

# Standard Image Formats

In order to exchange images between drivers and applications, it is necessary to have standard image data formats which both sides will interpret the same way. V4L2 includes several such formats, and this section is intended to be an unambiguous specification of the standard image data formats in V4L2.

V4L2 drivers are not limited to these formats, however. Driver-specific formats are possible. In that case the application may depend on a codec to convert images to one of the standard formats when needed. But the data can still be stored and retrieved in the proprietary format. For example, a device may support a proprietary compressed format. Applications can still capture and save the data in the compressed format, saving much disk space, and later use a codec to convert the images to the X Windows screen format when the video is to be displayed.

Even so, ultimately, some standard formats are needed, so the V4L2 specification would not be complete without well-defined standard formats.

The V4L2 standard formats are mainly uncompressed formats. The pixels are always arranged in memory from left to right, and from top to bottom. The first byte of data in the image buffer is always for the leftmost pixel of the topmost row. Following that is the pixel immediately to its right, and so on until the end of the top row of pixels. Following the rightmost pixel of the row there may be zero or more bytes of padding to guarantee that each row of pixel data has a certain alignment. Following the pad bytes, if any, is data for the leftmost pixel of the second row from the top, and so on. The last row has just as many pad bytes after it as the other rows.

In V4L2 each format has an identifier which looks like `PIX_FMT_XXX`, defined in the `ref:videodev2.h <videodev>` header file. These identifiers represent `ref:four character (FourCC) codes <v4l2-fourcc>` which are also listed below, however they are not the same as those used in the Windows world.

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For some formats, data is stored in separate, discontinuous memory buffers. Those formats are identified by a separate set of FourCC codes and are referred to as "multi-planar formats". For example, a `ref:YUV422 <V4L2-PIX-FMT-YUV422M>` frame is normally stored in one memory buffer, but it can also be placed in two or three separate buffers, with Y component in one buffer and CbCr components in another in the 2-planar version or with each component in its own buffer in the 3-planar case. Those sub-buffers are referred to as "*planes*".

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