Display Troubleshooting

It may help to activate your Nvidia drivers/Intel i965 drivers first if using those GPUs.

Emulation with 4K and ultrawide monitors, or problems when your screen is not fully displayed

Older 8-bit and 16bit systems, or arcade systems from the 80s and 90s were using 4:3 CRT screens. Modern displays are now 16:9 or wider, and can go up to 4K, i.e. 2160 pixels high (compared to 480 or 546 at the time!).

Having so many pixels to render on the screen is impactful on the system performance. When you have a 4K screen or an ultra-wide screen, Batocera will limit the resolution by default to HD 1920×1080. It's more than enough to render emulators, even the most recent one. However, when you have an ultra-wide monitor, display is stretched.

For 4K monitors, because the resolution is by default resized to 1920×1080, you might see a screen that looks like this one - actually it's what 1920×1080 is, centered in a 3840×2160 screen:

In order to cover the whole screen, the best solution is to set the **VIDEO MODE** to 1920×1080 – you can do that on a system-by-system basis in the **PER SYSTEM ADVANCED CONFIGURATION** screen.

Another use case is when you have a 1280×720 TV, for example, and you want to use bezels that are designed for 1920×1080. Batocera can automatically resize the bezels, but sometimes you need to force the **VIDEO MODE** to take your 1280×720 resolution.

If you absolutely want to use the 4K resolution for whatever reason (shaders looking better, you have a non-standard wide format on your TV/monitor…), you can force the **STRETCH BEZEL** option too. Same thing, this is something you can do on a system-by-system basis. **Warning:** this has an impact on the emulation performance.

When EmulationStation feels sluggish on a 4K TV

There are some SBC + TV combinations where EmulationStation feels sluggish (default theme seems to be lagging behind, with a refresh rate like 10 FPS). It's really depending on your own configuration, but we have reproduced this with a Raspberry Pi4 and a couple 4K TV models. By default, ES should negotiate with your TV to fix its resolution to 1080p, but sometimes your TV brand doesn't accept it and stays at 4K/2160p resolution.

To force 1080p in those cases, **in Batocera 31+** edit `/boot/batocera-boot.conf` and put:

```
es.resolution=max-1920x1080
```

This means that Batocera will take the most suitable resolution with a maximum of 1920×1080.

If you want to edit `/boot/batocera-boot.conf`, you can follow this page on how to do so.

You can get the list of all supported resolution by typing `batocera-resolution listModes`. If you want to force an **exact** resolution, you can put `es.resolution=1280×800` for instance.

For earlier versions of Batocera (**v29** and **v30**), you need to edit `batocera.conf` and add a line:

```
system.es.maxresolution=1920x1080
```

This shouldn't be necessary for most TVs, though, and the default mode can be set back with `es.maxresolution=0` (or just comment out or remove the line in `batocera.conf` or `/boot/batocera-boot.conf`).

How does that work under the hood?

1. On Batocera 31, know what are the resolutions available on your system + TV combination by entering the command `batocera-resolution listModes`:

```
# batocera-resolution listModes
max-1920x1080:maximum 1920x1080
max-640x480:maximum 640x480
1280x720:1280x720
4096x2160:4096x2160
3840x2160:3840x2160
1920x1080:1920x1080
1920x1080i:1920x1080i
1600x1200:1600x1200
1680x1050:1680x1050
1400x1050:1400x1050
1280x1024:1280x1024
```

```
1440x900:1440x900
1280x960:1280x960
1366x768:1366x768
1360x768:1360x768
1280x800:1280x800
1280x768:1280x768
1024x768:1024x768
800x600:800x600
720x576:720x576
720x576i:720x576i
720x480:720x480
720x480i:720x480i
640x480:640x480
```

2. Then, choose the mode from the list that is the one you want to force to RetroArch. For example, if I want to force 1024×768 for the emulators, I can add in my `/boot/batocera-boot.conf`:

```
es.resolution=1024x768
```

Emulators will then all select the same mode from the list above as their screen resolution. If I want to select a specific resolution only for a specific emulator, I can do that with from EmulationStation.

Batocera 5.27 and later will automatically resize 1920×1080 bezels to ultrawide by adding black borders on the sides. It will also resize full HD 1080 bezels to HD-ready 720p, or any resolution with an aspect ratio >= 16:10 – yes, 16:9 > 16:10 😉

3. If you ask for a 4K 3840×2160 resolution, but with a bezel that is HD 1920×1080, by default Batocera will add black borders around the bezel, like on the picture above. If you want your display to be full screen, you can either:

1. switch to a lower resolution (like 1920×1080)
2. add a line `mame.bezel_stretch=1` in your `batocera.conf` for each emulator you want to stretch. Or `global.bezel_stretch=1` if you want to enable stretching to your native 4K resolution. **WARNING** this has an impact on the emulation performance.

Display issues, when xrandr is your friend

This section is for PC x86 and x86_64, not for SBCs like Raspberry Pi or Odroid, and mostly outdated as most cases should be handled with the section above.

This tutorial is useful if you have display issues, for instance if you need to rotate your screen, or anything else.

On Batocera **v30** and lower, Batocera would simply select the highest available resolution + refresh rate your display reports as supported. Obviously, when running Batocera on weak SBCs like the Raspberry Pi connected to a 4K UHD TV, this would cause visual stutter as the SBC isn't powerful enough to output a 4K resolution at 60 FPS. You

would need to force a smaller resolution (like 1920×1080) to get better performance in this scenario.

Fortunately, from Batocera **v31** and higher, Batocera will default to using the 1920×1080 resolution as its maximum (and if you have one of those rare displays that support 120Hz or higher, it will default to that too for silky-smooth menu navigation! But only in EmulationStation, in-game will still be 60Hz by default). You can switch to using a genuine 4K resolution by setting your **VIDEO MODE** in **GAME SETTINGS** to 3840×2160, though even this won't have much a visual difference for most retro-games.

First of all, you need to connect on your Batocera through SSH. Then run the following commands:

```
export DISPLAY=:0.0
xrandr
```

This will output your display's reported “supported resolutions” (the currently used refresh rate will be marked with an asterisk (*) on the line of the current resolution being used). This is an example with an old 4/3 screen, but this is the same principle for other screens:

```
Screen 0: minimum 8 x 8, current 1366 x 768, maximum 32767 x 32767
LVDS1 connected primary 1366x768+0+0 (normal left inverted right x axis y
axis) 290mm x 160mm
1366x768 60.03*+ 40.03
1024x768 60.00
1024x576 60.00
960x540 60.00
800x600 60.32 56.25
864x486 60.00
640x480 59.94
```

If you have an error message telling you “can't open display :0.0”, you need to physically log onto your Batocera system with the display on. On a PC from EmulationStation, press `[F1]` and then launch a terminal from there (`xterm` from the **Applications** shortcut in the left sidebar).

If you'd like to edit the display output, edit the `/usr/bin/emulationstation-standalone` text file. You can do so from SSH by running the following:

```
nano /usr/bin/emulationstation-standalone
```

For Batocera **v31** and lower, this would be `nano /etc/X11/xinit/xinitrc` instead.

Scroll down (using the arrow keys) to the following section:

```
####################
## CUSTOMISATIONS ###
# to customize your display, you can copy this file to ~/.xinitrc and then
modify it

# rotate the screen
# xrandr -o left
# xrandr -o right
# xrandr -o inverted

# change the resolution
# xrandr -s 640x480

# change the resolution and the Hz
# xrandr -s 640x480 -r 60

####################
####################
```

Just uncomment (remove the hash character from the start of the line) the corresponding line with the option you want (changing it if something else is desired). For example, to just force a resolution of 640×480:

```
[...]
# change the resolution
xrandr -s 640x480

# change the resolution and the Hz
# xrandr -s 640x480 -r 60
[...]
```

To instead change the resolution to 1280×768 at 120Hz:

```
[...]
# change the resolution
# xrandr -s 640x480

# change the resolution and the Hz
xrandr -s 1280x768 -r 120

####################
[...]
```

Save the file with `[Ctrl] + [S]` and quit with `[Ctrl] + [Q]`.

EmulationStation by default runs in full-screen, and may use the old full-screen resolution even through restarts, cutting off a part of its display. For testing purposes, you can temporarily use windowed mode for the current session with:

```
exec emulationstation --windowed
```

Then restart EmulationStation with the following commands to test your new resolution:

```
/etc/init.d/S31emulationstation stop
/etc/init.d/S31emulationstation start
```

If you were to reboot Batocera at this point, you'll find that all the settings you just created have been lost. In order to make these settings permanent, you must save the overlay with the following command:

```
batocera-save-overlay
```

`xrandr` can do screen rotation; very useful for old vertical screen arcade machines!

Hope this was easy for all.