

TWL-System NITRO Intermediate File Plug-In for 3ds Max

User's Guide

2011/04/13

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and should be handled accordingly.**

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Revision History

Version	Revision Date	Description
1.6.0	2011/04/13	Added support for version 1.6.0.2011/04/13 of the plug-in (see change log). Additions/changes: <ul style="list-style-type: none"> Added support for 3ds Max 2011 (Windows 32-bit version). Ended support for 3ds Max 9.
	2009/07/08	Added support for version 1.6.0.2009/07/08 of the plug-in (see change log). Additions/changes: <ul style="list-style-type: none"> Ended support for 3ds Max 8.0.
	2009/05/28	Added support for version 1.6.0.2009/05/28 of the plug-in. This update does not include the plug-in for 3ds Max 8.0. The scope of support with the next update will be 3ds Max 9.0 and later. Additions/changes: <ul style="list-style-type: none"> Added support for 3ds Max 2010 (Windows 32-bit version) Bug fixes: <ul style="list-style-type: none"> Fixed a bug where it was not possible to change material names applied to nodes that have parent nodes using NITRO Replace Character, and NITRO Rename Over 16 Characters.
	2009/03/04	Added support for version 1.6.0 2009/03/04 of the plug-in. Additions and revisions to the manual: <ul style="list-style-type: none"> Revised the caution regarding opacity in "Material Types and Attributes." Bug fixes: <ul style="list-style-type: none"> Revised so that an error is generated when a node name or material name is blank. Revised so that when a mesh does not have a polygon, a warning is displayed and it is output as null. Fixed a bug that disabled the modifier when an error was generated at output. Fixed a bug that caused the IMD file pose for models using Physique to output incorrectly.
	2008/10/31	Added support for version 1.6.0 2008/10/31 of the plug-in. Additions and revisions to the manual: <ul style="list-style-type: none"> Processing when specifying a frame range for export is now high-speed. Bug fixes: <ul style="list-style-type: none"> Fixed a bug that would not correctly export the child of <node> when Merge Useless Node was specified. Fixed a bug that would not correctly export the IMD file pose on models that used Physique.
	2008/10/08	Made revisions to reflect the NITRO-System name change (NITRO-System has been renamed TWL-System).
	2008/08/05	Added support for version 1.6.0, 2008/08/05 of the plug-in. Revised section 3.2.2 Nodes That Are Not Exported. Revised explanation regarding visibility in section 3.4 Object Animation. Bug fixes: <ul style="list-style-type: none"> Fixed a bug that would not correctly export the polygon's volume_r when Compress Node is set to Unite. Fixed a bug where the determination for the UV range over warning was sometimes incorrect.

Version	Revision Date	Description
	2008/06/18	<p>Feature additions and changes:</p> <ul style="list-style-type: none"> Added support for 3ds Max 2009 (Windows 32-bit version). Ended support for 3ds Max 7.0. <p>Bug fixes:</p> <ul style="list-style-type: none"> Fixed a bug that turned off Save / Load Scene Settings if a new scene was created and saved without running the export plug-in. <p>Additions and revisions to the manual:</p> <ul style="list-style-type: none"> Added support for version 1.6.0, 2008/06/18 of the plug-in (see the entry under Feature additions and changes). Added explanations for the <code>max.n3es</code> and <code>menusettings.bin</code> files in section 4.1 How to Use and section 4.3 Storing Option Settings in a Scene.
	2008/04/08	<p>Additions and revisions to the manual:</p> <ul style="list-style-type: none"> Changed the format of the revision history in the Japanese version. Changed the title and subtitle on the cover page.
	2008/03/24	<p>Feature additions and changes:</p> <ul style="list-style-type: none"> Added a feature to batch export intermediate files in section 4.6 Batch Exporting Intermediate Files. Added support for relative texture file paths in section 3.10.2 Accessing Texture Files. <p>Bug fixes:</p> <ul style="list-style-type: none"> Fixed a bug that would sometimes output normals, vertex colors, and texture coordinates incorrectly when Use Primitive Strip was selected. Fixed a bug that caused texture pattern animations to be output improperly when multiple materials used the same texture. Fixed a bug that caused improper output for <code>tex_palette_idx</code> in <code><material></code> when texture palettes with the same name were used by multiple materials. Fixed a bug that sometimes caused invalid output of ICS, IMA, and ITA files. <p>Additions and revisions to the manual:</p> <ul style="list-style-type: none"> Added Chapter 1 List of Supported Features. Revised section 3.7 NURBS Models. Revised section 3.8 Subdivision Surfaces.
	2008/01/23	Added support for 3ds Max 2008 (Windows 32-bit version).
	2007/12/17	<p>Feature additions and changes:</p> <ul style="list-style-type: none"> Added a Data Creation plug-in: section 4.7 Polygon Rendering Priority Setting (NITRO Set Render Priority). <p>Bug fixes:</p> <ul style="list-style-type: none"> Fixed a bug that prevented IMD files from being output for poses with applied skin when using Biped. Fixed a Biped animation bug that would sometimes cause the first frame to be output improperly. <p>Additions and revisions to the manual:</p> <ul style="list-style-type: none"> Revised section 2.12 Skinning. Added section 2.13 Biped. Added section 2.14 Physique. Deleted the Character Studio section.

Version	Revision Date	Description
	2007/11/26	<p>Fixed a bug that caused improper operation when the startup time in Max was other than 0.</p> <p>Fixed a bug that caused the IMD file's material color and texture SRT to not take the values in the export option "Start Frame."</p> <p>Fixed a bug that caused improper operation when an ITP file was exported without exporting an IMD file.</p> <p>Fixed a bug that caused improper operation when the frame(s) to be exported from a texture pattern animation fall outside the frame range specified in the IFL file.</p> <p>Added content describing loop export of IFL files to section 2.10.5 Texture Pattern Animation.</p>
	2007/06/18	<p>Changed the name of the plug-in's main menu to NITRO-System</p> <p>Fixed a bug that occasionally caused 3ds Max to exit abnormally when exporting with the Triangulation option set to "As Is" or "As Is With Quad."</p> <p>Fixed a bug that caused models that use skinning to be exported incorrectly when the Triangulation option was set to "Generate Quads".</p> <p>Fixed a bug that caused models with a very small weight value set to be exported incorrectly when the Force Full Weight option was set to ON.</p>
	2007/05/18	<p>Fixed a bug that caused names of <tex_image>, <tex_palette>, and <material> in IMD files not to be stored in alphabetical order.</p> <p>Fixed a bug that caused names to be changed sometimes even if there were no duplicate names for nodes or materials.</p> <p>Made a correction so that the warning "Material name changed" will be displayed when there were duplicate material names.</p>
	2007/04/23	<p>Official support for 3ds Max 7.0 and 3ds Max 8.0.</p> <p>Be sure to refer to the cautions in the setup manual if you had been using the plug-in for 3ds Max 6 with 7.0, 7.5, or 8.0.</p> <p>Ended support for 3ds Max 6.</p> <p>Fixed a bug that caused ICA files to be output incorrectly if Compress Node is set to Merge Useless Node.</p> <p>Fixed a bug that caused incorrect output when the texture file specified for the IFL file is not a full path.</p> <p>The indices of problematic vertices are now displayed when the "Wrong weighted vertices exist" error occurs.</p> <p>Fixed a problem with the determination of the "Wrong weighted vertices exist" error.</p>
	2007/01/23	<p>Added support for 3ds Max 9.0 (32-bit version).</p> <p>Added section 3.1 3ds Max Versions.</p> <p>Added section 2.1.1 3ds Max 9.0 Plug-In Cautions.</p> <p>Made correction so that <tex_srt_anm> of materials with no texture will not be output for ITA files (only max9 is fixed).</p>
	2006/07/14	<p>Added an explanation about reference to the biped export problem in Known Bug List section to Chapter 6.</p> <p>Fixed a problem that caused 3ds Max to crash when there was model in the 3dmax view that had a multi/sub object material applied, and "NITRO Show Lighting" or "NITRO Show Display Face" were run.</p> <p>Fixed a problem that caused the incorrect paths to be set for diffuse maps when a script</p>

Version	Revision Date	Description
		<p>was used to do a batch export.</p> <p>Fixed a bug in which a warning was not output if the UV values exceeded the allowable range of -2048 to 2047 allowable range.</p> <p>Added a fix for the TGA file checker where it was not freeing a file handle after a file was determined to not be of the TGA format.</p> <p>Fixed <code><nrm></code> tag so that it is always exported regardless of changes to the value of <code><mtx idx></code>.</p> <p>Turned off the rounding fix code because cracks in the polygons were discovered by a developer when geometry was exported.</p> <p>Fixed the attribute names for the List of Custom Attributes table (section 5.4).</p>
	2005/12/15	<p>Fixed exporting of <code><material_array></code>, <code><matrix_array></code>, and <code><polygon_array></code> elements so that they will not be exported when their "size" attribute is 0.</p> <p>Fixed the bug that caused the <code><box_test></code> element of an IMD file to be incorrectly exported.</p> <p>Removed unnecessary rounding on some matrix calculations, and improved the precision of the floating values that were exported to intermediate files.</p>
	2005/07/08	<p>Added Known Bug List section to Chapter 6.</p> <p>Fixed problem with color becoming dark in some places when 4x4 texel compressed textures were created from texture files with names ending in <code>_cmp4</code> that did not have the additional information. (The palette data may be larger than in the previous version in some cases.)</p> <p>Added support for Intermediate File Format Version 1.6.0.</p> <p>Updated the NITRO Set Material Attribute data creation plug-in.</p> <p>Added the texture effect matrix. Deleted Tex Gen ST.</p> <p>Added a recommendation to use IFL files rather than the NITRO Morpher material (section 2.10.5).</p>
1.5.0	2005/01/21	<p>Added support for Intermediate File Format Version 1.5.0.</p> <p>Added warning to section 3.5 Warnings During Export.</p> <p>Updated the NITRO Set Material Attribute data creation plug-in and added an attribute that can be set.</p> <p>Added the NITRO Show Render Priority data creation plug-ins.</p> <p>Added section 2.6.8 Polygon Rendering Priority.</p> <p>Revised the description of section 3.2.5 Animation Options Interpolation.</p> <p>Added Polygon Rendering Priority Setting.</p> <p>Added Checking Polygon Rendering Priority (NITRO Show Render Priority).</p> <p>Added attributes to section 5.4 Additional Attributes.</p>
1.4.2	2004/12/17	Initial Japanese version.
1.4.1	2004/10/26	<p>Updated "imd options" image (Figure 4-6 imd Options)</p> <p>Updated triangulation option under "imd options" (section 4.2.4)</p>
	2004/10/14	<p>Changed the TriangulationForce option under "imd options" with a triangulation option (section 4.2.4).</p> <p>Updated "imd options" image (Figure 4-6 imd Options)</p>

Version	Revision Date	Description
	2004/10/11	Moved the location of the Force Quads option from stripping section. Added new warnings for unsupported materials and stripping modifier.
	2004/10/04	Added a description of the supported features of Character Studio.
	2004/09/16	Added “replace element name in string (NITRO-Replace Character)” and “rename element names that exceed 16 characters (NITRO Rename Over 16 Characters)” to the data creation plug-in
1.3.0	2004/08/19	Added a progress bar to the dialog for exporting with “Apply” button.
	2004/08/10	Modified texture matrix calculation to account for mirroring of s, t coordinates. Added description about not exporting vertex color for a given node.
	2004/08/02	Added support for TGA files that contain additional information for Nintendo NITRO-System information. Added scaling rule to ICA file <code>code_anm_info</code> . Added new warnings and errors during intermediate file output. Changed document wording match with the 3ds Max user interface (such as “node” changed to “object”). Added support for IFL files to be used with ITP animation. Added functionality to input and output the option settings for intermediate file output plug-ins as N3ES files.
1.2.1	2004/06/14	Initial version.

1 Supported Features

The following table shows the status of this plug-in's support for major 3ds Max features. "O" indicates that the item is supported, and "X" indicates that it is not supported.

Table 1-1 Supported Features

Feature		Support Status	Notes
Modeling			
Hierarchy-related	Hierarchical node structure output	O	
Visibility	Show Rendering Controls	O	
Polygon modeling	Vertex coordinates	O	
	Normals	O	
	Vertex colors	O	
	UV values	O	
Splines	Spline output	X	
NURBS curves	NURBS curve output	X	
NURBS surfaces	NURBS surface output	X	
Subdivision surface modeling	HSDS modifier output	X	
Materials	Diffuse light	O	
	Opacity	O	Polygon alpha
	Ambient light	O	
	Emitted light	O	Emission
	Specular light	O	
	Multi- and sub-objects	O	
Textures	UV mapping	O	
	Environment mapping	X	
	Projection mapping	X	
	Composite map	X	
	Tile UV and Mirror UV	O	

Feature		Support Status	Notes
	Offset UV	O	
	Tiling UV	O	
	W angle	O	
Animation			
General	Key frame animation	O	Bake and export
Characters	IK animation	O	Bake and export
	Constrained animation	O	
Visibility	Animation that shows rendering controls	O	Visibility animation
Materials	Diffuse light animation	O	Material color animation
	Opacity animation	O	
	Ambient light animation	O	
	Emitted light animation	O	
	Specular light animation	O	
Textures	Offset UV animation	O	Texture SRT animation
	Tiling UV animation	O	
	W angle animation	O	
	IFL file animation	O	Texture pattern animation
Skinning	Skin modifier animation	O	
Biped	Biped animation	O	
Physique	Physique modifier animation	O	Can only be output for full weight
Camera		X	
Lights		X	
Fog		X	
Particles		X	
Hair		X	
Fur		X	

2 Intermediate File Types

Intermediate file types that can be generated by this plug-in are listed in the table below. This plug-in outputs intermediate files in version 1.6.0 format.

Table 2-1 Intermediate File Types

Extension	Type of Data	Explanation
.imd	Model data	Model information including vertex, polygon, hierarchy, material, and texture data.
.ica	Character animation data	Animation information for controlling node matrices.
.iva	Visibility animation data	Animation information for controlling node visibility (show/hide).
.ima	Material color animation data	Animation information for controlling material color.
.itp	Texture pattern animation data	Animation information for substituting numerous textures.
.ita	Texture SRT animation data	Animation information for controlling texture matrices.

3 Cautions When Creating Data for TWL and NITRO

3.1 3ds Max Versions

This plug-in is for the Windows 32-bit versions of 3ds Max 2008, 3ds Max 2009, 3ds Max 2010, and 3ds Max 2011. Each version of 3ds Max is supported by a separate plug-in file.

3.2 Nodes

This manual refers to the units that make up the 3D model layer structure as nodes. Nodes correspond to things like objects and bones in 3ds Max.

However, nodes may be referred to as objects or bones in places that refer to menus and other items in 3ds Max.

3.2.1 Root Node

Intermediate files always have a single root node.

If multiple root nodes have been created in 3ds Max, the plug-in groups all of them together into a single node called `world_root` and adds this to the intermediate file that gets exported.

3.2.2 Nodes That Are Not Exported

Objects and bones are not exported if in **Properties**, in **Interactive**, **Hide** is selected. However, if they have child nodes for which the **Hide** option is cleared in **Interactive**, they are exported.

Camera target nodes are not exported. Nodes that do not possess children (for example, dummy) are not exported.

Objects for which the mesh is frozen are exported as nodes without a mesh node (that is, polygon data is not exported).

Note: Nodes are always exported regardless of the above conditions if the node-culling disable flag is set by the NITRO Set No Cut Node plug-in. For details, see section 5.11 Setting the Node-Culling Disable Flag (NITRO Set No Cut Node).

3.2.3 Culling Nodes That Are Not Needed for Model Display

In addition to the above-mentioned nodes that are not exported, you can also cull and not export nodes that are not required for model display by using the Export Plug-in option **Compress Node** (see section 4.2.2 General Options) and selecting **Cull Useless Node** or **Merge Useless Node**.

Also, in situations where object hierarchy is unnecessary, such as for topographic data, you can select **Unite** or **Unite and Combine Polygon** within the **Compress Node** option to merge multiple objects into a single node for export.

3.2.4 Node Names

Note: If you are using the TWL-System library, node names should be no longer than 16 characters.

3ds Max will accept nodes with the same name, so some caution is needed. If multiple nodes with the same name exist, the node that is most shallow within the hierarchy will be exported with the original name and the other nodes will have their node names appended with a suffix comprising an underscore and a number, for example, _1 or _2. (Be aware that when the TWL-System library is used, node names with the suffix must be no longer than 16 characters, including the underscore and the number.)

3.3 Animation

3.3.1 Time Axis

All of the intermediate file's animation data is exported in values of integer frames.

Note that in **Track View**, running a key with a tangent type set to **Step** at a fractional frame will make the timing on Nintendo DS deviate from the timing in 3ds Max during slow playback.

3.3.2 Values Exported to the IMD File

When an attribute is animated, the value exported to the IMD file is the Start frame, as specified in **Export Options**. Note that the exported value is not the value for the current frame in 3ds Max.

3.4 Object Animation

The attributes of an object that can be animated are Position, Rotation, Scaling, and Visibility. The following attributes require special care.

- **Base Point**

When data is exported, the Base Point is treated as the origin in local coordinate space. If the Base Point differs in each frame, data cannot be output correctly. Do not animate the Base Point.

- **Axis Order for Rotation**

Set the **Axis Order** box under **Motion** → **Euler Parameters** to xyz. If set to anything else, animation data volume could increase.

- **Adjust Transform**

Clear the **Don't Affect Children** check box under **Hierarchy** → **Adjust Transform Rollout**. If selected, data cannot be output correctly.

- **Visibility**

Set **Visibility** under **Rendering Control** → **View in Properties**. If the setting is 0, nodes are hidden; nodes are visible with any setting higher than 0. If a node is hidden, all node children will be hidden as well.

3.5 Bone Animation

The Scale, Rotate, Translate, and Visibility attributes of the bone can be animated. The following attributes require special care.

- **Axis Order for Rotation**

Set **Axis Order** box under **Motion** → **Euler Parameters** to xyz. If set to anything else, animation data volume could increase.

- **Adjust Transform**

Clear the **Don't Affect Children** check box under **Hierarchy** → **Adjust Transform Rollout**. If selected, data cannot be output correctly.

- **Transform**

Reset Transform under **Hierarchy** → **Adjust Transform Rollout**. If it is not reset, animation data volume could increase.

3.6 Polygon Models

3.6.1 Polygon Shapes

Because Nintendo DS cannot display the following polygon shapes correctly, divide these shapes into triangles in 3ds Max before exporting.

- Polygons with vertices that do not all lie in the same plane
- Concave polygons with internal angles of 180 degrees or larger
- Polygons with openings

Polygons that become these shapes as a result of deformations from skinning must also be divided into triangles before being output.

Note: The plug-in first divides all polygons with five or more sides that are in 3ds Max into triangles and then outputs them. In addition, you can specify how to output triangular and quadrilateral polygons. For a list of polygon shape export options, see the Triangulation description in section 4.2.4 IMD Options.

3.6.2 Setting the Display Face

The display face (front face, back face, or both faces) is set as a material property attached to the polygons. To set the display face, first create a NITRO Standard material and attach it to the polygon. After creating the material, you can set the display face by changing the attribute in NITRO Set Material Attribute rollout in the material editor. For details, see section 5.3 Setting Material Attributes (NITRO Set Material Attribute). Note that the process is not reflected in 3ds Max. To check the display face, use the NITRO Show Display Face plug-in detailed in section 5.5 Check the Polygon Display Surface (NITRO Show Display Face).

The mesh object's **Backface Culling** option on the **Object Properties** pop-up window is only set for display in 3ds Max and is not applied in the intermediate file.

3.6.3 Vertex Color

If you have created a model for which vertex color has been specified and you want to display the model without doing a light calculation, use the NITRO Set Material Attribute rollout to turn off light calculation for the materials attached to the polygons. (The light calculation is selected by default.) For details, see section 5.1 Exporting the Scene (NITRO Export).

When the light calculation is selected by the NITRO Set Material Attribute rollout, the model can be displayed by using a combination of vertex color and light calculations. (However, it remains undecided whether the TWL-System library will support this feature.)

Vertex color export can also be disabled for an object. To disable the export of vertex color information for an object, right-click on the object in one of the 3ds Max viewports. When the pop-up menu appears, select **Properties**. Under the **Display Properties** group, select or clear the **Vertex Channel Display** check box to enable or disable the export of vertex color data for that object.

3.6.4 Instancing

Instancing is not supported. Even if instancing is used and there are multiple nodes with the same shape, they are all exported the same.

3.6.5 Objects with Multi/Sub-Object Material

Objects with Multi/Sub-Object Material will be broken into multiple objects based on the sub-materials contained in the Multi/Sub-Object Material. For example, if a cube named "Box01" is created with a Multi/Sub-Object material applied and has two sub-materials that are applied to each of the three cube faces, the cube's geometry would be separated into two groups during export. A separate group is created for each sub material in the Multi/Sub-Object material. Consequently, two <polygon> elements will be exported to the IMD file for each sub material (one named "Box01" and one named "Box01_1").

3.6.6 Vertex Translate Animation Prohibited

Vertex translate animations cannot be exported.

3.6.7 Polygon Name

The name attribute in the <polygon> element of the IMD file will not necessarily have the same name as the node name. 3ds Max allows for multiple nodes to have the same name, but if this occurs the name attribute will adopt the same rules as mentioned earlier in section 3.2.4 Node Names.

Also, if the object uses a multi-sub object material the object will be split into multiple node indices. The name attribute for each <polygon> element will contain the node's name appended with an underscore and a number (for example _1, _2) based on the number of objects with the same name and the sub material index.

3.6.8 Polygon Rendering Priority

When multiple materials are associated with a single mesh model (equivalent to the `=imd <node>` element) in a 3DCG tool, the multiple polygons that constitute the mesh model are divided into multiple polygon groups (equivalent to the `=imd <polygon>` element). In this case, you can control the order in which polygon groups are rendered with respect to each material in the 3DCG tool by setting the **rendering priority** (`=imd file <display>` element attribute priority). Rendering priority is used when transparent polygons are displayed overlapping each other or when decal polygons are displayed.

Note: The rendering order mentioned here is the order in which render commands are sent to the TWL and NITRO geometry engines. According to these hardware specifications, translucent polygons are always rendered after opaque polygons. Therefore, even if you set priority so that translucent polygons are rendered before opaque polygons, TWL and NITRO will always render opaque polygons first.

If you want to manage the rendering order for a polygon group, set a rendering priority of at least 1 (the lower the value, the earlier it is rendered).

If there is no need to specify rendering order for a polygon group, set the rendering priority to **Don't care**. The rendering routine will determine the rendering timing for polygon groups that have a rendering priority of **Don't care**. If there are multiple polygon groups with the same rendering priority, the rendering routine will determine which polygon group will be rendered first.

`<rendering priority>`

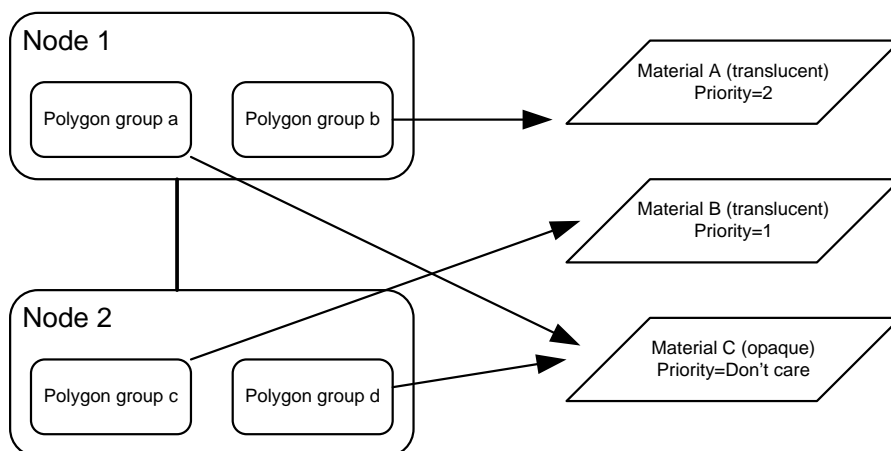
Don't care : No order specified (rendering timing is indeterminate).

* Intermediate files handle **Don't care** as a render priority 0.

1 or more : Render in order from smaller to larger values.

The rendering routine determines whether to control rendering order inside each node or in the overall model.

In the following example, rendering order changes according to whether control is done inside each node or in the overall model.

Figure 3-1 Rendering Priority Example**Controlling rendering order in each node (equivalent to IMD file <node> element)**

A rendering routine is used that employs generic Push/Pop matrix calculation. When rendering in order from the parent node, polygon groups are rendered on a node basis. Therefore, the overall model sends render commands in the following order.

"(polygon group **a**) → **b** → (**a**) → (**d**) → **c** → (**d**)" (either **a** or **d**)

Controlling rendering order over the overall model (IMD file)

In the case of a rendering routine that first does the required matrix calculations and then collectively sends render commands, there is no need for the rendering order to depend on the parent/child relationship. Therefore, it is possible to render all of the polygon groups in the model according to the rendering priority. In a node configuration like that shown above, render commands would be sent as shown below.

"(polygon group **a,d**) → **c** → (**a,d**) → **b** → (**a,d**)" (either **a** or **d**)

Because the rendering priority for polygon groups **a** and **d** is **Don't care**, the rendering routine will determine when to render each.

The rendering routine in the G3D library that is supplied with the TWL-System library controls rendering order using the overall model rendering order.

The NITRO Set Material Attribute rollout on the material editor is used to set rendering priority. If you do not set rendering priorities for materials with the NITRO Set Material Attribute rollout, the materials will be handled as rendering priority=**Don't care**. Use the NITRO Show Render Priority plug-in to check the priorities that have been set. For details, see section 5.7 Polygon Rendering Priority Setting (NITRO Set Render Priority).

The material compression feature and polygon groups

If two different materials within the same node have the same content and the same rendering priority, when you use the material compression feature in the intermediate file export plug-in, the materials and the polygon groups will each be combined into one.

If two materials are the same but their rendering priorities are different, the materials will be combined into one, but the polygon groups will not because their rendering priorities are different.

If different nodes contain the same materials and the same rendering priorities, the polygon group will be combined into one only if **Unite and Combine Polygon** is specified when culling nodes.

3.7 NURBS Models

NURBS curves cannot be exported. NURBS surfaces should be converted into meshes for export using the **Transform** → **Convert To Mesh** operation (or by another means).

3.8 Subdivision Surfaces

HSDS modifiers cannot be exported.

Before exporting subdivision surfaces, convert them into a mesh by collapsing the modifier stack.

3.9 Materials

3.9.1 Material Types and Attributes

All materials must be NITRO Standard or NITRO Morpher type. Multi/Sub-Object materials are allowed as long as all sub-materials are NITRO Standard or NITRO Morpher type.

These attributes are applied to the intermediate file that is exported:

- Diffuse light → `diffuse`
- Opacity → `alpha`
- Ambient light → `ambient`
- Self-Illumination → `emission`
- Specular reflection light → `specular`

You can configure specific attributes for TWL and NITRO using the NITRO Set Material Attribute rollout. For details, see section 5.1 Exporting the Scene (NITRO Export).

Intermediate file alphas take values in the range from 0 to 31, which correspond to the alpha values for the TWL and NITRO `PolygonAttr` command. However, when alpha is set to 0, it displays as completely transparent rather than as a wireframe. Also, if alpha is 0, the polygon image assigned to the material will be omitted.

You can set wireframe display with the NITRO Set Material Attribute rollout. For details, see section 5.1 Exporting the Scene (NITRO Export).

Even if a map is assigned to Opacity, the intermediate file is not affected.

There is an included script to convert Standard Materials to NITRO-Standard Materials. For details, see section 5.13 Using the NITROConvMat.ms script.

3.9.2 Material Names

If you are using the TWL-System library, material names should be no longer than 16 characters.

3.9.3 Material Color Animation

Animation can be set for the Diffuse, Opacity, Ambient, Self-Illumination, and Specular attributes.

3.10 Textures

3.10.1 Usable Texture Maps

Only bitmaps applied to the diffuse light map of a material can be exported as textures in intermediate files.

Procedural textures like checker and Gradient ramp cannot be exported. Use **Render to Texture**, which is located at **Rendering** → **Render To Texture** in the 3ds Max main menu, to convert them to bitmaps and then output.

IFL files may be used to make ITP animation as long as textures used in the IFL are in the bitmap format.

When using IFL files for texture pattern animation, the animation data will be output to the specified intermediate ITP file upon export. To apply an IFL file animation to a material, assign the IFL file in the same fashion as assigning a diffuse map bitmap texture to the material.

For information regarding the creation of IFL files and their format, consult the 3ds Max documentation. This procedure is described in **3ds Max Reference** → **Managing Scenes and Projects** → **Image File Formats** → **IFL File Format**.

The 3ds Max plug-in will export only textures on materials that are assigned to nodes in the scene. The export of all texture resources contained in the 3ds Max scene file is not supported.

3.10.2 Accessing Texture Files

When an absolute path is not specified in a bitmap as the path to a texture file, the following rules are used to access the file.

- Access using a relative path from the project folder.
- Access using a relative path from the current scene folder if no file exists in the path specified by the previous rule.

3.10.3 Texture Files and Format

When you use TGA files that contain additional TWL-System information (called additional information below), the data that is recorded in the additional information like the texture format, palette name, texel data, and palette data is applied to the intermediate files.

Currently you can make TGA files that contain additional information with the TWL-System Photoshop plug-ins. For information on using TWL-System Photoshop plug-ins, see the *TWL-System Photoshop Plug-in Manual*.

You can also use all texture file types supported by 3ds Max in addition to TGA files that have additional information and IFL files. However, when not using TGA files with additional information, multiple textures will not be able to share the same palette data.

A texture name that is the texture filename with the extension removed is exported. Do not use full-width characters or half-width katakana characters in filenames.

The maximum height and width for texture images is 1024 texels. If the height or the width is not a size used by Nintendo DS (8, 16, 32, 64, 128, 256, 512, or 1024), then texel color is added to the right side or the bottom side to export the texture image in a Nintendo DS-supported size.

In the case of TGA files that have additional information, the texture format will be the one that is specified in the additional information.

In the case of texture files that do not contain additional information, the texture format is determined automatically based on the following rules. For textures other than translucent textures, alpha values (8-bit) of 128 or greater are considered to be opaque.

1. When the filename without an extension ends in `_cmp2` → 4x4 texel compressed texture (use linear interpolation with a maximum of two palettes for each 4x4 texel)
2. When the filename without an extension ends in `_cmp4` → 4x4 texel compressed texture (maximum of four palettes for each 4x4 texel)
3. When neither (1) or (2) are true, and translucent texels and eight or fewer colors are used → A5I3 Translucent texture
4. When none of the above cases are true, and translucent texels and 32 or fewer colors are used → A5I3 Translucent texture
5. When none of the above cases are true, the format is determined by the number of colors used.
 - Number of colors is four or less → 4 color palette texture
 - Number of colors is 16 or less → 16 color palette texture
 - Number of colors is 256 or less → 256 color palette texture
 - Number of colors is 257 or more → Direct color texture

With the exception of the direct color texture format, palette data is also exported.

In the case of a TGA file that has additional information, the palette name will be the one that is specified in the additional information. If the palette name that is specified in the additional information is blank, `_p1` will be appended to the end of the filename (the extension remains unchanged).

In the case of texture files that do not have additional information, `_p1` will be appended to the end of the filename (the extension remains unchanged).

If you want multiple textures to share palette data, when you make a TGA file that has additional information, specify the same palette name. However, notice that if you give the same palette name to palettes that have different palette data, an error will occur when you output intermediate files.

Note: If you are using the TWL-System library, texture names (excluding the extension) and palette names should be no longer than 16 characters.

3.10.4 Texture Attributes

The Offset U, Offset V, Tiling U, Tiling V, Mirror U, Mirror V, Tile U, Tile V, and Angle W texture coordinate attributes are applied to the intermediate file.

You should set Angle U and Angle V to zero and have UV selected.

When the Tile U attribute or the Mirror U attribute is turned ON, texture images will not display properly if the image width is not $2^3 = 8$ or a greater power of 2 (for example, $2^4 = 16$). Similarly, when the Tile V attribute or the Mirror V attribute is set to ON, texture images will not display properly if the image height is not 8 or a greater power of 2.

The TWL and NITRO texture matrix becomes a unit matrix (without texture SRT) under the following specific set of conditions. The Offset attribute is $(0, 0)$, the Angle W attribute is (0) , and the Tiling attribute is $(1, 1)$. When the texture matrix is not a unit matrix, it will output as `TexCoord`, even if "Tex Gen Mode" has been set to NONE with the NITRO Set Material Attribute rollout. For details, see section 5.3 Setting Material Attributes (NITRO Set Material Attribute).

3.10.5 UV Limitations

In 3ds Max, textures are not displayed on surfaces without UV, but TWL and NITRO do not have this feature. Set the UV for all polygons to which textures have been pasted.

The sizes of UV values must fulfill the following conditions.

- $-2048 \leq U \text{ Value} \times \text{Texture Width} < 2048$
- $-2048 \leq V \text{ Value} \times \text{Texture Height} < 2048$

When there are no default Offset, Angle, or Tiling values, the resultant UV values applied to their attributes must fulfill the above conditions. Be careful that Repeat UV, and so forth, do not become too large.

3.10.6 Texture Pattern Animation

There are two ways of creating texture pattern animations in 3ds Max. The *first* way of creating texture pattern animations is by using IFL files.

To animate using IFL files:

1. From the Material/Map Browser window in 3ds Max, select bitmap to load an IFL file into the diffuse map slot of the desired material.
2. Export the scene using the plug-in, and the IFL animation will be output to the specified ITP file. For information on creating IFL files and their format specifications, consult the 3ds Max documentation in **3ds Max reference** → **Managing Scenes and Projects** → **Image File Formats** → **IFL File Format**.
3. Use Loop IFL Texture Animation in the NITRO Set Material Attribute rollout to set whether the IFL file animation will be exported as a looping animation. The ending state of the bitmap's time rollout will not be applied to the ITP file.

The second way of creating texture pattern animations is by using a NITRO Morpher Material and a Morph Modifier.

To create texture pattern animations using a NITRO Morpher Material and a Morph Modifier:

1. Open the Material Editor and create a NITRO Morpher material.
2. Apply a NITRO Standard material and a bitmap to the Base Material, which is the material that will be shown most of the time.
3. For each texture that will be in the animation, create a NITRO Standard material and a texture in the Channel Material Setup.
4. Select the geometry and apply the Morpher modifier to the stack.
5. In the Material Editor, select the material that was just created and then click **Choose Morph Object**. With Choose Morph Object highlighted, click the geometry in the viewport.
6. When the dialog box opens, choose **Morpher**, click **Bind**, and then apply the Morpher material to the geometry.
7. Select the geometry and the morph target slots, and then change the names to correspond to the number extensions of the textures. Spin them to 100% and click render to the texture change.

We recommend using IFL files for ITP animation rather than NITRO Morpher materials because IFL files allow for easy assignment through the diffuse map slot of a NITRO Standard material and previewing the ITP animation in the 3ds Max viewport. NITRO Morpher materials require configuration of a new material slot for each pattern you wish to animate and do not allow for previewing pattern animations directly in the 3ds Max viewport.

3.10.7 Texture SRT Animation

The texture coordinate attributes that are applied to the intermediate file are Offset, Tiling, and Angle W.

3.11 Skinning

3.11.1 Skinning Settings

Skinning is supported.

You can apply a skin modifier to the object.

Note: Do not perform the following operations after Skin.

- Changing the number of vertices
- Changing the "Rotate Order" of a bone that affects skinning

If you want to perform any of the above operations, first release the skin.

You can change the location of a vertex even after applying a skin. However, the "Editable Mesh" must be under the Skin in the modifier stack.

If you specify Skin for a model that has a parent node, do not change the parent node's Scale, Rotate, or Translate values. If you want to translate the entire model, do so by translating the highest-order bone.

3.11.2 Skinning Release

Remove the skin modifier.

3.11.3 Polygon Shapes Output to the IMD File

When skinning is configured, the polygons for pose with skin applied are output to the IMD file.

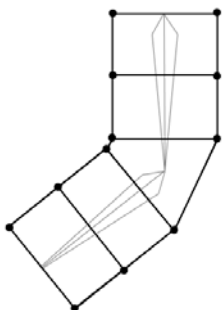
3.11.4 Envelopes in TWL-System

The deformation process that is called "skinning" in 3ds Max is called "envelope" in TWL-System.

In TWL-System, there are two types of envelopes, *fully weighted envelopes* and *weighted envelopes*.

- **Fully weighted envelopes**

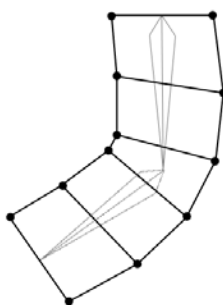
A fully weighted envelope refers to an envelope in which each vertex is fully weighted (100%) toward a single node. If all the vertices in a polygon mesh use fully weighted envelopes, the model is called a fully weighted envelope model.

Figure 3-2 Example of a Fully Weighted Envelope Model

- **Weighted envelopes**

A weighted envelope refers to an envelope in which vertices are associated with two or more nodes wherein the total weighting toward these nodes is 100%. If at least one vertex of a polygon mesh is a weighted envelope vertex, then the model is called a weighted envelope model.

A weighted envelope model allows you to create smooth curved surfaces by increasing the number of nodes that are associated with each vertex and by increasing the variety of weighting values. However, this increase will result in a greater amount of calculation during rendering.

Figure 3-3 Example of a Weighted Envelope Model

Note: For information regarding support for weighted envelope models in the G3D library provided in - TWL-System, see the *G3D Library Release Notes*.

3.12 Biped

Bipeds are supported. You can output freeform animations and footstep animations.

When configuring a sub-animation for a Biped, do not set an uneven scale value (a value whose X, Y, and Z values are not equal).

3.13 Physique

Models configured with a Physique modifier can be output by turning on the `Force Full Weight` output option. Soft-skinned Physique output is not supported.

3.14 Visibility Animation

To configure visibility animation, right-click an object and click **Properties**. You can change the “Visibility” parameter under the **General** tab → **Rendering Control** → **View**. The only values reflected in the file are zero and one.

Note: If the “Visibility” value is greater than zero it will be exported as one.

The visibility animation settings are configured in regard to nodes, so if you have set the Compress Node intermediate file export plug-in option to either **Cull Useless Node** or **Merge Useless Node**, be sure that you do not end up deleting objects for which visibility animation has been set. (You can use the NITRO Set No Cut Node plug-in to prevent deletion of specified objects.) When exporting visibility animation, do not set **Compress Node** to either **Unite** or **Unite and Combine Polygon**.

3.15 Billboard

Billboard is set for an object using the NITRO Set Billboard plug-in. However, this is not reflected in the 3ds Max window.

You can check the billboard using the NITRO Show Billboard plug-in.

4 Intermediate File Export Plug-In

4.1 How to Use

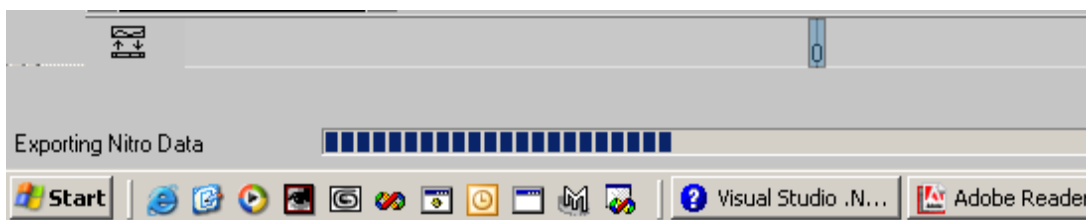
To export only specified nodes (including nodes at lower hierarchy levels), select the nodes that you want to output. If you are exporting the entire scene, you do not need to select nodes.

Select **NITRO-System** → **NITRO Export With Settings** to display the NITRO Export Option Window.

To output an intermediate file, set the appropriate options, and then click either **Export** or **Apply**.

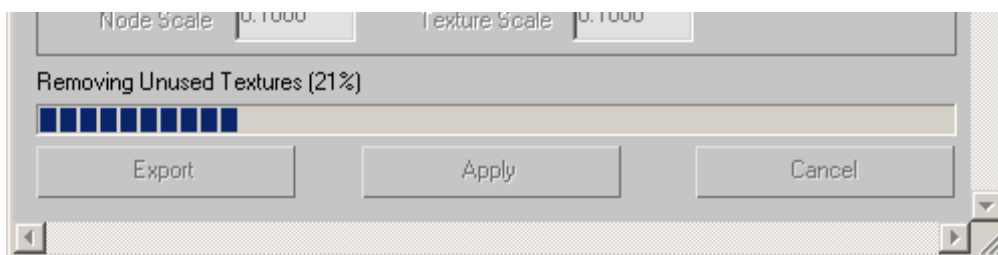
If **Export** is clicked, the dialog box will close and export progress will be shown on the 3ds Max progress bar at the bottom of the program.

Figure 4-1 Export Using Export



If **Apply** is clicked, the dialog box does not close and export progress is shown on the progress bar at the bottom of the dialog box.

Figure 4-2 Export Using Apply

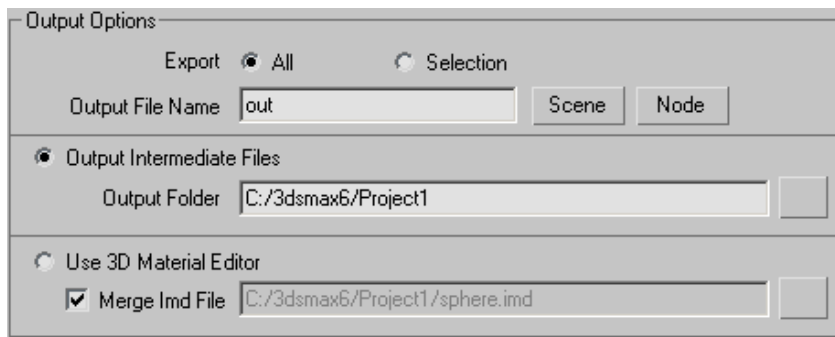


The option settings at the time of output will be recorded in 3ds Max as the current options (saved in the `max.n3es` file in the 3ds Max installation folder). It is also possible to save the option settings in the scene or import/export them as an `n3es` (NITRO 3D Export Settings) file. (Details are explained in section 4.3 Storing Option Settings in a Scene.)

4.2 Options

4.2.1 Output Options

These options relate to methods of outputting intermediate files.

Figure 4-3 Output Options

- **Export**

To output the entire scene, select **All**. To output only the selected node and those below it, select **Selection**.

If you select a model for which skinning has been applied and select **Selection**, nodes affected by the skinning will be output as exceptions.

- **Output File Name**

The intermediate filename (but not the extension) is set here. Do not use full-width characters or half-width kana characters.

If you click **Scene**, the current scene name is set. If you click **Node**, the selected node name (the node at the highest hierarchy level) is set. If you click **Node** without selecting a node, the name of the first node (in alphabetical order) is set.

- **Output Intermediate Files**

Select this if you want to output intermediate files to a specified folder. Specify the folder for the output intermediate files in the **Output Folder** box. Do not use kana characters.

- **Use 3D Material Editor**

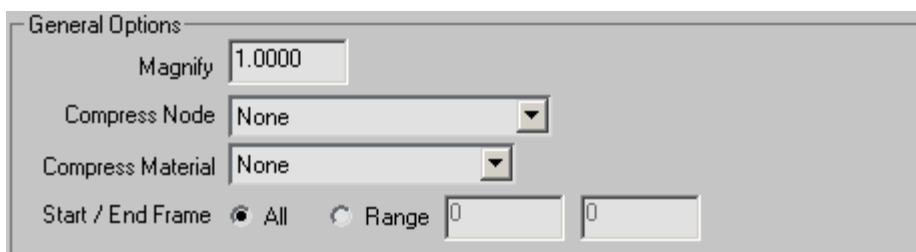
Select this to transfer intermediate file data to the 3D Material Editor. You cannot select both **Output Intermediate Files** and **Use 3D Material Editor** at the same time.

If you select **Merge Imd File** and specify the IMD file path name, the 3D Material Editor will automatically merge-load the specified IMD file after the data has been transferred. Do not use full-width characters or half-width kana characters in the IMD file path name.

For information on using the 3D Material Editor, see the *TWL-System 3D Material Editor*.

4.2.2 General Options

The following general options apply to all intermediate files.

Figure 4-4 General Options

- **Magnify**

The value that is multiplied with the model's vertex coordinates and Translate value.

- **Compress Node**

This specifies the node culling mode. By reducing the number of nodes, you ease the processing load for matrix calculations and use less memory.

Culling involves the nodes exported to the intermediate file and does not change data in 3ds Max.

Table 4-1 Object Culling Modes

Mode	Explanation
None	Nodes are not culled. The hierarchy structure created in 3ds Max is exported as is.
Cull Useless Node	Data is output after culling nodes unnecessary for model display. Effective for models that use skinning.
Merge Useless Node	<p>In addition to the Cull Useless Node process, nodes that can compose a matrix are so composed for export.</p> <p>This usually results in even fewer nodes than with just Cull Useless Node, but the following restriction applies to the Scale value.</p> <p>For nodes with children, you must configure a non-uniform Scale (that is, one where the Scale x, y, z values are not the same).</p> <p>The model may not display properly if you cull nodes and their children nodes that do not comply with this restriction.</p> <p>If the Scale value is animated, all frames must conform to the above restriction.</p>
Unite	<p>Objects are combined into a single object and all polygons are output in global coordinates. (The object takes the name <code>world_root</code>.)</p> <p>Polygons that belonged to separate objects (the IMD file's <code>polygon</code> elements) are output separately even if the material is the same.</p> <p>Do not select this mode when using character or visibility animation.</p>
Unite and Combine Polygon	<p>In addition to the Unite process, polygons with the same material are combined. However, polygons with vertex color will not be combined with polygons with no vertex color, even if the material is the same.</p> <p>This boosts display speed over Unite, but you lose the capacity for detailed clipping.</p> <p>Do not select this mode when you are using character or visibility animation.</p>

Note: If the node-culling disable flag is set for a node by the NITRO Set No Cut Node plug-in (see section 5.11 Setting the Node-Culling Disable Flag (NITRO Set No Cut Node)), then it will not be culled, even if you have selected Cull Useless Node or Merge Useless Node.

For details, see section 6.2 Node Culling Algorithms.

- **Compress Material**

Sets the material compression.

None specifies no compression. **Compress Same Material** specifies that all materials that have the same attributes are compressed for export as a single material. However, no compression takes place on materials configured for material color animation, texture pattern animation, or texture SRT animation.

If **Compress** has been set to **Don't compress** with the NITRO Set Material Attribute rollout, materials will not be compressed, even if **Compress Same Material** is specified.

- **Start / End Frame**

The range of animation (start frame to end frame) to export.

If **All** is selected, the entire range of animation in 3ds Max (Animation Start/End) will be output.

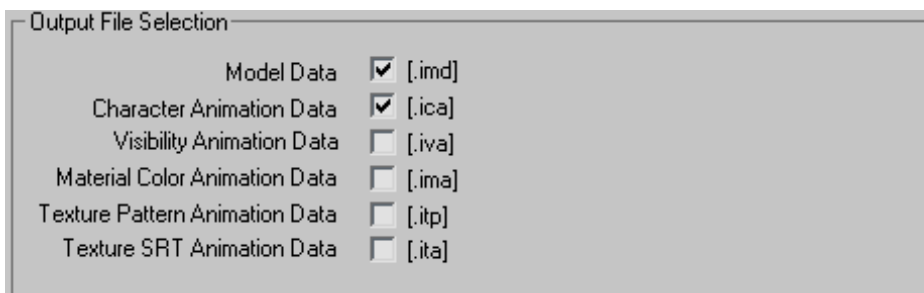
If **Range** is selected, the start and end frames can be specified by inputting a numeric value. However, if the input value for the start frame is smaller than the Animation Start frame in 3ds Max, the Animation Start frame will become the start frame. If the input value for the end frame is larger than the Animation End in 3ds Max, the Animation End frame will become the end frame.

If an attribute is animated, the value in the start frame will be output to the IMD file.

4.2.3 Output File Selection

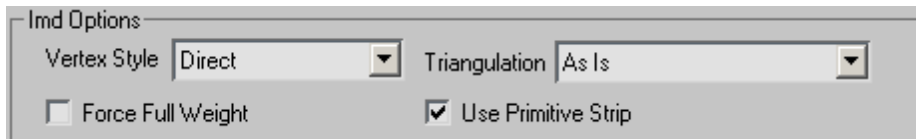
Select the check boxes to indicate which intermediate file types to export.

Figure 4-5 Output File Selection



4.2.4 IMD Options

These are the options for IMD files.

Figure 4-6 IMD Options

- **Vertex Style**

Sets the export format for vertex coordinates and vertex color.

Direct specifies direct output of vertex coordinates and vertex color values to the polygon element.

Index specifies that the vertex coordinate value matrix is output to the `vtx_pos_data` element and the vertex color value matrix is output to the `vtx_color_data` element. The index values for both these matrices are output to the polygon element.

The **Index** format is an extended format prepared for future use, when shape animation and vertex color animation can be supported. Normally, you should use the **Direct** format, which is optimized for the TWL and NITRO geometry commands.

- **Triangulation**

Specifies the type and placement of primitives that are exported to the IMD file.

If **As Is** is selected, objects in the scene are exported with a combination of triangles and quadrilaterals, as specified by the geometry of the object's model in 3ds Max. The primitive export shares a direct correlation with the triangles and quadrilaterals specified on a model by the Poly Object modifier in 3ds Max. For example, if you create a cube consisting of five faces as quadrilaterals and one face as two triangles using Poly Object, **As Is** will export five quadrilaterals and two triangles to the IMD file in the same orientation as set in 3ds Max. This option does not perform a check of quadrilaterals to make sure all four points of the primitive are coplanar and it does not check if the primitive's points form a lower order primitive (for example, triangle, line, or point).

If **As Is With Quad Checking** is selected, objects will be exported with the same combination of triangles and quadrilaterals that occurs with the **As Is** option, except in those cases where some quads contain four points that are not coplanar or four points that form a lower order primitive. Quads that meet one of these criteria will be exported as triangles to eliminate artifacts that occur when exporting quads with these conditions.

If **Generate Quads** is selected, objects will be exported as a combination of triangles and quadrilaterals, where the quadrilaterals are created algorithmically at export rather than at design time by an artist. The algorithm first turns each object's geometry into triangles and then traverses the geometry looking for coplanar triangles that can form quads. If two triangles are found that satisfy the condition for forming a quadrilateral, they will be combined into one quadrilateral. This algorithm does not take into account any quadrilateral placement set in 3ds Max (that is, with the PolyObject modifier). If specific placement of quadrilaterals is desired, use either the **As Is** or **As Is**

With Quad Checking option. Also keep in mind that if skinning is applied, forming quads with this option from skinned triangles can create artifacts on objects (such as missing polygons or quads).

If **All Tris** is selected, objects in the scene are exported as meshes made up entirely of triangles. No quadrilaterals will be exported, even if they are stored in 3ds Max.

- **Force Full Weight**

When this check box is selected, the object with the largest weighted value is forcibly exported with full weight (100% weight), even if the skinned model's vertex weight value is distributed among numerous objects. If multiple objects have the same weighted value, then the object that gets exported with full weight is the object with the smallest index when the **Compress Node** option is **None**.

When **Force Full Weight** is cleared, the weighted value for each object is exported as is.

- **Use Primitive Strip**

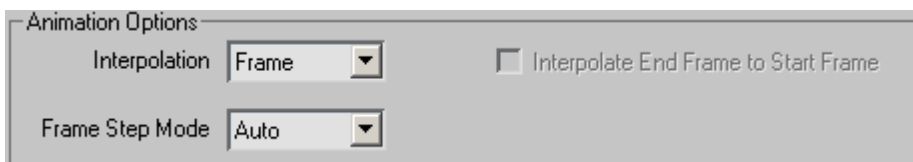
When this check box is cleared, polygon strips are not used, and polygons are output either as triangular or quadrilateral polygons.

When selected, triangular and quadrilateral polygon strips are used if possible, and output as triangular or quadrilateral polygons only the polygons that could not be made into strips. Selecting this setting allows for a reduced number of processing vertices.

4.2.5 Animation Options

The following options apply to animation in general.

Figure 4-7 Animation Options



- **Interpolation**

Interpolation specifies a method of animation playback that obtains values in decimal frames.

Specify **Frame** without discarding the decimal frames, so that decimal frames are rounded up to be handled as integer frames during playback. Specify **Linear** in order to use linear interpolation for the values in decimal frames.

With the G3D library included in the current version of TWL-System, it is possible to play in-between frames by setting interpolation to **Linear**. However, linear interpolation will slightly increase the CPU calculation process over **Frame**.

If animation data does not require setting interpolation to **Linear**, be sure to output with interpolation set to **Frame** to lighten the above-mentioned CPU processing load.

Note: As of October 2008, the G3D library supports only **Linear** for ICA files. IMA files and ITA files will play as **Frame**, even if **Linear** is specified. For information on the status of support for **Linear** with IMA and ITA files, see the *G3D Library Release Notes*.

As of October 2008, under the current version of the G3D library, **Linear** is supported only for ICA files. Even if **Linear** is set for an IMA file or ITA file, playback is the same as when **Frame** is specified. For the support status of **Linear** for IMA and ITA files, see the G3D library release notes.

- **Interpolate End Frame to Start Frame**

When this check box is selected, interpolation is conducted between the End frame and the Start frame, when animation is played with interpolation.

When cleared, the animation stops in the End frame state after the End frame.

- **Frame Step Mode**

Sets the extent of animation data culling.

1 = Do not cull; output the data from all frames

2 = Output the data from every other frame (this reduces data volume to 1/2 original)

4 = Output the data from every fourth frame (this reduces data volume to 1/4 original)

Auto = Output the data after determining the optimal amount of culling automatically for each animation curve, based on the settings of the Tolerance options

Table 4-2 Frames Output According to Frame Step Mode

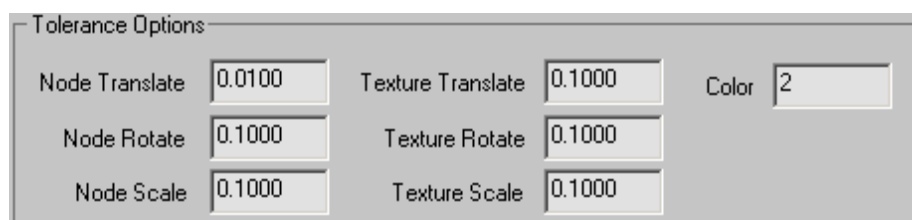
Frame Step Mode	Index of Frames to Output															
1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	0		2		4		6		8		10		12		14	15
4	0				4				8				12	13	14	15

When the cull number does not divide evenly into [total number of frames – 1], all remainder data is output.

4.2.6 Tolerance Options

These settings define the amount of error tolerance when optimizing animation data.

Figure 4-8 Tolerance Options



If the largest differences in values between the Start frame and other frames fall within the specified tolerance levels, then the animation values are considered to be uniform and only the Start frame value is exported.

These specified tolerances are also used as the yardstick for the error tolerance when the animation option **Frame Step Mode** is set to **Auto** and the decision regarding how much animation data to cull is determined automatically.

The amount of culling is determined so that the maximum number of errors from linear interpolation falls within the tolerance range specified here. A smaller error tolerance yields higher animation precision, but the amount of data increases because there is less culling.

- **Node Scale, Node Rotate, and Node Translate**

The error tolerance for the Scale, Rotate, and Translate values for character animation.

Node Rotate is expressed in units of degrees.

Node Translate sets the error tolerance for the value after being multiplied by Magnify.

- **Texture Scale, Texture Rotate, and Texture Translate**

The error tolerance for the Scale, Rotate, and Translate values for texture SRT animation.

Texture Rotate is expressed in units of degrees.

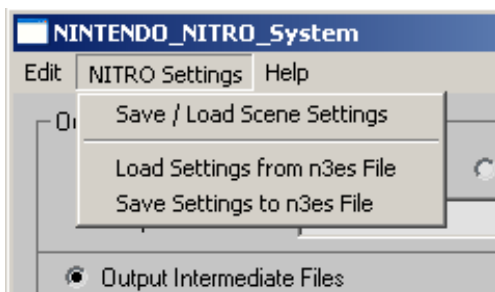
- **Color**

The error tolerance for the `diffuse`, `ambient`, `specular`, `emission`, and `polygon_alpha` values for material color animation.

4.3 Storing Option Settings in a Scene

Use the **NITRO Settings** menu in the Option window to store option settings in a scene and to import/export them as a N3ES (NITRO 3D Export Settings) file.

Figure 4-9 NITRO Settings Menu



When **Save / Load Scene Settings** is selected (default), the options that were set the last time intermediate files were output are saved in the max scene file when a scene is saved. These saved

option settings are loaded when the scene is opened. If the option settings are not saved in the scene data, the current option settings remain.

When **Save / Load Scene Settings** is not selected, the options that were set the last time intermediate files were output are not saved in the scene data. Also, the option settings are not loaded when the scene data is opened.

The state of **Save / Load Scene Settings** is saved in the `menusettings.bin` file in the 3ds Max installation folder.

4.3.1 Copying Option Settings to Another Scene

Select **Save / Load Scene Settings** and then open the scene from which you want to copy.

Select **Save / Load Scene Settings** and then open the scene to which you want to copy.

Select **Save / Load Scene Settings**.

Save the scene to complete copying.

4.3.2 Inputting and Outputting Option Settings as a n3es File

To output option settings to an n3es file, click **Save Settings to n3es File**. You can specify an output filename in the file selection window. If the output file's extension is not `.n3es`, `n3es` is added automatically.

To input option settings from an n3es file, click **Load Settings from n3es File**. You can specify an input filename in the file selection window.

4.4 Errors During Export

Error messages appear in a message box when errors occur during export operations. The following is an alphabetical list of errors that warrant special attention.

- **3D Material Editor is Not Found**

The 3D Material Editor has not been properly installed. If the `NNS_3DME_ROOT` environment variable is not set properly, fix it and restart 3ds Max.

- **All materials must be either "NITRO Standard" or "NITRO Morpher"**

The material type is not supported for export.

- **Can't export subdivision surface [node name]**

An HSDS or MeshSmooth subdivision modifier is applied to the node and cannot be exported.

- **Can't open file [file path]**

The file does not exist or cannot be opened.

- **Error reading IFL file: [ifl filename] applied to material: [material name]**

The IFL file cannot be correctly opened.

- **Failed to open texture on material [material name] at path: [texture file path]**

The assigned texture could not be loaded.

- **Failed to start 3D Material Editor**

Material Editor has output an error.

- **IFL File is incorrect**

The IFL file does not follow the IFL file format specification.

IGame.dll is missing from the 3ds Max root. Export cannot continue.

IGame.dll is not in the 3ds Max root folder. This file is required for exporting from 3ds Max.

- **Invalid n3es file [file path]**

The n3es file contents are invalid.

- **Invalid output folder**

The intermediate file output destination folder name is invalid.

- **Material name is empty**

The name of the material is blank.

- **Merge Imd File Path is empty**

The IMD file to be merged has no path.

- **Missing Morpher Diffuse Map**

The NITRO Morpher material is missing a diffuse map on one of its channels.

- **No effective node**

No valid object is exported. If you only want to output Dummy, use the NITRO Set No Cut Node plug-in to set the cut-disable flag. For details, see section 5.11 Setting the Node-Culling Disable Flag (NITRO Set No Cut Node).

- **No output file**

There is no intermediate file specified for output.

- **No nodes in the scene**

No nodes currently exist in the scene for export.

- **No texture image name [name]**

No texture has been specified in a material's diffuse slot.

- **Node name is empty**

The name of the node is blank.

- **Output filename is empty**

No output filename is specified.

- **Texture image missing in material [material name] at the path: [texture file path]**

The texture cannot be found on the disk assigned to a material for export.

- **Texture must be a bitmap**

The assigned texture map is not a bitmap image file.

- **Texture palette data is not identical [palette name]**

Two or more textures use palettes with the same name but with different palette data contents. If palette data contents differ, specify different palette names when creating TGA files (PIC files) with appended information.

- **Texture size over [texture name]**

The texture size has exceeded the limit that can be used on TWL and NITRO. Texture greater than 1024 texels for both height and width cannot be used by TWL or NITRO.

- **Wrong weighted vertices exist [node name]**

A vertex exists where the envelope weighted values do not total 100%. Correct the weighted values.

4.5 Warnings During Export

Warnings are displayed in the output window when they occur during export operations. The following is an alphabetical list of warnings that require special attention.

- **Can't export NURBS curve: [node name]**

The NURBS curve cannot be exported. Export as Null node.

- **Can't export NURBS surface: [node name]**

Convert the NURBS surface into a mesh before exporting it.

- **Exported material is not NITRO standard or NITRO Morpher and will be set to default parameters: [material name]**

Nodes with materials that are not NITRO Standard or NITRO Morpher materials are being exported. 3ds Max use is not recommended. Standard and Morpher materials will be set to the default values when exporting as NITRO Set Material Attributes options from the Material Editor.

- **Exported NITRO Morpher material contains textures of different sizes. ITP texture animation may not work as desired. Material: [material name]**

The textures specified in an ITP animation sequence do not share the same image dimensions, which can cause problems when viewing ITP animation.

- **Invalid end frame**

The final frame to be exported to an intermediate file is specified before the beginning frame in the tool.

- **Invalid start frame**

The beginning frame to be exported to an intermediate file is specified after the final frame in the tool.

- **Length of name over 16 characters [palette | texture | material | node] [name]**

A texture, material, node, or palette name being exported to IMD will exceed 16 characters.

- **Material “[material name]” is not of a supported material type and has been assigned a default material**

The specified material is not of the type NITRO Standard, NITRO Morpher, Multi/Sub Material, or Standard Material. A default material (the “dummy” material) will be assigned in its place.

- **Material name changed: [material name]**

There are several materials that are using the same name. The name of the material output to the intermediate file will be changed.

- **Mesh has no polygon**

The mesh does not have a polygon. Will be output as null.

- **Mtx_prim_size of <polygon> is over 1**

The value of IMD file <polygon> mtx_prim_size exceeds 1. This is generated by an envelope model which requires more than 31 matrices to render a polygon group.

Note: As of October 2008, it is not possible to display this type of IMD file with the G3D library included with TWL-System (that is, binary conversion is not possible). For information on the latest G3D libraries, see the *G3D Library Resource List*.

- **Multi texture is used. Use first texture only. [material name]**

Multi texture has been set.

- **Node name changed: [node name]**

Because several nodes with the same name exist, the node name output to the intermediate file has been changed.

- **No material color animation**

The IMA file export has been specified, but material color animation has not been set for export.

- **No Material on node “[node name]”**

Material is not attached to some objects. When this occurs, the plug-in automatically adds a default material to the intermediate file for export.

- **No texture pattern animation**

The ITP file export has been specified, but the texture pattern animation has not been set for export.

- **No texture SRT animation**

The ITA file export has been specified, but the texture SRT animation has not been set for export.

- **No visibility animation**

The IVA file export has been specified, but visibility animation has not been set for export.

- **Polygons of a higher order than quadrilateral were found on node [node name] and have been converted to triangles**

A node with polygons with over four vertices (for example, pentagons or hexagons) was exported. These polygons were converted to triangles and then exported.

- **Procedural texture is ignored on material: [material name]**

Procedural textures like checker and Gradient ramp will stop the file from exporting. Use **Render to Texture** located at **Rendering** → **Render To Texture** in the 3ds Max main menu to convert them to bitmaps and then output.

- **Same named texture file exist [texture name]**

The export filenames are the same but there are multiple texture files in different folders or with different extensions. If the folder or extensions for texture files are different, the texture files will be exported as separate textures even if filenames are the same. Be aware that `tex_image` will be exported multiple times with the same name.

- **Size of texture is wrong [texture name]**

The texture width or height is not a size used by TWL or NITRO (8, 16, 32, 64, 128, 256, 512, or 1024). The plug-in will automatically append the right edge or bottom edge with that texel color to make it a size that can be used by TWL and NITRO.

- **Skinning modifier applied to node "[node name]" with no bones attached**

A skinning modifier is applied to the specified node, but no bones have been associated with the mesh.

- **Texture height must be power of 2 for repeat / flip: Texture: [texture name]**

If the material's Tile V attribute or Mirror V attribute is on, the texture will not display properly if the image height is not 8 or a greater power of 2 (8, 16, 32, 64, 128, 256, 512, or 1024.). If this message occurs, change the texture's height or turn off the Tile V and Mirror V attributes.

- **Texture width must be power of 2 for repeat / flip: Texture: [texture name]**

If the material's Tile U attribute or Mirror U attribute is on, the texture will not display properly if the image width is not 8 or a greater power of 2 (8, 16, 32, 64, 128, 256, 512, or 1024). If this message occurs, change the texture's width or turn off the Tile U and Mirror U attributes.

- **The number of matrices for displaying the model is over 31** [`matrix size`]

The number of matrices necessary to render the model exceeds 31.

- **Total polygon and quadrilateral size over: Must satisfy formula:**

(`numPolys * 20 + numQuads * 24 <= 40960`)

The total number of triangles and quadrilaterals has exceeded the size of the TWL or NITRO polygon list RAM. This means you will not be able to display all of the polygons at the same time. The number of triangles and quadrilaterals must adhere to the formula in the warning.

- **Total polygon size over: [`num polys`] Polygons (Max 2048)**

The total number of polygons has exceeded the size of the TWL or NITRO polygon list RAM. This means you will not be able to display all of the polygons at the same time. The maximum number of polygons is 2048 triangles.

If triangles and quadrangles are mixed, the following condition must be met.

The number of triangles $\times 20$ + the number of quadrangles $\times 24 \leq 40960$.

- **Total quadrilateral size over: [`num quads`] Quadrilaterals (Max 1706)**

The total number of quadrilaterals has exceeded the size of the TWL or NITRO polygon list RAM. This means you will not be able to display all of the polygons at the same time. The maximum number of quadrilaterals is 1706.

- **Total vertex size over: [`num vertices`] Vertices (Max 6144)**

The total number of Vertex commands has exceeded the size of the TWL or NITRO vertex RAM (6144 vertices). This means you will not be able to display all of the polygons at the same time.

- **UV range over [`node name`] ([`material name`]) [`s`, `t`]**

The texture UV value (corresponds to the ST coordinate in the Nintendo DS) exceeds the TWL and NITRO limitations. The ST coordinate must be greater than or equal to -2048 and less than 2048.

- **Zero normal exist [`node name`]**

There is a normal vector that has a length of 0. This means that lighting will not perform correctly.

4.6 Batch Exporting Intermediate Files

4.6.1 Batch Export

Intermediate files for one or more scenes can be exported at once; this differs from opening and then exporting one scene at a time in 3ds Max.

This process is called a "Batch Export."

When a batch export is run, scenes will be sequentially loaded and exported to intermediate files as follows, according to the content in the N3BE file.

Batch export begins:

Scene 1: Load, then export intermediate file

Scene 2: Load, then export intermediate file

Scene 3: Load, then export intermediate file

...

Batch export ends.

4.6.2 How to Run a Batch Export

1. Prepare an N3BE file. An N3BE file specifies the scene to export, the intermediate file to export to, and the export conditions. Prepare it according to `NITRO_n3beFileFormat.pdf`, provided separately.
2. Run `nnsExport` in the **MaxScript Listener** window, using the prepared N3BE file as an argument
3. Open the **MaxScript Listener** window and enter the following.

```
nnsExport "C:\\sample.n3be" [Enter]
```

When the batch export has completed successfully, "true" will be displayed along with the following message.

```
Batch Export is finished. Total [number of scenes] scenes.
```

If there is a problem with the description in the N3BE file, "false" is displayed along with an error message, and then processing halts (finishes).

The primary error messages are as follows.

- Error: "****" is not specified. ("****" has not been specified)
- Error: "****" is wrong. ("****" is an invalid specification)

If an error related to intermediate files occurs during a batch export, "false" is displayed along with the following error message, and then processing halts (finishes).

```
Error: Failed to export
```

Error and warning content related to exporting intermediate files are output to the log file specified in the N3BE file.

4.6.3 Supplementary Items for Batch Export

An N3ES file is required for batch export

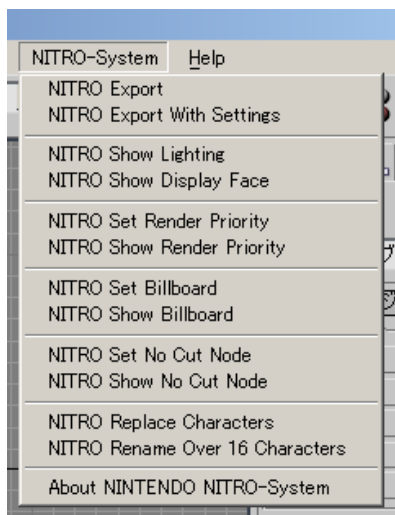
Specify an N3ES file in the N3BE file to specify the types of option settings to use when exporting intermediate files. Even if export option settings are saved in a scene file, they will not be accessed during a batch export; the settings in the N3ES file are always used.

5 Data Creation Plug-Ins

The Data Creation plug-ins assist the creation of data for TWL and NITRO.

They are mainly used on 3ds Max objects to configure and check attributes that are used for TWL and NITRO. With a few exceptions, Data Creation plug-ins are executed from the **NITRO-System** menu.

Figure 5-1 NITRO-System Menu



The following table lists data creation plug-ins.

Table 5-1 Data Creation Plug-Ins

Plug-In Name	Description
NITRO Set Material Attribute	Sets the TWL or NITRO attributes in a material (located in the material editor for NITRO Standard and NITRO Morpher materials).
NITRO Show Lighting	Checks lighting settings.
NITRO Show Display Face	Checks polygon display face settings.
NITRO Set Render Priority	Sets the polygon rendering priority.
NITRO Show Render Priority	Checks polygon rendering priority settings.
NITRO Set Billboard	Sets the billboard.
NITRO Show Billboard	Checks billboard settings.
NITRO Set No Cut Node	Sets the flag that disables node cutting.
NITRO Show No Cut Node	Checks the setting of the flag that disables node cutting.
NITRO Replace Character	Searches for and replaces element name strings.
NITRO Rename Over 16 Characters	Searches for and renames element names that exceed 16 characters.

5.1 Exporting the Scene (NITRO Export)

To perform a scene export using the same options that were set during the most recent export, selecting **NITRO Export** from the **NITRO-System** menu. If any intermediate files will be overwritten during export, a dialog box will appear asking whether to overwrite the files. An exception to this is if no N3ES settings file exists that holds information about the most recent export. In this case, **NITRO Export** behaves identically to the **NITRO Export With Settings** menu option defined below.

5.2 Exporting the Scene with NITRO Export Dialog Box (NITRO Export with Settings)

To cause the **NITRO Export** dialog box to appear where settings can be changed and the scene exported, select **NITRO Export with Settings** from the **NITRO-System** menu. If any intermediate files will be overwritten during export, a dialog box will appear asking whether to overwrite the files.

5.3 Setting Material Attributes (NITRO Set Material Attribute)

TWL and NITRO polygon attributes and the attributes for texture coordinates transformation and other modes are exported to the intermediate file as material attributes. These TWL and NITRO material attributes are configured for individual NITRO Materials. Setting or changing attributes is done by selecting a NITRO Material and then going down to the **NITRO Set Material Attribute** rollout.

Figure 5-2 NITRO Set Material Attribute Rollout

NITRO Set Material Attribute

Priority

☒ Don't Care
☐ Value
 1.0 1 (High Priority) - 255 (Low Priority)

Lighting

☒ Light0 ☐ Light1 ☐ Light2 ☐ Light3

☐ Use Specular Reflection Shininess Table
☐ Fog
☐ Wire Frame
☐ Depth Test for Decal Polygon
☐ Translucent Polygons Update Depth Buffer
☐ Render 1-pixel Polygon
☐ Far Clipping

Display Face

☒ Front Face ☐ Back Face ☐ Both Face

Polygon Mode

☒ Modulate ☐ Decal ☐ Toon / Highlight ☐ Shadow

Polygon ID: 0.0

Tex Gen Mode

☒ None ☐ TexCoord ☐ Normal ☐ Vertex

Tex Gen ST Source

☐ Polygon ☒ Material

Texture Effect Matrix

1.0	0.0
0.0	1.0
0.0	0.0
0.0	0.0

Compress

☒ Compress if possible ☐ Don't compress

☐ Loop IFL Texture Animation

The window displays the selected material's current settings. Select the appropriate items in the window to change different attributes. You can select a different material in the material editor to configure its attributes.

- **Priority**

Select either **Don't Care** (no rendering priority specification) or **Value** to set a numerical specification. If you specify a number, enter an integer from 1 to 255, and then press ENTER.

Polygons that belong to materials with lower numbers will be rendered first. If multiple materials have the same number, which material's polygons will be rendered first is indeterminate (it depends on the rendering routine).

- **Light0, Light1, Light2, Light3**

These specify the light that is modified when displayed in TWL and NITRO. It is not reflected in the 3ds Max display. The default for the Light0 check box is selected, and for Light1, Light2, and Light3 is cleared.

When any of these lights are selected, the normal data of the polygon that belongs to the material is output. When all of the lights are cleared, the normal data is not output.

- **Use Specular Reflection Shininess Table**

This specifies whether to use the **Specular Reflection Shininess Table** when calculating the specular components. The default for this check box is cleared.

When Light0, Light1, Light2, and Light3 are all cleared, this attribute cannot be changed and is output as Off in the intermediate file.

- **Fog**

This specifies whether to apply fog. The default is cleared.

- **Wire Frame**

This check box toggles wireframe display on and off. The default is cleared.

- **Depth Test for Decal Polygons**

This specifies whether to do a depth test for decal polygons. When selected, a depth test is performed for decal polygons. A fragment is rendered when its depth value fragment is the same as the depth in the depth buffer. When cleared, a normal polygon depth test is performed. A fragment is rendered when its depth is less than the depth in the depth buffer. The default is cleared.

Render decal polygons after the polygons on which they will be mapped.

- **Translucent Polygons Update Depth Buffer**

This specifies whether to update the depth buffer when rendering translucent polygons. The default is cleared.

- **Render 1-pixel Polygon**

This specifies whether to render one-pixel (dot) polygons. The default is cleared.

- **Far Clipping**

This specifies whether to do FAR clipping. When selected, polygons that intersect the far plane will be clipped. When cleared, polygons that intersect the far plane will be deleted. The default is cleared.

- **Display Face**

This specifies the polygon's display face, **Front Face** = Display the front face only, **Back Face** = Display the back face only, **Both Face** = Display both faces. The default is **Front Face**.

- **Polygon Mode**

Sets the polygon mode.

Modulate = Modulation mode, **Decal** = Decal mode, **Toon / Highlight** = Toon/highlight shading, **Shadow** = Shadow polygons. The default is **Modulate**.

- **Polygon ID**

Sets the polygon ID. Specify a value between 0 and 63. The default is 0.

- **Tex Gen Mode**

Sets the texture coordinates transform mode.

None = Do not transform the texture coordinates, **TexCoord** = TexCoord source, **Normal** = Normal source, **Vertex** = Vertex source. The default is **None**.

When performing environmental mapping, select **Normal**. When performing projection mapping, select **None**.

Even if the attribute is set to **None**, the data will be exported as **TexCoord** if the material is attached to a texture whose texture matrix is not a unit matrix. (If the mode is set to **Normal** or **Vertex**, the texture matrix will not affect what is exported.)

- **Tex Gen ST Source**

When the texture coordinate conversion mode is **Normal** or **Vertex**, specifies whether or not the texture coordinates of the corresponding polygons will be output.

Polygon outputs the texture coordinates of the polygons. You can use special mapping expressions, such as transformation of standard attached textures via normal vectors or vertex coordinates.

Material does not output the texture coordinates of the polygon. The texture coordinates are determined from the normal vector or the vertex coordinates. When performing general environmental or projection mapping, select **Material**.

The default is **Material**.

- **Texture Effect Matrix**

When the texture coordinate conversion mode is **Normal** or **Vertex**, this specifies a 4x2 matrix that influences the texture coordinate conversion. When performing environmental or texture mapping, this matrix can be used in adjusting the position, direction, and size of the texture.

Input a numeric value and press ENTER to convert the value to one that can be used with TWL and NITRO (a multiple of 1/4096). The following table describes each component of the matrix.

Table 5-2 Description of the Texture Effect Matrix Components

Influence of the X coordinate on the S coordinate	Influence of the X coordinate on the T coordinate
Influence of the Y coordinate on the S coordinate	Influence of the Y coordinate on the T coordinate
Influence of the Z coordinate on the S coordinate	Influence of the Z coordinate on the T coordinate
Amount of the S coordinate offset	Amount of the T coordinate offset

Note: A 4x4 matrix outputs an intermediate file, but since the third and fourth rows do not affect texture coordinate conversion, this matrix is effectively reduced to a 4x2 matrix where only the first and second rows can be configured.

When the **Tex Gen ST Source** is set to **Polygon**, the values in the fourth row have no effect.

Cautions regarding the G3D library provided in TWL-System

With the G3D library, the XYZ coordinates in the Texture Effect Matrix are as follows.

- **Environmental Mapping (Tex Gen Mode = Normal):** The coordinates when the normal vector is converted to a view-coordinate type.
- **Projection Mapping (Tex Gen Mode = Vertex):** The coordinates when vertex coordinates are converted to a world-coordinate type.

After applying these coordinates to the Texture Effect Matrix, the coordinates that were applied to the “Matrix for Aligning the Center and Position of the Mapping” and the “Texture Scale and Rotate Matrix Designated by the Material” become the final texture coordinates.

For environmental mapping, the fourth row of **Texture Effect Matrix** has no effect.

Environmental and projection mapping cannot display properly for the envelope model.

- **Compress**

This sets the flag indicating whether to compress when the **Compress Material** option is set to **Compress**.

Compress if possible = Compress if the attributes are the same as those of other materials. This is the default setting. Note that even when this setting is selected, the material will not be compressed if material color animation, texture pattern animation, or texture SRT animation has been configured.

Don't compress = Export as an independent material without compression, even if its attributes are the same as those of other materials.

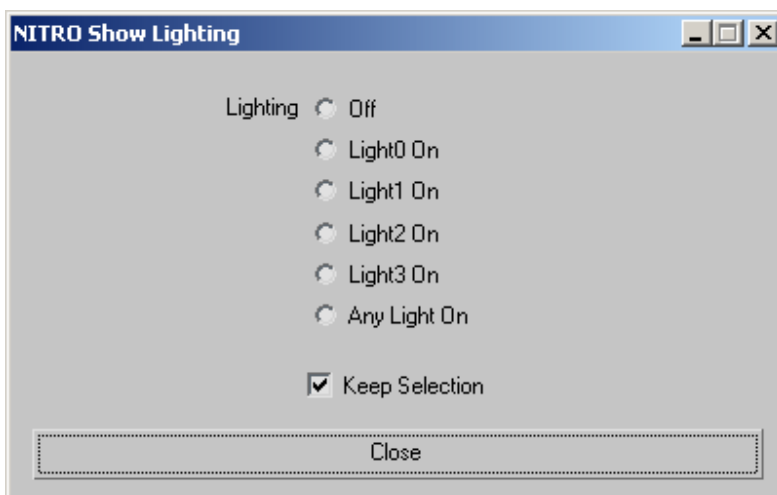
- **Loop IFL Texture Animation**

This check box toggles whether the original IFL animation will be looping or non-looping when exported to an ITP file. When this check box is selected, animation keys for the IFL animation will repeat until the animation ends. When this check box is cleared, the last keyframed texture will remain applied to the material from the point where it is applied until the end of the animation sequence. The default is cleared.

5.4 Check the Lighting (NITRO Show Lighting)

Execute by selecting **NITRO-System** → **NITRO Show Lighting**.

Figure 5-3 NITRO Show Lighting Dialog Box



When executed, a window appears. Click an option to select the objects that have materials set for that mode.

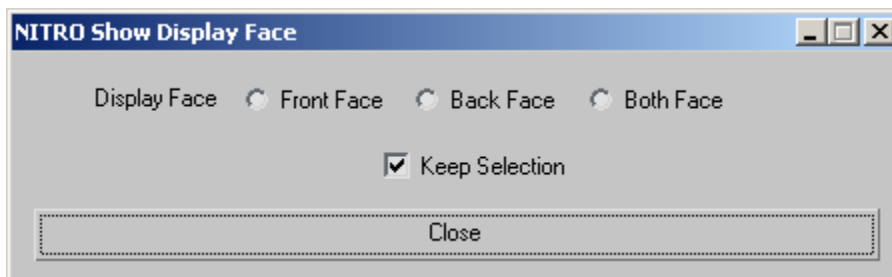
Off	Light is not modified
Light0 On	Light0 is modified
Light1 On	Light1 is modified
Light2 On	Light2 is modified
Light3 On	Light3 is modified
Any Light On	Any light on is modified

To maintain the pertinent polygons that belong to the materials in their selected state after the window closes, select the **Keep Selection** check box. When cleared, the selection state reverts to what it was before the execution of NITRO Show Lighting.

5.5 Check the Polygon Display Surface (NITRO Show Display Face)

Execute by selecting **NITRO-System** → **NITRO Show Display Face**.

Figure 5-4 NITRO Show Display Face Dialog Box



In the **NITRO Show Display Face** dialog box, select a **Display Face** option to display the polygons that belong to the materials with the selected state.

To maintain pertinent objects that belong to the materials in their selected state after the window closes, select the **Keep Selection** check box. When cleared, the selection state reverts to what it was prior to the execution of NITRO Show Display Face.

5.6 Polygon Rendering Priority Setting (Material Editor)

The **NITRO Set Material Attribute** rollout on the material editor sets polygon rendering priority for materials. For information on polygon rendering priority, see section 3.6.8 Polygon Rendering Priority.

Select a material in the material editor and scroll down to the **NITRO Set Material Attribute** rollout.

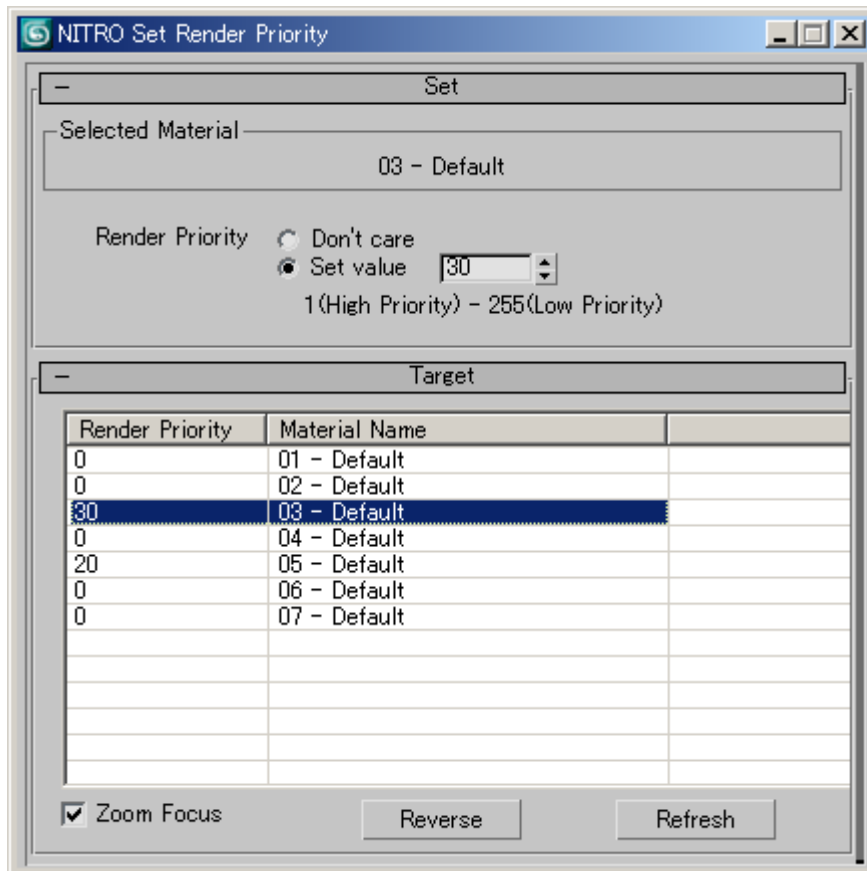
The rollout displays the current settings for the selected material under the Priority group box.

Select either **Don't care** (no rendering priority specification) or a numerical specification. If you specify a number, enter an integer from 1 to 255 and then press ENTER. Polygons that belong to materials with lower numbers will be rendered first. If multiple materials have the same number, which material's polygons will be rendered first is indeterminate (it depends on the rendering routine).

5.7 Polygon Rendering Priority Setting (NITRO Set Render Priority)

It is also possible to set the polygon rendering priority for multiple materials together.

Execute by selecting **NITRO-System** → **NITRO Set Render Priority**.

Figure 5-5 NITRO Set Render Priority Dialog Box

When you run the plug-in, the **NITRO Set Render Priority** dialog box opens. The names of the NITRO Standard or NITRO Morpher materials used in the scene are shown under **Target**.

Note: The search target materials are NITRO Standard and NITRO Morpher materials that are either attached to an object or contained in a multi-material.

The names of materials selected in the **Target** area (multiple selection is possible) are displayed under **Set**; these materials will be configured. If the content of a **Set** item is changed while its name is displayed in **Selected Material**, the content of the changed item will be applied. If multiple materials are selected, they will be changed simultaneously. However, settings will not be changed for unmodified items.

For **Render Priority**, click **Don't Care** (no rendering priority specification); or click **Set Value**, enter an integer between 1 and 255 and then confirm the value by pressing ENTER. The polygons associated with the material having the smallest value are rendered first. When this value is the same for multiple materials, the first polygon to render is undefined (it depends on the rendering routine).

Under **Target** you can re-sort the columns by clicking on the column headers. Click **Render Priority** to re-sort by rendering priority; click **Material Name** to re-sort alphabetically.

Selecting a material in the list will select objects displayed in the 3ds Max work view using that material. When a material is selected and the **Zoom Focus** check box (at the lower-left of the window) is also selected, objects placed outside of the work view will also be automatically displayed in the work view.

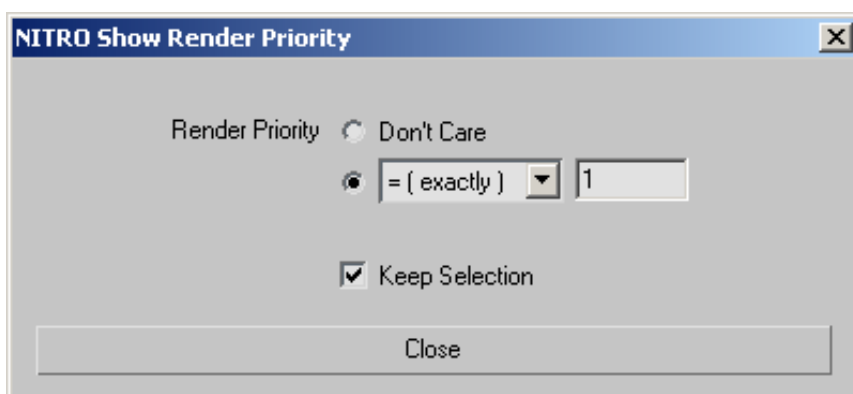
To invert the selection in the list, click **Reverse**.

To update the list content to the most recent state, or to update it after you add a material or open another scene, click **Refresh**.

5.8 Checking Polygon Rendering Priority (NITRO Show Render Priority)

Execute by selecting **NITRO-System** → **NITRO Show Render Priority**.

Figure 5-6 NITRO Show Render Priority Dialog Box



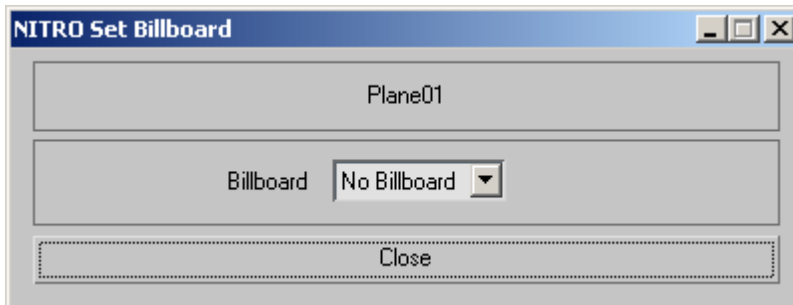
When you run the plug-in, **NITRO Show Render Priority** dialog box opens. If you select **Don't care** (do not specify rendering order) or a numerical specification, the relevant objects that contain materials with the specified priority criteria will be displayed as selected. You can set the following conditions: less than (< under), less than or equal to (<= below), equal to (= exactly), greater than or equal to (>= above), greater than (> over). You can use integers 1 through 255.

To maintain the pertinent objects that belong to the materials in the selected state after the window closes, select the **Keep Selection** check box. When cleared, the selection state reverts to what it was before the execution of **NITRO Show Render Priority**.

5.9 Setting the Billboard (NITRO Set Billboard)

Billboard is set for objects and bones using the NITRO Set Billboard plug-in. Note that the settings are not reflected in the 3ds Max screen.

Select an object or a bone (you can select multiple objects), and then select **NITRO-System** → **NITRO Set Billboard** to execute.

Figure 5-7 NITRO Set Billboard Dialog Box

The window shows the current settings of the selected object. If you have selected multiple objects, the window shows the settings of the first selected object.

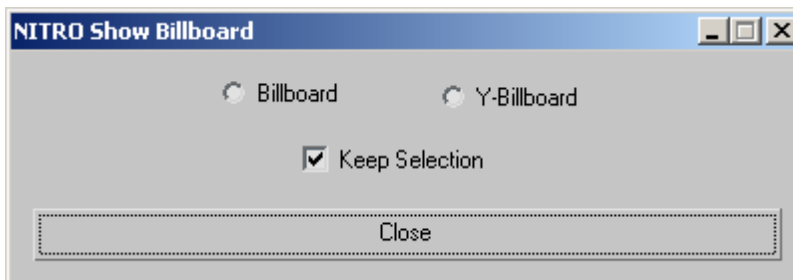
Click on the combo box to change the billboard mode. If multiple objects are selected, all selected objects can be changed at the same time.

No Billboard = No billboard, **Billboard** = Always display in the direction of the camera, and **Y-Billboard** = Display in the direction of the camera, centered along the global Y-axis.

You can set another node by selecting it without closing the window.

5.10 Checking the Billboard (NITRO Show Billboard)

Execute by clicking **NITRO-System** → **NITRO Show Billboard**.

Figure 5-8 NITRO Show Billboard Dialog Box

Click on a billboard mode in the window that opens up to display the objects and bones that have been set to that mode in the selected state.

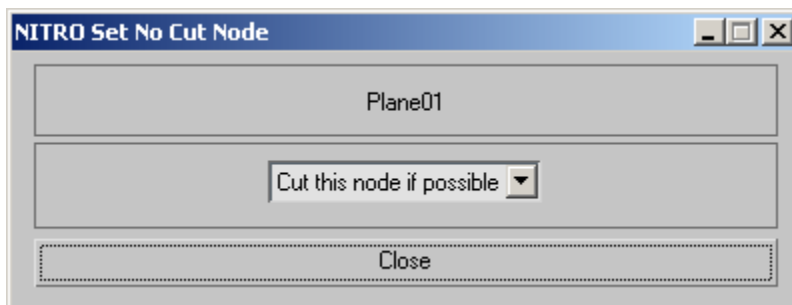
To maintain the pertinent objects in their selected state after the window closes, select the **Keep Selection** check box. When cleared, the selection state reverts to what it was prior to the execution of NITRO Show Billboard.

5.11 Setting the Node-Culling Disable Flag (NITRO Set No Cut Node)

The NITRO Set No Cut Node plug-in sets the flag for objects and bones so that even when the node-culling feature is enabled the objects are not culled when the intermediate file is output.

Select an object or a bone (you can select multiple objects) and then click on **NITRO-System** → **NITRO Set No Cut Node** to execute.

Figure 5-9 NITRO Set No Cut Node Dialog Box



The **NITRO Set No Cut Node** dialog box shows the current settings of the selected object. If you have selected multiple objects, the dialog box shows the settings of the last selected object.

Click the **Node** list arrow to change the flag that disables object culling. If multiple objects are selected, all selected objects can be changed at the same time.

- **Cut this node if possible** = When the node-culling feature is enabled, objects that can be culled are culled. This is the default setting.
- **Don't cut this node** = Do not cull objects even if the node-culling feature is enabled.

You can configure another node by selecting it without closing the window.

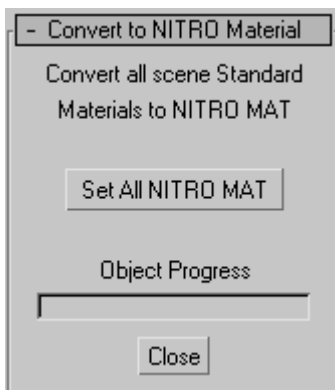
5.12 Checking the Node-Culling Disable Flag (NITRO Show No Cut Node)

Execute by selecting **NITRO-System** → **NITRO Show No Cut Node**.

When this executes, those objects and bones that have the flag that disables object culling set to **Don't cut this node** are shown in the selected state.

5.13 Using the NITROConvMat.ms script

Figure 5-10 NITRO Material Converter Script



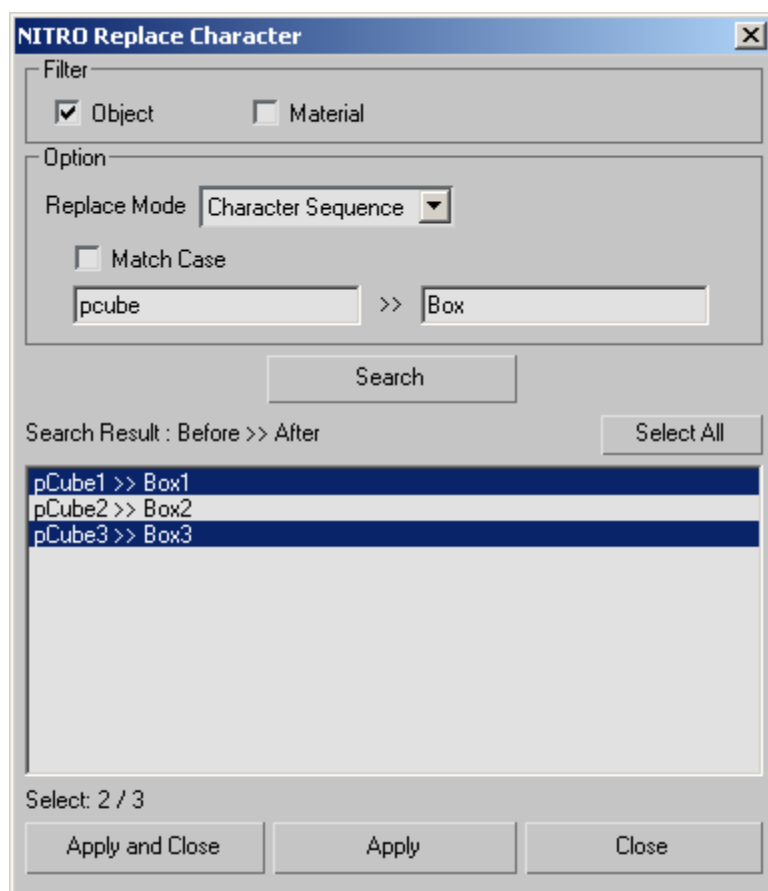
A script has been provided for converting Standard materials to NITRO Standard materials. To use the script, do the following.

1. Click the utilities sheet (it looks like a hammer) in 3ds Max and then click **MAXScript**.
2. In the **Utilities** combo box, locate **Convert to NITRO Material**. After you select the script, a new group should appear with the name **Convert to NITRO Material**.
3. Click **Set All NITRO MAT**. This will convert all the Standard materials used in the scene to NITRO Standard materials.

5.14 Replace Element Name Strings (NITRO Replace Character)

This plug-in collectively replaces element name strings (object name and material name). You can also change element name characters from capital to small characters or from small to capital characters.

To execute, select **NITRO-System** → **NITRO Replace Character**.

Figure 5-11 NITRO Replace Character Dialog Box

Select a **Filter** element type (you may select more than one).

Use **Option** → **Replace Mode** to select a replace mode.

- **Character Sequence**

This replaces the search string in the text box on the left with the replace string in the text box on the right.

To distinguish the case when the plug-in searches for elements that contain the search string, select the **Match Case** check box. When cleared, case is not distinguished.

To limit the search and to replace either the beginning or the end of the element name, use the following symbols at the beginning of the search string.

○ ^

Indicates the beginning of the element name. If you use only ^, the replace string will be appended before the target element name. For example:

[^cube] >> [box] will only change [cube] that is at the beginning of an element name to [box].

[^] >> [cube] will append the [cube] string in front of an element name.

- **\$**

Indicates the end of the element name. If you use only \$, the replace string will be appended at the end of the targeted element name. For example:

[test] >> [] will delete [test] from an element name that ends with [test].

[\$] >> [test] will append [test] at the end of an element name.

- **Small to Capital Letter**

Converts all small letters to capital letters.

- **Capital to Small Letter**

Converts all capital letters to small letters.

To list the results of the search (current element names and the element names after replacement) in the **Search Results** box, click **Search**.

From the list, select the element names that you want to replace (that is, they will also be selected by Max). Immediately after you click **Search**, all of the elements in the list will be selected.

To switch the select status of individual elements, press CTRL+Left-click.

To select all of the elements in the list, click **Select All**.

If an element name is not displayed in the **After** column, a blank replace string causes all of the characters in the filename to be deleted, an action that results in an element with no filename. These elements will not be replaced even if they are selected; you must redo the settings.

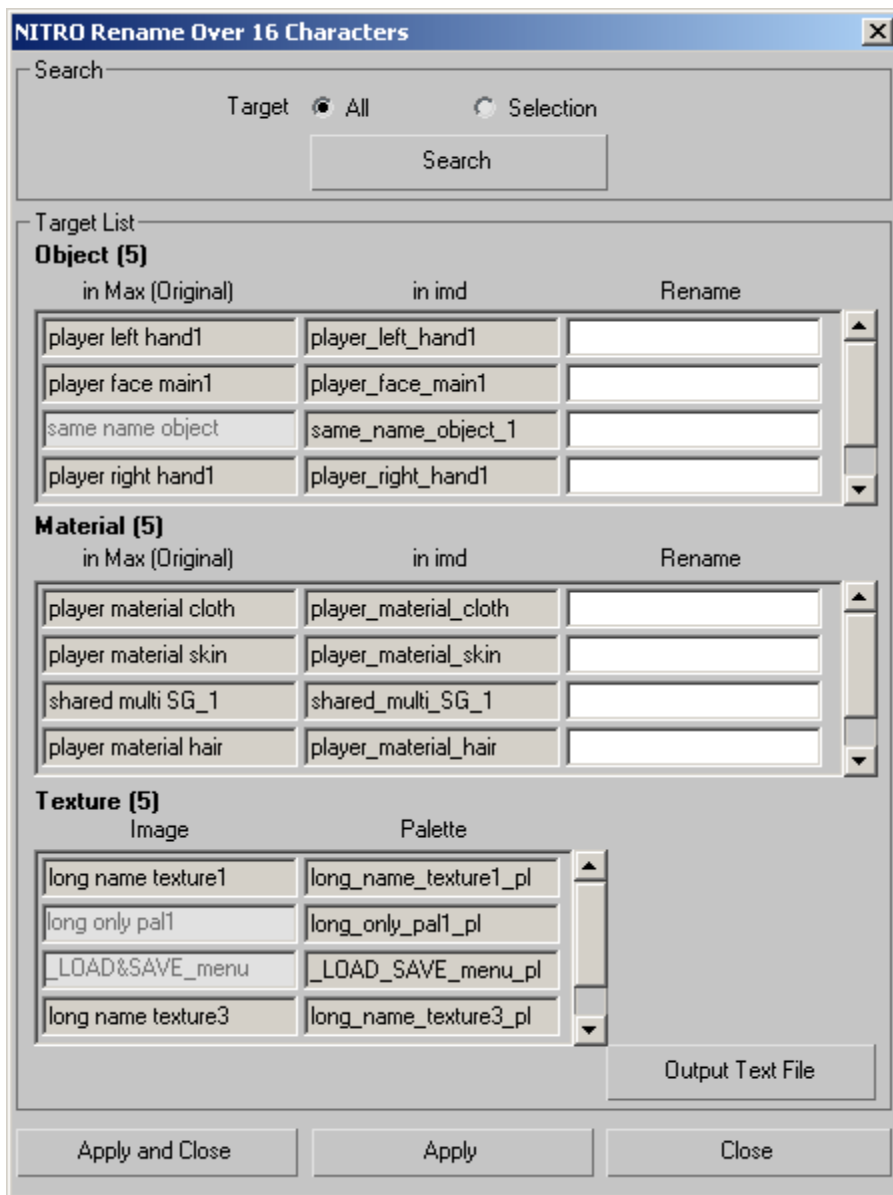
Replacement will happen when you click **Apply**. A Warning will appear if an element name is entered that cannot be used by 3ds Max.

Although an error or warning may appear if you click **Apply** while the Attribute Editor is open, the string will be properly replaced.

5.15 Rename Element Names That Exceed 16 Characters (NITRO Rename Over 16 Characters)

This plug-in searches for and renames the names of elements (object name, material name, texture image name, and texture palette name) that are to be exported to intermediate files when the name exceeds 16 characters. Note that texture image names and texture palette names cannot be changed.

To use this, select **NITRO-System** → **Rename Over 16 Characters**.

Figure 5-12 Rename Over 16 Characters Dialog Box

First, select the search **Target** option. If you are going to export an entire scene as intermediate files, click **All**. If you are going to export only an object and its sub-objects, click **Selection**.

Next, if the **Target** is **Selection**, use 3ds Max to select the export target nodes. You need not select objects if the **Target** is **All**.

To display a list of the elements to be exported to intermediate files whose names exceed 16 characters in **Target List** (that is, they will be selected in 3ds Max), click **Search**. The displayed results are for when the intermediate file export options **Compress Node** and **Compress Material** are set to **None**, and the option **Output Texture** is set to **Only Used**.

For nodes and materials, the **in Max** column lists the names as they are in 3ds Max, and the **in imd** column lists the filenames as they are in the intermediate file. The **Image** column lists the texture image names, and the **Palette** column lists the texture palette names. Items that do not exceed 16 characters appear in a light color. Placing the cursor over an item in the **Image** or **Palette** column in the Texture section displays the respective full path name in a pop-up window.

Next, type a new name in the **Rename** column. You cannot use the following.

- Names that cannot be used as 3ds Max node names
- Names that exceed 16 characters

To change the names, click **Apply**. Note that elements whose **Rename** names would become blank will not be changed. Entries whose names have changed will be selected in 3ds Max and removed from the **Target List**.

When you click **Output Text File**, the current **Target List** will be output as a text file. In the case of textures, the texture file path name will also be output. This feature is useful when, for example, you wish to later collectively revise texture filenames and texture palette names. It is also useful for other purposes such as confirming element names before and after changing.

6 Information for Programmers

6.1 Node Matrices in 3ds Max

3ds Max has two types of nodes that correspond to the IMD file's `node` element. These are the object and the bone.

With coordinates multiplied on the left, the transform node and bone node matrices are as follows.

$[S] * [R] * [T]$

[S] = Scale matrix

[R] = Rotate matrix ([X axis Rotate matrix]*[Y axis Rotate matrix]*[Z axis Rotate matrix])

[T] = Translate matrix

6.2 Node Culling Algorithms

6.2.1 Algorithm for the Cull Useless Node Specification

1. Cull the node if it does not have children and is not used to display the matrix (that is, the node is not used in the envelope). If the node has polygons, move them to the root node.
2. Repeat step 1 until there are no more nodes to cull.
3. Finally, if the root node `world_root` added by the plug-in has one child node, cull `world_root` as well and move any polygons held by `world_root` to its child node.

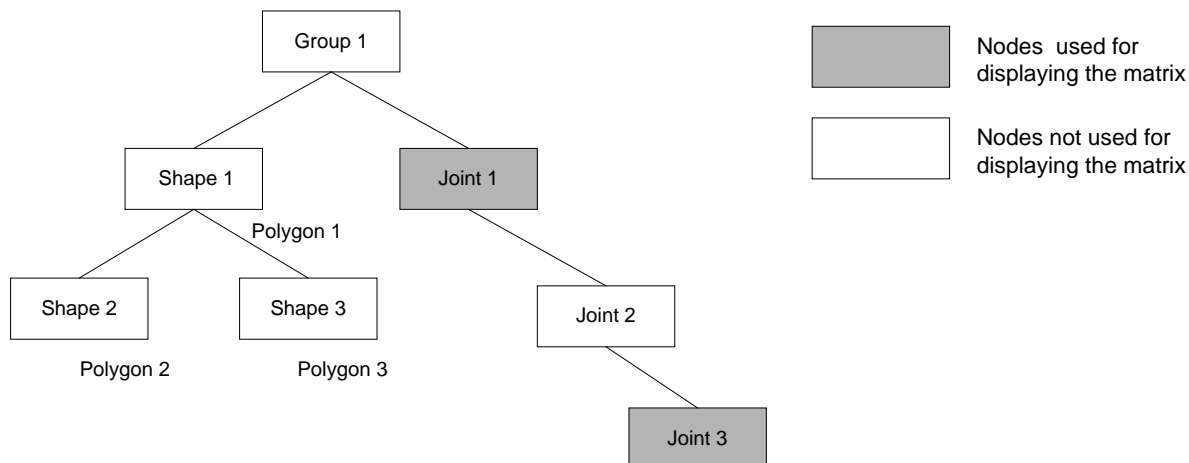
6.2.2 Algorithm for the Merge Useless Node Specification

1. Perform the same steps as the Cull Useless Node algorithm.
2. Look at the nodes that remain (other than the root node). If the matrix for a node's parent is not used for display, merge that node's matrix with its parent node matrix and cull the parent node. If that parent node has multiple child nodes, do this merging process for each child node. If the parent node has polygons, move those polygons to the root node.
3. Repeat step 2 until there are no more nodes to cull.
4. Finally, also cull the root node if it has one child node and its matrix is not being used for display. Move the root node's polygons to the child node.

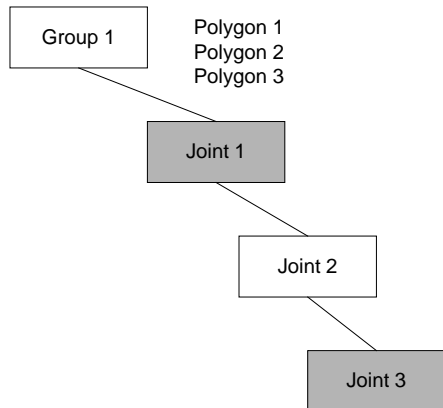
6.2.3 Examples of Node Culling

Figure 6-1 Examples of Node Culling

1 No node culling



2 Cull Useless Node

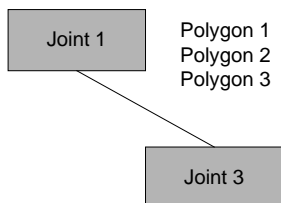


1. Shape 2, which does not have a child, is culled and polygon 2 is moved to group 1, which is the root node.

2. Similarly, childless shape 3 is culled and polygon 3 is moved to group 1.

3. Shape 1's children are gone, so it is culled too and polygon 1 is moved to group 1.

3 Merge Useless Node



1. Joint 2 is culled and its matrix is merged into joint 3.

2. Group 1 is culled and its matrix is merged into joint 1. Polygons 1, 2, & 3 are moved to joint 1.

6.3 Texture Matrices in 3ds Max

The source code in Code 6-1 shows the method used to create the TWL and NITRO texture coordinate transformation matrix from the texture Scale, Rotate, and Translate values exported from 3ds Max.

Code 6-1 Texture Matrix

```
// For this texture matrix, the Scale values of ST are uTiling, vTiling
// The Rotate value is theta, sin(theta) is sinTheta, cos(theta) is cosTheta
// The Translate values of ST are uOffset, vOffset
// And the Texture's image width is texWidth (original width of tex_image)
// The Texture's image height is texHeight (original height of tex_image)
// FLIP_U indicates that the S axis is mirrored
// FLIP_V indicates that the T axis is mirrored

MtxFx44          aMtx, bMtx, cMtx, texMtx;
fx32             cosTheta, sinTheta;

//translate by -0.5 in both U and V directions
MTX_Identity44(&aMtx);
aMtx.m[3][0] = -FX32_HALF * texWidth;
aMtx.m[3][1] = -FX32_HALF * texHeight;

//apply texture translation
aMtx.m[3][0] += -uOffset * texWidth;
aMtx.m[3][1] += vOffset * texHeight;

//apply rotation
sinTheta = FX_SinIdx(theta);
cosTheta = FX_CosIdx(theta);
MTX_RotZ44(&bMtx, sinTheta, cosTheta);
MTX_Concat44(&aMtx, &bMtx, &cMtx);

//apply scale
MTX_Scale44(&aMtx, uTiling, vTiling, 0);
MTX_Concat44(&cMtx, &aMtx, &texMtx);

//translate back by 0.5 in both U and V directions
texMtx.m[3][0] += FLIP_U ? FX32_ONE * texWidth : FX32_HALF * texWidth;
texMtx.m[3][1] += FLIP_V ? 0 : FX32_HALF * texHeight;

// uTile, vTile, sinTheta, cosTheta, uOffset, vOffset are 12-bit fixed-point
decimals
// texWidth and texHeight are integers with no decimal
```

6.4 Custom Attributes

The Intermediate File Export Plug-in uses a number of additional attributes. Attributes with names beginning with `Nns_` are set by executing the plug-in in NITRO-System. Attributes allocated to other materials can be checked through the NITRO Set Material Attribute.

Table 6-1 List of Custom Attributes

Type	Target	Attribute Name	Attribute Type	Meaning of Values
Light0 enable flag	Material	light_0	bool	0 = Not affected by Light0 1 = Affected by Light0
Light1 enable flag	Material	light_1	bool	0 = Not affected by Light1 1 = Affected by Light1
Light2 enable flag	Material	light_2	bool	0 = Not affected by Light2 1 = Affected by Light2
Light3 enable flag	Material	light_3	bool	0 = Not affected by Light3 1 = Affected by Light3
Specular Reflection Shininess Table enable flag	Material	specularTblOn	bool	0 = Does not use Specular Reflection Shininess Table 1 = Use Specular Reflection Shininess Table
Fog enable flag	Material	fogOn	bool	0 = Does not apply fog 1 = Apply fog
Wireframe display flag	Material	wireFrame	bool	0 = Wire Frame display ON 1 = Wire Frame display OFF
Decal polygon depth test flag	Material	depthTestDecal	bool	0= Does not do depth test for decal polygons 1= Does depth test for decal polygons
Translucent polygon depth value update flag	Material	transUpdateDepth	bool	0= Does not update depth buffer when rendering translucent polygons 1= Updates depth buffer when rendering translucent polygons
1-dot polygon rendering flag	Material	render_1Pixel	bool	0= Does not render 1-dot polygons 1= Renders 1 dot polygons
FAR clipping flag	Material	farClipping	bool	0= Deletes if intersects FAR plane 1= Clips if intersects FAR plane
Polygon ID	Material	polyID	short	Polygon ID value (0—63)

Type	Target	Attribute Name	Attribute Type	Meaning of Values
Polygon's display face	Material	displayFace	enum	0 = Display front face 1 = Display back face 2 = Display both faces
Polygon mode	Material	polyMode	enum	0 = Modulation mode 1 = Decal mode 2 = Toon / Highlight shading 3 = Shadow polygon
Texture coordinates transform mode	Material	texGen	enum	0 = Do not transform texture coordinates 1 = TexCoord source 2 = Normal source 3 = Vertex source
Texture coordinate output flag for when the texture coordinate conversion mode is Normal or Vertex	Material	texGenST	enum	0 = Output polygon's texture coordinates 1 = Do not output polygon's texture coordinates.
Matrix that affects texture coordinate conversion	Material	tex_effect_mtx_0_0 tex_effect_mtx_3_1	matrix	4x4 matrix
Material compression-disable flag	Material	comPress	bool	0 = Compression OK 1 = No compression
Use polygon rendering priority flag	Material	priorityRadio	bool	0= Does not use rendering priority (Don't care) 1= Uses rendering priority
Polygon rendering priority	Material	priorityValue	short	Rendering priority value (1-255)
Billboard	Node	Nns_billboard	enum	No_Billboard = None Billboard = Billboard Y-Billboard = Y-axis billboard
Node culling-disable flag	Node	Nns_no_cut	bool	False = Culling OK True = Do not cull
IFL animation loop flag	Material	iflLoop	bool	False = Do not loop animation True = Loop animation

7 Known Bug List

1. Version 1.4.2 of the plug-in allows four lights to be turned on or off individually per material. Previous versions allowed only Light0 to be turned on or off. If an older version of the plug-in is used to turn lighting off for a material and then the plug-in is upgraded to the current version, the material's light setting will not reflect the old version's settings when the scene is loaded again. If an old scene with lighting turned off is loaded with the new plug-in, Light0 will be turned on by default. To remove lighting from the scene in this case, turn off all the lights; lighting will be as it was for the old scene.
2. If the 3ds Max files that were created with version 1.4.2 are loaded without saving the file and "NITRO Set Material Attribute" is rolled out, the program will crash with an error message. You can workaround this by re-saving the 3ds Max file with version 1.6.0 of the plug-in.
3. In version 1.5.0 of the plug-in, if the Priority setting of a material is set to a desired value, saved, and then the scene containing that material is loaded with version 1.6.0 of the plug-in, the priority value will revert to the default value of Don't Care. To retain the desired value, set the priority and resave the scene with version 1.6.0.
4. A problem may occur when skinned models are exported from a 3ds Max file that contains a unit system different from the unit system currently set in 3ds Max. When the file is opened and the 3ds Max unit system is converted to that of the file, some scaling transformation issues can occur. This is a bug in 3ds Max and can cause exported data to be incorrect in the intermediate files.

To work around this bug, do the following:

- (a) Open your MAX scene file and adopt the MAX file's unit system if prompted to do so.
- (b) Select all of the bones in the scene.
- (c) From the 3ds Max main menu, select **Character** → **Bone Tools** to open the **Bone Tools** window.
- (d) Expand the **Object Properties** rollout on the **Bone Tools** window and clear the **Bone On** check box under the **Bone Properties** group box.
- (e) Resave the file as a new MAX file.
- (f) Load the new MAX file.
- (g) Select **Utility Panel** → **More** → **Rescale World Units** and then click **Rescale**. Rescale the scene by the amount needed to transform the unit system into the system unit you desire. (For example, if your current scene is centimeters and the file's unit system is inches, you need to scale the scene by 2.54 to achieve the desired result.)
- (h) Select the mesh, go into the Skin modifier panel, and then under the **Advanced Parameters** rollout, clear and then select the **Always Deform** check box.
- (i) Save the scene and export.

5. When two or more biped objects are exported from a single scene, the biped objects will move to the wrong location after output. To avoid this issue, output no more than one biped object per scene.

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