



九齊科技股份有限公司
Nyquest Technology Co., Ltd.

User Manual

Voice Changer for NX1 Series

What you hear at PC is what you get at NX1

Version 1.2

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1 Introduction

Voice Changer is an application development tool provided by Nyquest Technology Corporation Limited (Nyquest), it's a software-hardware combination tool for customized voice changing effects. It is based on the commonly used DSP algorithm, and the parameters are open for users to quickly adjust their preferred effects, and additional post-level sound processor can be added. After the user is satisfied with the demonstration, user can directly compile and download it to NX1_FDB or NX1_EVB through *Q-Writer* to confirm the real effect from the hardware, which greatly shortens the development time of the voice changing simulation.

Content:

- [1.1 What is Voice Changer](#)
- [1.2 Installing Voice Changer](#)
- [1.3 The Main Interface](#)
- [1.4 Menu](#)
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1.1 What is Voice Changer

Voice Changer is a brand-new interface that allows users to combine various related DSP parameters according to their needs, and can quickly demo the simulation effects of Fixed-Point C on the computer. After many times of effects, amplification, filter combination and parameter adjustment, *Voice Changer* can directly call NYIDE to compile it into NX1 OTP or NX1 EF series, and download it to the corresponding NX1_FDB or NX1_EVB through *Q-Writer* for verifying the actual embedded effect. Since the simulation on the computer has already taken into the resource requirements of the actual IC, the great benefits of *Voice Changer* is that What you hear at PC is what you get at NX1!

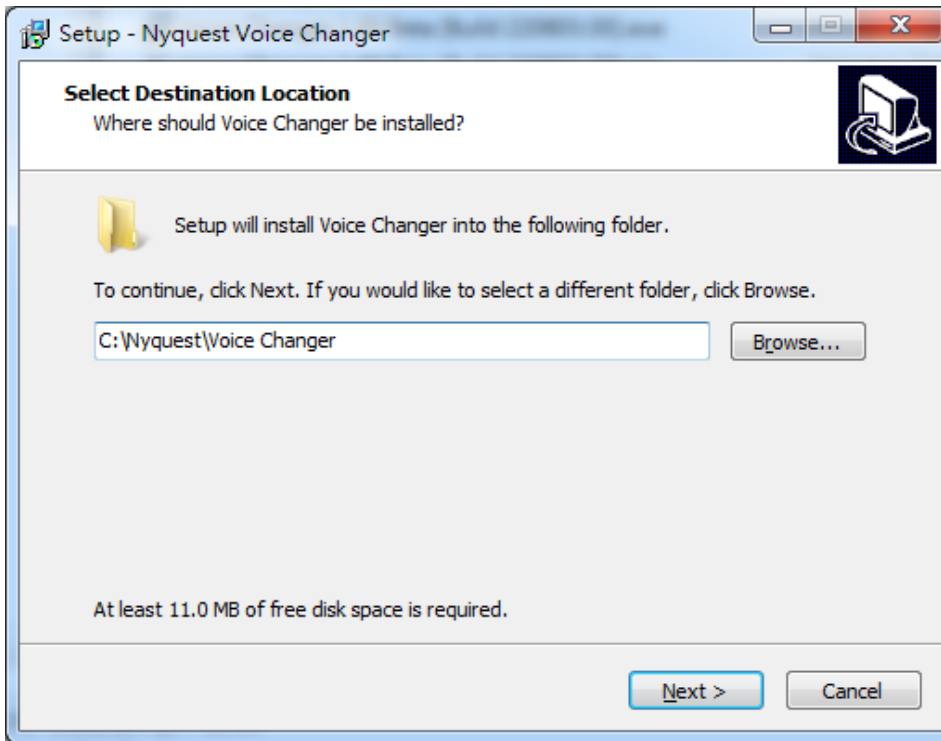
1.2 Installing Voice Changer

Please contact Nyquest to acquire the latest version of *Q-Recorder*. To install *Q-Recorder*, please unzip the .zip file to a specific folder and then double-click on the .exe file in the specific folder to start the installation. Follow the instructions of the installation wizard to complete the installation.

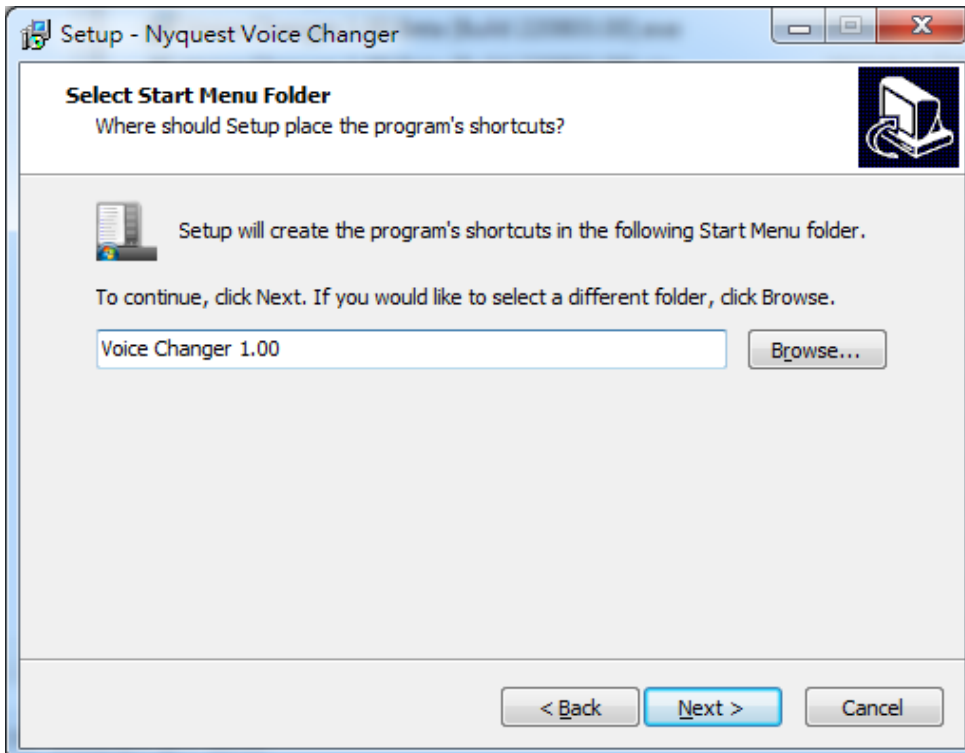
System requirement:

- ◆ Pentium 1.3GMHz CPU or above, Microsoft Windows operating system (7, 8, 10, 11).
- ◆ At least 1G of RAM.
- ◆ At least 2G free space on hard disk.
- ◆ A display card and monitor with resolution of 1440x768 or higher. ◦

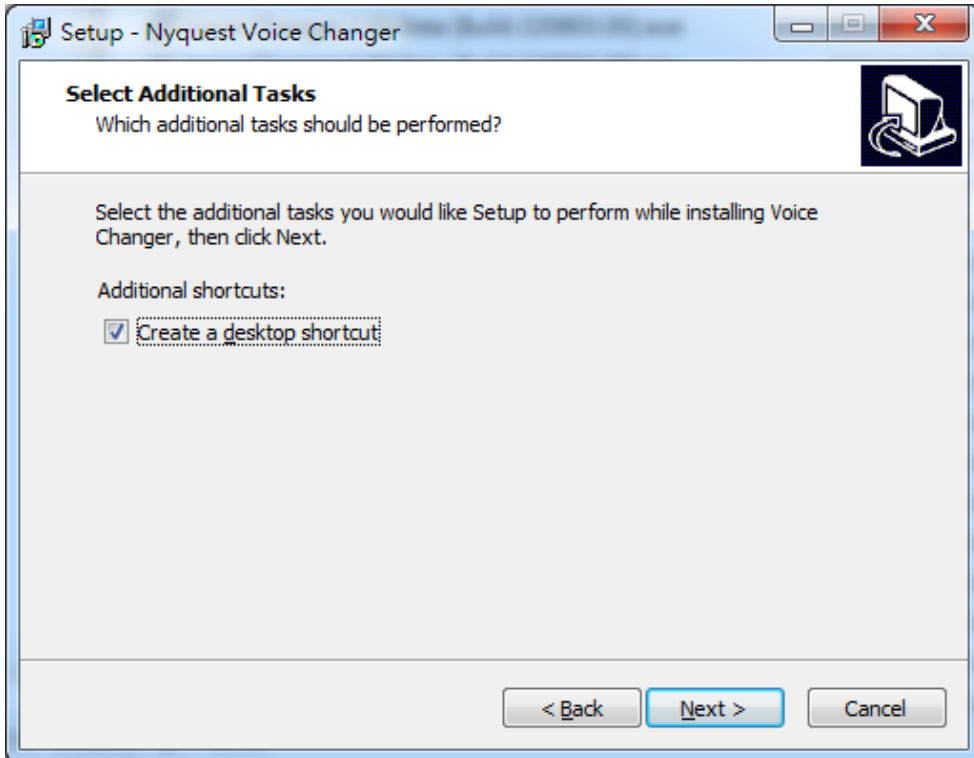
Step 1: Next ◦ Step 1: Click on the installation file of *Voice Changer* for getting start. . Or press “Browse...” to select a different installation folder



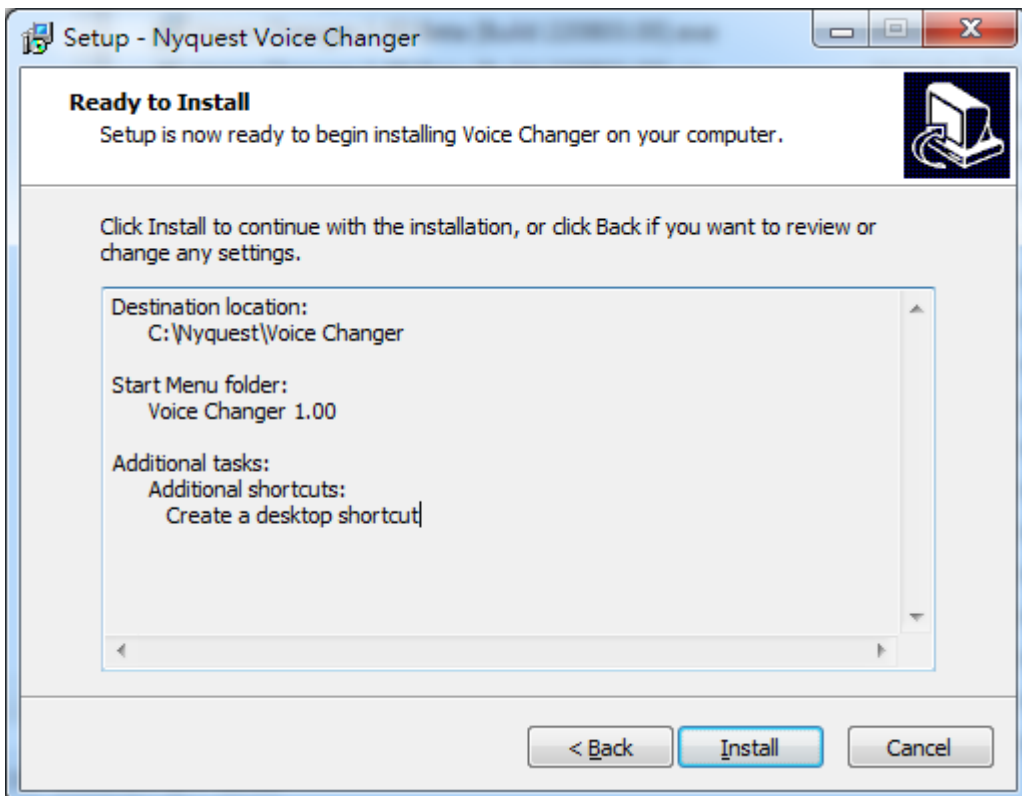
Step 2: The default destination location. If user wants to change location, please press Browse to select a different folder. Then press Next.



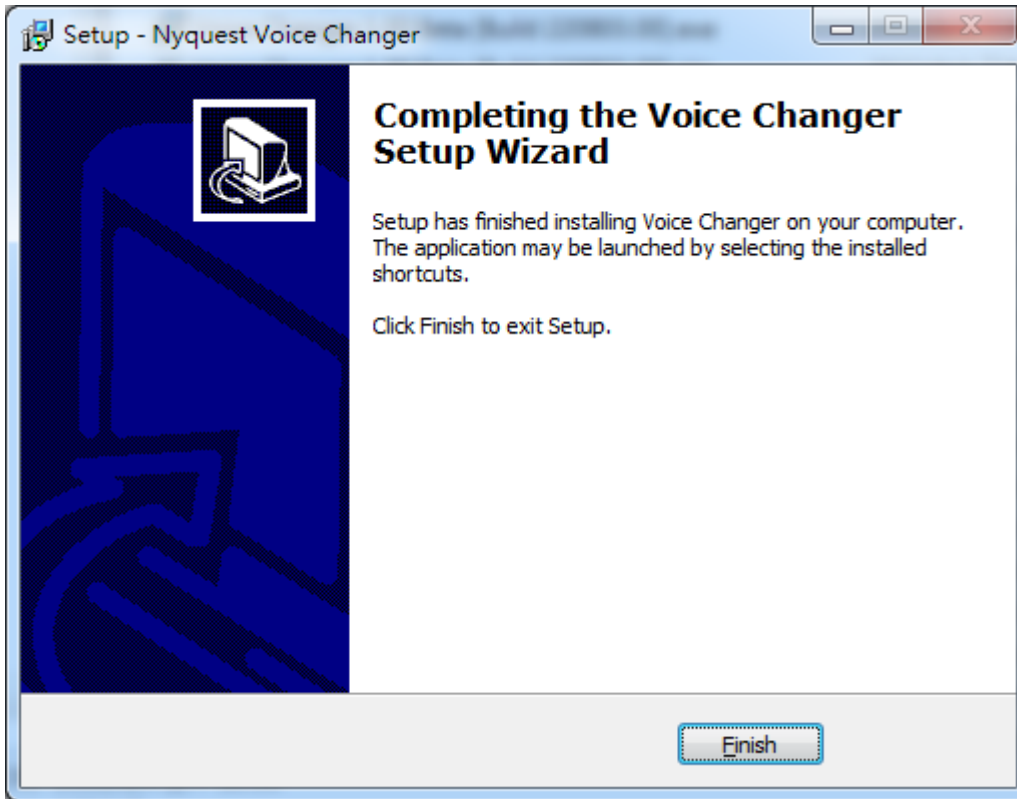
Step 3: Tick to build a shortcut on desktop or not. Then press Next.



Step 4: The setup wizard will show the installation settings. If the settings are correct, please click on Install for getting started.



Step 5: After completing the installation, a pop-up dialogue will be shown to inform user. Please press Finish to exit setup.



1.3 The Main Interface

Effect	Name	ROM	RAM	CPU
Echo		5,192	2,790	27.49
Robot1		568	280	9.64
Robot2		1,788	3,764	19.61
Robot3		3,144	6,840	53.78
Robot4		13,580	3,060	55.32
Pitch / Speed Change		5,528	3,760	37.56

Amplitude/Noise Gate	Name	ROM	RAM	CPU
Auto Gain Control		608	360	0.00
Dynamic Range Control		3,008	344	6.60
Noise Gate		2,168	296	0.00
Digital Amplitude		1,612	412	12.71

Filter	Name	ROM	RAM	CPU
Record Play EQ Filter		4,136	408	9.08
High Pass Filter		4,324	412	5.11
Low Pass Filter		4,324	412	5.11
Band Pass Filter		4,324	412	5.11

ROM Size: 16,200 / 65,536 bytes (24.71%) | RAM Size: 2,096 / 12,288 bytes (17.05%) | CPU Loading: 9.14 / 100.00%

1.4 Menu

The Menu provides 3 commands, includes File, Function and Help.

Content:

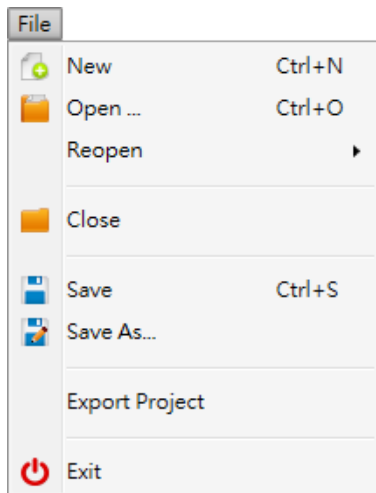
[1.4.1 File](#)

[1.4.2 Function](#)

[1.4.3 Help](#)

1.4.1 File

Click [File] on Menu Bar, and the menu is shown below.

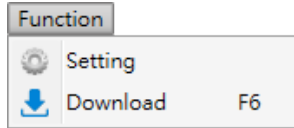


The items and description of [File] are below.

Item	Description
New	Create a new <i>Voice Changer</i> project.
Open...	Open an existing <i>Voice Changer</i> project.
Reopen	List the recently opened <i>Voice Changer</i> projects, from which one can be chosen.
Close	Close the currently open <i>Voice Changer</i> project.
Save	Save the <i>Voice Changer</i> project.
Save As...	Save the <i>Voice Changer</i> project with a different name and/or to a new location.
Export Project	Export project and the used files to another directory
Exit	Close and exit <i>Voice Changer</i> .

1.4.2 Function

Click [Function] on Menu Bar, and the menu is shown below.

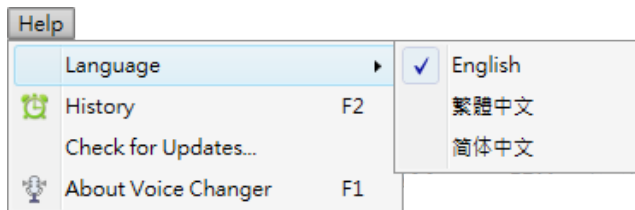


The items and description of [Function] are below.

Item	Description
Setting	The Setting is the function to set the environment variable of project.
Download	The Download function is used for converting a project file (.vcprj) into a target demo file (.bin).

1.4.3 Help

Click [Help] on Menu Bar, and the menu is shown below.



The items and description of [Help] are below.













Item	Description
Language	<i>Voice Changer</i> is available in English, Traditional Chinese or Simplified Chinese.
History	Revision history of <i>Voice Changer</i> .
Check for Updates...	Check for the latest version of <i>Voice Changer</i> . This function will connect to the Internet.
About Voice Changer	Display the information of <i>Voice Changer</i> including its version.

1.5 Shortcut

Shortcut buttons offer quick access of main functions, and they are located under the menu bar. Users could execute main functions directly without accessing the menus.

 **New:** Create a new *Voice Changer* project.

 **Open:** Open an existing *Voice Changer* project.

-  **Close:** Close the currently open *Voice Changer* project.
-  **Save:** Save the *Voice Changer* project.
-  **Save as...:** Save the *Voice Changer* project with a different name and/or to a new location.
-  **Add:** Add the selected effect into the effect combination.
-  **Remove:** Remove the selected effect from the effect combination.
-  **Remove all:** Remove all effects.
-  **Reset:** Reset the properties of effect combination.
-  **Play:** Play selected voice file.
-  **Pause:** Pause or resume the playback.
-  **Stop:** Stop the currently playing file.
-  **Setting:** The Setting is the function to set the environment variable of project.
-  **Download:** The Download function is used for converting a project file (.vcprj) into a target demo file (.bin).

Mode: : Select the demo mode as Record Play or Real-time. The demo mode supports different effects which also leads to the different interfaces. After downloading the file, it will demonstrate the file by user's selection.

Resample: : Set the resample of the demo voice file and the sample rate of demo recordings. The Record Play mode provides 4 options: 8kHz / 10kHz / 12kHz / 16kHz. The Real-time mode provides 3 options: 8kHz / 12kHz / 16kHz.

1.6 Status Bar

ROM Size: The size of ROM of the demo file, its unit is Byte.

ROM Size: 80 / 65,536 bytes (0.12%)

RAM Size: The size of RAM of the demo file, its unit is Byte.

RAM Size: 194 / 12,288 bytes (1.57%)

CPU Loading: The CPU loading of the demo file, its unit is %.

CPU Loading: 0.00 / 100.00 %

Duration: The duration of demo file in the unit of second.

Duration: 1,168,930 ms

Sampling Rate: The sampling rate of the demo file, its unit is Hz.

Sampling Rate: 6,000 Hz

2 Effect

The Effect box lists all effects. User can add or delete an effect by using the [Function] menu, shortcut, or right-mouse click. The items from Effect list will be different by the demonstration mode (Record Play / Real-time).

Effect				Amplitude/Noise Gate				Filter			
Name	ROM	RAM	CPU	Name	ROM	RAM	CPU	Name	ROM	RAM	CPU
Echo	5,192	2,790	27.49	Auto Gain Control	608	360	0.00	Record Play EQ Filter	4,136	408	9.08
Robot1	568	280	9.64	Dynamic Range Control	3,008	344	6.60	High Pass Filter	4,324	412	5.11
Robot2	1,788	3,764	19.61	Noise Gate	2,168	296	0.00	Low Pass Filter	4,324	412	5.11
Robot3	3,144	6,840	53.78	Digital Amplitude	1,612	412	12.71	Band Pass Filter	4,324	412	5.11
Robot4	13,580	3,060	55.32								
Pitch / Speed Change	5,528	3,760	13.54								

2.1 Name

The Name column shows the effect name. It's disabled to reuse the same effect while editing the effect combination.

2.2 ROM

The ROM size is occupied by used effects, its unit is Byte. The value of ROM column will be different because the property, mode, and environment of the selected effects.

2.3 RAM

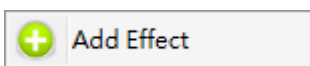
The RAM size occupied by used effects, its unit is Byte. The value of RAM column will be different because the property, mode and environment of the selected effects.

2.4 CPU

The CPU loading of effects, its unit is %. The value of CPU column will be different because the property, mode and environment of the selected effects.

2.5 Right-Click Menu

Right-click on the Effect list to open the context menu. The option is listed below.



Option	Description
Add Effect	Add the selected effect into the effect combination.

3 Properties

The Properties box shows the selected effect properties. User can adjust the effect properties based on the selected demo mode. The list and options of Properties will be different based on the selected mode and the environment of the project.

3.1 Echo

Users can adjust the delay time and repeat times of echo to reach the specified echo outcome.

3.1.1 Delay Time

Set the delay time of echo. User can set the delay time of echo according to different applications. The higher the re-sampling frequency, the shorter the maximum delay time that can be set; whereas the lower the re-sampling frequency, the longer the maximum delay time that can be set

3.1.2 Repeat Times

Set the repeat times for echo.

3.1.3 Quality

The Quality option provides Low and High settings. When the Low setting is applied, the algorithm will occupy less memory but the quality is vague and rough. Whereas the High setting is applied, the algorithm will occupy more memory resources but the quality is better and clear.

3.2 Robot

The Robot item provides 4 effects, the differences are below.

Effect	Description
Robot1	The articulation is vague, with a magical sound effect.
Robot2	The articulation is vague, with magical and electronic sound effect.
Robot3	The articulation is vague, with a cold metallic sound effect.
Robot4	The articulation is clear, with a flat intonation and cold sound effect.

3.2.1 Pitch Factor

The pitch of robot effect. There are 16 levels (0~15), the smaller the level, the lower pitch, and vice versa.

3.2.2 Noise Gate

The noise gate for the robot effect. There are 8 levels (0~7), the smaller the level, the more contained background noise, and the more completed voice. On the contrary, the larger level, the less background

noise, but the uncompleted voice.

3.2.3 Compress

The compress switch of the robot effect. The quality will be worse when the switch is on, and the RAM usage is less. And vice versa, the quality will be better when the switch is off, and the RAM usage is more.

3.3 Pitch Change

Change the pitch of voice without changing speed, sharp and flat within a maximum range of plus or minus one octave.

3.3.1 Pitch Factor

There are 25 levels (-12~12) for changing pitch, the smaller level, the flatter pitch, and vice versa, the larger level, the sharper pitch. When the Factor is set to -12, it means the pitch will be lower one octave, the one-half of the original audio source. When the Factor is set to 12, it means the pitch will be high one octave, twice of the original audio source.

3.4 Pitch / Speed Change

Adjust the pitch and speed of audio at the same time.

3.4.1 Pitch Factor

The factor for changing the pitch of pitch and speed change. Please refer to [3.3.1 Pitch Factor](#) for details.

3.4.2 Speed Factor

There are 25 levels (-12~12) for changing speed, the smaller level, the slower speed, and vice versa, the larger level, the faster pitch. When the Factor is set to -12, it means the speed will be slowed as one-half of the original audio source. When the Factor is set to 12, it means the speed will speed up as twice of the original audio source.

3.4.3 HQ

The switch of HQ effect. The quality will be better when the switch is on, and the CPU usage is more. And vice versa, the quality will be worse when the switch is off, and the CPU usage is less.

Note: If the audio source is the voice of an adult male, it's recommended to open the HQ.

3.5 Reverb Sound

To simulate the effect of the reverb sound in a small room.

3.5.1 Factor

There are 8 levels (0~7) for adjusting reverb sound. The smaller the level, the weaker effect, and vice versa.

3.6 Ghost Sound

The effect of the erratic ghost sound.

3.6.1 Pitch Factor

The factor for changing the pitch of ghost sound. Please refer to [3.3.1 Pitch Factor](#) for details.

3.6.2 Envelope Factor

The Envelope Factor provides 3 kinds of ghost sound effect, their differences are listed below.

Factor	Descriptions
0	Suitable for speaking, the tone of volume goes smooth.
1	Suitable for speaking, the tone of volume goes fast.
2	Suitable for whoop, the tone of volume smooth and slow.

3.7 Chorus Sound

Chorus can be presented as a combination of two or three persons.

3.7.1 Pitch Factor

The factor for changing the pitch of chorus sound. Please refer to [3.3.1 Pitch Factor](#) for details.

3.7.2 Delay Time

The delay time of chorus. There are 2 options: Delay 1 Time and Delay 2 Time. The Delay 1 time means the delay time between Voice 1 and Voice 2. Delay 2 Time means the delay time between Voice 2 and Voice 3.

3.7.3 Voice Volume

The volume of chorus voice. Voice 1 ~ 3 Volume means the volume from Voice1 ~ 3. There are 101 levels to set. 0 means mute, the smaller the level, the quieter volume, and vice versa. 100% means the original volume of the source file.

3.7.4 Gain

The overall volume of chorus voices. There are 11 levels (+1.0 ~ +2.0), the smaller the level, the quieter volume, and vice versa. The +1.0 level means no adjustment, and +2.0 level means the volume is twice loud.

3.8 Darth Sound

Simulate the Darth sound effect from the movie Star War.

3.8.1 Darth Sound Type

Voice Changer provides 4 options of Darth sound effect.

Option	Description
Type 0	Metallic sound
Type 1	Metallic sound with a little bit of hoarse
Type 2	Metallic sound with hoarse
Type 3	Hoarse sound

3.8.2 Pitch Factor

The pitch factor for Darth sound effect. Please refer to [3.3.1 Pitch Factor](#) for details.

3.9 Animal Roar Sound

Simulate the roaring tones of ferocious animals like tigers, lions or dinosaurs. It is recommended to lower the pitch parameter and speed parameter, which can be more similar to the low roar of ferocious animals.

3.9.1 Pitch Factor

Please refer to [3.3.1 Pitch Factor](#) for the details of Pitch Factor.

3.9.2 Speed Factor

Please refer to [3.4.2 Speed Factor](#) for the details of Speed Factor.

3.9.3 Reverb Factor

Please refer to [3.5.1 Reverb Factor](#) for the details of Reverb Factor.

3.9.4 HQ

Please refer to [3.4.3 HQ](#) for the details of HQ.

3.10 Auto Gain Control

The Auto Gain Control can maintain the volume of the overall original voice file automatically.

3.10.1 Auto Gain Control Type

There are 3 types for setting the Auto Gain Control, their differences are listed below.

Option	Mode	Description
Type 0	Record Play	-5dB of the target volume.
	Real-Time	-7dB of the target volume.
Type 1	Record Play	-12dB of the target volume, update the gain fast.
	Real-Time	-5dB of the target volume, update the gain fast.
Type 2	Record Play	-12dB of the target volume
	Real-Time	-9dB of the target volume

3.11 Dynamic Range Control

The Dynamic Range Control can limit the volume range by reducing the loud volume and raising the quiet volume. It makes the voices saturated and solid.

3.12 Noise Gate

When the input signals are under the threshold of noise gate, the noise gates attenuate the volume. It also can adjust the attack / release effect of voices.

3.12.1 Noise Gate Type

There are 4 types for setting the Noise Gate Type, their differences are listed below.

Option	Description
Type 0	The speed of attack and release is normal, it keeps most normal speed of sentences.
Type 1	The speed of release is the slowest, it keeps more Tail.
Type 2	The speed of attack is the slowest, it keeps more noisy consonants.
Type 3	The speed of attack is fast, but medium for the release. It keeps entire speech sentences.

3.13 Digital Amplitude

Auto-judge the speech sentences, it can raise the volume up to full scale (0dB), and reduce the background noise from sentences at the same time. It is recommended to use an equalization filter to multiply and multiply the listening volume. ◦

3.13.1 Digital Amplitude Type

There are 3 options for the Digital Amplitude Type, their differences are listed below.

Option	Description
Type 0	Reduce the volume of some unvoiced sentences, the volume gain curve will be smoother and the pronunciation will be softer.
Type 1	Reduce the volume of non-speech sentences, and emphasis the sound of speech sentences.
Type 2	Fast volume gain. The front-end speech is well preserved, and the articulation sounds clear and neat.

3.13.2 Sound Detection

The Sound Detection provides the Dynamic and the Fixed option. When user selects the Dynamic option, the VAD will be activated by system dynamic detection. When setting the Fixed option, the VAD will be activated by the Threshold which is set by user.

3.13.3 Threshold

When the Sound Detection is set to the Fixed option, the VAD will be activated by the Threshold which is set by user. There are 101 levels for threshold (0%~100%). When the volume exceeds the VAD, the sound will be amplified.

3.13.4 Max. Volume

The maximum volume ratio determines the maximum ratio of the amplified volume. The maximum volume ratio has 100 levels (1% ~ 100%); the smaller the value, the lower the volume; otherwise, the larger the value, the higher the volume. When the maximum volume ratio is set to 1%, it means that the volume is almost silent; on the contrary, when the maximum volume ratio is set to 100%, it means that the volume corresponds to full scale.

3.14 Echo Cancel

Reduce the background noise from non-speech audio, it can avoid the howling noises which is generated by energy feedback.

3.14.1 Threshold

The threshold setting can reduce the volume of Echo Chancel to 0dB. The smaller the value, the better the original sound source can preserve the speech integrity; the larger the value, the lower the original sound source can retain the speech integrity, which is suitable for the original sound source with large background noise.

3.15 Record Play EQ Filter

Set the different frequency of gain values to change the clarity of the vocals or the tension balance of the song.

3.15.1 Record Play EQ Filter Type

Voice Changer provides 2 types of EQ filter, their differences are listed below.

Type	Description
0	Loud and clear, suitable for megaphone and voice changing effects.
1	Thick and warm, suitable for speech.

3.16 High Pass Filter/ Low Pass Filter/ Band Pass Filter

The Filter can roll-off the set frequency range of signal. The High Pass Filter can roll-off with the decreasing frequency and pass the high frequency signals. The Low Pass Filter can pass the low frequency signals and roll-off with the increasing frequency. The Band Pass Filter roll-off with decreasing frequency as well as increasing frequency, passing the signals in band range.

3.16.1 Frequency

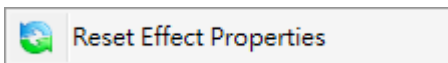
Set the passband and stopband of filter for the frequency range. The cut-off frequency is at the frequency -3dB signal. The High Pass Filter can roll-off with the decreasing frequency and pass the high frequency signals. The Low Pass Filter can pass the low frequency signals and roll-off with the increasing frequency. The Band Pass Filter can set 2 groups of cut-off frequency which means it allows two groups of cut-off frequency pass signals and roll-off with the filtered-out frequency.

3.16.2 Gain

The Gain for filter can reduce or gain volume to the filtered audio. There are 41 levels (-10.0 ~ +10.0), the smaller value, the more decreased volume, and vice versa.

3.17 Right Click Menu

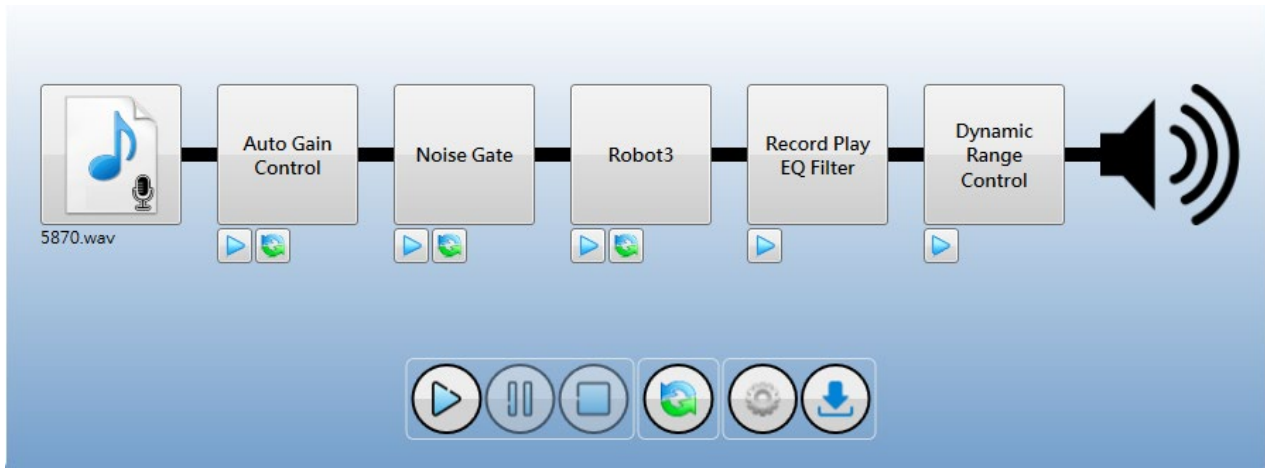
Open the context menu by right-click on the Effect Properties list.



Option	Description
Reset Effect Properties	Reset the selected effect properties.

4 Effect Combination

The Effect Combination can arrange the added effects and combine effects as one sentence. It's up to 5 effects for each combination. Please refer to [1.5 Shortcut](#) for the related functions.

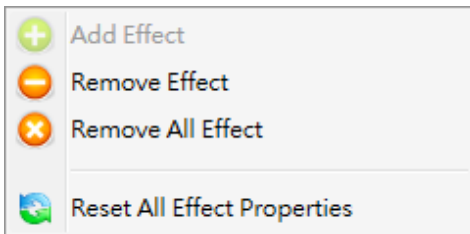


4.1 Demo

The audio file of *Voice Changer* only accepts 16/24/32-bit mono and stereo wave files (.wav), *Quick-IO* files (.nyq) or *Q-Sound* files (.nyw). To include a voice file. Just click on the icon, a pop-up menu will be shown for adding files on demands.

4.2 Right Click Menu

Just right-click on the Effect Combination window, the right click menu will pop up.



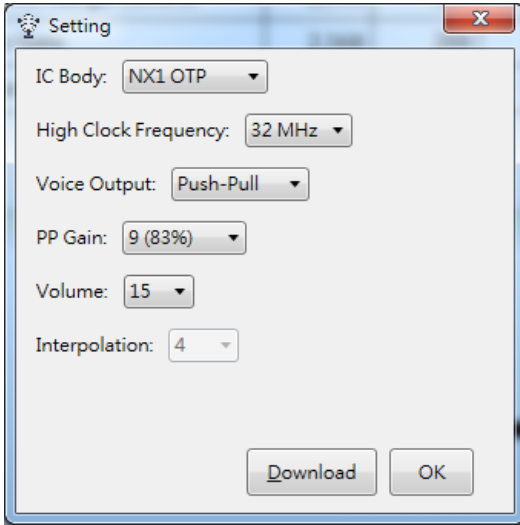
Option	Description
Add Effect	Add the selected effect into the combination.
Remove Effect	Remove the selected effect from the combination.
Remove All Effect	Remove all the effects.
Reset All Effect Properties	Reset all effects from the combination.

5 Setting/Download

Execute the Setting function, user can edit the environment parameters of demo project through the pop-up window. The operation flow is described as below.

5.1 Setting

All the hardware options will be shown in this Setting window, user can set the options by the pull-down menu.



IC Body: This setting provides NX1 OTP (NX1_FDB) and NX1 EF (NX1_EVB) for user.

High Clock Frequency: This are 4 options provided for NX1 OTP series: 12MHz, 16MHz, 24MHz and 32MHz; the default is 32MHz. For NX1 EF series, the provided options are 32MHz, 40MHz and 48MHz, the default is 48MHz.

Voice Output: Set the output driver types for speaker. For NX1 OTP series, user can select different voice output modes as Push-Pull or DAC. The following table shows the corresponding percentage in deferent levels of Push-Pull. For NX1 EF, user can select DAC or PWM as voice output mode.

Push-Pull																
Level	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Percentage (%)	130	122	114	107	100	94	88	83	77	71	66	60	55	50	45	40

PP Gain: The Push-Pull Gain function is only available for setting Push-Pull as voice output mode, and user can select level 1 to 16.

PWM Current: Set the PWM output current. There are 3 output options: Normal, Large and Ultra, the default is Normal.

Speaker: Set the speaker impedance. There 3 options: 4Ω, 8Ω, and 16Ω. This option is only available when PWM is set as voice output mode, and the default is 8Ω.

Volume: Set the playback volume, user can select level 1 to 15.

Interpolation: Set the samples of interpolation. This setting provides 4 sample options: 4, 8, 16 and 32. The more parameters, the more samples, and vice versa. This default parameter for NX1 2/13FS IC is 16. For NX1 OTP IC, the default parameter is 4.

MIC Gain Control: When the demo mode is Real-time, user can set the MIC Gain Control, it provides 0~31 levels for setting volume.

5.2 Download

Press to automatically download to the demo hardware plugged in currently connected programming device. If there are more than two devices connected, please select “Configure Download” in Function Menu for selecting the demo hardware you want to download.

Note: Please install NYIDE, NYC_NX1 and SPI_Encoder before using Voice Changer.

The corresponding key functions

Demo Mode	Key Sequence	Function
Record play	1	Start to record.
	2	Stop recording / Stop playback.
	3	Start to record (apply effects and activate EQ filter).
	4	EQ filter key.
	N	Recording indicator output.
Real-Time	1	Enable the microphone (apply effects).
	2	Disable the microphone.

Note:

1. *N means the last output pin of PA.*
2. *Due to the different pins of different ICs, the key sequence and output pins may be different.*

6 Revision History

Version	Date	Description	Pages Modified
1.0	2022/11/28	The first version.	-
1.1	2023/05/03	Update the descriptions of Echo. Add the description of Animal Roar Sound.	13 16
1.2	2024/02/16	Update the descriptions of Setting	21