

PS: Creating Normal/ *Bump* Maps v4.0

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What's Needed:

Photo Editor

Photoshop Software

NVIDIA Texture Tools (plugin)

NVIDIA Normal Map filter, NVIDIA DDS plug-in, Mipster, Cube Map Shuffler.

- **Found** (Photoshop CC Only):: <https://developer.nvidia.com/nvidia-texture-tools-exporter>
- **Found** (Legacy versions of Photoshop 5.0 to CS6): [Here](#).
- NVIDIA Graphics (Display) Card is **Not** Required.

OR

NVIDIA Texture Tools Exporter (NTT – standalone)

- **Found:** <https://developer.nvidia.com/nvidia-texture-tools-exporter> (located at bottom of page and on the right-hand side).
- NVIDIA Graphics (Display) Card **Not** Required.

Please install either the **NVIDIA Texture Tools** (plugin or *standalone*) before starting this tutorial. Also, it is best that all texture maps start out in the “power of 2” before editing. The reason is if you resize or rescale after or during editing you could cause your maps to become blurry or not sharp.

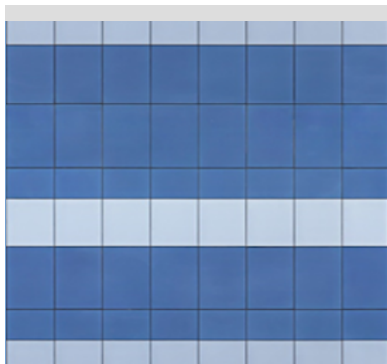
Introduction

Whether you choose a *specular* workflow or a *metallic* workflow (in P3D v4.4 or later), *bump* maps can enhance your scenery/ aircraft models. The difference between the 2 can change how you create the normal/ *bump* map. You could now have an *albedo* map and a *diffuse* map to work with. Keep in mind though; a *diffuse* map is much easier in creating a *bump* map compared to an *albedo* map.

Note: The difference between a *diffuse* map and an *albedo* maps is: The *diffuse* map contains directional light information and the *albedo* map does not.

The problem, generally speaking, that occurs in creating a *bump* map is the fact that the *diffuse* map, can look like a simple 2D representation (*albedo* map) of the texture. Such as, this texture,

[TexturesCom_HighRiseGlass0091_1_seamless_S](#), which was found on [www.textures.com](#) ([Picture 1](#)), if this was your *diffuse* map; it doesn't show any height reference because there isn't any light information to give it depth.



[Picture 1](#)

So, if this was converted into a *bump* map, as is, it would not appear as you would expect. It would need to be adjusted first. The adjustments have to do with how the colors would be translated after they are desaturated.

Unlike the texture, [TexturesCom_BrickOldMixedSize0040_1_seamless_S](#), which was also found on [www.textures.com](#), wouldn't need any adjustments ([Picture 2](#)). You would skip to [Step 2](#) (desaturate it).



[Picture 2](#)

If you have already created a *height* map by using the tutorial, "[PS: Creating Height Maps \(HM\)](#)", continue on with [Step 5](#).

[Step 1: Layering](#)

We need to take each of the different "parts" [ex. panels, windows (glass), and the trim] and place them each, into a different layer. Within any of the [Photoshop](#) software, I would use the *Rectangular Marquee Tool*; making sure you have placed each

"part" in their proper layer. This will give us greater control in adjusting the parts, along with re-painting them.

Now would be a good time to re-paint each of the layers, such as the *windows* (even if your *windows* are to be transparent at a later time) and the *trim* (using the *Eyedropper Tool* to obtain the color in the particular layer). The reason is to make each "part" have within, the same color.

Note: You might want to re-paint the certain “parts” prior to placing them into their own layers [especially the *windows (glass)*]. This could make it easier to place them in their different layers also. These are the colors used:

- *Windows (glass)*: R148, G168, B204
- *Panels*: R195, G212, B232
- *Trim*: R43, G46, B54

After getting the different parts into their own layers, make duplicates of each one of the “parts” and place them at the top of the layer stack (you might wish to rename each of them as originals, for example, *Windows – Orig*, etc.).

After you have renamed them, make them invisible (by clicking on the “eye” so it isn’t seen next to each layer).

Now would be a good time to **save**, such **as** (Shift+Ctrl+S)

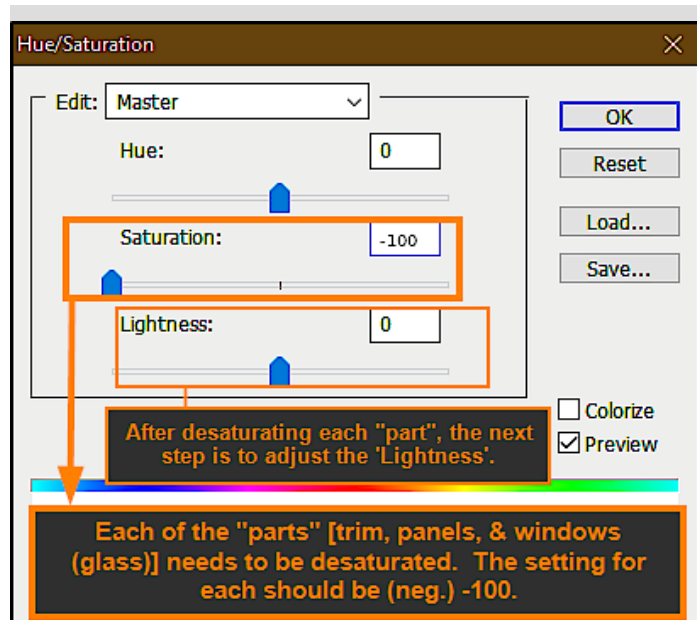
HighRiseGlass009_b.psd – Remember to save as to something **different** than your *diffuse* map. Do **NOT** overwrite your *diffuse* or *albedo* maps!!

Step 2: Desaturation

Now that we have all the “parts” in their own different layers, we now have better control over what we can do to each “part”. We will now desaturate the color from each of the layers.

To desaturate each of the layers [trim, panels, and windows (*glass*)], you would use the **Layer** tab -> **New Adjustment Layer** -> **Hue/Saturation**; make sure to have it attached or chained (activating the “Group with Previous Layer” or “Use Previous Layer to Create Clipping Mask” field) to each of their corresponding layer. For each of the layers, you will set the “Saturation” value to **(negative) -100**. Click on ‘OK’ when done with each layer (**Picture 3**).

Save (Ctrl+S) again, ex. *HighRiseGlass009_b.psd*.



Picture 3

For the texture, *BrickOldMixedSize0040*, to desaturate, you would use the **Layer** tab and then **New Adjustment Layer -> Hue/Saturation**, on the whole texture. You will set the “Saturation” value to **(negative) -100**.

Save (Ctrl+S) this texture *BrickOldMixedSize0040_b.psd*. Go to [Step 4](#).

Step 3: Adjust Lighting

After we have desaturated our layers, we need to adjust how light or dark the “part” will be.

But first, we need to decide what “part” or “parts” need to appear closer or raised to the user. Once you have decided this, the “part” that is to appear closer to the user needs to be lighter or towards the color of white. Otherwise, to appear farther away, you will need to make the “part” darker or towards the color of black.

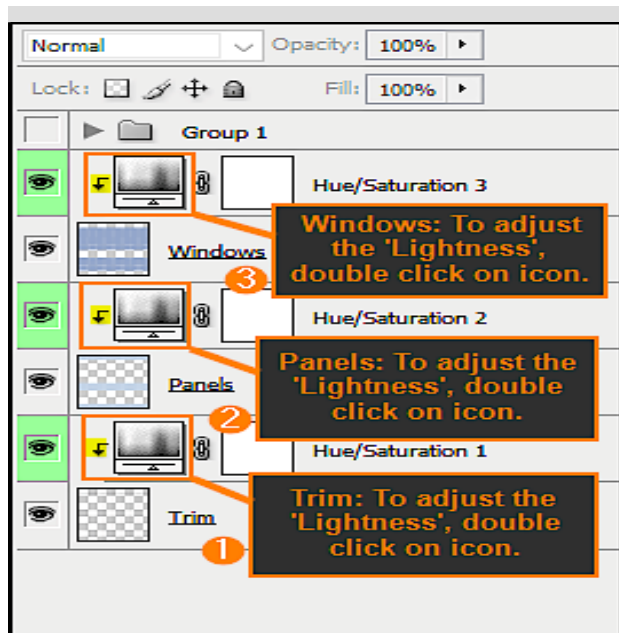
We have chosen to make the *trim* appear the closest, so we will have it appear lighter in color. The *panels*, we want them to appear closer than but not as close as the *trim* or the *windows*, so we will make them light but not as light as the *trim*. The *windows* (*glass*) are to appear the farthest away from the user, so we will make them darker than the rest of the other “parts”.

I’m adjusting the “*Lightness*” through the **Adjustment Layer -> Hue/Saturation**, which was created in the previous step [you will double click on the *adjustment sub-layer* icon to edit or adjust them ([Picture 4](#))].

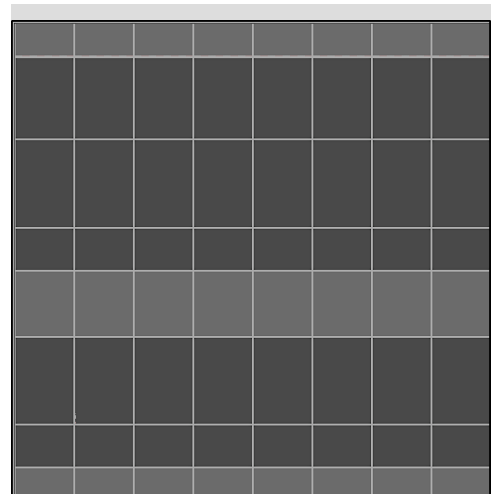
(3) **Windows** (farthest = darkest) I have set it to **(negative) -60** (going towards the left of 0).

(2) **Panels** (closer to the trim) I have set it to **(negative) -50** (going towards the left of 0).

(1) **Trim** (closest = lightest) I have set it at **+60** (going towards the right of 0).



Picture 4



Picture 5

After you have adjusted the “*Lightness*” slider for each layer, you should see something similar to [Picture 5](#).

Note: Always try starting with the closest (*which would be the lightest*) and proceed until you get to the farthest (*which would be the darkest*) - take it slow. Also, keep in mind that if any of the colors are not the same as above then the “*Lightness*” values could be different.

I suggest at this point that you **save** [(Ctrl+S) ex. *HighRiseGlass0091_b.psd*].

Step 4: Merging & Flattening

Now you’re ready to **merge** the layers into a single layer.

According to the SDKs of FSX (FSX: SE), & P3D, the layers that make up the normal/ *bump* map, need to be a flattened image and should **not** have an alpha channel.

So, in merging, make sure the “*eye*” (next to each layer) is visible and then, right-click within the layer stack, and click on **Merge Visible** (Shift+Ctrl+E). Afterward, you will need to click on **Flatten Image** by right-clicking within the layer stack. If you are asked, “*Discard hidden layers?*” click on ‘OK’.

OR

Make sure the layers to be merged are visible and then right-click within the layer stack and click on **Flatten Image**. If asked, “*Discard hidden layers?*” click on ‘OK’.

Go ahead and **save as** [(Shift+Ctrl+S) ex. *HighRiseGlass0091_hm.psd*]. Take **notice** that we have saved under a different filename. This will allow you to adjust or edit from the *HighRiseGlass0091_b.psd* if you need to.

After you have saved, re-**save as** (Shift+Ctrl+S) again, but this time as *HighRiseGlass0091_bump.psd*.

For texture, *BrickOldMixedSize0040*, you’re to **merge** the *adjustment layer* with the *base layer* of the texture. Make sure the layers are visible (the “*eye*” next to each), and right-click within the layer stack and click on **Merge Visible** (Shift+Ctrl+E). You will then right-click within the layer stack and click on **Flatten Image**. If you are asked, “*Discard hidden layers?*” click on ‘OK’.

OR

You could also just make sure the layers are visible and then right-click within the layer stack and click on **Flatten Image**. If you are asked, “Discard hidden layers?” click on ‘OK’.

Go ahead and **save as** [(Shift+Ctrl+S) ex. *BrickOldMixedSize0040_hm.psd*]. Take **notice** that we have saved under a different filename. This will allow you to adjust or edit from the *BrickOldMixedSize0040_b.psd* if you need to. After you have saved, re-**save as** (Shift+Ctrl+S) again, but this time as *BrickOldMixedSize0040_bump.psd*.

Step 5: Creating a Normal Map

For the *height* map that was already created through the tutorial, “PS: Creating Height Maps (HM)”, **load** (Ctrl+O) the texture, for example, *HighRiseGlass0091_hm.psd* or *HighRiseGlass0091_hm2.psd*.

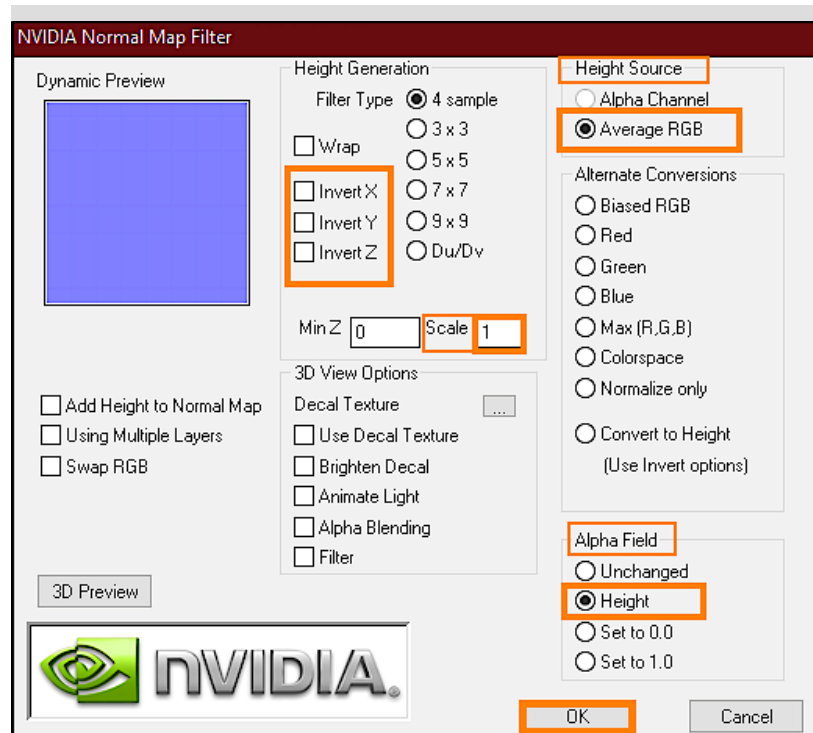
Re-**save as** (Shift+Ctrl+S) *HighRiseGlass0091_norm.psd* (or *HighRiseGlass0091_norm2.psd*), so that you **do not** overwrite your height map (HM) and continue with this tutorial. **Notice** that we have saved under a different filename.

If you are using *ImageTool* then goto [Step 5a](#). If you are using the **NVIDIA Texture Tools Exporter (NTT-standalone)**, continue onto [Step 5b](#). Otherwise, continue on.

If you are using *ImageTool* then goto [Step 5a](#). If you are using the **NVIDIA Texture Tools Exporter (NTT-standalone)**, continue onto [Step 5b](#).

To create a *Normal* map, click on the **Filter** tab -> **NVIDIA Tools** -> **NormalMapFilter**.

The setup, the “*Invert X*”, “*Invert Y*”, and/or “*Invert Z*” may need to click to the **On** position, but **NOT** in this case. The “*Scale*”



Picture 6

can also be changed, but **1** is usually satisfactory. The “*Height Source*” section should be set to **Average RGB** and the “*Alpha Field*” should be set to **Height**. None of the other sections need to be changed ([Picture 6](#)).

Once you’re satisfied, click on ‘**OK**’ at the bottom. Of course, if you think you have made a mistake within the plugin, you can hit the ‘**Cancel**’ button, re-run the **plugin** and start over.

For texture, *BrickOldMixedSize0040*, the setup for the “*Invert X*” is **Off**, “*Invert Y*” is **Off**, and “*Invert Z*” is **Off**. This will make the grout appear farther to the user. Everything else, the “*Scale*”, “*Height Source*” and the “*Alpha Field*” need to be set same as above ([Picture 6](#)). Again, **save as** (Shift+Ctrl+S) *BrickOldMixedSize0040_bump.psd*.

Special Note: If you want to create a *specular* map using the normal/ *bump* map, you will need to produce an “*altered normal*” map. To do so, you would turn **on** the Boolean box for the “*Invert Y*”, or what the opposite or reverse of how it was done above. The “*Invert Z*” will always stay **off** and leave the “*Scale*” at **1**.

Then **save as** (Shift+Ctrl+S), to something different such as *HighRiseGlass0091_an.psd*. Look in the tutorial, “[PS: Creating Specular Maps](#)” to see how this “*altered normal*” map can be applied.

After you have done the above, **save as** (Shift+Ctrl+S) the texture (ex. *HighRiseGlass0091_bump.psd*) and continue on to [Step 6](#).

Step 5a: ImageTool

We need to create the *normal* map and convert it to a *bump* map, so it will be read correctly in *FSX* (*FSX: SE*) or *P3D v5.x* (or *previous versions thereof*). Make sure that any texture going through ImageTool is in the proper format (ex. “.psd” or “.tga”) and are in the “*power of 2*”.

Using [ImageTool](#), through the *command prompt*:

[Syntax: *Drive*:ImageTool (-batch -nogui) -nobeep -nomip -dxt5 -RedInAlpha -dds -nodither <path/filename>]

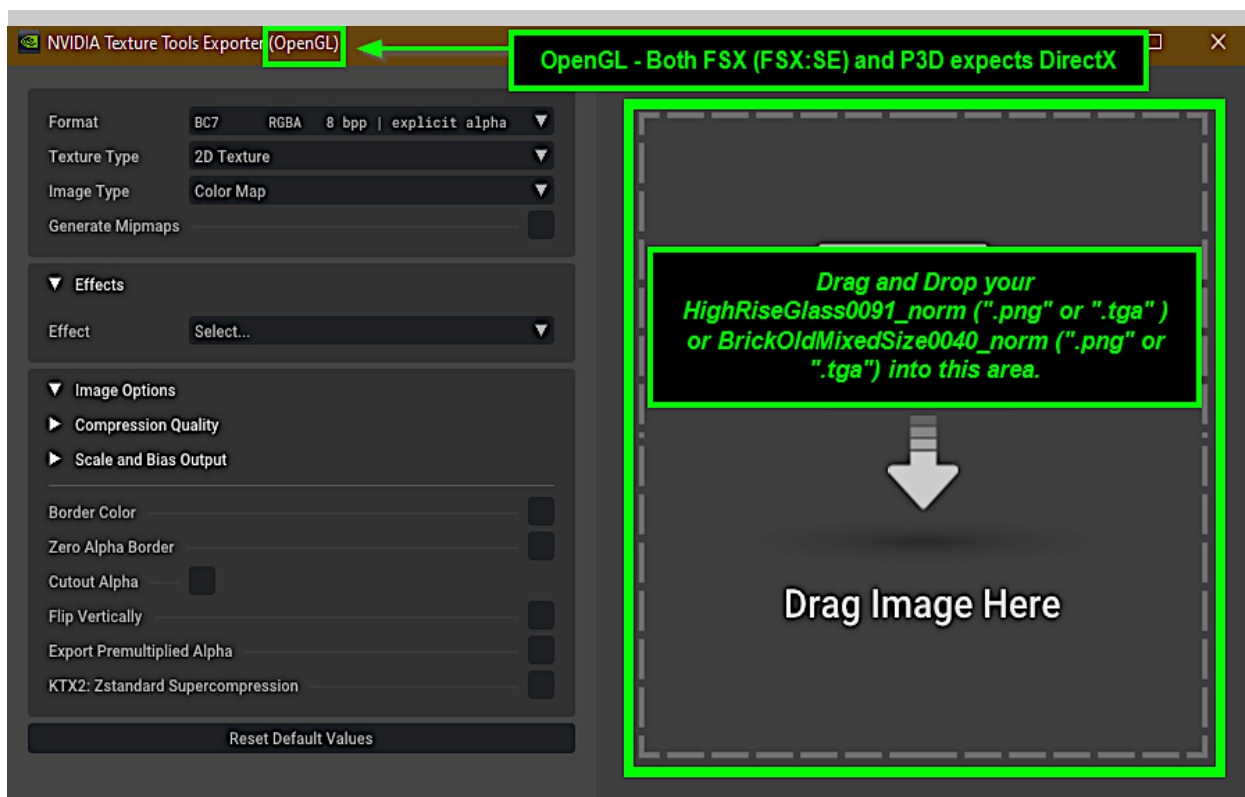
The “*-batch*” & “*-nogui*” are optional and should only be used when you wish to process multiple files, better known as “*batch processing*” (using a *batch file*). This method can be useful, in particular, when a lot of *normal* maps or other types of maps that need to be converted.

More Information on [ImageTool](#), the *command prompt*, and with creating *batch* (".bat") files can be downloaded here, [Appendix A](#).

ImageTool is a part of the *FSX* and *P3D* SDKs. *FSX*: SE should use the *P3D* v1.4 SDK if the *FSX* SDK is not available.

Step 5b: NVIDIA Texture Tool Exporter (NTT – standalone)

The *NVIDIA Texture Tools Exporter* (*NTT-standalone*) is a standalone application which functions like the plugin for *Photoshop* (but it doesn't require it. – See [NTT-1](#)).



NTT-1

The main difference between the plug-in and the *NTT-standalone* is that the *NTT-standalone* is Open GL (*stated at the top of the application*) and not DirectX which is what *FSX* (*FSX:SE*) and *P3D* uses. You will **always** need to “invert Y” when you are creating a *normal* map through the *NVIDIA Texture Tools Exporter* (*NTT-standalone*). Let's get started.

First, drag and drop your texture into the right-hand section of the *NTT* (ex. *HighRiseGlass0091_norm.psd*, *HighRiseGlass0091_norm.png*

or *BrickOldMixedSize0040_norm.tga*). After you have dropped the texture, click in the “*Display Compressed*” Boolean box that is located in the upper right-hand corner (see [NTT-2](#)). We need it to be **on** (checkmark appears).

Now, we will be working on setting up/ changing the necessary fields that are on the left-hand side of the *NTT-standalone*. At the top, initially, there is “*Format*”, “*Texture Type*”, and “*Image Type*” fields. After dragging and dropping the texture into *NTT*, we are left with only 2, “*Format*” and “*Image Type*”. We will leave the “*Format*” as: **BC7 RGBA 8 bpp explicit alpha**. The “*Texture Type*” though, we will need to change it from **Color Map** to **Normal Map : Tangent Space** (See [NTT-3](#)).

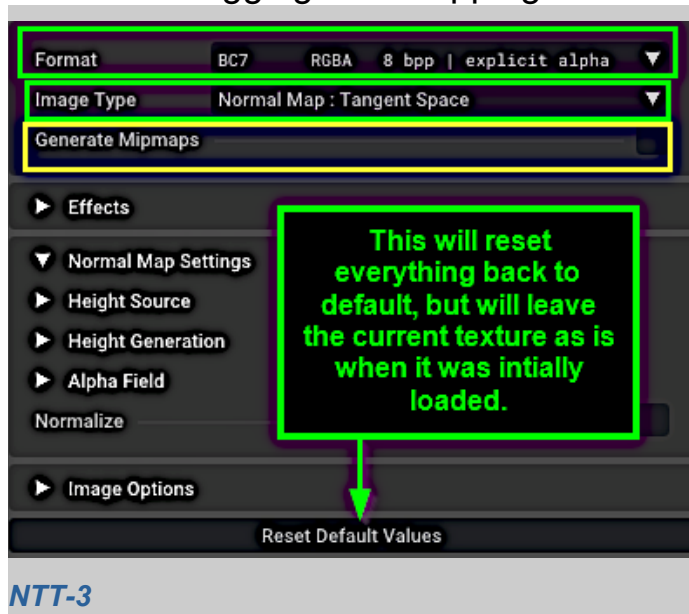
The “*Generate Mipmaps*” Boolean box needs to be “clicked on” so that it is **off** (checkmark disappears).

Once you have turned off mipmaps, the “*Mip*” slider at the top right corner of *NTT* will disappear (see [NTT-2](#) surrounded in yellow).

Note: Even though you can have mipmaps in *bump* maps, the sharpness in the details at a distance are not visible to human eye in reality, especially for the smallest of the mipmaps.

Through *NTT*, you can limit the number of mipmaps that are created through the “*Mip*” slider at the top right-hand corner. The number of “*Mip*” that should be created depends on the size of the texture. A general rule that we follow, a texture that is below 512 should not have mipmaps. For this texture, we would only have 2 created.

To enter a **2** or any other value (into a slider) is by clicking the “*Ctrl+LMB*” (Left -Mouse-Button) simultaneously and then after the value



has been entered, click the “LMB” outside the area where the value was entered for it to be accepted.

Mipmap Options (if used – not pictured)

The “Filter Type” needs to stay at **Box** and the Gamma Correct Boolean box activated (turned **on**). The other 2 Boolean boxes need to be deactivated or turned **off**.

If you notice any kind of discoloration (a yellowish tint) to the texture in the viewer, make sure that the “Format” is set correctly to **BC7 RGBA 8 bpp explicit alpha**.

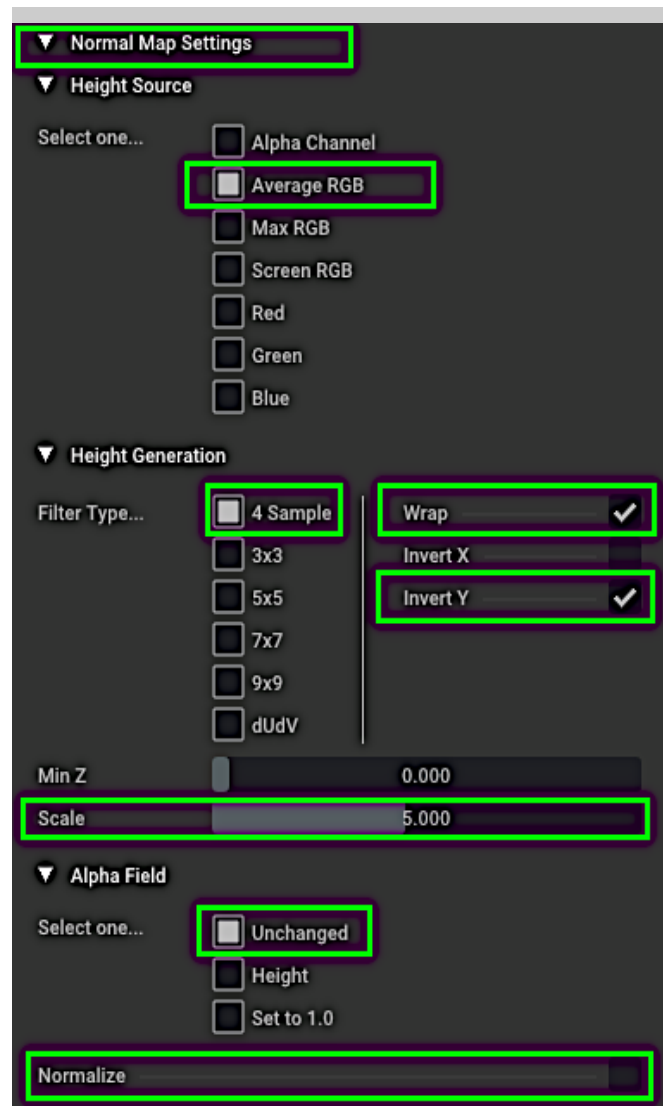
Normal Map Settings

Under the *Height Source* we need to set it to **Average RGB**.

The “Height Generation” sub-section: We have the “Filter Type” and Boolean boxes for “Wrap” (*Tileable*), “Invert X”, and “Invert Y”. Any option for the “Filter Type” is good to use, but we have decided on **4 Sample**. As you can see (see [NTT-4](#)), we have activated (turned **on**) the “Wrap” (*Tileable*) and the “Invert Y” Boolean boxes. If you remember, OpenGL is used by *NTT-standalone*, but *FSX(FSX: SE)* and *P3D* requires DirectX.

Next are the 2 sliders, “Min Z” and “Scale”. We left the “Min Z” at **0** and raised the “Scale” to **5**.

Again, to enter the values into the slider fields is by clicking the “Ctrl+LMB” (Left-



[NTT-4](#)

Mouse-Button) simultaneously and then after the value was entered, click the “LMB” outside the area where the value was entered for it to be accepted.

The “Alpha Field” sub-section needs to be kept at **Unchanged**. The last option in this section to change is the “Normalize” Boolean box. It needs to be unchecked or deactivated (**off**).

Image Options

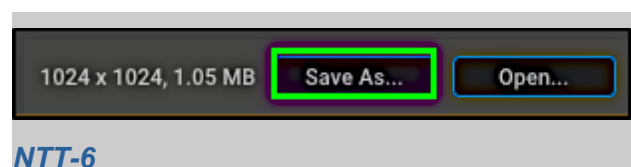
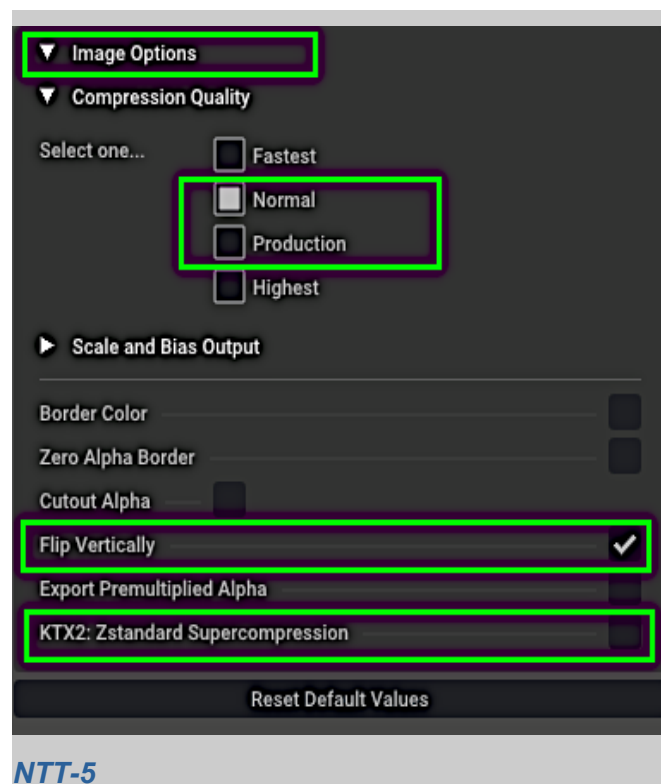
The “Compression Quality” sub-section is initially set to **Fastest**, but we would use either **Normal** or **Production** only.

Under the “Scale and Bias Output” sub-section, nothing needs to be changed or corrected. Just leave it as is.

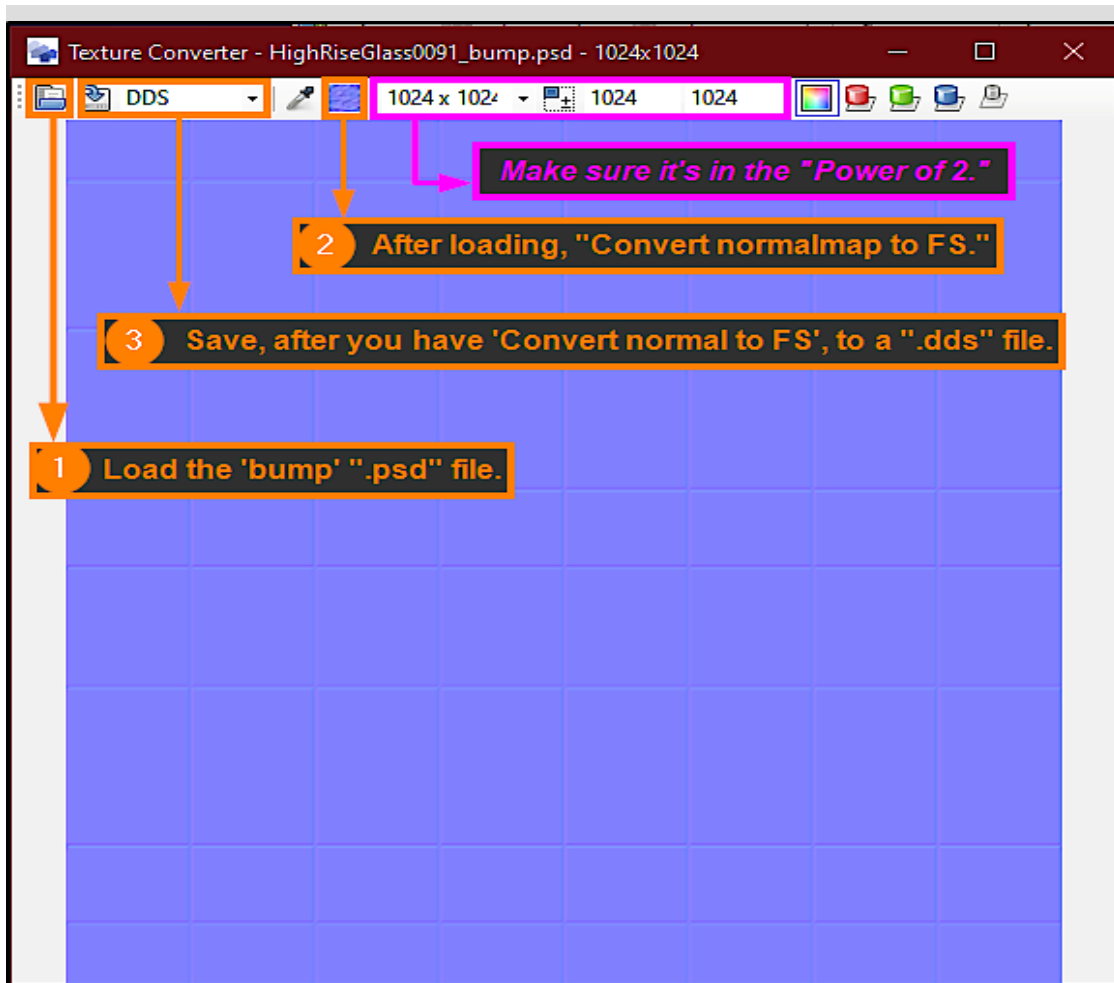
The next sub-section we need to make changes or corrections to; all are Boolean boxes to either activate or deactivate. We need to activate (**on**) “Flip Vertically” and deactivate (**off**) “KTX2: Zstandard supercompression (see [NTT-5](#))”.

Completing the Normal Map

We are almost done, After you have verified the settings, click on the ‘**Save As**’ at the bottom right-hand corner (see [NTT-6](#)). Be careful, you will need to fill out the whole filename + extension (“.dds” - ex. *HighRiseGlass0091_norm.dds* or *BrickOldMixedSize0040_norm.dds*)). Continue onto the next step.



Step 6: ModelConverterX (MCX)



Picture 7

This last step is necessary after you have gone through either *Photoshop* or the **NVIDIA Texture Tools Exporter (NNT-standalone)**. The reason is because of the difference between what a *normal* map is compared to what a *bump* map is within *FSX* (*FSX: SE*) and *P3D*.

What is required to be done: the information within the *red* channel of the *normal* map needs to be moved to the *alpha* channel.. This will leave the red channel as black. This could be done within *Photoshop* but it can be confusing and also time consuming. If enough of you request on how to do this within *Photoshop*, I would be happy to include it in the tutorial.

Run **ModelConverterX (MCX)** by Arno Gerretsen. Click on **Special tools** tab at the top right-hand side and locate and ⁽¹⁾ click on "Texture converter". Locate and load in your texture (ex. *HighRiseGlass0091_norm.dds* or

[BrickOldMixedSize0040_norm.dds](#)). After the texture has loaded, you will ⁽²⁾ click on the “Convert normalmap to FS” ([Picture 7](#)). You’re now ready to ⁽³⁾ save as a “.dds” file within MCX.

ModelConverterX (MCX) by Arno Gerretsen can be downloaded from [here](#). We recommend that you download the *Development Release* version.

Conclusion

You’re Done, Finished! Please, don’t hesitate in asking any questions or comments through either our email (at the top) or you can contact us through our [Facebook](#) page.



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