Nexus Manual

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Nexus firmware

Date	Revision	Changes
2023-12-31	0.4	Phoneme Mode
2023-11-27	0.3	Added MIDI USB functions
2023-03-24	0.2	use Tab to save a sentence in keyboard mode and play it back in SD TTS mode
2023-03-17	0.1	Initial release

Main Menu

Note: The screen saver will switch off the screen after 10 minutes of inactivity. The red LED will flash every 3 seconds. To wake up: rotate the encoder.

To exit a function, **hold the button until the screen becomes black**, then immediately release it.

As you manipulate the potentiometer and the switch, their roles will be displayed for 2 seconds at the bottom of the screen.

Note: When Nexus is busy talking, the AUX signal goes HIGH.

USB TTS

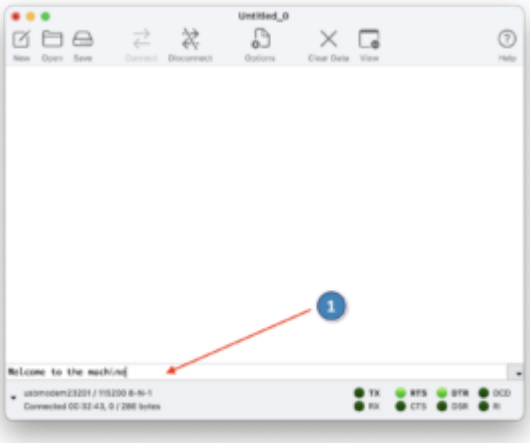
Use this utility to design or refine your sentences. Type your text and press Enter to start the speech.

I strongly recommend using Coolterm from Roger Meirs. It’s a freeware that runs on the three major platforms (macOS, Windows & Linux)

- Connect the USB cable to EMY
- Start Coolterm
- Open the Serial port option windows (under Connection/Options)
- Select Emy’s USB port and set the baud rate to 115200

- Open the Terminal section and set the terminal mode to “Line Mode”. Make sure the Enter Key Emulation is set to “CR” or “CR + LF”

- Type your text and press Enter to start the speech



When done: copy the line into a file for later use and transfer it to the SD card.

note: The potentiometer can also be used while in USB TTS mode

P1 Select the voice. This may affect some voice characteristics and overwrite changes done previously with the other potentiometers.

P2 Speed

P3 Formant

P4 Reverb

P5 Expression

SD TTS

Load and read a ".txt" file from the SD card to utilize the Text-to-Speech feature. (A maximum of 20 .txt files can be used.)

Note: Please add an empty line at the end of the file.

If a sentence ends with a period, the pitch will drop at the end of the sentence; a question mark will cause the pitch to rise.

Use the rotary selector to choose a file, and then press the button once to initiate reading. (or use a Gate signal as a trigger)

A **double-click** while in SD TTS mode will return you to the file selection menu.

Mode

Use the switch to set the mode:

- CV: The sound entry is used to pick the line in the file

- Loop: looping through all the lines in sequence
- Random: accessing the line randomly

Sound: Use it to pick a line from the file

P1 Select the voice. This may affect some voice characteristics and overwrite changes done previously with the other potentiometers.

P2 Speed

P3 Formant

P4 Reverb

P5 Expression

Keyboard

Connect a USB keyboard to the USB port using the gender changer adapter.

⚠ **Do not** use this port to power something apart from a **standard keyboard.**

The maximum current that can be provided is 300 mA.

The busy signal acts as a gate signal which stays up while the keyboard is pressed.

Type the text and press **Enter** to start the speech. (the Gate and the Button are also active)

Use the **Backspace** to delete the last character.

Use **Escape** to erase the string and start over.

Use **Tab to** save the sentence you are working on to the "keyboard.txt" file and play it back later in the SD TTS mode.

(New sentences are appended to the end of the file)

Phonemes

In Phoneme mode, the **rotary selector** is utilized to choose a specific group of phonemes.
The available groups include "All," "Vowels," "Consonants," "Pure Vowels," "Diphthongs," "Plosives," "Nasals," "Fric&Affric" (Fricatives and Affricates), and "Approximants."

The gate input is designed to trigger the speech.

Mode
The mode of operation can be set using the switch with three distinct positions:

- Upper position for CV mode, where the CV from the Sound jack entry is used to pick the phoneme from the selected group.
- Middle position for Loop mode, cycling through the phonemes of the chosen group.
- Lower position for Random mode, enabling random access to phonemes within the selected group.

The potentiometers offer control similar to the SD TTS mode but with a key variation:

P1 is used to select the voice, affecting certain voice characteristics and potentially overwriting previous adjustments.

P2 controls the speed of the speech.

P3 adjusts the formant.

P4 sets the reverb level.

P5, distinctively in this mode, sets the pitch of the phoneme being synthesized.

Phonemes groups

Category	Sub-Category	Phonemes
All Phonemes	The Complete Range	All Phonemes from Vowels and Consonants
Vowels	Pure Vowels	A, AA, AE, AH, AX, E, EH, I, IH, IX, IY, O, U, UH, UW
	Diphthongs	AW, AY, EI, EY, OW, OY, EW
Consonants	Plosives	B, D, G, K, P, T
	Nasals	M, N, NG, NY
	Fricatives and Affricates	F, S, SH, V, Z, ZH, TH, DH, H, CH, J
	Approximants	L, R, ER, RR, W, WH, Y, YY

MIDI

Control your Nexus device via MIDI.

Use the rotary function to select your desired MIDI channel. The MIDI mode allows you to control and produce speech in one of three ways: by letter, phoneme, or phonetic composition. The mode you’re in depends on the position of the switch.

Note that while “MIDI Note ON” events are supported, “MIDI Note OFF” events will have no effect.

Whenever a MIDI note is received, the green LED will turn on. Whenever speech starts, the red LED will turn on.

Mode: Alphabet (Switch in Upper Position)

In this mode, each MIDI note corresponds to a specific letter: A=C1, B=C2…Z=C#3.

The speech is triggered when the device receives the designated “Speak” note. Special notes are also assigned to adjust Speed, Pitch, and Volume.
Similar to SD TTS mode, if a sentence ends with a period, the pitch drops at the end of the sentence; a question mark will cause the pitch to rise.

Mode: Phoneme (Switch in Middle Position)

In this mode, the phoneme corresponding to the MIDI note is immediately triggered when a “Note On” event occurs. In this mode, prosody marker notes are ignored.

The phoneme’s volume can be adjusted through velocity, which is mapped across 10 distinct levels.

Mode: Phonetic (Switch in Lower Position)

In this mode, phonemes are queued as they are received via MIDI notes. The speech sequence begins when the device receives the designated “Speak” note. Prosody marker notes are also functional in this mode, allowing for enhanced control over speech characteristics like pitch, speed, and volume.

Midi Controllers

Midi controller can also be **applied in real-time**, once the speech is started, both in Phonetic and Alphabet mode (see the following table)

Nexus	Range	Controller
Speed	0-13	Modulation wheel CC1
Voice	0-10	Breath controller CC2
Reverb	0-9	Controller CC3

Nexus	Range	Controller
Formant	0-99	Foot pedal CC4
Pitch	0-99	Portamento CC5
Expression	0-9	Data Entry CC6
Volume	0-9	Volume CC7

MIDI to Phonemes mapping

Number	Phoneme	MIDI Note	Example
0	A	C1	das (Spanish)
1	AA	C#1	cot
2	AE	D1	cat
3	AH	D#1	cut
4	AW	E1	cow
5	AX	F1	bottom
6	AY	F#1	bite
7	B	G1	bib
8	CH	G#1	church
9	D	A1	did
10	DH	A#1	either
11	DX	B1	city
12	E	C2	ser (Spanish)
13	EH	C#2	bet
14	EI	D2	mesa (Spanish)
15	ER	D#2	bird
16	EW	E2	acteur (French)
17	EY	F2	bake
18	F	F#2	fee
19	G	G2	gag
20	H	G#2	he

Number	Phoneme	MIDI Note	Example
21	I	A2	libro (Spanish)
22	IH	A#2	bit
23	IX	B2	rabbit
24	IY	C3	beet
25	J	C#3	age
26	K	D3	cute
27	KX	D#3	ski
28	L	E3	long
29	M	F3	me
30	N	F#3	new
31	NG	G3	rung
32	NY	G#3	Niño (Spanish)
33	O	A3	no (Spanish)
34	OW	A#3	boat
35	OY	B3	boy
36	P	C4	pop
37	PX	C#4	spot
38	R	D4	ring
39	RR	D#4	tres (Spanish)
40	S	E4	sell
41	SH	F4	shell
42	T	F#4	tin
43	TH	G4	thin
44	TX	G#4	stick
45	U	A4	uno (Spanish)
46	UH	A#4	book
47	UW	B4	boot
48	V	C5	valve

Number	Phoneme	MIDI Note	Example
49	W	C#5	we
50	WH	D5	when
51	Y	D#5	mayo (Spanish)
52	YY	E5	you
53	Z	F5	zoo
54	ZH	F#5	vision
55	SPACE	G5	variable pause
56	?	G#5	Question
57	COMMA	A5	medium pause
58	PERIOD	A#5	long pause
59	Speak	B5	Start speech in phonetic mode
60	+ Pitch	C6	Increase pitch
61	- Pitch	C#6	Decrease pitch
62	+ Speed	D6	Increase speed
63	- Speed	D#6	Decrease speed
64	+ Volume	E6	Increase volume
65	- Volume	F6	Decrease volume

Nexus Phonemes MIDI effect rack for Ableton Live

1 file(s) 12.33 KB

Nexus Alphabet MIDI effect rack for Ableton Live

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Nexus Python Alphabet to MIDI notes

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Code

Code Display code version

Calibration pot calibration

Flasher Firmware loader: pick a firmware and reboot

Nexus voices

The text-to-speech synthesizer has 11 standard voices, and several individual voice parameter controls that can be used to vary the voice characteristics independently. The Voice command alters numerous internal voice parameters (articulation, pitch, expression, tone, etc.) and should precede any individual voice parameter control commands.

N	Voice Name
0	Perfect Paul (default)
1	Vader
2	Big Bob
3	Precise Pete

N	Voice Name
4	Ricochet Randy
5	Biff
6	Skip
7	Robo Robert
8	Goliath
9	Alvin
10	Gretchen

Nexus commands

Use the $ symbol to add a command in your text and modify the behavior of the TTS synthesizer.
You don't need to repeat a command for each line of your text, as it remembers the last command sent.

Command	Function	n Range	n Default	Example
nA	Articulation	0-9	5	
C	Character mode		-	
D	Phoneme mode	-	-	$Dk ax m p yy uw dx er
nE	Expression	0-9	5	
nJaaaabbbb	Sinusoidal tone generator	1-59999	-	$50j10001000
nF	Formant frequency	0-99	50	
nP	Pitch	0-99	50	
nO	Voice	0-10	0	$9ohello
nS	Speed	0-13	5	$2S
nV	Volume	0-9	5	
nR	Reverb	0-9	0	

Command	Function	n Range	n Default	Example
T	Text mode	-	-	
n*	DTMF	0-16	-	$2*$9*$5*$6*$9*$5*
M	Monotone	-	-	

Commands examples

```
$0o I am perfect Paul
$1o $2s I am Vader and I speek slowly
$2o $9s I am Big Bob and I speek fast
$2v low volume
$C IBM TNT FDA LOL RST
$t $5v back to normal
100 hertz $80j01000100
200 hertz $80j02000200
500 hertz $80j05000500
1000 hertz $80j10001000
$50j02000450
$2*$9*$5*$6*$9*$5*
```

Phonetic examples

```
$d50-- k /o m\ p yy /uw \t er \l <i -------b
$d30 harder, /behter, /faester, \stronger
$dt r a n /s i \\----u m a n
$D d i`m eh n ch' m a \sh ---i ---n
$dv i rr' s i n d' d i r o b o t e ---r
$do r d i n a t /er \ay n d i v i d \u e l
$dtekn----o'/p------ap
$d$2s i sh b i n m ay n e m \a sh i ---n
$dm/iusike' ---ehlektr\own---ik
```

Nexus Phoneme Symbols

Phoneme	Example	Phoneme	Example
A	das (Spanish)	N	new

Phoneme	Example	Phoneme	Example
AA	cot	NG	rung
AE	cat	NY	Niño (Spanish)
AH	cut	O	no (Spanish)
AW	cow	OW	boat
AX	bottom	OY	boy
AY	bite	P	pop
B	bib	PX	spot
CH	church	R	ring
D	did	RR	tres (Spanish)
DH	either	S	sell
DX	city	SH	shell
E	ser (Spanish)	T	tin
EH	bet	TH	thin
EI	mesa (Spanish)	TX	stick
ER	bird	U	uno (Spanish)
EW	acteur (French)	UH	book
EY	bake	UW	boot
F	fee	V	valve
G	gag	W	we
H	he	WH	when
I	libro (Spanish)	Y	mayo (Spanish)
IH	bit	YY	you
IX	rabbit	Z	zoo
IY	beet	ZH	vision
J	age	space	variable pause
K	cute	' (apostrophe)	short pause
KX	ski	, (comma)	medium pause
L	long	. (period)	long pause

Phoneme	Example	Phoneme	Example
M	me		

Nexus Prosody

Symbol	Function
nn	Set pitch to nn
/	Increase pitch
\	Decrease pitch
+	Increase speed
-	Decrease speed
>	Increase volume
<	Decrease volume

Doubletalk RC8660 datasheet

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