D3D9Client documentation

Installation

You need a DirectX February 2010 or newer to run D3D9Client. To install the client itself you need to extract the zip package in the root folder of the Orbiter. In order to use a graphics client you need to run "Orbiter_ng.exe" instead of "Orbiter.exe". Also the client must be activated from the Modules tab.

DirectX Runtimes

If the redistributable package isn't installed in your computer you will receive an error message "The program can't start because d3dx9_42.dll is missing from your computer". Or you may see a pop-up window in Orbiter LaunchPad telling about a missing runtimes. If that happens then download and extract the content of the package in any empty directory you want and then find a Setup.exe and run it. You can delete the contents of the directory after the setup is completed. The directory is just a temporary storage for the installation files.

Here is a link: http://www.microsoft.com/en-us/download/details.aspx?id=9033

Orbiter Sound 3.5, Spacecraft3.dll

In order to use Spacecraft3.dll and Orbiter Sound (Version 3.5) with an external graphics client –like D3D9Client is one–, symbolic links in `/Modules/Server/` folder must be created.

Note, that for the current version of Orbiter Sound (Version 4.0) the "Sound" link is not necessary anymore. It will not be created via the according Button in D3D9Clients "Advanced Setup" dialog, if D3DClient detects that the loaded Orbiter Sound Module if of Version 4.0. Anyhow, it does not harm if the "Sound" link is present for a Orbiter Sound 4.0 setup.

The two symbolic links in `/Modules/Server/` folder for "`Config`" and "`Sound`" folders point (or link) to their "originals" located in the root folder of the Orbiter installation.
If you are using Windows XP or newer and your installation is on a NTFS filesystem, these links can easily be created from Video Tab -> Advanced Setup. If you have problems with creating the links you can also use a software called Link Shell Extension (see link below) or you can simply copy the `Config` and `Sound` folders into `/Modules/Server/`. But then you have to keep them updated manually.

Here is the link: http://schinagl.priv.at/nt/hardlinkshellext/hardlinkshellext.html

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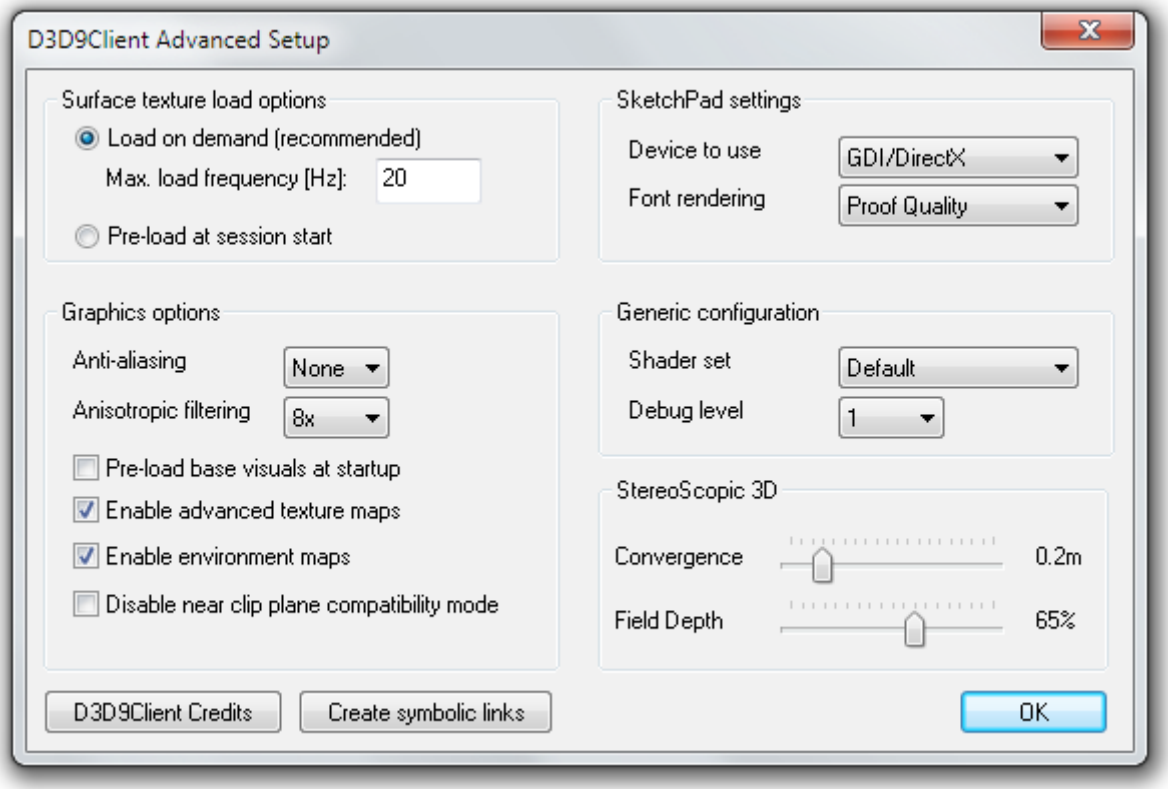
Fullscreen Mode and Alt-Tabing

D3D9Client doesn't support alt-tabing in a so-called "True Fullscreen Mode". Therefore, it's recommended that you use a windowed fullscreen mode that will run the orbiter in a fullscreen sized

borderless window. There is also a conflict between a GDI based dialog (i.e. pop-up) windows and anti-aliasing in a true fullscreen mode which will disable the anti-aliasing.

D3D9Client Advanced Setup

Under the regular Video Tab of the Orbiter (Orbiter_NG) Launchpad you find the "Advanced" Button that will show the "D3D9Client Advanced Setup" Dialog. Here you can change several settings to tweak your experience with the D3D9Client.



On the lower left side of the Dialog you'll find the "Create symbolic links" button that will create the symbolic links that are needed for some add-ons. The symbolic links can only be created on an NTFS filesystem, so if you have installed your Orbiter installation for example on an FAT32 of extFS filesystem this feature will not work. In this case you have to copy the according folders as explained in the "Orbiter Sound, Spacecraft3.dll" chapter (above).

Surface texture load options

Here you can change the behavior how the D3D9Client will load surface textures. The two options available are either "Load on demand (recommended)" or "Pre-load at session start":

- Load on demand (recommended)

  With this recommended option selected the D3D9Client will only load surface textures when they come into view while you are orbiting a planet. The value in the "Max. load frequency [Hz]" input field lets you tune the maximum frequency the D3D9Client will check whether some new surface textures have come into view.

- Pre-load at session start

  With this option selected the D3D9Client will load all surface textures at startup of a scenario which results in a longer loading time.

Graphics options

Here you can change settings according to your graphic hardware:

- Anti-aliasing

  Depending on your hardware you can select the anti-aliasing feature that will "smoothen" the visual artifacts that occur when displaying edges.

- Anisotropic filtering

  Depending on your hardware you can select the level of anisotropic filtering. For further details about this topic take a look at Anisotropic filtering in the wikipedia.

Following checkboxes can be checked (enabled) or unchecked (disabled) to further fine-tune your D3D9Client experience:

- Pre-load base visuals at startup

  With this option ***enabled*** the D3D9Client will load all base visuals at startup of a scenario which results in a longer loading time.
  With this option ***disabled*** the D3D9Client will only load base visuals when they come into view while you are e.g. flying through the atmosphere or orbiting a planet.

- Enable advanced texture maps

  With this option enabled D3D9Client will try to add additional texture information for meshes that supply them. This advanced texture maps define for example how "rough" or "shiny" a texture appears.

- Enable environment maps

  With this option enabled D3D9Client will try to add additional texture information for meshes that supply them. This environment maps define how "reflective" a texture appears. This reflections can be seen best on shiny metal surfaces, which do reflect the "environment" more or less mirror-like.

  Note: This option must be ***enabled*** to be able to use the "D3D9 Debug Controls" dialogs option which displays the current environment (as a flattened cuboid) for debugging purposes.

- Disable near clip plane compatibility mode

  If the near clip-plane compatibility mode is enabled then the minimum clip-plane distance is 1.0 meters as is in the Orbiters internal engine. If the compatibility mode is disabled then the client can reduce the clip distance down to 0.1 meters, if there is a graphics close to the camera. This setting will only effect in so-called exterior pass. Virtual cockpit near clip-plane distance is defined in D3D9Client.cfg and the default value is 0.1 meters.

SketchPad settings

The SketchPad is used in Orbiter to draw 2D graphics onto surfaces. These are for example MFD Displays or announcements in the Simulation.

- Device to use

  The two options you can choose from at "Device to use" are "GDI/DirectX" and "GDI Only".

  GDI/DirectX will use the DirectX 2D drawing capabilities of your graphic hardware to draw 2D surfaces. Normally this is the recommended setting, because it will not produce so much CPU load that the "GDI Only" option.
  GDI Only will only use GDI to draw 2D surfaces which might be the option when you experience any glitches or graphical artifacts in MFD screens. This mode is used for older graphic hardware to be able to run Orbiter.

- Font rendering

  The four options you can choose from at "Font rendering" are "Crisp", "Default", "Cleartype" and "Proof Quality".

  Each setting will render fonts more smooth but uses a bit more graphic hardware performance.

Generic configuration

The generic configuration contains options that will change the general behavior of D3D9Client. For most of the time the default setup should be fine ("Default" Shader set and Debug Level "1"). But you can for example change the verbosity of the internal logging system to be able to report more detailed issue information when you experience an error or failure.

- Shader set

  If you have different shader sets you like to switch between, this select box lets you choose between them.
  Note however, that this option is not always available and strongly depends on the version of D3D9Client! The R6 release for example has only the "Default" shader set to select.

- Debug level

  The five options you can choose from here [0...4] represent the level of information that will be written into the log-file. The log-file is called D3D9ClientLog.html which can be found in *Modules\D3D9Client* directory. Higher values will create more detailed output.

  Until you have any problems and like to have more detailed information what's going on, you should keep this level reasonably low as higher values will result in more disk I/O what slows down the Simulation.

StereoScopic 3D

The stereoScopic 3D settings allow you to tweak the 3D experience if you are using a NVIDIA graphic card that provides this feature.

- Convergence

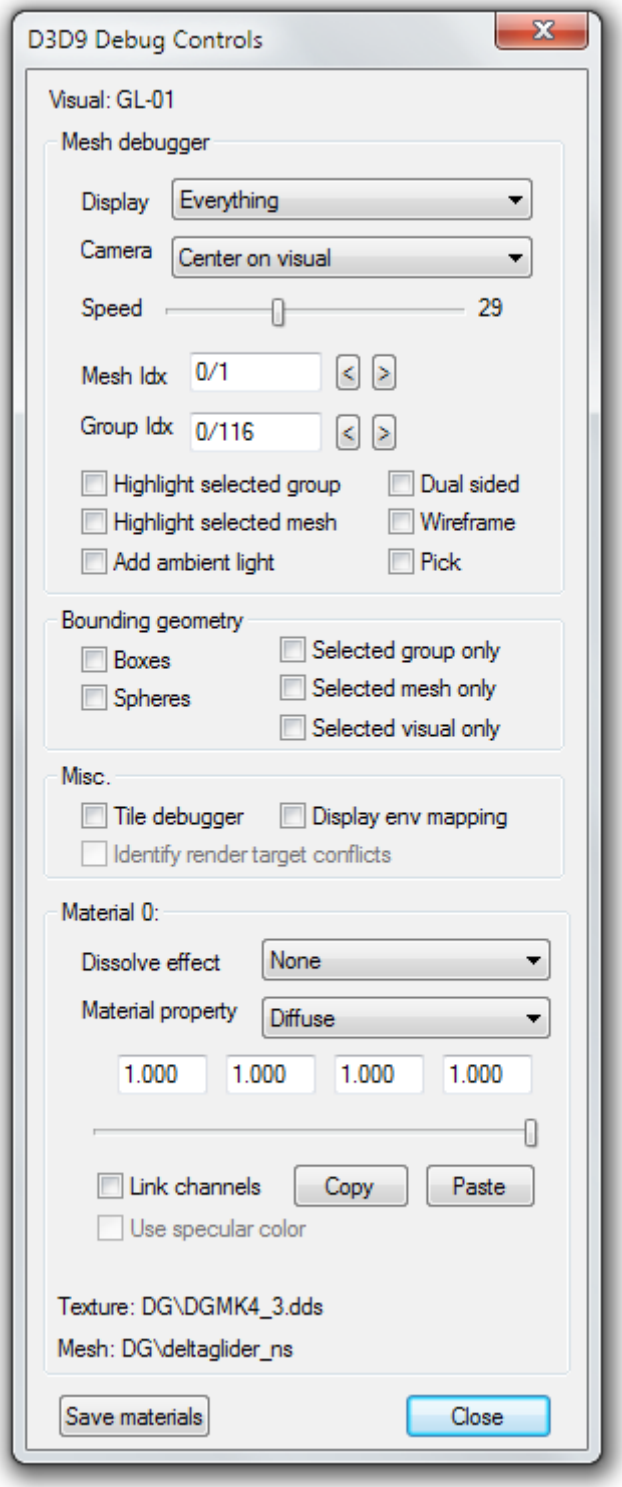
  The convergence value lets you choose "how far your eyes are apart". The default value is 0.2 meters (20 cm / 7.8 inches) which is round about the average distance between your eyes. Increasing this value might result in a view with "more depth".

- Field Depth

  In optics, particularly as it relates to film and photography, depth of field (DOF) is the distance between the nearest and farthest objects in a scene that appear acceptably sharp in an image. In the context of Stereoscopic 3D it defines the distance where the relative position between the "right eye objects" and the "left eye objects" are overlapping exactly and switch their position when further away or closer that that "point". For further details about this topic take a look at Depth of field in the wikipedia.

D3D9 Debug Controls Dialog

The D3D9 Debug Controls Dialog allows you look at different things while the simulation is running. Such things are for example the highlighting of Meshes or Groups, so their location and look can be easily checked. Looking at a complete scene in wireframe mode might for example help in finding any mesh parts that are not placed correct.
The D3D9 Debug Controls Dialog also allows you to change the settings of materials at runtime, so that changes can be 'seen' while changing them.



Mesh debugger

The mesh debugger group contains elements to inspect a mesh. It gives a mesh developer some tools at hand to better inspect a mesh in its 'natural environment', the Orbiter Simulation environment.
Whith the options available in this group one can for example separate individual parts of the shown scene and leave out all the rest, so it might be easier to see what really happens at rendering.
Other settings change the environment so that the current lighting conditions do not apply, so when the mesh is currently in the shadowed part of the orbit it can still be seen with some artificial ambient light.
For all possibilities, please read the descriptions of the individual GUI- Elements, below.

- Display

  This combo box lets you select what parts of a scene is rendered. The possible options are: "Everything", "Selected Visual", "Selected Mesh" or "Selected Group".
  Everything will, as the name suggests, display everything. This will show the scene as it will be shown normally when running a Orbiter simulation session.
  Selected Visual will display only the currently selected visual. Planets and moons for example are excluded.
  Selected Mesh will display only the currently selected mesh. If for example two vessels are in the complete scene, only one of them will be displayed. All other vessels, planets and moons are excluded.
  Selected Group will display only the current selected group. This is often just a "part" of a vessels mesh. All other groups, vessels, planets and moons are excluded.

- Camera

  This combo box lets you select the camera-mode. It can be either "Center on visual" or "Wheel Fly/Pan Cam".
  Center on visual will select the 'normal' Orbiter camera operations where with pressed right mouse button you can 'drag' the camera around the current selected visual.
  Wheel Fly/Pan Cam will select another camera-mode where with pressed left mouse button you can pan the camera left/right or up/down and with the right mouse button pressed it can be 'tilted'.

- Speed

  This control lets you change the speed of the camera movements when you are in "Wheel Fly/Pan Cam" camera-mode (see Camera).
  The value is a kind of 'factor' applied to the movement of the mouse (or the mouse-wheel). It ranges from 1 (beeing the lowest speed) to 8192 (beeing very fast).

- Mesh Idx

  This control lets you select one mesh of a multi-mesh vessel by its index. If a vessel consists of a "hull"-mesh and a cockpit-mesh, you will be able to select the two meshes individually by selecting the according mesh index here.

- Group Idx

  This control lets you select one group out of the current selected mesh (see Mesh Idx) of a multi-group mesh by its index. If a mesh consists of multiple groups, you will be able to select the individual groups by selecting the according group index here.

- Highlight selected group

  With this option ***enabled*** the current selected group will be permanently highlighted (green).

- Highlight selected mesh

  With this option ***enabled*** the current selected mesh will be permanently highlighted (blue).

- Add ambient light

  With this option ***enabled*** the current selected mesh will be lit by artificial ambient light independent of the current 'global' lighting conditions. The mesh is then not only lit from the sun (lighting only parts of the mesh), but from all sides. This also applies to situations when the mesh is usually not lit at all, when on the night (dark) side of an orbit.

- Dual sided

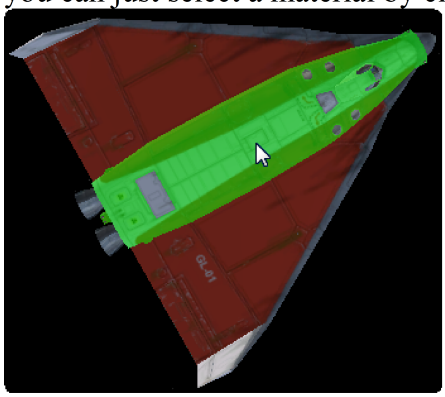
  Faces are normally only rendered from one side (the "backside" is kind of completely transparent). With this option ***enabled*** all faces are rendered opaque from both sides.
  This option might help developers to identify parts of the mesh that are "sticking out" of another mesh-part, that are normally only to be seen from the "inside". A cockpit mesh inside a hull mesh can be for example much bigger than the hull and it will not be easy to find out, cause from the "inside", the hull faces are transparent so the (to big) cockpit mesh can be seen. And from the "outside" the cockpit faces are transparent although "covering" the hull.

- Wireframe

  With this option ***enabled*** the scene (or only parts of it, see Display) will be rendered as wireframe model. In a wireframe model only the edges (the lines connecting vertices) of the meshes are drawn. This can be helpful to identify 'useless' parts a mesh.

- Pick

  The Pick option is one of the most useful tools for selecting materials. With this option ***enabled*** you can just select a material by clicking onto it with the left mouse button.

  Pick in action

  Whenever a material is picked it will light up in green, so it is easy to see which material is chosen. After a material is chosen all the settings in the lower part of the D3D9 Debug Controls Dialog apply to that material.

Bounding geometry

The options in this group offers additional rendering of bounding boxes or spheres of individual mesh parts.

- Boxes

  With this option ***enabled***, objects of the scene will have their bounding boxes also drawn.

- Spheres

  With this option ***enabled***, objects of the scene will have their bounding spheres drawn. The sphere represents the smallest volume that still fits the complete geometry.

- Selected group only

  This is one of three options that let you limit the parts of the mesh that are rendered. With this option ***enabled***, only the currently selected **group** will be rendered.

- Selected mesh only

  This is the second of three options that let you limit the parts of the mesh that are rendered. With this option ***enabled***, only the currently selected **mesh** will be rendered.

- Selected visual only

  This is the third of the three options that let you limit the parts of the mesh that are rendered. With this option ***enabled***, only the currently selected **visual** (vessel mesh) will be rendered.

Misc.

This group contains some debugging options to assist on more severe problems or let you see the current environment, that is used for the environment mapping feature of the D3D9Client.

- Tile debugger
- Identify render target conflicts
- Display env mapping

  With this option ***enabled*** the environment mapping "box" will be displayed as a flattened box.
  This will become a cross-like area that shows the environment of each of the sides of that "virtual box".
  This box can be imagined as a box with mirror-surfaces which show the environment the face of the box 'sees'

Material 'X'

- Dissolve effect
- Material property
- (4) Channel values & Slider
- Copy & Paste
- Link channels
- Use specular color

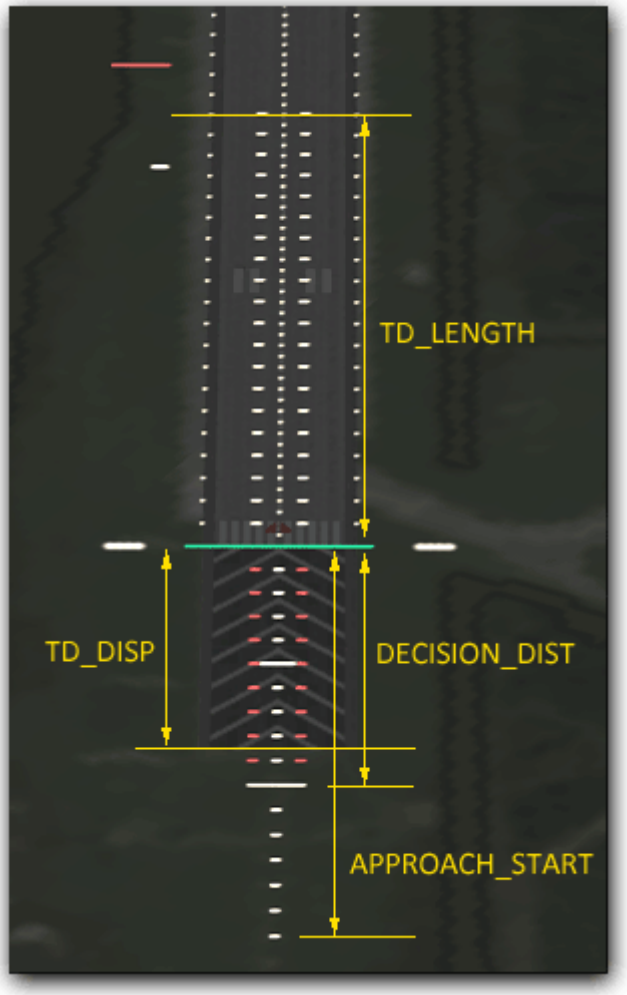
Save materials *Button*

The ***save materials*** button in the "D3D9 Debug Controls" Dialog does just that: it saves the materials ;)
Once you are happy with the result you have adjusted in the Material 'X' group, click on "save materials" and the changed material specifications will be saved in the `Config\GC\` folder of your Orbiter installation.
Then of course you can tweak these file(s) in `Config\GC\` folder with notepad etc.

So next time you fly with a ship of the same class it will have the properties, you have defined or changed, applied.
If you want to have the "default" look back, just delete the according file from that folder (e.g. `Config\GC\DeltaGlider.cfg`) and the standard Orbiter appearance will be restored.
The install ZIP of D3D9Client contains some of those files already, that contain some nice "advanced looks" for some of the standard vessels. You can always take those and place it back into that folder to get the "D3D9-Default" look.

Base Configuration settings

The D3D9Client allows you to to configure some more details when settings up runway lights.
Additionally to the parameters that Orbiter itself defines (see *Doc\OrbiterConfig.pdf* for further details) there are some extra parameters you can define.
For a better understanding how some of those parameters will affect the rendering of the runway lights this image might help:



<RUNWAYLIGHTS>

- **<END1 V>**

  First end point of runway (center line).

- **<END2 V>**

  Second end point of runway (center line).

- **<WIDTH F>**

  Runway width (m)
  Note: Two different light configurations exists (wide>59m) and (narrow<59m)

- **<PAPI F F F I I>**

Precision Approach Path Indicator (PAPI).
Parameters:
Designated approach angle (deg)
Approach cone aperture (deg)
Offset of PAPI location from runway endpoints. (m)
PAPI Mode (int:0-3) (this is optional parameter)
PAPI runway end point (int: 0-1) (if this parameter is not defined then PAPI is added in both ends)

PAPI Modes:
0: On center line
1: On left side
2: On right side
3 or none: On both sides

PAPI Endpoint:
0: PAPI lights added to END1 only
1: PAPI lights added to END2 only
Not Defined: PAPI lights added in both ends

Note: Runwaylights can have 12 PAPI lights. Orbiter's inline engine will ignore the last parameter. If more than one PAPI entries exists in the runwaylights the inline engine will only use the last one.

- **<VASI F F F I>**

Visual Approach Slope Indicator (VASI).
Parameters:
Designated approach angle (deg)
Distance between white and red indicator lights (m)
Offset of VASI (red bar) location from runway endpoints (m)
VASI runway end point (int: 0-1) (if not defined then VASI is added in both ends)

Note: Runwaylights can have 2 VASI lights.

- **<TD_DISP F>**

Touch Down displacement (m). (default: 0m)
Displacement between runway endpoint and the green line.

- **<TD_DISP2 F>**

Touch Down displacement for the other end of the runway (m). (default: 0m)
Displacement between runway endpoint and the green line. If this value isn't specified then TD_DISP is used for both ends of the runway.

- **<TD_LENGTH F>**

Length of the Touchdown zone (m). (default: 600m)
Two columns of lights on a runway each containing 3 parallel lights.

- **<DECISION_DIST F>**

Length of the "red lights" zone (m). (default: 257m)
This zone contains 2 x 3 x 9 red lights and the spacing between lights will depend about the length of the zone. The touchdown zone will use the same spacing about 30m.

- **<APPROACH_START F>**

  Length of the approach lights from the green line (m). (default: 900m)
  It's the long column of 5 parallel lights.

- **<SINGLEENDED>**

  If the singleended keyword is defined then the lights are only rendered when approaching a runway from END1 towards END2. If you want a asymmetric runwaylights then you need two runwaylight sections in a base configuration file.

- **<CATEGORY>**

  Defines the category of runway lights. 1 = SSALR, 2 = ALSF-II, If this value isn't specified then the category is automatically selected based on a runway width. ALSF-II is used if the width is greater than 59m.

Example of runway lights for KSC:

```
RUNWAYLIGHTS
  END1 -8220 -3 -600
  END2 -12670 -12 -3155
  WIDTH 100
  PAPI 5.0 3.0 257 3      ; both sides of the green line, in both ends
  PAPI 20.0 3.0 -2000 0 0 ; on a center line 2km before rwy in END 1
  PAPI 20.0 3.0 -2000 3 1 ; both sides of center line, 2km before rwy, in END 2
  VASI 1.5 152 671
  TD_DISP 257
  TD_LENGTH 600
  DECISION_DIST 257
  APPROACH_START 900
END
```

Advanced Texture Maps

Additional texture maps can be automatically assigned for a mesh simply by placing additional textures into a texture folder. Additional textures are identified by using an identifier in the end of the textures name like "dgmk4_1_bump.dds" where "dgmk4_1.dds" is the name of the base texture.

A fully specified texture set could for example consist of these files:

```
cube.dds       <= 'base' texture
cube_bump.dds  <= 'advanced texture Bump-map'
cube_spec.dds  <= 'advanced texture Specular-map'
cube_emis.dds  <= 'advanced texture Emission-map'
```

Available identifiers are:

- **<_norm>**

  Tangent space normal map and the valid formats are:

  <R8G8B8> 3-bytes per pixel. Best quality (uncompressed)
  <V8U8> 2-bytes per pixel. Good quality (uncompressed)
  <DXT1> 1-byte per pixel. Bad quality (compressed)

  V8U8 offers the best quality for 2-bytes per pixel. This format can be created with nVidia texture tools.

  Note: The configuration of this (*_norm*) identifier is ignored if a *_bump* configuration is also found. However, the *_norm* configuration is the preferred one that should be used when you have the choice (see also _bump).

- **<_spec>**

  Specular map controls a specular reflection in per pixel basis. Alpha channel is containing a specular power setting. Value 255 is mapped to 80.0 and 0 to 0.0. Valid formats are <R8G8B8A8>, <DXT3> or <DXT5>. If a specular map is assigned then a material specific settings are ignored.

- **<_bump>**

  Bump maps are also supported by the D3D9Client. They are automatically converted into normal maps during loading of bump maps (see note).
  The **recommended** formats are <A8> and <L8>:
  <A8> 1-byte per pixel alpha
  <L8> 1-byte per pixel luminance

  From the **not recommended** multi-channel textures only the **red** channel is used; They are:
  <R8B8G8> 3-bytes per pixel (only red is used anyway)
  <DXT1> 1-byte per pixel compressed
  <R16F> 2-bytes per pixel (might work, not tested!)

  Note: The configuration using the (*_bump*) identifier will overwrite any *_norm* configuration in case both identifiers are found. The *_norm* configuration is however the one that should be used when you have the choice (see also _norm).

- **<_emis>**

  Currently emission map works more like a light map and the simplified equation is:

```
pixel_color.rgb = texture.rgb * clamp(emission_map.rgb +
                                      sun_light.rgb + local_lights.rgb)
```

  Alpha channel is ignored therefore the recommended formats are <R8G8B8> or <DXT1>.
  The exact implementation would require some discussion with an add-on developers to define the function for the emission map. An other possibility is:

```
pixel_color.rgb = texture.rgb * clamp(sun_light.rgb + local_lights.rgb)
                + emission_map.rgb
```

  Of course, the clamp function can be changed to a different kind of color curve manipulation function to control contrast and lightness.