10.5 Render - Render Output

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Render Output

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Displaying and Saving Images

Rendering still images is fairly simple. *Rendering Animations* is a bit more complex and is covered in the next sections.

To render an image from the active camera, in the Render Panel, press the *Render* button. By default the 3D view is replaced with the UV/Image Editor and the render appears.

Displaying Renders

Renders are displayed in the Image Editor. You can set the way this is displayed to several different options in the Display menu:

Keep UI
: The image is rendered to the Image Editor, but the UI remains the same. You will need to open the Image Editor manually to see the render result.

New Window
: A new floating window opens up, displaying the render.

Image Editor
: One of the existing editors is replaced with the Image Editor, showing the render.

Full Screen
: The Image editor replaces the UI, showing the render.

For each of these options, pressing `Esc` will close the render view and return to the previous view.

Saving

Rendered images can be saved like any other image: Using Image ‣ Save As Image or by pressing `F3`

Display Options

When a rendered image is displayed in the Image Editor, several new menu items become available.

Slot Menu
: You can save successive renders into the render buffer by selecting a new slot before rendering. If an image has been rendered to a slot, it can be viewed by selecting that slot. Empty slots appear as blank grids in the image editor. Use the `J` and `Alt-J` to cycle forwards and backwards through saved renders.

Render Layer
: If you are using *Render Layers*, use this menu to select which layer is displayed.

Render Pass
: If you are using *Render Passes*, use this menu to select which pass is displayed.

Display Mode

: The last four buttons set how the image is displayed.

  RGB
  : Draw image as rendered, without alpha channel.

  RGBA
  : Replaces transparent pixels with background checkerboard, denoting the alpha channel.

  Alpha Channel
  : Displays a gray-scale image. White areas are opaque, black areas have an alpha of 0.

  Z Depth
  : Display the depth from the camera, from Clip Start to Clip End, as specified in the *Camera settings*.

Animation Playback

The ‘Play’ button in the render panel will play back your rendered animation in a new window.

You can also drop images or movie files in a running animation player. It will then restart the player with the new data.

The following table shows the available hotkeys for the animation player:

Hotkey	Action
A	Toggle frame skipping.
P	Toggle ping-pong.
F	Flip drawing on the X axis.
Shift-F	Flip drawing on the Y axis.
Return	Start playback (when paused).
Numpad0	Toggle looping.
NumpadPeriod	Manual frame stepping.
Left	Step back one frame.
Right	Step forward one frame.
Down	Step back 10 frames.
Up	Step forward 10 frames.
Shift-Down	Use backward playback.
Shift-Up	Use forward playback.
Shift	Hold to show frame numbers.
LMB	Scrub in time.
Ctrl-Plus	Zoom in
Ctrl-Minus	Zoom out
Esc	Quit
Numpad1	60 fps
Numpad2	50 fps
Numpad3	30 fps
Numpad4	25 fps
Shift-Numpad4	24 fps
Numpad5	20 fps
Numpad6	15 fps
Numpad7	12 fps
Numpad8	10 fps
Numpad9	6 fps
NumpadSlash	5 fps

Hotkey	Action
`Minus`	Slow down playback.
`Plus`	Speed up playback.

A external player can be used instead by selecting it in the *User Preferences*.

Output Options

The first step in the rendering process is to determine and set the output options. This includes render size, frame rate, pixel aspect ratio, output location, and file type.

Dimensions

Resolution

X/Y

The number of pixels horizontally and vertically in the image.

Percentage slider

Reduce or increase the size of the rendered image relative to the X/Y values above. This is useful for small test renders that are the same proportions as the final image.

Aspect Ratio

Older televisions may have non-square pixels, so this can be used to control the shape of the pixels along the respective axis.

See *Video Output* for details on pixel aspect ratio.

Border

You can render just a portion of the view instead of the entire frame. While in Camera View, press `Ctrl-B` and drag a rectangle to define the area you want to render. `Ctrl-Alt-B` is the shortcut to disable the border.

Note

This disables the *Save Buffers* option in *Performance* and *Full Sample* option in *Anti-Aliasing*.

Enabling *Crop* will crop the rendered image to the *Border* size, instead of rendering a black region around it.

Frame Range

Set the *Start* and *End* frames for *Rendering Animations*. *Step* controls the number of frames to advance by for each frame in the timeline.

Frame Rate

For an *Animation* the frame rate is how many frames will be displayed per second.

Time Remapping

Use to remap the length of an animation.

Presets

To make life easier the topmost menu provides some common presets. You can add your own or remove one with the `+` and `-` buttons:

Output Panel

This panel provides options for setting the location of rendered frames for animations, and the quality of the saved images.

File Path

Choose the location to save rendered frames.

When rendering an animation, the frame number is appended at the end of the file name with 4 padded zeros (e.g. `image0001.png`). You can set a custom padding size by adding the appropriate number of `#` at the end of the file name (e.g. `image_##.png` would translate to `image_01.png`).

Overwrite
Overwrite existing files when rendering
Placeholders
Create empty placeholder frames while rendering
File Extensions
Adds the correct file extensions per file type to the output files
Cache Result
Saves the rendered image to your hard drive. This is helpful for heavy compositing.
Output Format
Choose the file format to save to. Based on which format is used, other options such as channels, bit-depth and compression level are available.

Hint

Primitive Render-Farm

An easy way to get multiple machines to share the rendering workload is to:

- Set up a shared directory over a network file-system.
- Disable *Overwrite*, enable *Placeholders* in the Render *Output* panel.
- Start as many machines as you wish rendering to that directory

Video Output

Preparing your work for video

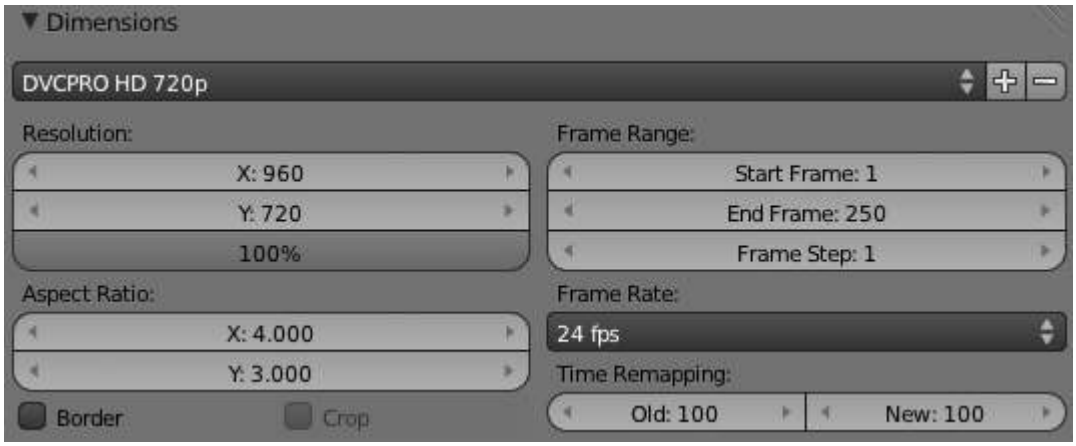
Once you have mastered the trick of animation you will surely start to produce wonderful animations, encoded with your favorite codecs, and possibly you'll share them on the Internet with the rest of the community.

Sooner or later you will be struck with the desire to build an animation for television, or maybe burn your own

DVDs. To spare you some disappointment, here are some tips specifically targeted at Video preparation. The first and principal one is to remember the double-dashed white lines in the camera view!

If you render for PC then the whole rendered image which lies within the *outer* dashed rectangle will be shown. For television, some lines and some part of the lines will be lost due to the mechanics of the electron beam scanning in your TV's cathode ray tube. You are guaranteed that what is within the *inner* dashed rectangle in camera view will be visible on the screen. Everything within the two rectangles may or may not be visible, depending on the given TV set that your audience watches the video on.

Dimensions Presets



The rendering size is strictly dictated by the TV standard. There are various popular presets included, more can be added for your convenience.

Saved information is:

Resolution:	X, Y & percentage scale
Aspect ratio:	pixel aspect ratio
Frame rate:	frames per second, for animation

See also Dimensions

Pixel Aspect Ratio

Unlike regular computer monitors, some screens (typically older TV sets) do *not* have the square pixels making it it necessary to generate *pre-distorted* images which will look stretched on a computer but which will display correctly on a TV set. It is important that you use the correct pixel aspect ratio when rendering to prevent re-scaling, resulting in lowered image quality.

Color Saturation

Most video tapes and video signals are not based on the RGB model but on the YCrCb model: more precisely, the YUV in Europe (PAL), and the YIQ in the USA (NTSC), the latter being quite similar to the former. Hence some knowledge of this is necessary too.

The YCrCb model sends information as 'Luminance', or intensity (Y) and two 'Crominance' signals, red and blue (Cr and Cb). Actually a Black and White TV set shows only luminance, while color TV sets reconstruct

color from Crominances (and from luminance). Construction of the YCrCb values from the RGB ones takes two steps (the constants *in italics* depend on the system: PAL or NTSC):

First, the Gamma correction (*g* varies: 2.2 for NTSC, 2.8 for PAL):

- $R' = R^{1/g}$:*$G' = G^{1/g}$
- $B' = B^{1/g}$

Then, the conversion itself:

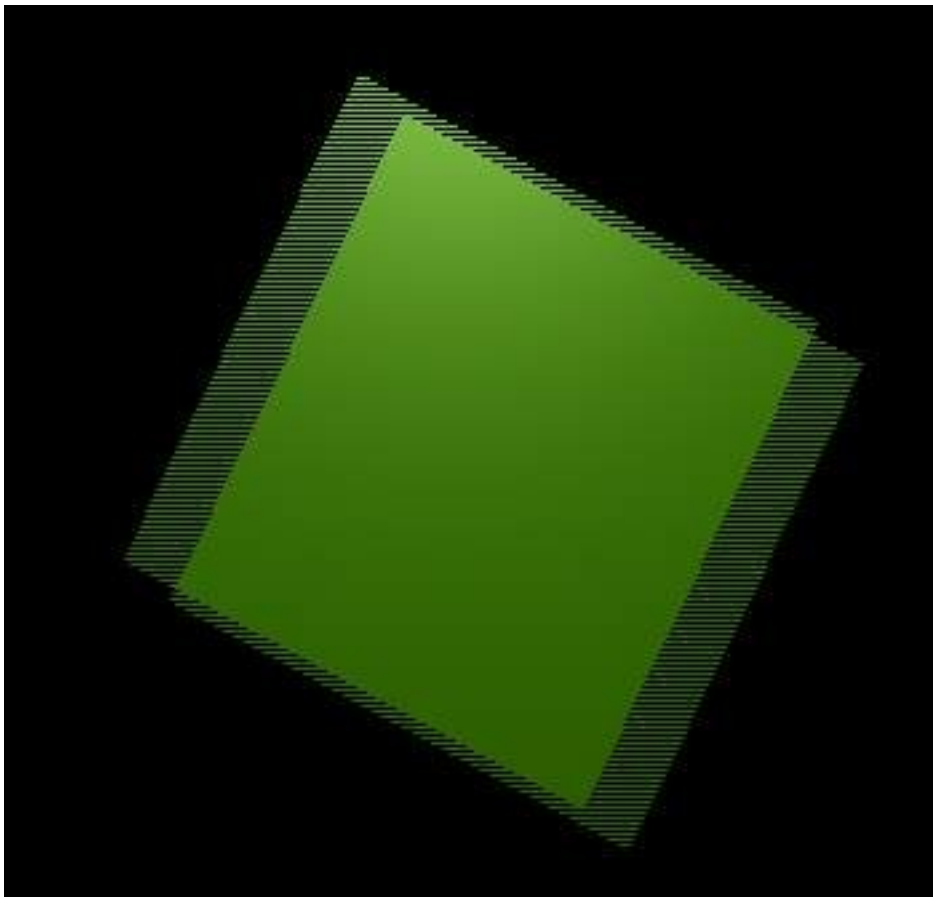
- $Y = 0.299R' + 0.587G' + 0.114B'$
- $Cr = a_1 (R' - Y) + b_1 (B' - Y)$
- $Cb = a_2 (R' - Y) + b_2 (B' - Y)$

Whereas a standard 24 bit RGB picture has 8 bits for each channel, to keep bandwidth down, and considering that the human eye is more sensitive to luminance than to chrominance, the luminance signal is sent with more bits than the two chrominance signals. This bit expansion results in a smaller dynamic of colors in video, than what you are used to on monitors. You hence have to keep in mind that not all colors can be correctly displayed.

A rule of thumb is to keep the colors as ‘grayish’ or ‘unsaturated’ as possible; this roughly means keeping the dynamics of your colors within 80% of one another. In other words, the difference between the highest RGB value and the lowest RGB value should not exceed 0.8 ([0-1] range) or 200 ([0-255] range).

This is not strict - something more than 0.8 is acceptable - but an RGB display with color contrast that ranges from 0.0 to 1.0 will appear to be very ugly (over-saturated) on video, while appearing bright and dynamic on a computer monitor.

Rendering to fields



Field Rendering result.

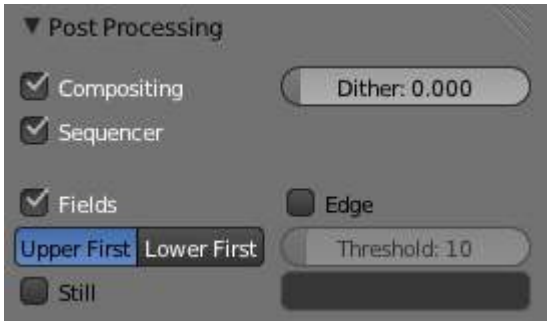
The TV standards prescribe that there should be 25 frames per second (PAL) or 30 frames per second (NTSC). Since the phosphors of the screen do not maintain luminosity for very long, this could produce a noticeable flickering.

To minimize this, a TV does not represent frames as a computer does (‘progressive’ mode), but rather represents half-frames, or *fields* at a double refresh rate, hence 50 half frames per second on PAL and 60 half frames per second on NTSC. This was originally bound to the frequency of power lines in Europe (50Hz) and the US (60Hz).

In particular, fields are “interlaced” in the sense that one field presents all the even lines of the complete frame and the subsequent field the odd ones.

Since there is a non-negligible time difference between each field (1/50 or 1/60 of a second) merely rendering a frame the usual way and splitting it into two half frames does not work. A noticeable jitter of the edges of moving objects would be present.

Options



Field Rendering setup.

Fields
: Enable field rendering. When the *Fields* button in the *Render* Panel is pressed (*Post Processing* section), Blender prepares each frame in two passes. On the first it renders only the even lines, then it *advances in time by half a time step* and renders all the odd lines. This produces odd results on a PC screen *(Field Rendering result)*. but will show correctly on a TV set.

Upper First / Lower First
: Toggles between rendering the even and odd frames first.

Still
: Disables the half-frame time step between fields (*x*).

Note

Setting up the correct field order

Blender's default setting is to produce Even fields *before* Odd fields; this complies with European PAL standards. Odd fields are scanned first on NTSC.

Of course, if you make the wrong selection things are even worse than if no Field rendering at all was used!

If you are really confused, a simple trick to determine the correct field order is to render a short test animation of a white square moving from left to right on a black background. Prepare one version with odd field order and another with even field order, and look at them on a television screen. The one with the right field order will look smooth and the other one horrible. Doing this simple test will save you *hours* of wasted rendering time...

Note

Fields and Composite Nodes

Nodes are currently not field-aware. This is partly due to the fact that in fields, too much information is missing to do good neighborhood operations (blur, vector blur etc.). The solution is to render your animation at double the frame rate without fields and do the interlacing of the footage afterwards.