



Version 4.6

Stéphane Madrau

1. INTRODUCTION	3
1.1. HISTORICAL	3
1.2. SYSTEM REQUIREMENTS	4
2. LICENSE	5
3. INSTALLATION: LIST OF FILES	6
3.1. WHAT IS INSTALLED AND WHERE ?	6
WHAT OTHER FILES DOES IT CREATE OR MODIFY ?	6
3.2. UNINSTALLATION	6
4. THE SWITCHRESX UTILITY — BASIC FEATURES	8
4.1. BASE INTERFACE	8
4.2. THE SWITCHRESX PREFERENCES	8
4.2.1. About section	9
4.2.2. General section	9
4.2.3. Display Sets section	9
4.2.4. Applications section	10
4.2.5. Menus section	10
4.2.6. Desktop section	11
4.2.7. Displays sections – one for each attached display	11
5. EXTENDING YOUR MONITOR – ADVANCED FEATURES	14
5.1. DISPLAY RANGE SETTINGS	14
5.2. DEFAULT RESOLUTION SETTING	14
5.3. CUSTOM RESOLUTIONS	15
6. DEFINITION OF SOME TERMS	18
6.1. BASIC DEFINITION	18
6.2. WHERE SWITCHRESX GETS INVOLVED	19
6.3. LIMITS	19
6.4. HOW TO FIND THE REQUESTED VALUES IN SWITCHRESX	20
6.5. USING SWITCHRESX TO CREATE RESOLUTIONS – QUICK TUTORIAL	21
7. FREQUENTLY ASKED QUESTIONS	22
7.1. TROUBLESHOOTING	22
7.2. SWITCHRESX ON MACOS 10.11.x (ELCAPITAN)	22

8. VARIOUS	25
8.1. COMMENTS	25
8.2. USED TOOLS.....	25

1. INTRODUCTION

SwitchResX is an utility that allows you to control and customize the settings of your monitors.

SwitchResX is running in the background, and its user interface is just an icon in the Menu Bar and a Contextual Menu Item. A Preferences Pane lets you customize the different settings. In this way it's always available everywhere you need it.

What is the difference with the standard System Menu Extra or the System Preferences Panel ?

If only one feature should be mentioned: SwitchResX will allow you to select all resolutions that your monitor and video card can do, and you're not limited to the choice that Apple did for you. Moreover, with SwitchResX you can even define a new resolution if the one you're looking for is not available.

But there's more:

SwitchResX is completely configurable. You can define which resolutions are really accessible, and which will require a confirmation. An option allows you to redirect a resolution on another, in all applications.

You can also create 'Display Sets' which will allow you to change the resolution, the depth and position of all your monitors, and to use an AppleScript with one click, or one key.

You can assign a specific Display Set to an application, so that every time you use this application, your Mac will automatically switch to predefined resolutions...

1.1. HISTORICAL

Historically, SwitchRes was a tool that has been used to control all aspects of the monitor resolutions. That included automatic resolution changes based on launching an application, easy resolutions management via aggregated display sets, and also extending the monitor capabilities by enabling more resolutions than the simple set that the System did allow.

On MacOS 8 and 9, adding more resolutions was not possible, strictly speaking. The video driver was programmed with some resolutions, and the System would, just select among these which ones could be displayed on your monitor, and would hide the others from user choice.

Sometimes the System was too conservative and disabled resolutions that could indeed be displayed.

SwitchRes extended your choice to include these resolutions, and because they were there already but not shown, you could use them without having to reboot. But you were limited in the range of resolutions that could be added: only the ones programmed in the display driver could be used.

On macOS, resolutions are managed in a completely different way. The display drivers are programmed in a way that virtually all resolutions could be enabled. It's a continuous choice of parameters in a wide space. A resolution is thus a combination of some parameters, and depending on your video card and display capabilities, some discrete timings are preprogrammed. But you can always decide to add new timing sets to try to create a new resolution, and that's where SwitchResX comes in.

In this wide open space, resolutions are scanned at startup or whenever a new monitor is detected (it's not possible at this time, and at the level where SwitchResX operates, to add resolutions on the fly). On the other hand, you are not limited in your choice: you can create whatever resolution you want, it only needs to be validated by the System at startup (and the System is sometimes still conservative unfortunately).

On macOS, SwitchResX lets you use almost all functions of its older brother SwitchRes2. If you were familiar with the Display Sets, Applications or Menu settings of SwitchRes2, you'll get the same on macOS.

But the function used to create more resolutions has been rewritten to take care of this particularity. It is then much more powerful than the simple choice of some more resolutions that were given in SwitchRes2, but as a drawback this power is a little more difficult to handle. The function that SwitchResX provides is powerful, and gives you a lot of flexibility over your monitor, but could not be compared with the simple function that was present in MacOS 8 or 9.

Thus, SwitchResX has two audiences:

- it can be used like SwitchRes2 for its Display Sets, Applications or Menu settings, and is easy to apprehend for these options;
- it can define new timings: the user interface used for this feature is intuitive, but the number of settings involved should probably reserve it to power users

1.2. SYSTEM REQUIREMENTS

SwitchResX will require a Mac with at least macOS 10.6.

2. LICENSE

SwitchResX is distributed as a 14€ shareware. This version is an evaluation version. You can use it for 10 days. After that, the preferences saving and restoring will be deactivated.

To unlock SwitchResX, you will have to register it. You can use the included 'Register' links to automatically be directed to the correct address for registration, or go to

http://www.madrau.com/srx_download/download.html

For special site licenses, school or school district licenses, you can contact the author to learn how to register at special prices.

3. INSTALLATION: LIST OF FILES

You just need to double click the SwitchResX preferences pane icon, which will place the preference pane at the right place in the System.

When the Preference Pane is open, then SwitchResX will update or install its internal components at the right place.

3.1. WHAT IS INSTALLED AND WHERE ?

- The "SwitchResX" Prefpane is installed in your "Library/Preferences Panes" folder.
- The "SwitchResX Menu" Contextual Menu Plugin is installed in the "Library/ScriptingAdditions" folder, or in the "/System/Library/ScriptingAdditions" folder
- The "SwitchResX Extensions" element is installed in the "Library/ScriptingAdditions" folder, or in the "/System/Library/ScriptingAdditions" folder

WHAT OTHER FILES DOES IT CREATE OR MODIFY ?

SwitchResX creates three preferences files when used:

- The "fr.madrau.switchresx.dameon.plist" in the "Preferences" folder contains all preferences related to the SwitchResX tool
- The "fr.madrau.switchresx.app.plist" in the "Preferences" folder contains settings related to the SwitchResX Control application, including custom resolutions
- The "fr.madrau.switchresx.display-layout.plist" in the "Preferences" folder contains settings related to the positions of the icons and the windows

When you define new custom timings or make system-wide changes on your system for new resolutions, SwitchResX modifies a specific file in your "/System/Library/Displays/Override" directory. Which file is depending on your monitor vendor and model.

You can find which file is altered by sorting the files there by date, the one that was modified by SwitchResX will be easily found.

3.2. UNINSTALLATION

The SwitchResX Control program also contains an uninstaller, which can be called from within the Application menu.

But if you prefer, you can also remove the elements manually if you wish. To remove all components of SwitchResX, you can drag all elements listed above to the trash. Or you can search for your hard disk for all items containing the name "SwitchRes" in it and trash them;

this will also remove the three preferences files that are created if you launched the program.

If you have made any system-wide change like creating a new custom resolution, you may wish to first reset the factory defaults settings by clicking the "Factory Defaults" button in the SwitchResX application.

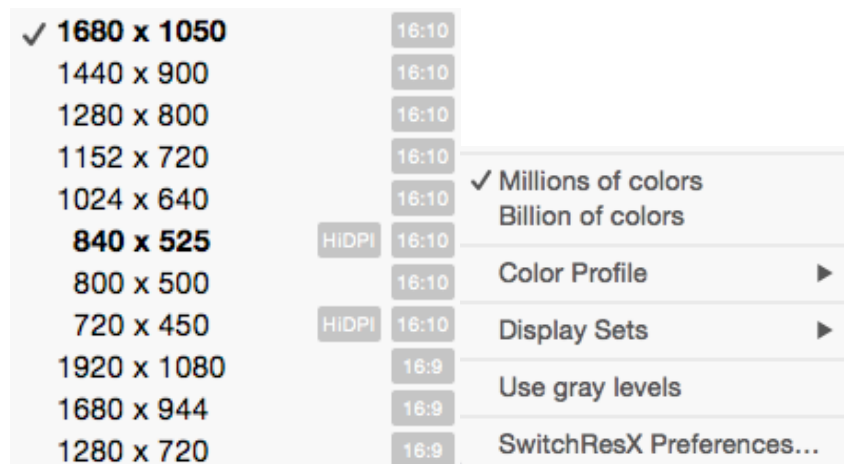
Important: Don't delete the directory `"/System/Library/Displays/Overrides"` from your system, as it can cause some very big troubles.

4. THE SWITCHRESX UTILITY — BASIC FEATURES

4.1. BASE INTERFACE

After installation, you will be presented with the sole user interface of SwitchResX : the SwitchResX menu in one of the following locations:

- in the menu bar



- in the Contextual Menu when clicking on the Finder's (or PathFinder's) desktop

If you have more than one display, then the display-specific options are grouped into hierarchical submenus.

Most options of the menu are obvious: you can directly choose the resolution and the depth of the all monitors, as well as other specific options.

All options shown in this menu are completely configurable. You can choose to only show some options, independently from one menu to the other. This is done in the SwitchResX Preferences Pane.

4.2. THE SWITCHRESX PREFERENCES

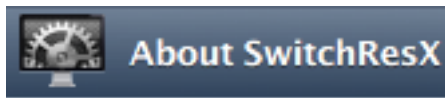
This Preferences Panel can be launched by the item in the SwitchResX menus, by the System Preferences Pane, or by launching it in the Finder.

The settings in the Preferences Pane are divided in 6 sections. The sections are accessible by the icons in the left tools list.

Preferences are saved when quitting the Preferences Pane or closing the window. Most of the settings are applied immediately.

Let's check the sections one by one:

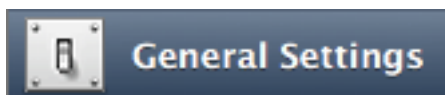
4.2.1. About section



Here you get information about the program, the version, the installed modules, and you can enter your serial number after registering.

You can install or uninstall the helper tools (Extensions module and Contextual Menu Plugin), as well as check if a newer online version is available.

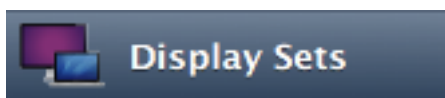
4.2.2. General section



The options shown in this part of the window lets you define basic settings:

- Define a System-wide key shortcut for opening the Preferences Pane
- Define a System-wide key shortcut for closing SwitchResX Daemon
- Set the resolution of every monitor attached after restart or use a specific Display Set.
- Auto-launch SwitchResX after startup or login
- Tell SwitchResX to use the Keychain to store your administrator login and password. By activating this option, you won't be asked to enter them each time you make changes in the Resolutions panel (see below)

4.2.3. Display Sets section



You have more than one monitor and you are tired of switching multiple displays resolutions one after the other? You often need to change at the same time a resolution and a color depth? You want to activate and deactivate video mirroring with just a key?

SwitchResX can define multiple options Display Sets. These sets contain resolutions, depths, position of a monitor, main monitor settings, video mirroring option, all together in one single Menu option. That's it.

The Display Sets are activated either by a Key shortcut, a selection in one menu, when an application starts, or brought to the front, and even at startup.

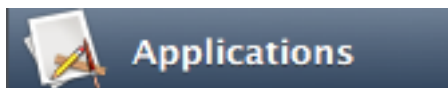
For each of these events, the Set will be applied. This goes far beyond a simple resolution change, because with just one key you might want to tell SwitchResX to open an application and automatically use the correct display settings.

But there's more: you can add any AppleScript to a Display Set ! That extends the power of Display Sets to any scriptable item of the system! And since Display Sets can automatically assigned to Applications (see below), you could chain automatic actions whenever any specified application is launched.

The options in the Display Set are self-explanatory. Since SwitchResX can remember settings for as much as 99 different displays, even unattached, you can remember different settings on the same Display Set for example for a MacBook when working alone, or when attached to a monitor at work, or to a completely different monitor at home...

Hint: The order of the Display Sets in all SwitchResX menus matches the order in this list. It is customizable by Drag and Drop.

4.2.4. Applications section



In this part, you define the application settings. You can define settings that will be used for every application, and other settings that will be used for certain applications only, when the application is launched or brought to the front.

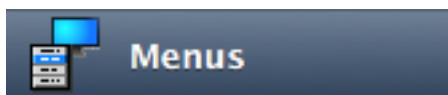
The principal settings are the Display Set and the sound level. That will allow you to launch a game with a correct sound level, and with the correct Monitor parameters that you have defined in a Display Set (see above). Of course, the older settings can be restored when the application quits.

Other interesting options in this section are:

- Automatically hiding the Dock and the other Applications
- Restoring the older settings when the application quits
- Applying again the defined settings when the application is brought to front

The last application definable option is the ability to forbid every resolution change coming from the application itself. Only SwitchResX will be able to change the resolution. This is useful for games that will change your monitor to an hard-coded resolution.

4.2.5. Menus section



This section lets you define what you want to see in the SwitchResX menus: the main menu in the Menu bar and the Contextual Menu.

Here you can also activate or deactivate the menu in the menu bar.



Try everything to choose what you like the most...!

NB: Sometimes the main menu icon appears crossed. This means that SwitchResX Daemon is not running while the menu is. You just need to start the Daemon again. This can be done by clicking on the menu icon or by using the option in the Contextual Menu.

4.2.6. Desktop section



SwitchResX lets you save the positions of the icons on your desktop, as well as the positions and sizes of the windows of the Finder. This part of the Control Panel lets you define more precisely how SwitchResX will handle this function

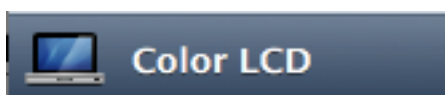
This option can be done manually: you define when the desktop layout should be saved. It can also be done automatically: when the resolution is changed, SwitchResX will keep the desktop layout automatically, and reapply the correct layout in the new resolution.

You can customize this feature and:

- Tell SwitchResX to store only icons, or only windows, or even both when rearranging the desktop.
- Windows size and positions of all applications or only the Finder ones can be saved and restored.
- You can allow SwitchResX to place your icons at their exact position, or let it choose to place them on an invisible grid, so that icons are correctly aligned. The grid spacing can be changed. If you enable this option, a new command in the menus will be added, to rearrange your desktop when you want, without having to save/restore the icons.
- Anchor your icons on their parent screen: when you move a display, the icons/windows can stay at their original position, or move along with the display. It's up to you to decide which option is better.

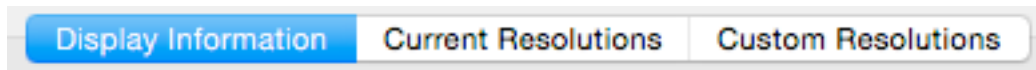
You can save the icons and windows and store them per Resolution (each time this resolution will be used, the desktop will be restored), or per Display Set (which gives you more flexibility to store desktop elements on more than one display: store all windows of an application on the main display in a multiple display environment and restore them when your external display is no more available, for example).

4.2.7. Displays sections – one for each attached display



In this section you control the resolutions choice that the system gives to you for all displays. The local popup menu lets you choose the desired display whose settings you control in this panel.

This panel is then composed of 3 tabs. The tabs are:



- Display Information
- Current resolutions
- Custom

4.2.7.1. Display Information tab

macOS identifies all monitors by a vendor code and a product code. Moreover, the displays communicate some information to the system via a protocol named EDID. From this information, the system knows the capabilities of the display: maximal resolution, name of the display...

This tab gives you information about the selected display. This is currently the name, the vendor and product ID, some frequency ranges, the default resolution used by your monitor at **startup**, and the resolution that is used as the base when macOS creates scaled resolutions.

You can export the result of the EDID as a text file, so that you can really see the details of what the system knows about your display. At this time, you can also edit some of these settings (see "Advanced features" in section 5).

Some options finally let you configure the display by:

- Modifying the monitor name (Example: "MacBook Pro" instead of "Color LCD")
- Setting the brightness of a monitor to zero when SwitchResX deactivates a monitor (not all monitors can control their brightness from software)
- Setting a dark picture on screen when SwitchResX deactivates a monitor (when setting luminosity will not work)

4.2.7.2. Current resolutions tab

This tab shows the list of resolutions that are currently active on your system. If a resolution is not listed here, it means that it is not available, neither for the system nor for SwitchResX.

From this list, you can customize the way the system handles such resolutions. You can customize:

- the resolution name as shown in SwitchResX menus. This doesn't affect the way the system itself shows the resolution
- if the resolution should be disabled: a disabled resolution will not be shown in SwitchResX. It will be shown in the system but the system will not be able to use it.

- if the resolution should be redirected: a redirected resolution will not be shown in SwitchResX. It will be shown in the system, and if you select it in the system, another resolution will be used instead.
- if the resolution should be in SwitchResX menus
- if the resolution should trigger a warning alert when selected. In this case, if you select this resolution, SwitchResX will pop up a dialog asking you to confirm your choice.

By selecting a resolution, you will activate a dialog that will let you display the timing's parameters, which can be useful if you need to customize a resolution, based on an existing one.

You can also mark native resolutions in bold in this list, as well as in the SwitchResX menu.

4.2.7.3. Custom resolutions tab

In this tab, you can define complete, new resolutions to be used by the system at next restart. This is considered as an advanced feature, and is described in the section 5.

5. EXTENDING YOUR MONITOR – ADVANCED FEATURES

Here are defined the advanced features that power users may need to get control of their monitor.

Disclaimer: Please note that the features here are powerful, which means you can shoot yourself in the foot by creating a resolution that you can activate but not see. macOS will then reboot in the black and you will think that you have destroyed your monitor.

In case you end up in a non-functional state, see the troubleshooting section. You can also always contact me by email for support, and I will help as best as I can.

To apply any advanced feature change, you will be prompted for an Administrator password. **Be sure to know what you do before applying a change that requests your Administrator password.**

5.1. DISPLAY RANGE SETTINGS

An useful feature is that you can edit the display capabilities to fake the System, and thus letting it enable some resolutions that it would otherwise not enable.

The System will compare all the resolutions that you can define or enable and check if they are within the display capabilities. When you expand these capabilities, you fool the System and it will probably enable resolutions that it didn't enable before.

You can modify the acceptable range of vertical refresh rates, the acceptable range of horizontal refresh rates and the acceptable range of pixel clocks.

Be careful and don't enter too high values, as it could let the System activate resolutions that your display is really not able to show. In this case you would end in with a black screen if you select such a resolution (see troubleshooting section).

5.2. DEFAULT RESOLUTION SETTING

Here you can define what resolution the System will use during the boot.

That allows you to specify a resolution that you know is sure, safe and valid, even if you defined other higher resolutions.

SwitchResX will by default fill the fields here with settings that it knows are valid, to avoid you to shoot yourself in the foot during the next reboot. This option should probably not be modified, except if you know what you are doing.

5.3. CUSTOM RESOLUTIONS

This is one of the most important features in SwitchResX.

In this tab, you can define complete, new resolutions to be used by the system at next restart.

Two types of resolutions can be created in SwitchResX: Custom timings and Scaled resolutions.

Scaled resolutions...

...are only possible on hardware that supports this feature. This generally includes LCD and Plasma screens, and more generally digitally linked displays. Such displays have a physical number of pixels that are determined when they are built. This is their "native" resolution. For convenience, they can also show smaller resolutions by interpolating the picture on their native resolution.

For example, if a display has physically 1280 columns of 960 pixels, it can also show the logical 640x480 resolution by splitting all logical dots on 4 physical pixels.

This mode allows you to create all resolutions that you want on such displays. On some macOS versions, you can create resolutions that are bigger than the native display resolution. This is a feature that depends on the capability of the video driver. On previous versions (before macOS Mountain Lion), macOS would create stretched as well as non-stretched resolutions, if the scaled resolution that you created would not match the native aspect ratio of the display. Nowadays, only non-stretched resolutions are created and the aspect ratio of your scaled resolution should match the native aspect ratio of your display.

HiDPI resolutions may also be created with this mode (Mountain Lion and later): you should create a scaled resolution that with a size that is a double the size of the HiDPI mode you want to create (ie. To get 1920x1080 HiDPI, create 3840x2160). This obviously will only work on MACOS versions and video drivers that support creating resolutions bigger than native.

Finally, beginning with Yosemite 10.10.3, you can now define which resolution is used as the base when creating scaled resolutions. For example, your monitor can have a native resolution of 4096x2160, but you would rather have all your scaled resolutions to be 16/9 and thus use 3840x2160 as the scaling base.

Custom timings...

...are the resolutions that you normally use, limited only by the capabilities of the monitor. For creating these resolutions, you will need to know the details of the resolutions, the so-called timing parameters. Such parameters can be found on the Internet on home-theater user discussion groups for example, or on some Linux or Windows user discussion groups.

If you really don't know the timing parameters for a new resolution, you can try to use one of the simplified settings formulas that are available. This will give you "first shots" of all timing parameters if you enter just the width, height and frequency of the desired timing. But be aware that there is little chance that the obtained values are immediately valid: you will probably need a long trial-and-error process to get the correct values. Starting from existing resolutions is always a good idea, that's why SwitchResX can give you the detailed information for a specific existing resolution.

Standard timings...

...are custom resolutions that the system knows of internally. You can choose any of these standard resolutions from the popup menu that appears, but you can't customize the timing parameters directly.

And now ?

It can happen that the correct value is not recognized, and that SwitchResX validates a slightly different value (eg. you enter 1366 and you get 1368). This is normal, because video cards sometimes need the values to be multiple of 2, 4 or 8 to be validated. There is no way you can work around this, as any value that is not the format the video card requests will be completely discarded by the system.

Once you have defined the new resolution (either scaled or custom), a restart is required.

What if the new resolution doesn't activate?

At restart, the system will make some checks for all timings. Below is a (non exhaustive) list of the tests that are done during the reboot process:

For scaled modes:

- Active horizontal (Nx) bigger than 640 and Active vertical (Ny) bigger than 480
- Driver can do the scaling process, and can upscale resolutions if the mode is bigger than native
- Aspect ratio of the display is respected on latest macOS versions
- Check with existing duplicate timings (height and width +/-20 pixels)

For non scaled modes

- Timing is within monitors limits, if they are known
- Checks granularity
- Checks if mode doesn't request more hardware links than available (dual DVI cards)
- Checks if mode is within native aspect ratio of the screen +/- 20% (not too enlarged or too narrowed): don't try a 1024x200 screen for example

For all kind of modes

- Check duplicated mode : for GTF and scaled modes

- Nx identical +/-20 pixels
 - Ny identical +/- 20 pixels
 - Vertical frequency differs by less than 1.0Hz
- Check duplicated mode : for EDID generated modes
 - All timing parameters are strictly identical
 - Pixel clocks are tested in range (min/max) overlap

If any of these tests has failed, the resolution will not be activated. If, once you have restarted, the resolution is not in the "Active" list, check again your parameters.

All in all, this feature is very powerful, but is difficult to apprehend, and can take time until everything works the way it should.

Also check the following section (6.5) for some useful tips.

6. DEFINITION OF SOME TERMS

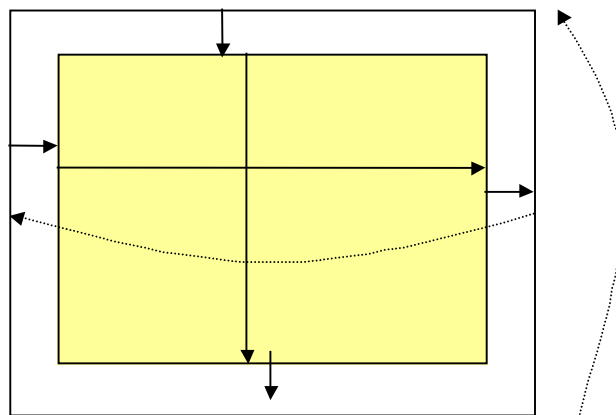
All information below is based on my experience, and is not to be interpreted as rules or norms. Some information can be flawed, in which case I would be happy to correct it.

These are definitions that are useful for the Advanced Features. If you don't use this mode, you don't even need to read this section, but it can be interesting.

6.1. BASIC DEFINITION

Here's a quick explanation of the following values that SwitchResX requests:

- Active
- Scaled
- Sync
- Porches
- Frequencies, or refresh rates
- Pixel clock



Try to imagine the scheme above is your screen, and the electron beam draws the picture. It goes from top left to bottom right, horizontally on a single line, then vertically, line by line. An analogy is a person reading a book, with somebody turning the page in front of him.

First we need to define the geometry (size, position) of the picture on the screen:

It's possible to understand all these values in matters of "time" you're taking to read them one by one, or in matters of "number of pixels" (letters) that you read.

- front vertical porch is the unused stripe before the first line begins (top)
- front horizontal porch is the unused stripe before every line on the right
- back porches are the unused stripes after the screen (bottom or left)

- syncs are the times that is lost when the beam restarts its sequence (horizontal : time to go to the next line, to come from far right to far left ; vertical : time to go to the next page, to come from bottom of the screen to the top again).
- active values are the visible area : number of pixels on each line, number of lines on each page
- scaled values are the number of pixels that are magnified on a screen. It is only useful for scaled modes

Now that the geometry is defined, we need to know how fast we can draw the picture:

- The pixel clock is how often a single pixel is drawn.
- The horizontal frequency is how often a single line is drawn
- The vertical frequency is how often the complete page is refreshed

All these parameters are linked, of course: if you know how many lines there's on a page, and how many pages are drawn per second, you can calculate how many lines you draw per second, etc.

That's why modifying a sync parameter, keeping geometry constant, implies other modifications in the sync. SwitchResX does the calculations for you to keep the shown values consistent.

6.2. WHERE SWITCHRESX GETS INVOLVED

You can thus see easily that you can play with the geometry.

If you keep the total and visible geometries constant, you can move the visible area by modifying the porches (for example: increasing front horizontal porch and decreasing the back horizontal porch by the same value will move the picture to the right).

If you keep only the total geometry constant, you can enlarge the picture by decreasing the porches values and increasing the active values.

Keeping everything constant but only increasing the frequencies will ask the video and monitor more "power" (in term of bandwidth, or pixel clock), but will decrease the flicker.

The buttons on the right of the SwitchResX window are designed to do that easily

I suggest also reading the FAQ named "XFree86-Video-Timings-HOWTO.txt" (Google for this file, it's available from a lot of sources).

6.3. LIMITS

Your monitor has limits; your video card also has limits.

The limits are the number of pixels that can be displayed and the frequencies at which it can be displayed. All frequencies are limited, so even if you don't ask for a high vertical refresh rate, the monitor can go out of sync if the horizontal refresh rate resulting is out of its spec.

There are fixed sync monitors: some are fixed in the vertical refresh rate (LCD often request 60Hz only), some on the horizontal refresh rate (the iMac G3 and eMac monitors).

There's also one limit that fixes that all values should be multiple of 2, 4, 8 or so. This fixes the granularity of the card, and timings that are entered with values not satisfying this condition are rejected. SwitchResX tries to force the granularity to the requested value when you define your timing, and that can be the source of some problems (for example: forcing 1368 when you prefer entering 1366).

6.4. HOW TO FIND THE REQUESTED VALUES IN SWITCHRESX

Generally, you know the size of the screen that you want to have: 1024x768 for example.

Generally also, you know the frequency you want to draw. The term frequency is used for the vertical refresh rate. For CRT monitors, this is generally 75Hz minimum; for LCD or Plasma screens it is normally around 60Hz.

The other values are generally unknown, but monitors are generally the same or use similar methods to define a timing. There are thus methods to guess the other values.

Some of these methods became standard and timings generated by these are guaranteed to work on all monitors respecting this standard.

The so-called GTF (Global Timing Formula), CVT (Coordinated Video Timing) methods will give you estimates of the other parameters if you enter the Nx (Active horizontal), Ny (Active vertical) and Hz (Vertical refresh rate) values.

The parameters obtained can:

- work directly: you can live with them, well done
- work but give a bad picture: try to slightly change the parameters in the direction
- not work at all: if you're sure that the resolution is acceptable, in the monitor's limits, you can try an other method

There's no bulletproof way of obtaining the correct parameters at first shot, except if you have luck, or if you know the set of values that need to be entered. You can perhaps find them on the web if anybody else already tried it and succeeded. But again, take care of the granularity: you can find parameters that were found for another video card, with an other granularity, and the one you'll try may not work as is.

6.5. USING SWITCHRESX TO CREATE RESOLUTIONS – QUICK TUTORIAL

You have a LCD or Plasma screen, and you want bigger icons or windows: define a scaled down resolution: you just need the picture size that you want to define (width, height) with the parameters above.

You want to define a new timing to get the native resolution of your screen (HDTV, Plasma, LCD): you'll need to define a new custom resolution

Open the SwitchResX application, press the "Resolutions" icon in the toolbar, and select the attached monitor you want to define. Go to the "Custom" tab, and press the "Add" button.

If you know all parameters, enter them. Begin with the pixel clock, and use the top-to bottom, left-to right order. That's easier, and that's how the calculations are done to keep the values consistent.

If you want to try an estimative, select "simplified settings" and choose the desired method. Generally, GTF gives a good idea. Enter just the Nx, Ny and Hz values, and the others will be filled for you. But remember that they may not work as is.

Click on OK, save the settings.

Reboot. Yes, it needs to reboot. SwitchResX doesn't talk to the monitor, or the video card. It just generates the timing for you, and the System will use it if it can. But for the system to use it, you need to make it recognize. There are several ways for that, including unplugging/replugging your monitor, but rebooting is the simplest.

After reboot, your new resolution may or may not be active. The System is doing a lot of tests at reboot to know if your timing is valid, and depending on the result of these tests, it will or will not enable it (see below). You can see if the resolution is active if it appears in SwitchResX menus or in the System Preferences.

If it is enabled, you can try it immediately: select it in SwitchResX menus or in the System Preferences. If it is correct, you won. If it gives a bad picture, then you can go back to tweaking.

Tips:

In all cases, for a fixed geometry, try to respect the horizontal refresh rate, then the vertical refresh rate.

Entering a similar set of parameters with a vertical refresh rate changed of 1Hz is generally not a problem.

Entering a different set with a picture size of 1368 instead of 1366 is also probably accepted and will not make any big difference on your screen.

7. FREQUENTLY ASKED QUESTIONS

7.1. TROUBLESHOOTING

Generally you come here if you have enabled a new display mode, or modified the Display capabilities ranges, you rebooted and your monitor is black.

This happens when the System has accepted your changes, enabled additional resolutions, used this additional resolution, but the monitor doesn't accept it and goes out of sync.

First, try to reboot in safe mode. The file named "com.apple.windowserver.plist" in the Preferences folder contains the resolution that the System tries to use at startup. Deleting this file helps generally.

If not, try to press the "Reset" or "Factory defaults" button in SwitchResX Control for your monitor. This will delete all changes that you have made for this monitor, and after reboot it should be in the factory state again.

Better and more actual troubleshooting can be found on the online FAQ <http://www.madrau.com/support/support/faq.html>

If nothing above does work, send me an email and I'll work with you to correct this issue.

7.2. SWITCHRESX ON MACOS 10.11 (ELCAPITAN) OR SIERRA (10.12)

ElCapitan introduces a feature called « System Integrity Protection », aka « SIP » or « rootless ». A lot has been said about this feature on several information media.

One of the most widely used features in SwitchResX is the ability to define new custom resolutions to your monitor. For doing this, SwitchResX modifies a System file. With El Capitan, System Integrity Protection does not allow SwitchResX to modify this file.

That means that if you want to use SwitchResX to add, modify, or create a new custom resolution, or a scaled Retina resolution, then you must temporarily disable System Integrity Protection before doing this.

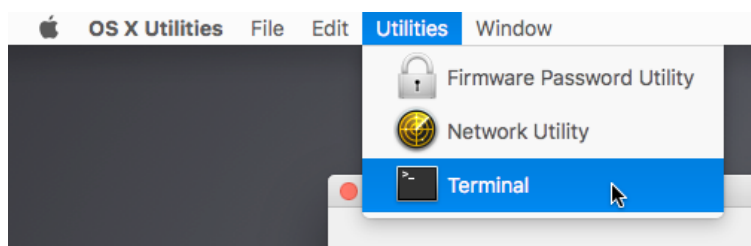
Once the resolution has been created and activated, you can turn SIP on again.

How to disable SIP

Disabling SIP requires booting into the recovery partition. You boot in recovery mode by pressing CMD + R when starting up your Mac.



Then open a Terminal window

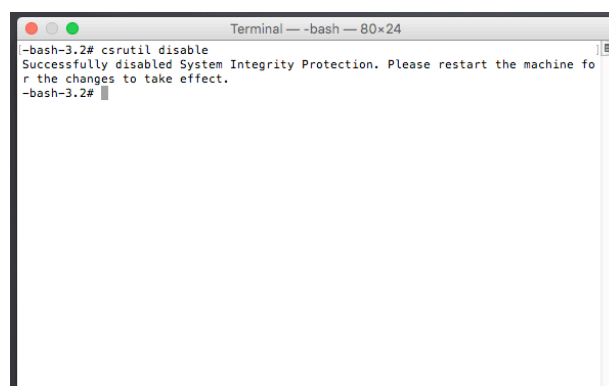


and type the command below.

```
# csrutil disable
```

that should confirm with the following message:

```
Successfully disabled System Integrity Protection. Please restart  
the machine for the changes to take effect.
```



You can then reboot normally on your standard El Capitan system partition.

To re-enable SIP, boot back into the recovery partition and set state to enabled:

```
# csrutil enable
```

Let me just repeat:

If you just use SwitchResX for any other feature and don't plan to alter your list of resolutions, then you can leave System Integrity Protection turned on.

SwitchResX should work flawlessly on El Capitan.

If you however want a custom resolution, you have to turn SIP off, the time the resolution has to be saved in the System. Then you can turn it on again.

Long story:

macOS has a built-in mechanism to override the behavior of badly designed monitors, to allow correcting bugs in monitors firmware, or to let them be detected correctly.

SwitchResX has used this mechanism to enhance the resolutions lists since years. This mechanism uses monitor profiles files, which overrides the standard hardware monitor detection.

These files are however System files, and thus are part of the System Integrity Protection on El Capitan. That means that on El Capitan, no application, or no user can create such a file for a new monitor, or alter such a file to add a new missing resolution for an existing monitor, when SIP is active.

Don't get me wrong: I think that any protection to macOS cannot do any harm.

But I personally think that these files, which are monitor profiles, should be alterable by the user, the owner of the monitor, whose only objective is to make his hardware (his Mac and his monitors) work the way it was designed.

Surely, macOS should include such profile files for monitors that Apple knows when the OS is released, and these files should be protected by SIP. But the end user should have the last word and should be able to enhance this choice for new monitors that Apple wasn't aware of when they released the OS. An user shouldn't rely on Apple being reactive enough to let him use his own hardware the way it should work.

I filed a bug report on Apple's system when El Capitan first developer beta was released (rdar://21371773) to let an user define its own user defined monitor profile files, parallel to the system files that macOS integrates and manages, without altering macOS system files.

Until this problem is addressed, the only way will still be the way I describe above: temporally disable SIP the time SwitchResX changes the System file, then reactivate it.

8. VARIOUS

8.1. COMMENTS

For all comments, you can email me at:

stephane@madrau.com

8.2. USED TOOLS

"SwitchResX extensions" and "SwitchResX Contextual Menu" are using code from:

- mach_override: http://github.com/rentzsch/mach_star
- JRSwizzle <http://github.com/rentzsch/jrswizzle>