79	osc pulsewidth		122	*Local Ctrl*	
37	Porta LSB	amp sustain		80	Gen Purp 5	osc 3 waveset		123	*AllNoteOff*	
38	*Data Ent LSB*	filter attack		81	Gen Purp 6	lfo1 -> osc1		124	*Omni Mode Off*	
39	Main Volume LSB	filter decay		82	Gen Purp 7	lfo1 -> osc2		125	*Omni Mode On*	
40	Balance LSB	filter sustain		83	Gen Purp 8	lfo1 -> filter		126	*Mono Mode On*	
41	Controller 41	filter release		84	Porta Ctrl	lfo1 -> pw		127	*Poly Mode On*	
42	Pan LSB			85	Controller 85					