

How to Position Gauges in a Virtual Cockpit and Provide Background Illumination.

Software recommended for completing this process.

Paint Shop Pro or similar graphics editing package.

FS Panel Studio found at <http://www.fspanelstudio.com>

DXTbmp found at <http://www.mnwright.btinternet.co.uk/index.htm>

1.0 Number of VC sections in the panel.cfg file.

I'm going to start the wrong way round. Might seem strange, but I want you to understand what we are heading towards. When the VC panel is complete, you will see in the panel.cfg something like,

```
[Vcockpit01]
```

```
Background_color=0,0,0
```

```
size_mm=1024,1024
```

```
visible=0
```

```
pixel size=1024,1024
```

```
texture=$f117VC1
```

```
gauge00=fsae_f117!F117 Multi-Function Display, 401,570,369,440
```

```
gauge01=fsae_f117!f117 pfd, 14,573,369,440
```

```
etc.
```

The heading [Vcockpit01] tells FS2004 that this is a virtual cockpit layout. If you have a simple panel with maybe just a few gauges, you may be able to get all your gauges into one section and on one surface (polygon). However, this is not preferred for reasons explained below. If you have a complex panel, with gauges at different heights from the panel polygon (for example, the PFD and MFD may protrude further than other gauges) you would need to mount your gauges on different polygons. By the way, the polygons that VC gauges sit on are called planars. In this latter case, it is easy to fall into the trap of having a number of gauge sections, i.e. [Vcockpit01], [Vcockpit02], [Vcockpit03], etc. The point is, if you have too many sections, the gauge animations will turn into a slide show. Ideally, you want only one section to optimise, say, needle movement smoothness. In practise, with the more complex panels, I have found for practical purposes, two sections are required. Two sections are still acceptable for gauge smoothness.

It pays to have this in mind when designing the panel. There is actually another point to this. This tutorial will also explain how to obtain realistic, individual, background gauge illumination, instead of having a cockpit or cabin light that illuminates from the front and looks awful. If you have a simple panel, with all the gauges on the same polygon, when illumination is applied, the areas between the gauges turn solid black. Therefore, to overcome this unrealistic looking problem, each gauge needs to be applied to individual polygons (planars).

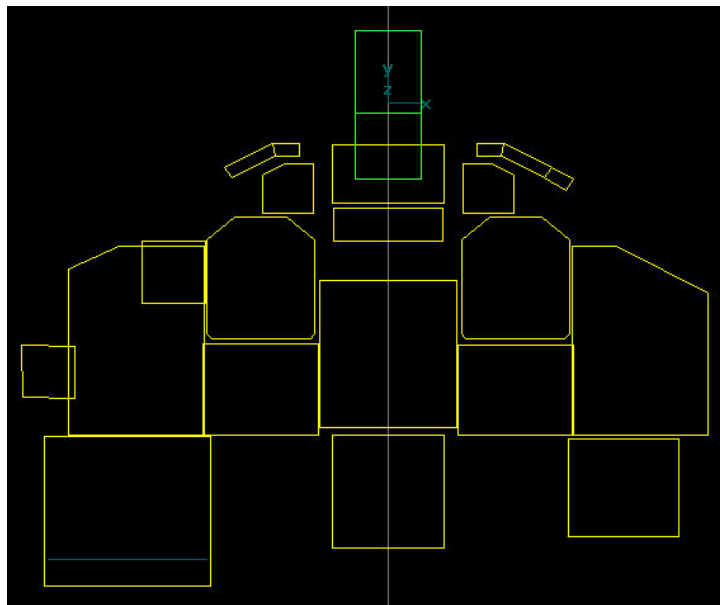
So to conclude this first part, each gauge needs to be placed on its own polygon (planar). Without full knowledge of producing a VC panel, the less experienced may well enter their gauges in the panel.cfg in many sections, and thus lose smooth gauge animation.

2.0 Building the VC panel. Planars

First, produce a 2D panel. This tutorial is for VC, so I am not going to explain how to produce a 2D panel. Compile your model with a 2D panel. With the 2D panel showing in Fs2004, hit the PrtSc key on the keyboard. In your graphics editor (PSP, for example), paste in the saved view and save as a 256 colour bitmap. This bitmap can be used as the panel view in the outside spot view. Apply this bitmap to the model's panel polygon.



Now make polygons (planars) to cover each gauge. Make them the same shape as each gauge, and at the same angle as the panel polygon. Position them so they are just away from the panel polygon in the aft direction. The end result for my F-117A aircraft looked like this.

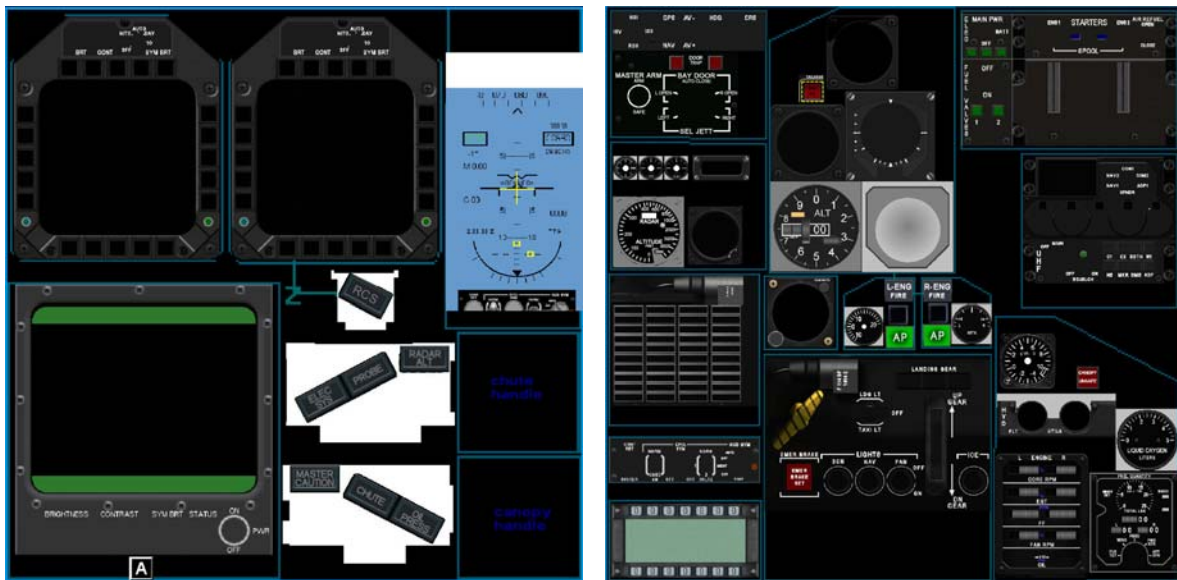


At this stage, it is tempting to add the planars together as one part, and use one VC texture (explained later), but this will not optimise the gauges visual quality.

3.0 Applying the VC textures.

FS2004 uses a special VC 'texture', whose file name starts with a \$ sign and has no extension. I named mine \$f117VC1. It does not actually add visual textures. Think of it as a 'canvas'. It is used to position the gauges. The visual aspects of the gauges come from the gauges themselves. In this method, any background panel bitmap should be applied to the panel polygon. To keep the number of [Vcockpitxx] sections to a minimum, we need to place as many gauges as possible onto each 'canvas' texture (remember I advised earlier to have no more than two VC sections). This is achieved as follows.

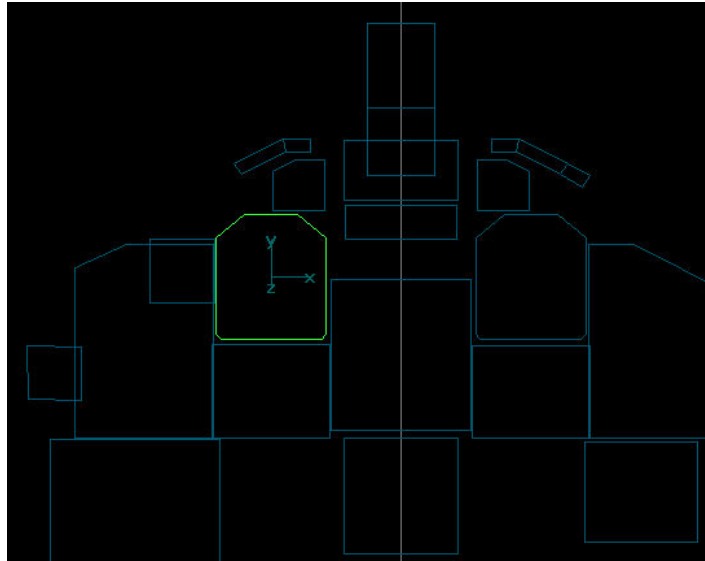
First I took all the background bitmaps of my gauges and put them together like a jigsaw puzzle onto an ordinary bitmap sized at 1024x1024. I actually did this twice to cater for all my gauges. Save these as ordinary bitmaps (any colour depth). I named them f117VC1.bmp and f117VC2.bmp



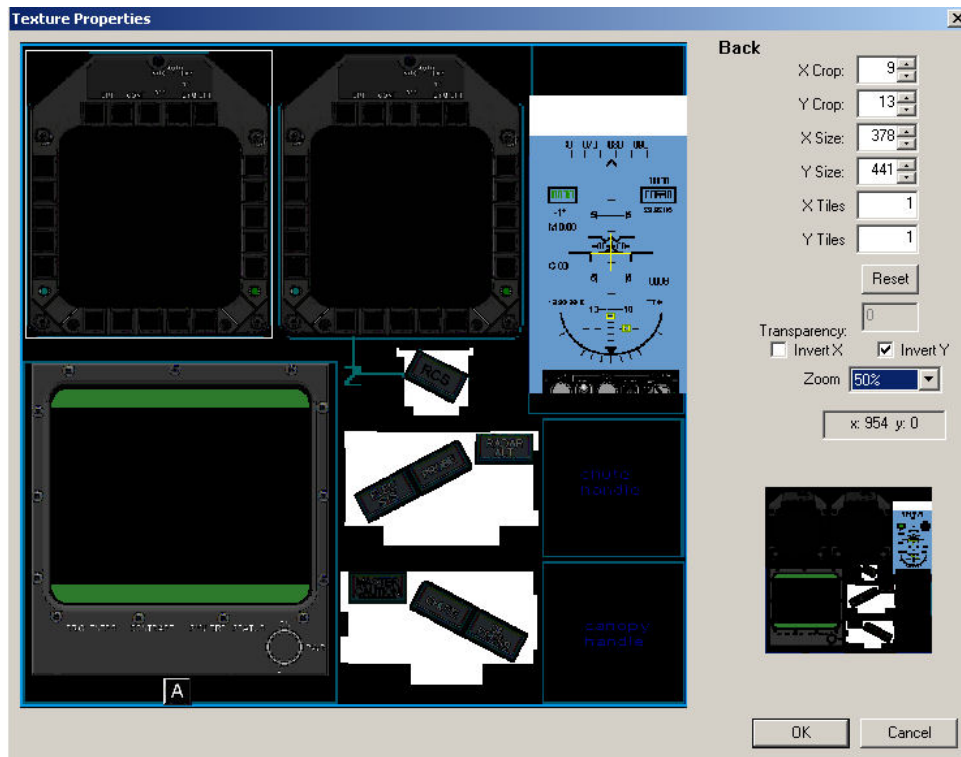
The idea is to minimise the areas between the gauges, and to maximise the size of each gauge. So mix the gauges around until you get the most efficient use of space. The gauge pictures sizes can be changed to suit, but bear in mind that the gauges with a lot of detail need to be of reasonable size. The height: width ratio of each gauge should remain the same.

Choose a gauge planar, and apply a texture from the relevant bitmap above. The examples are from FSDS2. The first gauge was a military style PFD, hence the shape. The first view below shows the planar I used first.

Choosing a gauge planar.

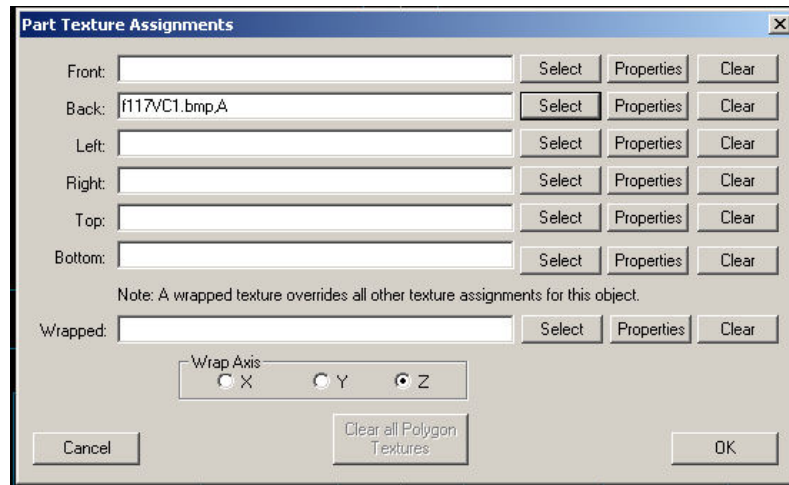


Applying the texture f117VC1.bmp .

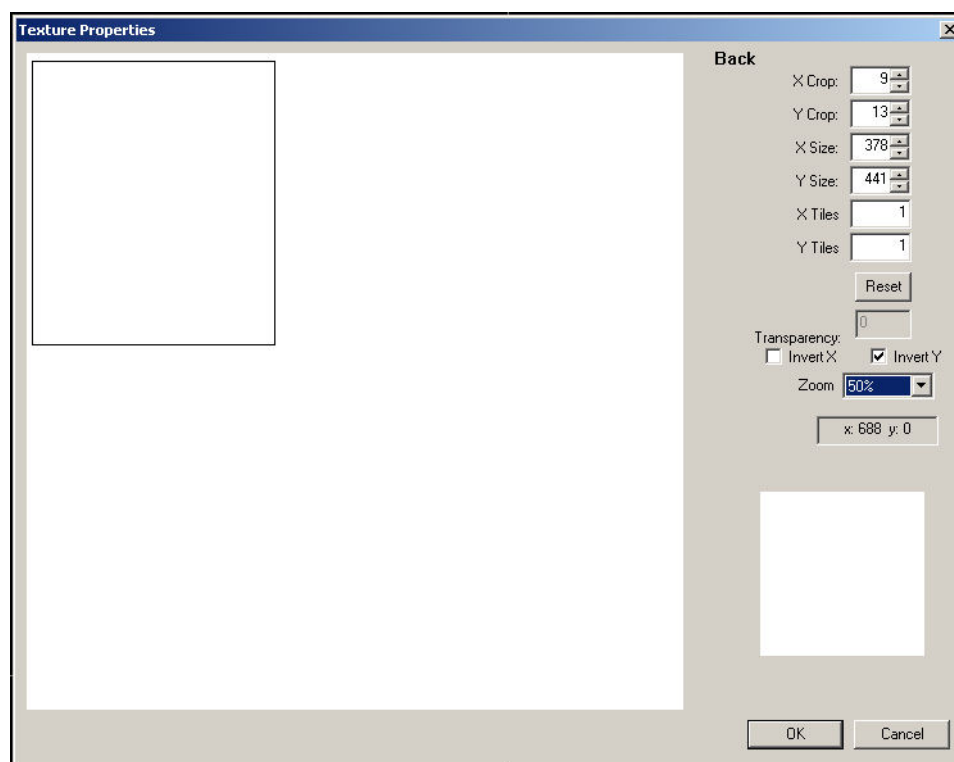


Note. Check the Invert Y box (very important). The white lined box shows the boundary of the texture area used, and should just surround the gauge picture. Also, apply the lightmap instruction to the bitmap name used.

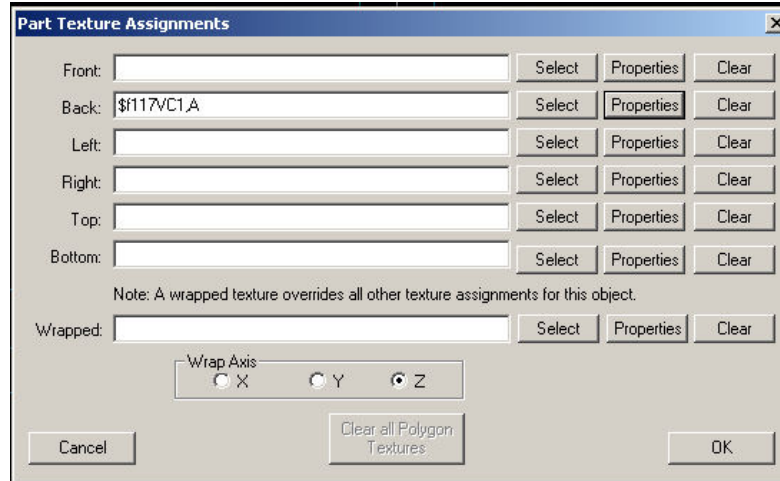
In FSDS2, it looks like this with and 'A' suffix.



Now make new 1024x1024 bitmaps, 256 colours, and white and give them the same name as the 'jigsaw' bitmaps. Back up the original first for further use (important). Go into windows explorer and change the bitmap name with a \$ at the front and remove the .bmp extension. Reapply a texture to the planar using the new bitmap. The co-ordinates should remain the same. If not, write down the co-ordinates.



Remember to apply the lightmap instruction.



Repeat this process for each gauge planar.

4.0 Position the gauges in the VC.

In the panel.cfg file, add the following. It is almost the last entry, only followed by the sections [Color] and [Default View]

Add f117VC1.bmp into the aircraft panel folder. This can be removed when the VC is completed.

```
[Vcockpit01]
file=f117VC1.bmp
Background_color=0,0,0
size_mm=1024,1024
visible=0
pixel size=1024,1024
texture=$f117VC1
```

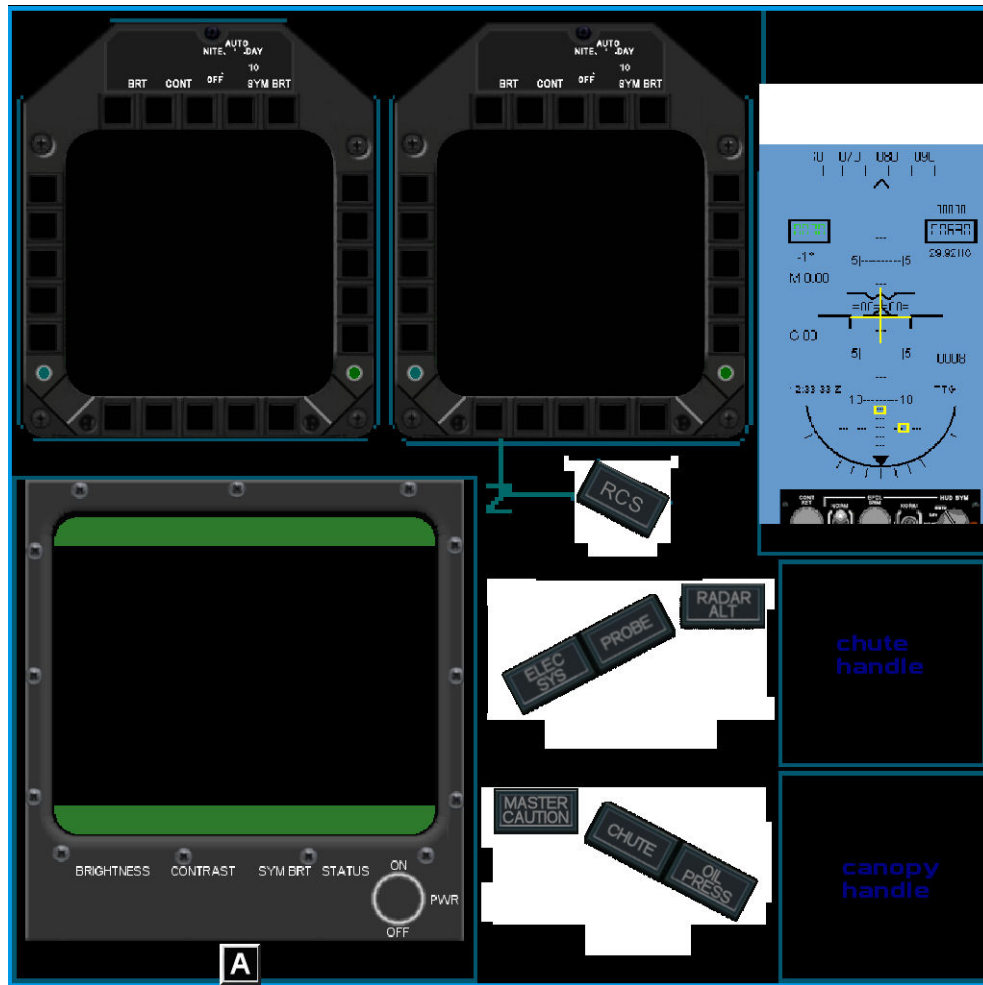
The file=f117VC1.bmp was the 'jigsaw' bitmap made earlier.

The texture=\$f117VC1 name was the VC texture name you made earlier.

Note. No gauge details are shown at this stage.

Next is to position the gauges. A great tool to use is FS Panel Studio.

Open the panel in FS Panel Studio and open the [Vcockpit01] window. You will see the bitmap f117VC1.bmp as shown below.



Now add your gauges to the same positions as their pictures. You have now added your gauges on the same positions as the f117VC1.bmp 'jigsaw' bitmap, and hence into the same positions on the \$f117VC1 VC type texture (canvas).

The gauge positions now have to be mirrored about the X axis (moved in the Y direction). During the move, the gauges themselves will remain upright.

From 1024, subtract the Y position in FS panel studio for a particular gauge, and then subtract the Y size of the gauge. If the Y height is 18, and the Y size is 440, the formula is

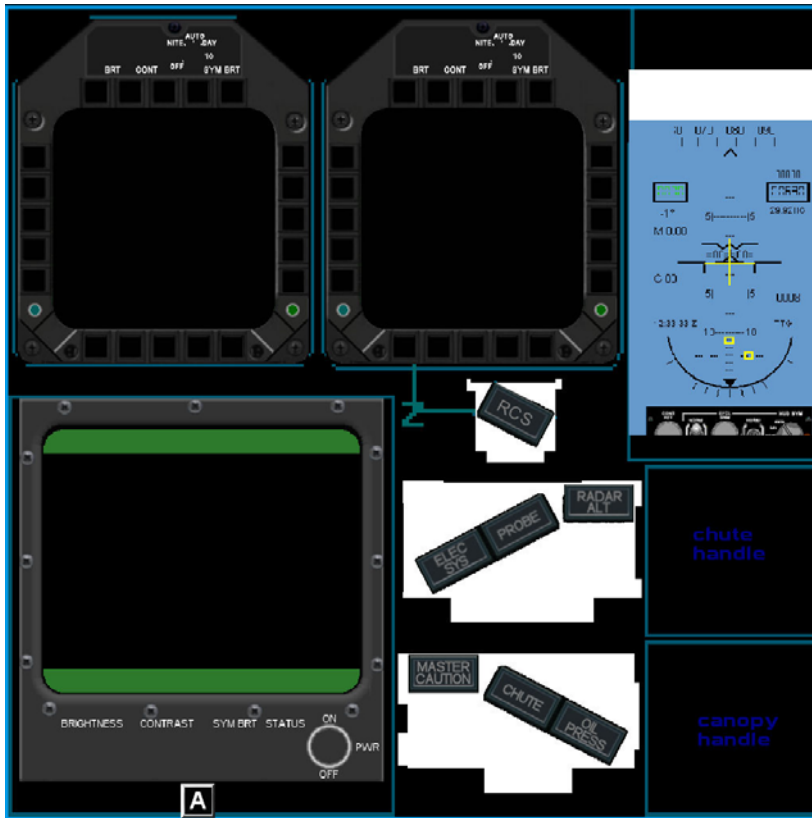
$1024 - 18 - 440 = 566$ The new Y position is 566. The X position remains the same.

Repeat for all the gauges.

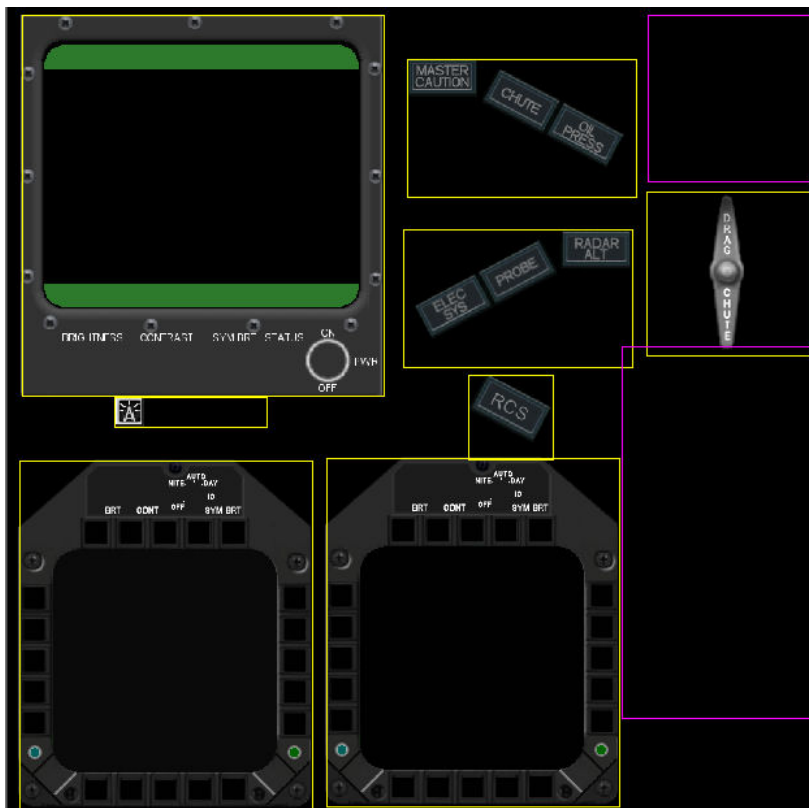
The following two pictures on the next page show the gauges' position when overlaid on the 'jigsaw' bitmap and then their new positions with the mirrored Y positions.

NOTE: There is a quick cheat here (thanks Wozza, I'm glad somebody's thinking).

Instead of the math, invert the 'jigsaw' bitmap first, and then position the gauges. Voila, no math involved. This is a simple method when there is only one gauge per planar. If you have a group of gauges on the same planar, position the group (keeping their correct relative positions) in the same Y dimension envelope that the inverted group image makes, although each gauge will not overlay its inverted image.



Gauge positions when overlaid on the 'jigsaw' bitmap f117VC1.bmp



Gauge positions after the Y positions have been mirrored. The HUD (mostly blue) gauge does not show here as it does not use a background bitmap in the gauge. But the outline can still be moved to position it successfully. Also, the HUD is text on a transparent background. The 'A' suffix is not applied (no lightmap) else the gauge area would be black. I used the cabin light for illumination. Not the best result, but dealing with this is unknown.

Now save the panel and the following section will be seen in the panel.cfg file.

```
[Vcockpit01]
//file=f117VC1.bmp                <<<<<See note below
Background_color=0,0,0
size_mm=1024,1024
visible=0
pixel size=1024,1024
texture=$f117VC1

gauge00=fsae_f117!F117 Multi-Function Display, 401,570,369,440
gauge01=fsae_f117!f117 pfd, 14,573,369,440
gauge02=fsae_f117!f117 target, 18,12,457,481
gauge03=fsae_f117!f117 VC Icon group, 135,494,192,38
gauge04=fsae_f117!F117 eyebrow LEFT 2D, 499,282,289,174
gauge05=fsae_f117!F117 eyebrow RIGHT 2D, 504,67,289,174
gauge06=fsae_f117!F117 chute handle, 805,234,208,208
gauge07=fsae_f117!F117 eyebrow RIGHT RCS 3D, 581,466,107,107
gauge08=fsae_f117!f117 HUD, 773,430,251,470
gauge09=fsae_f117!F117 Canopy VC lever, 806,12,210,210
```

Note. Switch off the file=f117VC1.bmp by putting // at the start of the line otherwise the bitmap will show on the planars and look totally wrong.
The same procedure is now applied to the second VC section.

Add the following to the panel.cfg file after the [Vcockpit01] section.

```
[Vcockpit02]
file=f117VC2.bmp
Background_color=0,0,0
size_mm=1024,1024
visible=0
pixel size=1024,1024
texture=$f117VC2
```

Repeat the process as for the first section.

The following two pictures again show the first gauge overlay and then the gauges repositioned by mirroring their Y positions. Don't forget that you could start with an inverted image of the 'jigsaw' bitmap, especially if you have individual planars, and forget the math. As mentioned before, there are some gauge groups. Remember, if you don't bother with the math method, to move all the gauges in that group so that they remain in their same relative positions, and tuck the group into the Y dimension envelope of their inverted image..



Gauge positions when overlaid on the 'jigsaw' bitmap f117VC2.bmp



Gauge positions after the Y positions have been mirrored.

Again, switch off file=f117VC2.bmp with // at the start of the line.
The second section will look like this.

[Vcockpit02]

//file=f117VC2.bmp
Background_color=0,0,0
size_mm=1024,1024
visible=0
pixel size=1024,1024
texture=\$f117VC2

gauge00=fsae_f117!F117 Autopilot group, 9,10,264,132
gauge01=fsae_f117!f117 HUD control board, 8,181,264,78
gauge02=fsae_f117!F117 stby at ind 2, 148,671,97,102
gauge03=fsae_f117!f117 ECU, 630,775,383,236
gauge04=fsae_f117!F117 radar alt, 13,652,126,126
gauge05=fsae_f117!f117 Gear panel, 285,7,397,275
gauge06=fsae_f117!f117 annun panel, 10,283,262,229
gauge07=fsae_f117!F117 AOA, 424,466,69,69
gauge08=fsae_f117!f117 eng fire LEFT, 496,417,50,40
gauge09=fsae_f117!F117 fcs, 503,463,34,36
gauge10=fsae_f117!F117 ap MASTER, 497,500,49,39
gauge11=fsae_f117!F117 beta, 614,464,71,71
gauge12=fsae_f117!f117 eng fire RIGHT, 563,421,50,40
gauge13=fsae_f117!F117 fcs, 574,463,34,36
gauge14=fsae_f117!F117 ap MASTER, 564, 499 ,49,39
gauge15=fsae_f117!f117 radios, 740,490,271,228
gauge16=fsae_f117!F117 vsi, 393,566,126,130
gauge17=fsae_f117!f117 tailhook, 344,670,44,49
gauge18=fsae_f117!F117 Airspeed, 294,721,132,136
gauge19=fsae_f117!F117 at ind, 427,698,159,159
gauge20=fsae_f117!f117 PFD C_H control board, 12,790,272,69
gauge21=fsae_f117!f117 Altimeter, 293,859,161,159
gauge22=fsae_f117!F117 HSI, 455,859,161,161
gauge23=fsae_f117!f117 master arm, 27,862,221,150
gauge24=fsae_f117!F117 zoom IAS ATT IND ALT HSI, 587,698,32,112
gauge25=fsae_f117!F117 cabin light switch, 590,815,28,28
gauge26=fsae_f117!F117 clock, 284,414,126,131
gauge27=fsae_f117!F117 G meter, 699,34,98,98
gauge28=fsae_f117!F117 Canopy, 837,95,38,38
gauge29=fsae_f117!F117 hyd, 694,142,210,78
gauge30=fsae_f117!F117 Oxygen, 905,168,109,109
gauge31=fsae_f117!f117 aileron trim, 105,581,42,42
gauge32=fsae_f117!F117 elevator trim, 15,581,42,42

Note, the bitmaps f117VC1.bmp, f117VC2.bmp, \$f117VC1 and \$f117VC2 do not have to be placed in in any of the final aircraft folders.

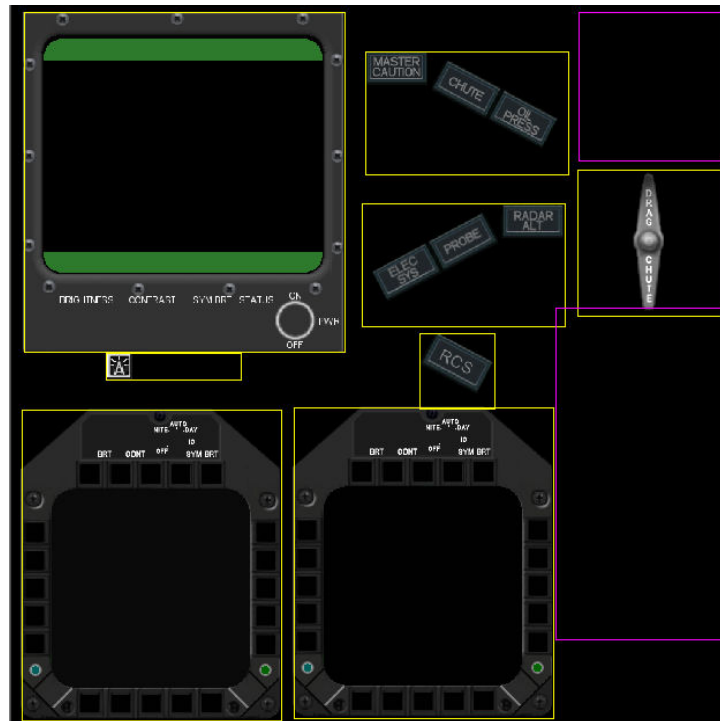
5.0 Quality control checks.

Start FS2004 and inspect the gauge positions in the VC view. You may need to tweak their final positions in the panel.cfg a little.

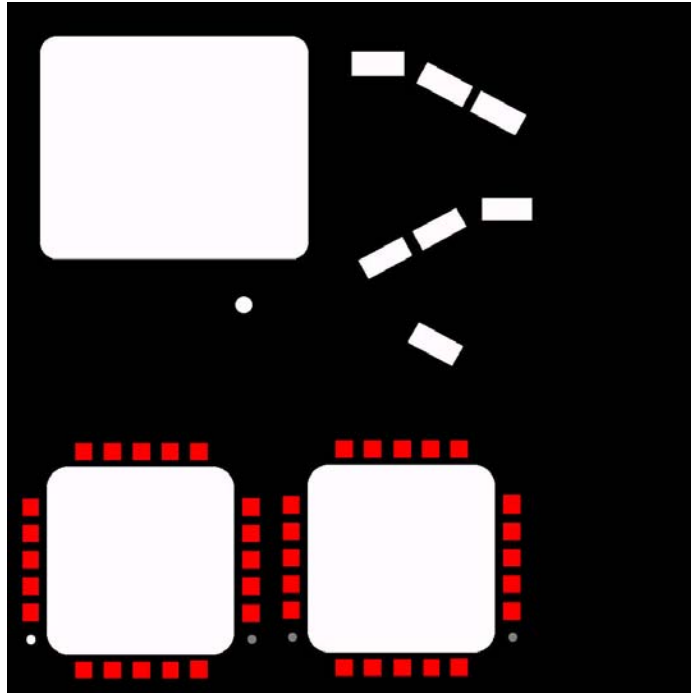
6.0 Gauge background illumination.

Earlier, when applying the texture to the planars, you added an 'A' suffix to the bitmap name. This tells Fs2004 to add a lightmap. This can be switched on and off on the panel.

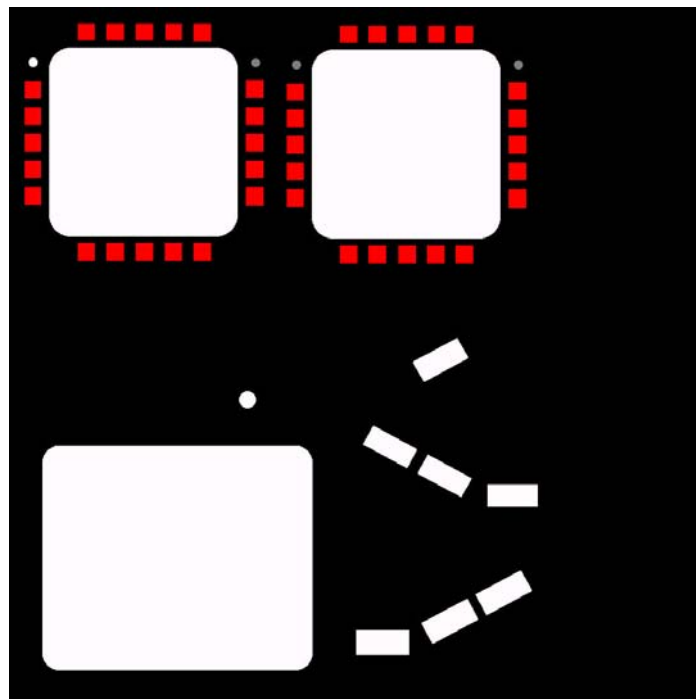
First, make the lightmap bitmap. An easy way to do this is to take a copy of the gauge layout shown in FS Panel Studio as shown in this picture and save it in the graphics editor.



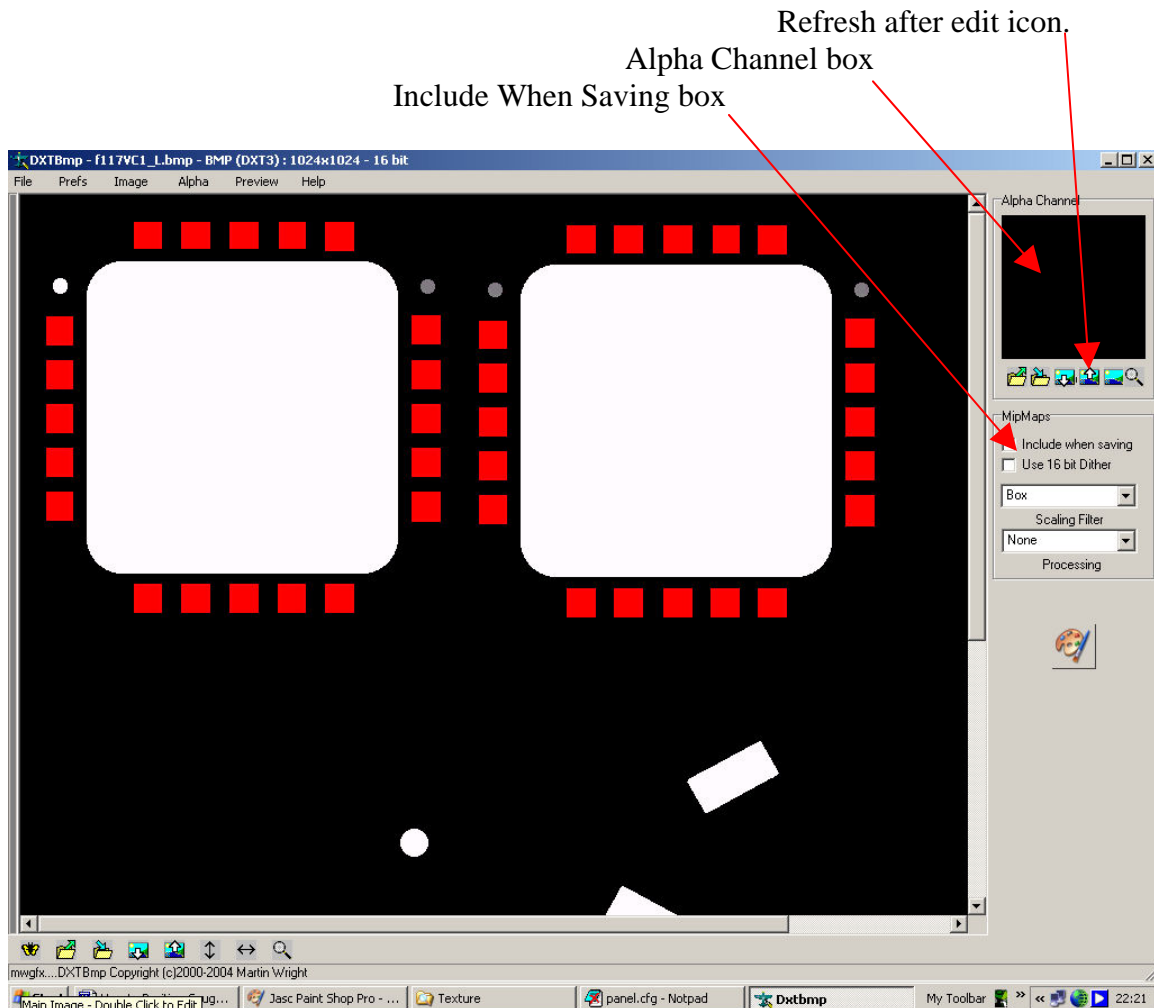
Then paint the areas to be illuminated with white, or at least a light colour. The non-illuminated areas are painted black. I have painted the PFD and MFD button illuminated areas red. See the following picture



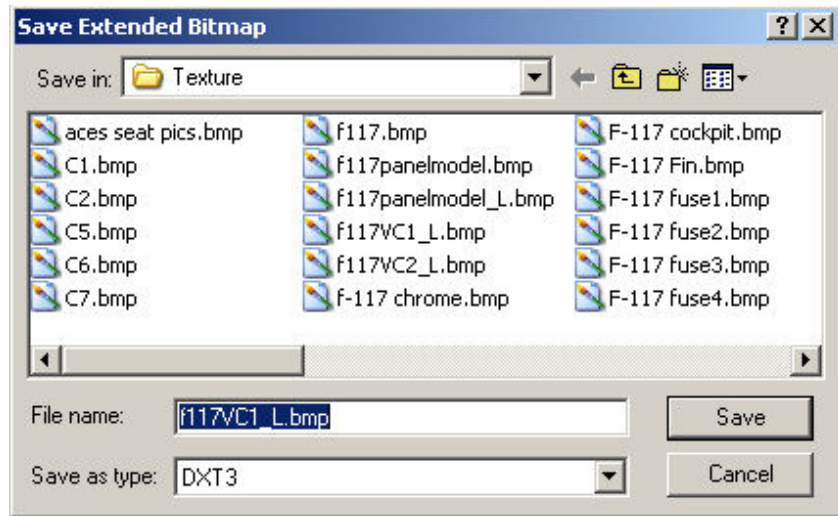
Now, this is another case where FS2004 thinks in up-side-down mode. The final lightmap bitmap has to be inverted, so completely flip the bitmap in the Y direction thus.



You have to add an alpha channel to this bitmap and save it as a DXT3. Open this bitmap in DXTbmp. Tell DXTbmp the location of the graphics editor, on the menu bar 'prefs', 'select editor'. Make sure the 'Include When Saving' box is unchecked. Double click in the 'Alpha Channel' box. The graphics editor will open (if not already open) and a plain white bitmap will appear called trans.bmp. Paint this black and just 'Save' (not Save As). Click the 'Refresh After Edit' icon in DXTbmp, and the Alpha Channel will become black.



Save from the menu bar as 'File', 'Save As', 'Extended bitmap'.



In this box select type as DXT3. The file name is as follows. In this example, the VC texture was \$f117VC1. Save as f117VC1_L.bmp. That is, remove the '\$', add '_L' (underscore capital L) and add the extension .bmp. Save this file to the Textures folder of the aircraft.

Repeat the process for the second set of gauges.

When you switch the panel lights, the gauges will illuminate at dusk, night and dawn.

Academic Note. With a black alpha channel any light type will switch on the illumination except the landing lights. With a white alpha channel, illumination occurs only with the landing lights switch. Read the next section for better illumination control.

7.0 Improved method for controlling gauge background illumination.

This method was highlighted by Bill Leaming which is a blindingly obvious method that no one else had thought of. This method is particularly suitable for the way gauges are positioned in this tutorial.

Follow this tutorial through, but tag each gauge planar with Panel Light Switch On. Now copy all the gauge planars and texture without the lightmap suffix 'A', and tag each of these to Panel Light Switch Off. Now the illumination will only work with the panel light switch.

8.0 Examples.

I thought I would end this tutorial with some pictorial examples of VC gauge placement and illumination. These views are from my F-117A Nighthawk, available at

<http://www.FS2x.com>

