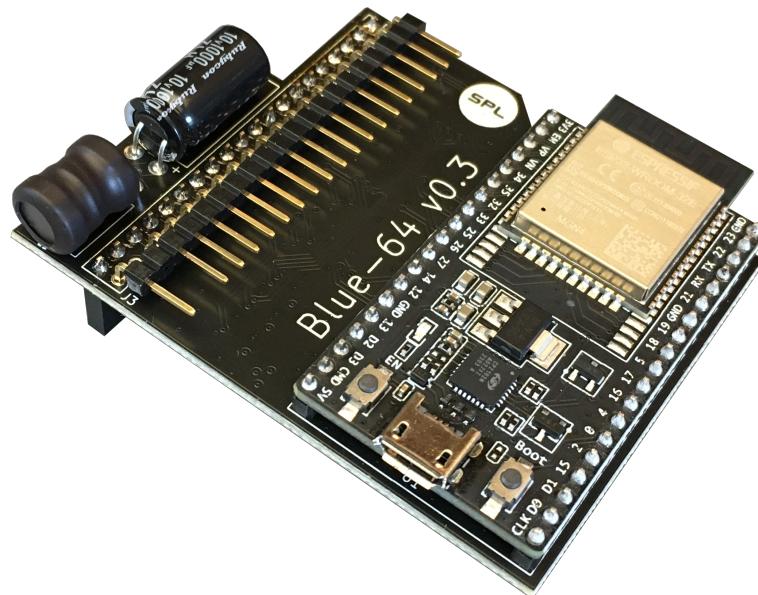


# Blue-64

**Author:** Vittorio Pascucci

If you wish to get in touch with the developer, please join the SPL [Discord server](#).

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*Figure 1. Blue-64 (Developer Board)*

Blue-64 is a plug & play bluetooth adapter for the Commodore 64 that plugs onto the keyboard header inside the computer and can control the keyboard lines and emulate keystrokes and joystick inputs. The goal of the project is to support two bluetooth controllers and a bluetooth keyboard simultaneously, in order to be able to control the C64 completely wirelessly.

Blue-64 can be purchased pre-assembled or as a DIY-Kit from these authorized shops:

- [Retro8BitShop](#)
- [Retro-Updates](#)
- [Restore-Store](#)

Sales of Blue-64 by any shop other than the ones mentioned above may be in violation of the [License](#) terms and conditions and should be reported to the developer

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# 1. Pairing a Bluetooth Device

The Blue-64 is **always listening to incoming pairing requests** up to a maximum of three devices paired simultaneously. This means that it is sufficient to simply set a Bluetooth controller or keyboard in pairing mode and it will automatically pair with the Blue-64 without the need to set the Blue-64 itself in pairing mode.

# 2. Controller Mapping (xInput)

The following key mappings directly apply to "xInput" devices, such as the Xbox-One controller. Different controllers such as the Switch controller and the Playstation 4/5 controller have nearly identical mapping, where buttons in similar positions perform the same function as their xInput counterparts

Joystick	Controller	Controller Alt.
UP	D-Pad UP	Button B
DOWN	D-Pad DOWN	Button X
LEFT	D-Pad LEFT	Left Analog
RIGHT	D-Pad RIGHT	Left Analog
FIRE	Button A	Button Y (Autofire)

Controller buttons not mentioned in the table above can be mapped to trigger any keyboard keystroke through the [on-screen menu](#). Default Controller-Keyboard mappings are reported below:

Keyboard	Controller
SPACE	Menu Button
F1	Right Shoulder

## 2.1. Autofire

The "Y Button" is dedicated to autofire, which can be configured from inactive to 10Hz (100ms) fire-rate through the [on-screen menu](#)

## 2.2. Swapping Joystick Ports

Joystick ports assigned to the connected bluetooth controllers can be swapped with the "View + Y" key combination on the controller. If two controllers are currently connected, only the controller currently assigned to joystick port 2 can swap the ports (to prevent pesky little siblings or partners from swapping ports in-game)

# 3. Keyboard Mapping

At the moment Blue-64 **only supports the English US layout**. The key mapping can be switched between "symbolic" and "positional ([Vice](#))" through the [on-screen menu](#). With "symbolic" mapping the keys on the bluetooth keyboard do exactly what they say on the label, including their "shift" function (if applicable) with a few exceptions:

En-US Key (symbolic)	C64 Key
'~'	Arrow Left
'\'	Arrow Up
6+Shift	£
Tab / Shift+Tab	Stop / Run
Esc	Restore
Delete, F12	Clear
Home, F9	Home
Insert, F10	Insert
Start (Windows)	Commodore
Shift+'\'	Pi

## 4. On-Screen Menu & Additional Functions

Blue-64 has an internal menu that is visualized by printing text on screen. The menu allows typing and executing frequently used macros like loading the tape, loading and/or running programs from disk drive etc. as well as configuring additional preferences.

### 4.1. Navigating the On-Screen Menu (xInput)

1. The on-screen menu can only be navigated via a connected bluetooth controller and/or keyboard and **not with the native C64 keyboard**
2. In order to **Enter** the on-screen menu simply press "View + A/B" on the controller or "Alt/AltGr + Up/Down/Left/Right Arrow" on the keyboard, and menu entries will start printing on screen
3. Once inside the on-screen menu, in order to move or "**Cycle**" through the varius entries press "View + A/B" on the controller or "Alt/AltGr + Up/Down/Left/Right Arrow" on the keyboard
4. In order to **Exit** the on-screen menu or any submenu press "View + X" on the controller or "Alt/AltGr + Backspace" on the keyboard. This will bring the menu "back one level" or produce a blank screen when exiting the menu completely
5. In order to **Confirm** a choice press "View + Menu" on the controller or "Alt/AltGr + Enter" on the keyboard

Function	Controller Button(s)	Keyboard Key(s)
Enter/Cycle Menu	View + A/B	Alt/AltGr + Up/Down/Left/Right Arrow
Confirm Menu	View + Menu	Alt/AltGr + Enter
Exit Menu	View + X	Alt/AltGr + Backspace

**NOTE**

Pressing "View + Menu" on the controller or "Alt/AltGr + Enter" on the keyboard outside of the on-screen menu will launch the last displayed entry. If no entry was yet displayed, the "**LOAD TAPE**" entry will be launched.

**NOTE** Please beware that the "view" and "menu" buttons may be called differently on non xInput devices but are generally in similar positions

**NOTE** Please beware that some controllers, such as 8bitDo or Switch controllers have X-Y and A-B button labels swapped compared to a regular Xbox controllers. What matters in this case is the buttons' position, not the label, so for instance the A button will always be the one at the bottom regardless of the label

## 4.2. Loading Tape/Disk

The first entries of the on-screen menu allow to quickly launch commonly used commands:

1. **LOAD TAPE:** LOAD
2. **LOAD DISK:** LOAD\$,8
3. **RUN DISK:** LOAD\*,8

In order to launch these commands:

1. **Enter** the on-screen menu
2. **Cycle** to find the desired command
3. **Confirm** (The appropriate command will be automatically typed on-screen and run)

**NOTE** When loading the tape it is often necessary to press "space" on the keyboard to run the first program. The "space" key is also mapped by default on the "Menu" button of the controller

## 4.3. Checking Device information

The "DEVICE INFO" menu entry shows relevant information about the device, including the firmware version. In order to display the device info:

1. **Enter** the on-screen menu
2. **Cycle** to find the "DEVICE INFO" entry
3. **Confirm**
4. Once the device information is plotted on screen, **Exit** the (sub)menu

## 4.4. Selecting Keyboard Mapping

The [Keyboard mapping profile](#) can be switched between "symbolic" and "positional". In order to select the desired profile:

1. **Enter** the on-screen menu
2. **Cycle** to find the "KEYBOARD MAPPING" entry
3. **Confirm** to enter the submenu
4. **Cycle** to select the desired profile

5. **Confirm** (this will also exit the submenu)
6. **Exit** the menu

## 4.5. Configuring Autofire Rate

Autofire rate can be configured between "none" (single shot) to 10Hz (10 shots per second) through the on-screen menu. In order to configure the autofire rate:

1. **Enter** the on-screen menu
2. **Cycle** to find the "AUTOFIRE RATE" entry
3. **Confirm** to enter the submenu
4. **Cycle** to select the desired rate
5. **Confirm** (this will also exit the submenu)
6. **Exit** the menu

## 4.6. Mapping Controller Buttons to Keyboard Keys

All [unused controller buttons](#) can be remapped to trigger keyboard keystrokes through the on-screen menu. In order to assign keystrokes to controller buttons:

1. **Enter** the on-screen menu
2. **Cycle** to find the "CONTROLLER MAPPING" entry
3. **Confirm** to enter the submenu
4. **Cycle** to find the controller button you wish to assign a keystroke to

**NOTE**

While cycling through the controller buttons, the currently assigned keystroke is shown on the right. If no keystroke is assigned to the currently displayed button the "" (empty) symbol is shown

1. **Confirm** to select the currently displayed controller button
  - a. To leave the current association unchanged **Exit** the (sub)menu immediately
  - b. To remove the current keystroke association **Confirm** immediately
  - c. If a bluetooth keyboard is connected, press the desired key (including modifiers) on the bluetooth keyboard, then **Confirm**
  - d. If no bluetooth keyboard is connected, **Cycle** until the desired key is displayed on the right, then **Confirm**.
2. Any of the aforementioned actions will also deselect the current button
3. **Cycle** to find another desired button to assign a keystroke to
4. Repeat the steps above until all desired buttons have been mapped
5. **Exit** the (sub)menu

## 4.7. Restoring Default Settings

Default settings can be restored through the on-screen menu. In order to restore default settings:

1. **Enter** the on-screen menu
2. **Cycle** to find the "RESTORE DEFAULTS" entry
3. **Confirm** to enter the submenu
4. **Cycle** to select "YES"
5. **Confirm** (this will also exit the submenu)
6. **Exit** the menu

## 5. Compatibility

### 5.1. C64 Motherboard Compatibility

Blue-64 has been verified to be compatible with the following C64 motherboard revisions:

Motherboard	Notes
250407	-
250425	-
250466	-
326298	-
ku14194	-
250469	The developer version of Blue-64 needs a <a href="#">special adapter</a> and the female header is mounted upside down



Figure 2. Shortboard Adapter

## 5.2. Device Support

Blue-64 is based on the [bluepad32](#) library from Ricardo Quesada. As such it supports the exact same devices (bluetooth controllers & keyboards) as bluepad32.

Supported Controllers: [https://bluepad32.readthedocs.io/en/latest/supported\\_gamepads/](https://bluepad32.readthedocs.io/en/latest/supported_gamepads/)

Supported Keyboards: [https://bluepad32.readthedocs.io/en/latest/supported\\_keyboards/](https://bluepad32.readthedocs.io/en/latest/supported_keyboards/)

## 5.3. Limitations

- At the moment Blue-64 only supports Bluetooth Low Energy (BLE) devices.
- Blue-64 can only interact with the lines present on the keyboard header, thus it has no access to the "paddle" control lines. Therefore it cannot emulate the Commodore mouse, paddle controls, and does **not support additional joystick fire buttons** (other than the primary one) that are based on paddle control. Luckily though, most games supporting additional fire buttons also map them to keyboard keys, which can be mapped to controller buttons through the on-screen menu.
- Blue-64 can only perform **one keystroke at a time**, with the exception of modifier keys like `control`, `commodore`, `left-shift` and `restore` which can all be pressed simultaneously. In order to overcome this limitation, when multiple regular keys are pressed simultaneously, Blue-64 **always performs the latest keypress**. At the same time it remembers the order of the last 8 simultaneous keystrokes, in order to trigger new keystrokes in the inverse order when the current one is released.

## 6. Firmware Update

Firmware binaries can be found in the "Releases" section of the project's [GitHub](#) page. The three files in the "binaries.zip" folder are necessary to perform a firmware update: - bootloader.bin - partition-table.bin - application.bin

### 6.1. "Developer Boards" (up to v0.3)

**NOTE**

It is not possible to "brick" the "Developer Board", if something fails it will always be able to retry flashing new firmware.

1. Download and install the CP210X Universal Windows Drivers for the on-board programmer at this website: <https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers?tab=downloads>

2. Download the Espressif Flash Download Tool at this website:  
<https://www.espressif.com/en/support/download/other-tools>

**NOTE**

It has been reported that the Espressif Download Tool often fails. Please utilize the online tool instead by following the same steps: <https://espressif.github.io/esptool-js/>

3. Run the .exe application and select "ESP32" as target and "Develop" as work mode when prompted. Be sure to select a UART baud rate of 115200.

4. In the following screen upload the three binary files in the order at the addresses shown in the screenshot below:

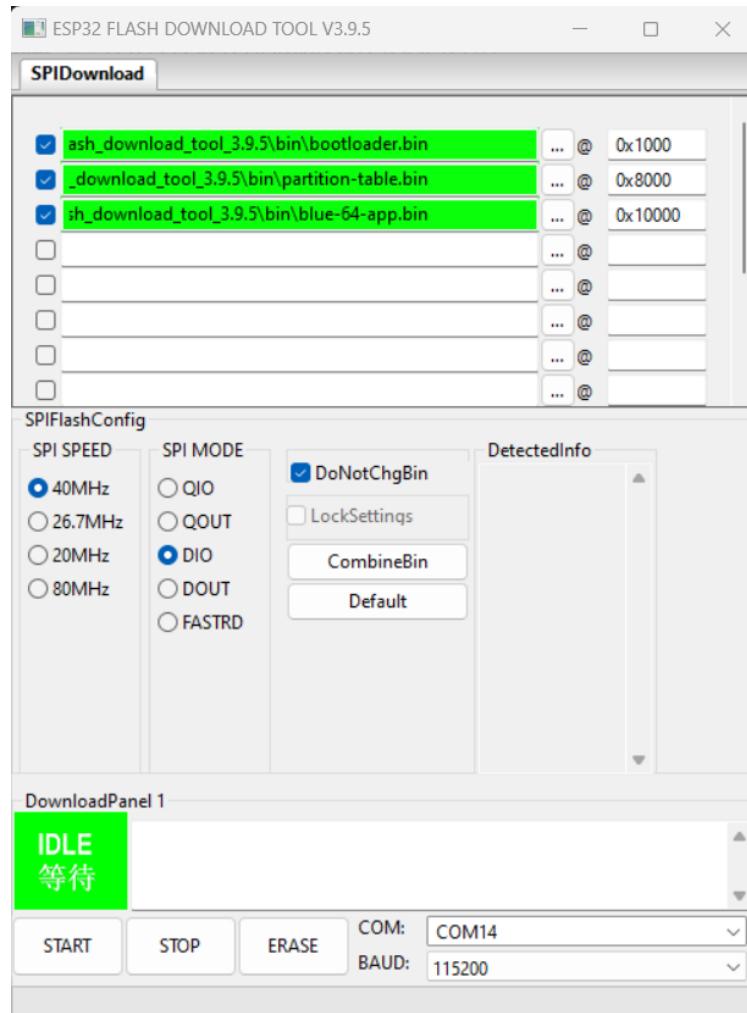


Figure 3. ESP Flash Tool

5. Connect the PC to the USB port on the Blue-64 and select the appropriate COM port in the Flash Download Tool. Press the "erase" button to erase the FLASH and finally press "start" and the new firmware will be downloaded to the board (should take less than a minute).

## 6.2. "Regular Boards" (v1.0 and above)

Regular boards are updated via the Micro SD card slot.

1. Format a Micro SD card to FAT32.
2. Copy application.bin to the root of the SD card.
3. Switch off the C64 and insert the SD card into the dedicated slot on the Blue-64 board.
4. Switch on the C64, after a few seconds an on-screen prompt will state that the update has started. If the prompt does not appear within 10 seconds it means that the ESP cannot mount the SD card or cannot find the application.bin file in its root.

**NOTE**

DO NOT POWER OFF THE C64 DURING THIS PROCESS UNLESS IT TAKES MORE THAN 10 MINUTES

1. After about a minute an on-screen prompt will communicate the result of the update procedure.

2. Switch off the C64, remove the SD-Card and switch on again. , Navigate to the Device-Info entry on the [on-screen menu](#) and verify that the latest version is currently running on the device.

**NOTE**

In the extremely unlikely event that the device becomes "bricked" (as in not functioning properly and also not being able to accept new firmware), it is **always possible** to flash new firmware via the UART header on the bottom of the board. This can be done with an inexpensive USB-to-UART adapter and basic soldering skills. Please get in touch with the developer for support.

## 7. Installation & Precautions

Most notably, particular care shall be used when plugging the Blue-64 onto the motherboard, as the female connector on the Blue-64 has no alignment key and thus won't prevent incorrect installation. Always install the Blue-64 with the computer turned off and verify carefully that the connection to the motherboard header is properly aligned.

A step-by-step video guide on how to assemble and install the Blue-64 board is available on [YouTube](#): Users shall follow these instructions carefully and fully understand the circuit's limitations before installing and/or using it.

Incorrect installation of the board supply or failure to comply with the recommended operating conditions may result in damage to the board and/or to the computer, with risk of overheating, fire and/or explosion.

## 8. License

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