

## VIRTUATILT BASIC CONFIGURATION AND SETUP

Following some basic instructions to have your VirtuaTilt up and running quickly.

VirtuaTilt controller is powered by FRDM KL25Z board with Pinscape software already installed.

**Please always refer to official Pinscape build guide available here:**

<http://mjrnet.org/pinscape/BuildGuideV2/BuildGuide.php?sid=kl25zSoftwareSetup>

### KL25Z Software Setup

VirtuaTilt comes with a KL25Z "microcontroller", which is basically a tiny computer. **Pinscape firmware is already installed (latest version - August 19, 2024)**. That serves as both the operating system and the application software. It controls all of the virtual pinball functions of the KL25Z, including the sensors, buttons, and feedback devices, and it handles communications with Windows.

In addition to the Pinscape firmware that runs on the KL25Z, there's a separate Pinscape program that runs on your Windows PC, called the **ConfigTool**. This provides an interactive interface for setting up the device, configuring it, and testing it. You don't need to leave the ConfigTool running all the time; it's only needed to set up and test the device. You can also run it again at any time to change options, update the firmware, or troubleshoot problems (it includes some testing features that can help debug the hardware setup).

The software installation process is all controlled from the PC. The Config Tool handles the KL25Z software setup, so the first step is to install the Config Tool on your PC. You can download it from official page:

<http://mjrnet.org/pinscape/swversions.php>

To install, download the ZIP file above, unblock it (**very important!**) and unpack it into a folder on your hard disk. Use any location that's convenient. Open the folder and double-click the "**PinscapeConfigTool.exe**" application.

### VirtuaTilt default config

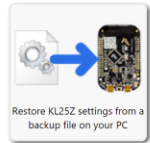
Following is the default VirtuaTilt config in Pinscape. We recommend to leave it as-is for testing buttons, potentiometer, feedback devices, etc. You can obviously change it afterwards, according to your personal preferences. We also recommend to save it, in case you need to revert back to original configuration:

## Back up & Restore

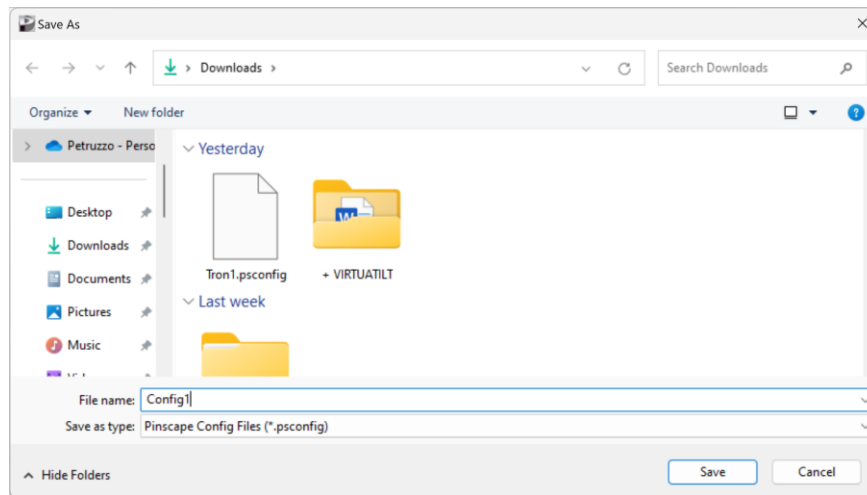
Pinscape Unit #1 | LedWiz Unit #1 | CPU ID 001A-004F9002-53274E45



Saves the configuration settings from the KL25Z to a file on your PC. You can use this file as a data backup in case of hardware problems or data loss on the KL25Z. You can also use it to duplicate this device's settings on other devices, or share your setup with other people.



Restores the KL25Z to the settings saved in a backup file. You can use this to recover from data loss or hardware failures, or to restore working settings after making experimental or unwanted changes.



Pinscape Setup

## Settings

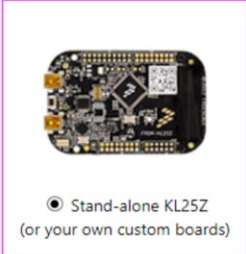
---


**Configuration settings for KL25Z CPU ID 0049-004E9002-53274E45**


Memory used: 9.5K bytes of 16K bytes (6,672 bytes free) [Explain](#)

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**System type.** Are you using this KL25Z on its own, or with a set of expansion boards? [Help](#)


☒ Stand-alone KL25Z  
(or your own custom boards)


☐ Pinscape Expansion Boards


☐ Pinscape All-in-One

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**USB Identification.** This is how the KL25Z identifies itself to Windows through the USB port.

LedWiz Unit 1  (USB Vendor ID FAFA, Product 00F0)

- If you have a **real** LedWiz unit in your system, choose **LedWiz Unit 8** for your first Pinscape unit, 9 for the second, etc.
- If you **don't** have any real LedWiz units, choose **LedWiz Unit 1** for the first unit, 2 for the second, etc.

[I want more details!](#)

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**Pinscape ID.** This is a **separate** ID from the LedWiz unit number. DOF R3 and the [DOF Config Tool](#) use this ID to identify the unit. **Set this to 1 for your first unit**, 2 for the second, and so on. You **don't** have to copy the LedWiz unit number here! This is completely unrelated to the LedWiz number. This setting **must always** be **1** for your first (or only) Pinscape unit, or DOF won't work.

Pinscape Unit 1

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**Reset on disconnect.** If the USB connection is broken, and can't be re-established within a time limit, the KL25Z can automatically reset itself as an attempt to fix whatever's wrong. Select ☒ Enabled

Time before reboot (seconds):

[Details](#)

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**TV ON switch.** If one or more of your monitors needs to be turned on manually every time you power up your cabinet, you can use this feature to switch them on automatically. See the [TV ON](#) feature for details.

☐ Enabled

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**IR Remote Control.** The controller can send and/or receive IR remote control signals if you attach some additional components. This can be used with the [TV ON](#) feature to turn your cabinet on automatically. See the [TV ON](#) feature for details on the components required and how to connect them. If you don't have any IR components attached or wish to disable them, simply set the pin assignments here to "Not Connected".

IR LED (transmitter) pin:	<input type="text" value="Not Connected"/>	Requires a PWM-capable pin
IR receiver input pin:	<input type="text" value="Not Connected"/>	Requires an interrupt-capable pin

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**Joystick input.** The controller acts like a Windows USB Joystick in order to send the plunger position, accelerometer readings (for nudging), and button input

☒ Enable joystick input

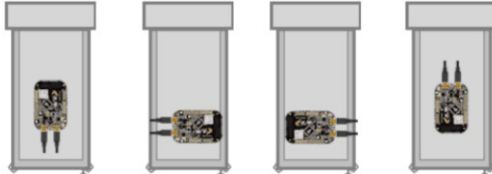
[Why would I want to disable this?](#)

Joystick axis format:  [What's this?](#)

Joystick report interval (milliseconds):  [Explain](#)

Accelerometer "stutter":  [Explain](#)

**Accelerometer orientation.** If you're using the accelerometer (for nudge sensing), the software needs to know how the KL25Z is oriented in the cabinet so that below, level with the floor of the cabinet, with the chips and LEDs facing up.



☐ Ports facing front ☐ Ports facing left ☐ Ports facing right ☒ Ports facing rear

**Dynamic range.** Select the range for accelerometer readings. Ranges above  $\pm 2G$  have lower precision. [Details](#)

- ☒  $\pm 1G$  (original Pinscape setting, highest precision)
- ☐  $\pm 2G$  (same precision as  $\pm 1G$  but with wider range)
- ☐  $\pm 4G$  (reduced precision, wider range)
- ☐  $\pm 8G$  (lowest precision, widest range)

**Auto-centering.** The controller automatically zeroes the accelerometer after it's been sitting still for a while. This compensates for any tilt in the mounting plate. [Joystick Viewer](#).

- ☐ Manually center only (no auto-centering)
- ☒ Auto-center with default time (5 seconds)
- ☐ Auto-center with custom time

## Plunger sensor setup

Sensor type:

[Live Sensor View](#)

**Potentiometer.** This uses a slide potentiometer, which is a variable resistor with a control knob that moves linearly across the length of the device. Attach pot's electrical resistance changes as the knob moves, proportionally to the position, so the controller can determine the plunger position by reading the voltage.

### Pin assignments:

Wiper:  *Requires an ADC (analog in) pin*

**Plunger calibration button.** If you wish, you can install a pushbutton in your cabinet to activate plunger calibration mode. This is optional, since you can also use the joystick for calibration.

Button input:  ☐ Enabled

Indicator lamp output:  ☐ Enabled

**ZB Launch Ball setup.** You can set up your mechanical plunger to act as a "virtual" Launch Ball button for tables that use a button instead of a plunger.

☐ Enabled

**Button inputs.** You can use the KL25Z as a key encoder to connect pinball-style buttons on your cabinet to the PC. Set up the wiring connections and key pin or key assignment to change a setting.

[Test Buttons](#)

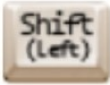

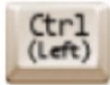
















Shift button number:  [Help](#)

- ☒ Shift OR Key mode
- ☐ Shift AND Key mode

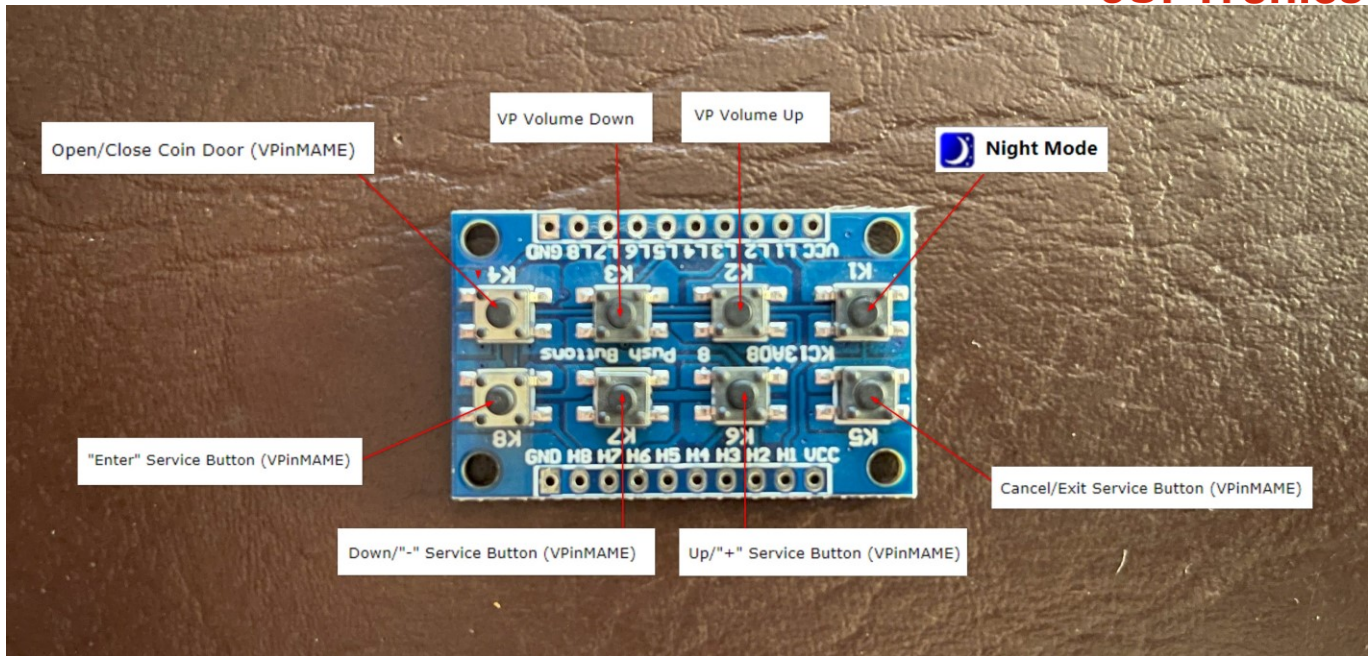
[Set standard joystick buttons](#) | [Set standard keyboard keys](#) | [View standard key assignments](#)

## Buttons Mapping

This is the default VirtuaTilt buttons mapping:

Default Control	Keyboard Config		Button Color
Left Flipper		Left Flipper	
Left MagnaSave		Left MagnaSave	
Right Flipper		Right Flipper	
Right MagnaSave		Right MagnaSave	
Start		Start Game	
Coin In		Coin In	
Exit/Cancel		Exit to menu	
Launch Ball		Plunger/Launch Ball	
Extra Ball		Extra Ball (Buy-In)	
Fire!	To be assigned on Visual Pinball		





**NOTE:** Button ports on Pinscape config tool are different for every VirtuaTilt machine.

No.	Port	PC Input	Options	VP Usage
1	PTC2	1		Start Game
2	PTB3	Shift (Right)		Right Flipper
3	PTB2	Ctrl (Right)		Right MagnaSave
4	PTB1	Enter		Plunger/Launch Ball
5	PTE30	2		Extra Ball (Buy-In)
6	PTE22	6		-
7	PTE5	7	Night Mode	-
8	PTE4	+		VP Volume Down
9	PTE3	-		VP Volume Up
10	PTE2	End		Open/Close Coin Door
11	PTB11	)		Service Button "Enter"
12	PTB10	(		Service Button "Up/+"
13	PTB9	*		Service Button "Down/-"
14	PTB8	&		Service Button "Cancel/Exit"
15	PTC12	%		Coin In (main/left slot)
16	PTC13	Esc		Exit to menu (PinballX/HyperPin front ends)
17	PTC16	Shift (Left)		Left Flipper
18	PTC17	Ctrl (Left)		Left MagnaSave
19	PTA16	19		-
20	PTA17	20		-
21	PTE31	21		-
22	PTD6	22		-
23	PTD7	23		-
24	PTE1	24		-
25	Not Connected			

## TLC5940 (external PWM controller chip) setup [What's this?](#)

Number of TLC5940 chips:

## TLC59116 (external PWM controller chip) setup [What's this?](#)

Disabled - [Show Settings](#)

## 74HC595 (external digital out chip) setup [What's this?](#)

Number of 74HC595 chips:

**Pinscape After Dark.** You can set up a button or switch to activate **Night Mode**, which disables the feedback device outputs that you designate as noise-makers, and neighbors. [Details](#)

Button input number:  0 = no input button assigned

Button type:



☒ Momentary button  
(Toggles mode when pushed)



☐ On/off switch

Indicator lamp output port:  0 = no indicator output

**Feedback device outputs.** Pinball software on the PC can control output devices connected to the KL25Z to create special effects during play, such as tactile feedback. Use these port numbers when you set up your [DOF configuration](#). For each port, you can select the physical output pin that the port is wired

### Test Outputs

Port No.	Type	Location	Pin	Port	Options [?]	Description
	1	Digital	KL25Z J1-2	PTA1		Bumper
	2	PWM	KL25Z J1-4	PTA2		Shaker Motor
	3	Digital	KL25Z J1-6	PTD4		Flipper Left
	4	Digital	KL25Z J1-8	PTA12		Flipper Right
	5	PWM	KL25Z J1-10	PTA4		
	6	PWM	KL25Z J1-12	PTA5		
	7	PWM	KL25Z J2-2	PTA13		
	8	PWM	KL25Z J2-4	PTD5		
	9	PWM	KL25Z J2-6	PTD0		
	10	PWM	KL25Z J2-10	PTD3		
	11	Digital	KL25Z J2-8	PTD2		
	12	Digital	KL25Z J1-14	PTC8		
	13	Digital	KL25Z J1-16	PTC9		
	14	Digital	KL25Z J1-1	PTC7		
	15	Digital	KL25Z J1-3	PTC0		
	16	Digital	KL25Z J1-5	PTC3		
	17	Digital	KL25Z J1-7	PTC4		
	18	Digital	KL25Z J1-9	PTC5		
	19	Digital	KL25Z J1-11	PTC6		
	20	Digital	KL25Z J1-13	PTC10		
	21	Digital	KL25Z J1-15	PTC11		
	22	Digital	KL25Z J2-18	PTE0		

## Installing DOF

Install DOF using .msi files from official page: <http://mjrnnet.org/pinscape/dll-updates.html> and follow **installation instructions**.

Latest version (**1 September 2024**) allows merging of X86 and X64 installs. **64bit versions only of both VPX and DOF are highly recommended.**

NOTE: unblock files after download (**very important!**)

The official step-by-step guide for DOF configuration is available here: [Pinscape Build Guide \(mjrnnet.org\)](http://mjrnnet.org/pinscape/build-guide)

## Configuring DOF for VirtuaTilt

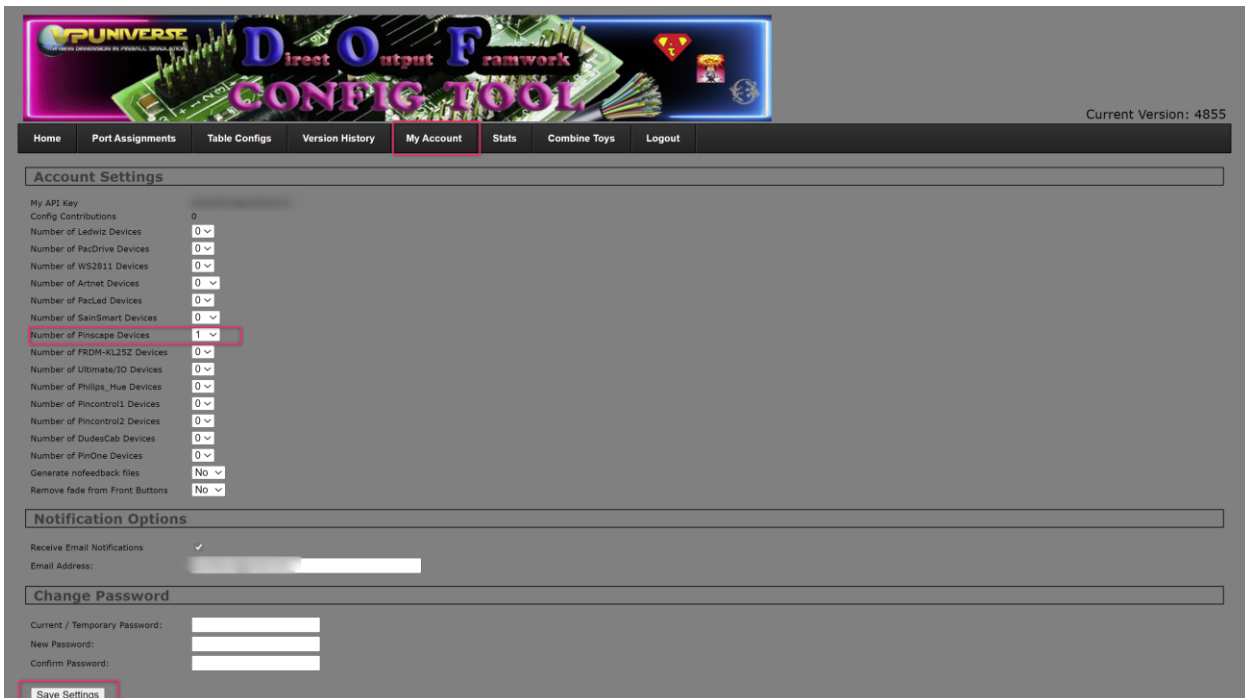
In order to configure DOF you need to setup a configuration file. You can create an account and login to the [DOF Config tool](#) page or **you can just download provided config files from our [GitHub repository](#)** and copy/move the files into your **C:\DirectOutput\** directory (or wherever DOF is installed on your PC), overwriting existing files.

## Changing DOF Configuration

### Select your device

Once you have an account setup, go to **My Account** and select the number of devices for your setup.

- Select **1 for Number of Pinscape Devices** and then **Save Settings**



Current Version: 4855

Home Port Assignments Table Configs Version History **My Account** Stats Combine Toys Logout

### Account Settings

My API Key: [Redacted]

Config Contributions: 0

Number of Ledwiz Devices: 0

Number of PacDrive Devices: 0

Number of WS2811 Devices: 0

Number of Artnet Devices: 0

Number of PacLed Devices: 0

Number of SainSmart Devices: 0

**Number of Pinscape Devices: 1**

Number of FRDM-KL25Z Devices: 0

Number of Ultimate70 Devices: 0

Number of Philips\_Hue Devices: 0

Number of Pincontrol1 Devices: 0

Number of Pincontrol2 Devices: 0

Number of DudesCab Devices: 0

Number of PinOne Devices: 0

Generate nofeedback files: No

Remove fade from Front Buttons: No

### Notification Options

Receive Email Notifications: ☒

Email Address: [Redacted]

### Change Password

Current / Temporary Password: [Redacted]

New Password: [Redacted]

Confirm Password: [Redacted]

**Save Settings**



## Creating a config file

When creating a config file for your setup, its simply a matter of selecting the outputs for each device in your cabinet. VirtuaTilt is already configured this way:

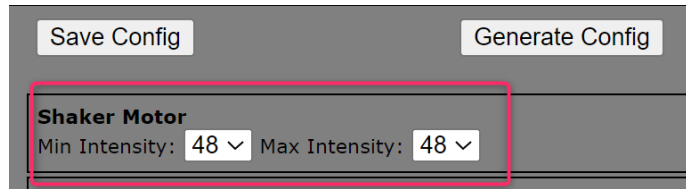
- **Port1** – Solenoid – Combo for bumpers and slingshots
- **Port2** – Shaker Motor
- **Port3** – Left Flipper Solenoid
- **Port4** – Right Flipper Solenoid

The **Combo1** config is assigned to slingshot and bumpers:

Combo ID	Option	Toy Category	Toy 1	Toy 2	Toy 3	Toy 4
Combo1	Delete	Mono	Slingshot Left	Slingshot Right	8 Bumper Left	8 Bumper Right
New	Add	Mono				

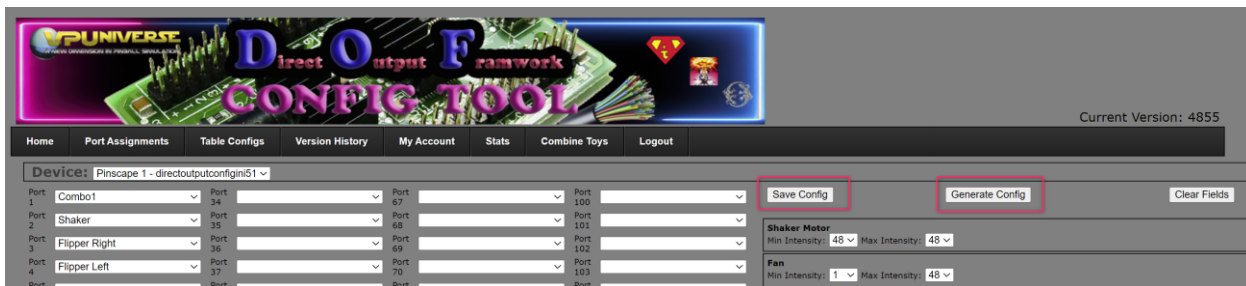
You can change it according to your personal preferences. To do this, simply navigate to the "**Combine Toys**" section in the config tool and enter your new combos.

**NOTE:** Shaker Motor Intensity is already set at Maximum (48). You can change it according to your personal preferences:

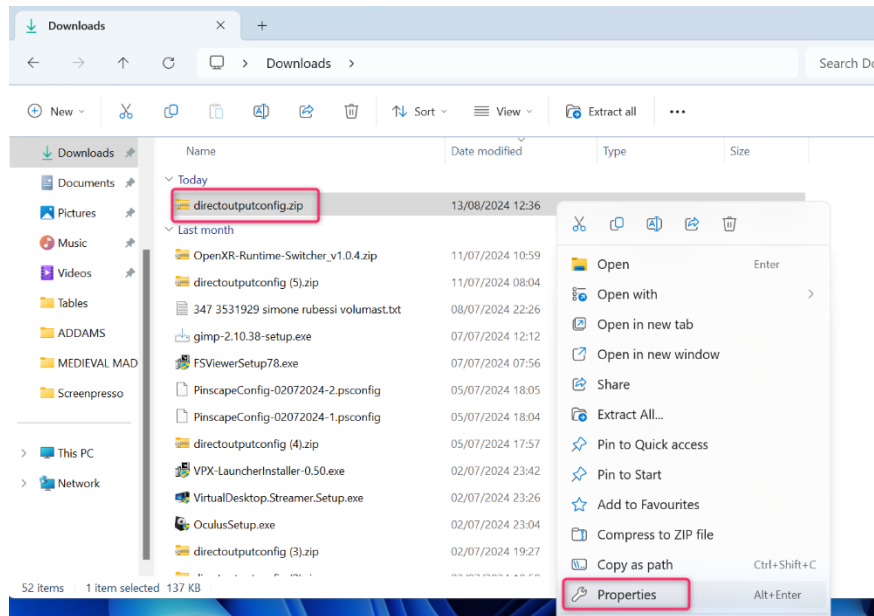


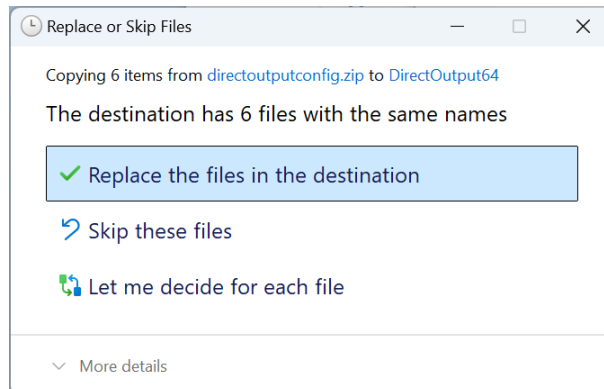
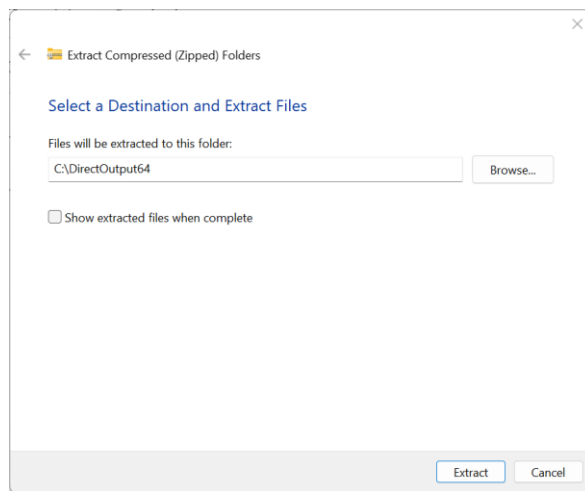
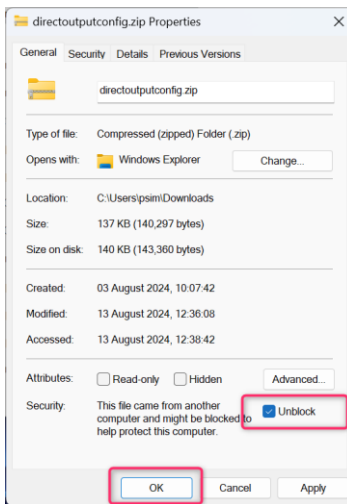
## Setting your config in DOF

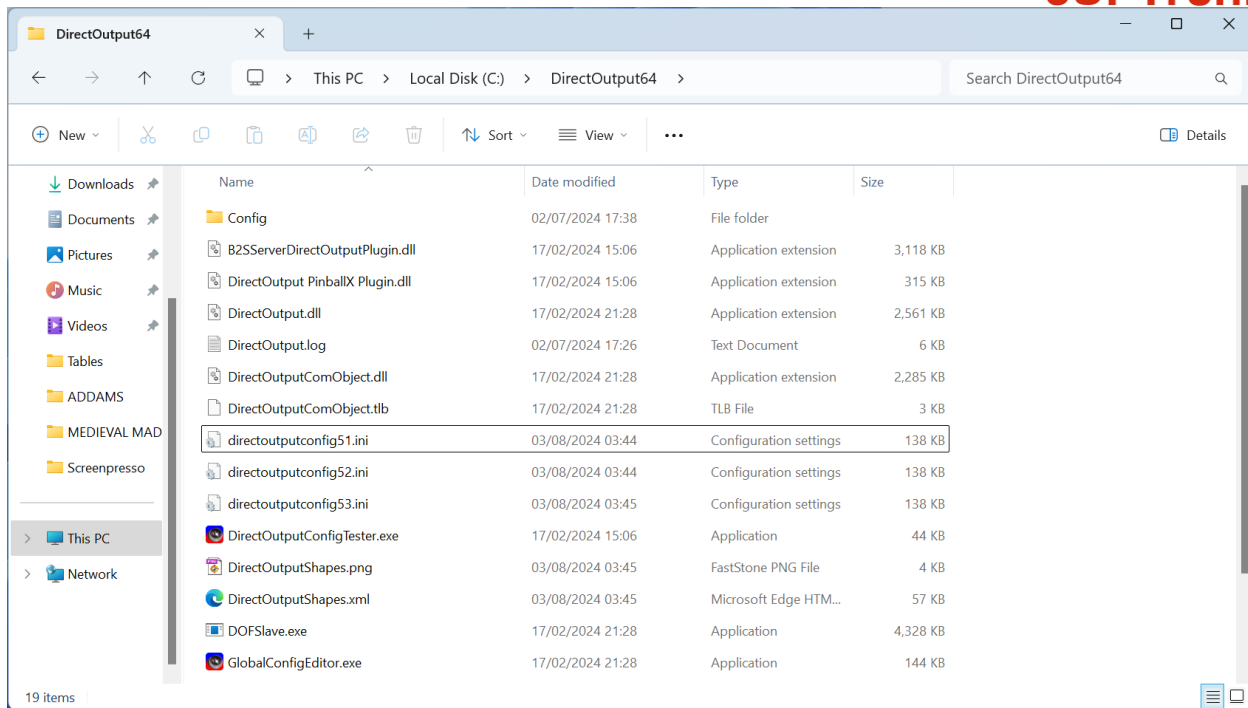
Once you have everything set in the config tool, click the **Save Config** button, then **Generate Config** button:



This will download a copy of the configuration files onto your PC. All you need to do now is to extract the zipfile into your **C:\DirectOutput\** directory (or wherever DOF is installed on your PC) and overwrite all files:

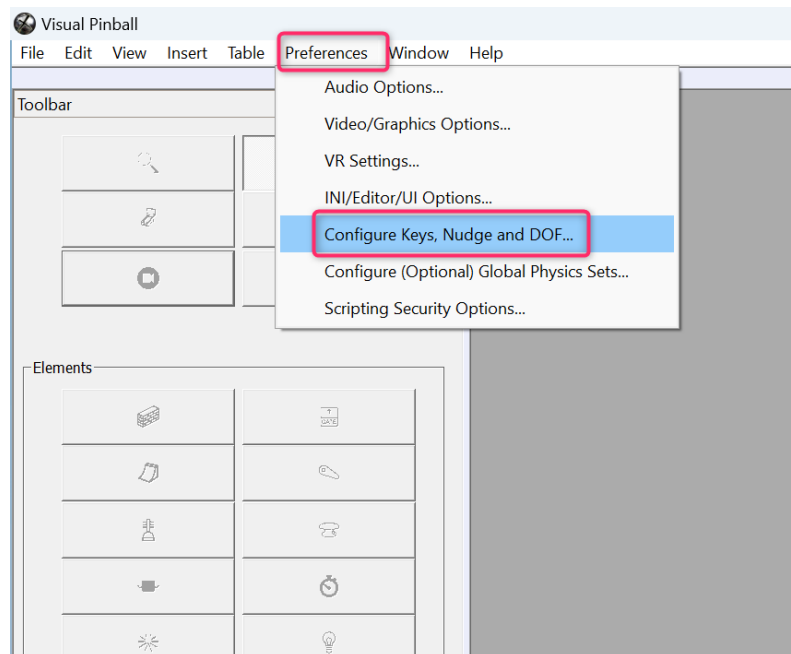






## Visual Pinball configuration

Replicate the following configuration in Visual Pinball settings:



Keys, Nudge and DOF

Button Assignments

Left Flipper L Shift (none)	Right Flipper R Shift (none)	LMagnaSave L Ctrl (none)	RMagnaSave R Ctrl (none)
Start Game 1 (none)	Add Credit 5 (none)	Add Credit 2 4 (none)	Plunger Enter (none)
Exit Game Q (none)	Volume - (none)	Volume + (none)	Debug/Perf Info F11 (none)
Left Nudge Z (none)	Fwd Nudge Space (none)	Right Nudge (none)	Mech Tilt T (none)
Custom 1 Up (none)	Custom 2 Down (none)	Custom 3 Left (none)	Custom 4 Right (none)
Debug Balls O (none)	Debugger/! Edit D (none)	Lockbar/Fire Menu Button 18	Pause P (none)
StagedLFlipper L Windows (none)	StagedRFlipper R Alt (none)	Tweak F12 (none)	

☐ Override Default Button Layout ☐ Disable ESC Key

\*To assign Custom Keys to Gamepad Buttons, click on the button and select desired key, then choose desired gamepad button from dropdown box.

PinMAME Buttons

EB BuyIn (2) (none)	Coin 3 (5) (none)	Coin 4 (6) (none)	Door (END) Button 10
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Service Buttons

Cancel (7) (none)	Down (8) (none)	Up (9) (none)	Enter (0) (none)
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Note that some keys can also be configured in the VPMKeys.vbs file

Nudge, Plumb, Plunger (Changes will not affect open tables)

Axis Assignments

X Axis (L/R) X Axis <input type="checkbox"/> Reverse	X-Max 100	X-Gain 150 %
Y Axis (U/D) Y Axis <input type="checkbox"/> Reverse	Y-Max 100	Y-Gain 150 %
Plunger Z Axis <input type="checkbox"/> Reverse	Dead Zone 0 %	

☐ Enable 1s Plunger Retract

☐ Legacy/VP9-style non-realistic Keyboard Nudge 100 % Strength

☒ Enable Nudge Filter (mainly for Analog/additional Board setups)

☒ Enable Analog Nudge ☐ Normal Board Mounting Orientation

☒ Tilt Sensitivity 400 ☐ Accelerometer Rotation 0

☒ Enable Mouse handling during Play

☐ Enable flying around (Arrow Keys + Left Alt Key) during Camera/Light/Material Edit Mode

To interactively set, calibrate and test the Nudge parameters, please load the 'Nudge Test and Calibration.vpx' table and run it

DOF Controller Options

Contactors DOF	Knocker Both	
Chimes Both	Bell Both	
Gear Both	Shaker DOF	
Flippers DOF	Targets Both	
Drop Targets Both	* This will only apply to tables that are using the Controller.vbs in their script code	

☐ Disable B2S

Input API Direct Input

Ctrl. Rumble Behavior Table with generic fz

OK Cancel

## Nudge/Tilt configuration in Visual Pinball

We recommend starting with following values and modify them afterwards:

Video/Graphics Options

Edited settings

☒ Global application settings  
☐ Specific table overrides

Display

Display 1\*2400x1600 LQ144P1JX01

☐ Window ☒ Exclusive Fullscreen

☐ Disable Desktop Composition

☐ Force 10Bit-Monitor support

2400 x 1600 (120Hz 21:10)

2400 x 1600 (100Hz 21:10)

2400 x 1600 (75Hz 21:10)

2400 x 1600 (60Hz 21:10)

2400 x 1600 (48Hz 21:10)

2400 x 1600 (30Hz 21:10)

2400 x 1600 (24Hz 21:10)

2048 x 1536 (120Hz 4:3)

2048 x 1536 (100Hz 4:3)

2048 x 1536 (75Hz 4:3)

2048 x 1536 (60Hz 4:3)

2048 x 1536 (48Hz 4:3)

2048 x 1536 (30Hz 4:3)

2048 x 1536 (24Hz 4:3)

2048 x 1152 (120Hz 16:9)

View mode Desktop & FSS

Environment lighting

☐ Override Table Global Lighting

Night/Day

☐ Automatic Day/Night cycle

Latitude 52.520000 Longitude 13.370000

Reset to Defaults

Set for Low End PC Set for High End PC

Ball Rendering

☒ Ball Trails Strength 0.500000

☐ Force round ball (compensate perspective stretch)

☐ Disable Lighting

☐ Overwrite Ball Image

Ball Image

Ball Decal

Performance and Troubleshooting

Max. Ambient Occlusion Static AO

Max. Reflection Mode Static & Unsynchronized

Max. Texture Dimension Unlimited

☐ Compress Textures (performance)

☒ Force Anisotropic Texture Filtering (quality)

☐ Force Bloom Filter off (performance)

☐ Use Alternative Depth Buffer processing (legacy)

☐ Use Software Vertex processing (legacy)

Elements Detail Level (decrease = performance)

3D Stereo Output Disabled

☐ Fake Stereo (Performance)

Anaglyph Filter

Anaglyph Brightness 1.000000

Anaglyph Saturation 1.000000

Eye Separation (mm) 0.030000

ZPD 0.500000

Offset 0.000000

☐ Use Y-Axis (Cabinet/Rotated Screen)

Input / Physics / Video Synchronization

Synchronization mode Frame Pacing

Maximum Framerate 0

Maximum pre-rendered Frames 1

Anti-Aliasing

MSAA Samples Disabled

Supersampling Disabled

Post-processed Standard FXAA

Sharpen Disabled

☐ Enable ScaleFX for internal DMD (post-processed Anti-Aliasing)

Cabinet Layout

Screen Width (cm) 0.000000

Screen Height (cm) 0.000000

Screen Inclination 0.000000

Player X (cm) 0.000000

Player Y (cm) 0.000000

Player Z (cm) 70.000000

☐ BAM Headtracking

Miscellaneous Features

Visual Nudge Strength 0.200000

☐ Additional Screen Space Reflections

Save Changes Close

Keys, Nudge and DOF

Button Assignments

Left Flipper L Shift (none)	Right Flipper R Shift (none)	LMagnaSave L Ctrl (none)	RMagnaSave R Ctrl (none)
Start Game 1 (none)	Add Credit 5 (none)	Add Credit 2 4 (none)	Plunger Enter (none)
Exit Game Q (none)	Volume - (none)	Volume + i (none)	Debug/Perf Info F11 (none)
Left Nudge Z (none)	Fwd Nudge Space (none)	Right Nudge - (none)	Mech Tilt T (none)
Custom 1 Up (none)	Custom 2 Down (none)	Custom 3 Left (none)	Custom 4 Right (none)
Debug Balls O (none)	Debugger/ Edit D (none)	Lockbar/Fire Menu Button 18	Pause P (none)
StagedL Flipper L Windows (none)	StagedR Flipper R Alt (none)	Tweak F12 (none)	

☐ Override Default Button Layout ☐ Disable ESC Key

\*To assign Custom Keys to Gamepad Buttons, click on the button and select desired key, then choose desired gamepad button from dropdown box.

PinMAME Buttons

EB BuyIn (2) (none)	Coin 3 (5) (none)	Coin 4 (6) (none)	Door (END) Button 10
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Service Buttons

Cancel (7) (none)	Down (8) (none)	Up (9) (none)	Enter (0) (none)
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Note that some keys can also be configured in the VPMKeys.vbs file

Nudge, Plumb, Plunger (Changes will not affect open tables)

Axis Assignments

X Axis (L/R) X Axis	<input type="checkbox"/> Reverse	X-Max 100	X-Gain 150 %
Y Axis (U/D) Y Axis	<input type="checkbox"/> Reverse	Y-Max 100	Y-Gain 150 %
Plunger Z Axis	<input type="checkbox"/> Reverse	Dead Zone 0 %	

☐ Legacy/VP9-style non-realistic Keyboard Nudge ☐ Enable 1s Plunger Retract

☒ Enable Nudge Filter (mainly for Analog/Additional Board setups)

☒ Enable Analog Nudge ☐ Normal Board Mounting Orientation

☒ Tilt Sensitivity 400 ☐ Accelerometer Rotation 0

☒ Enable Mouse handling during Play

☐ Enable flying around (Arrow Keys + Left Alt Key) during Camera/Light/Material Edit Mode

To interactively set, calibrate and test the Nudge parameters, please load the 'Nudge Test and Calibration.vpx' table and run it

DOF Controller Options

Contactors DOF	Knocker Both
Chimes Both	Bell Both
Gear Both	Shaker DOF
Flippers DOF	Targets Both
Drop Targets Both	

\* This will only apply to tables that are using the Controller.vbs in their script code

☐ Disable B2S

Input API Direct Input

Ctrl Rumble Behavior Table with generic fs

OK Cancel

Your VirtuaTilt should now be able to play Visual Pinball and have feedback on all supported tables!